Fort Hall Mine Landfill
1500 North Fort Hall Mine Road
Pocatello, Idaho

FINAL

2023 Spring Semiannual Cell 1, 2, and 4 Groundwater Monitoring and Remediation System Operation and Maintenance Report

PREPARED FOR:
Bannock County Public Works
5500 South Fifth Avenue
Pocatello, Idaho 83204

PREPARED BY:
CDM Smith
560 North Park Avenue, Suite 300
Helena, Montana 59601

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Acronyms and Abbreviations

amsl	above mean sea level
bgs	below ground surface
CAS	compliance agreement schedule
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
City	the City of Pocatello
cm/s	centimeter per second
CO	Consent Order
COC	chemical of concern
CSM	conceptual site model
DO	dissolved oxygen
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
foot/foot	foot per foot
feet/day	feet per day
FHML	Fort Hall Mine Landfill
GCL	geocomposite clay liner
gpm	gallons per minute
HDPE	high-density polyethylene
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDGW	Idaho Groundwater Rule
IDWR	Idaho Department of Water Resources
J	estimated result
LCL	lower confidence limit
LCS/LCSD	laboratory control sample/laboratory control sample duplicate
LFG	landfill gas
LPRV	Lower Portneuf River Valley
MCL	maximum contaminant level
MDL	method detection limit
µg/L	micrograms per liter
µS/cm	microSiemen per centimeter
mg/L	milligram per liter
MS/MSD	matrix spike/matrix spike duplicate
MSW	municipal solid waste
MW	monitoring well
O&M	operations and maintenance
ORP	oxidation-reduction potential
%	percent
Paragon	Paragon Consulting, Inc.
PCA	principal component analysis
PCB	polychlorinated biphenyl
PCE	tetrachloroethene

PVA	Portneuf Valley Aquifer
QAPP	quality assurance project plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RL	reporting limit
RPD	relative percent difference
RW	remediation wells
S	summation statistic
S/D	shallow/deep (well)
SOP	standard operating procedure
SVOC	semivolatile organic compound
2,3,7,8-TCDD	2,3,7,8-tetrachloro-p-dibenzodioxin
TCE	trichloroethene
TOC	total organic carbon
trans-1,2-DCE	trans-1,2-dichloroethene
UJ	estimated nondetect result
UCL	upper confidence limit
UPL	upper prediction limit
VC	vinyl chloride
VOC	volatile organic compound

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Section 1

Introduction

CDM Smith implemented groundwater sampling at select monitoring wells and remediation system extraction wells at the Fort Hall Mine Landfill (FHML) during the spring 2023 sampling events (April 11 through 15 and May 15 through 19, 2023) under Amendment No. 1 to Task Order No. 11 of the Bannock County Master Services Agreement contract executed July 24, 2018. CDM Smith presented the sampling results in this groundwater monitoring report to satisfy monitoring requirements associated with the following:

- Idaho Department of Environmental Quality (IDEQ) Consent Order (CO) pursuant to the Idaho Environmental Protection and Health Act, Idaho Code §39-101 et seq. and the Idaho Solid Waste Facilities Act, §39-7401 et seq., to address chemicals of concern (COCs) (e.g., trichloroethene [TCE] and tetrachloroethene [PCE]) known to originate in Cell 1, the historical landfill operated before land disposal regulations were promulgated.

- IDEQ Compliance Agreement Schedule (CAS) pursuant to the Idaho Environmental Protection and Health Act, Idaho Code §39-101 et seq. and the Idaho Solid Waste Facilities Act, §39-7401 et seq., to bring FHML into compliance with Idaho Code §39-7401 and the Subtitle D requirements in Title 40 Code of Federal Regulations (CFR) Part 258 et seq. for monitoring of municipal solid waste (MSW) landfills (Criteria for Municipal Solid Waste Landfills, 40 CFR, §258, Subpart E, Appendices I and II, Federal Register Volume 56, Issue 196 [October 9, 1991]).

The groundwater sampling was completed under the *Final Fort Hall Mine Landfill, Groundwater Monitoring Program Plan Quality Assurance Project Plan* (QAPP), dated May 25, 2021 (CDM Smith 2021b). A summary of planned sampling is provided in **Appendix A**.

1.1 Purpose of Report

CDM Smith conducted the spring 2023 groundwater sampling event in accordance with the current CO and CAS between Bannock County and IDEQ. To comply with both the remedy performance monitoring for Cell 1 and the Resource Conservation and Recovery Act (RCRA) monitoring requirements for Cells 2 and 4, samples were collected from the Cell 1, 2, and 4 monitoring wells, and select offsite monitoring wells.

The purposes of this report are the following:

- Present analytical and field data that were collected during the spring 2023 groundwater sampling event.

- Update PCE and TCE groundwater plume extents and groundwater elevation potentiometric contour maps for the FHML Cell 1 source area and downgradient plume.

- Evaluate the current remediation system performance.

- Report operations and maintenance (O&M) activities for the remediation system.
- Update COC trend data and statistical analysis of COC trends.
- Provide the status of RCRA compliance monitoring at Cells 2 and 4 and the statistical analysis of detected parameters from Appendices I and II of 40 CFR, §258 Criteria for Municipal Solid Waste Landfills (Federal Register 1991) against background levels and promulgated standards.
- Provide recommendations for operating the groundwater treatment system.

1.2 Report Organization

This report is organized into the following sections:

1.0 Introduction: This section describes the purpose and organization of the report and provides a summary of site background information and the conceptual site model (CSM), which includes the site location, sources of contamination, geologic and hydrogeologic framework, nature and extent of contamination, and a description of the remediation system.

2.0 Field Activities: This section presents a summary of the spring 2023 sampling activities and analysis, including private property notifications, groundwater sampling and analysis, decontamination and handling of investigation-derived waste, and deviations from the QAPP (CDM Smith 2021b). This section also summarizes the remediation system O&M, including well rehabilitation and equipment replacement.

3.0 Groundwater Monitoring Results: This section presents the results of the spring 2023 groundwater sampling activities and summarizes data quality and usability, potentiometric surface data, groundwater analytical results, and the performance of the remediation system.

4.0 Groundwater Data Analysis: This section presents the current nature and extent of the FHML TCE and PCE plumes and an updated evaluation of the COC trends and statistical analyses.

5.0 Conclusions and Recommendations: This section presents the conclusions of the data analysis and provides recommendations according to the decision criteria developed in the QAPP (CDM Smith 2021b) for treatment system maintenance activities at FHML.

6.0 References: This section presents references used to prepare this report.

The following appendices are also included:

Appendix A – Sampling Plan

Appendix B – Field Documentation

Appendix C – Spring 2023 Groundwater Analytical Data

Appendix D – Data Usability Assessment Report

Appendix E – Laboratory Reports (Data Packages)

Appendix F – VOCs, Geochemistry, and Inorganics Trend Charts

Appendix G – Statistical Methods, Approach, and Analysis

1.3 Background

The following sections briefly describe the site history and CSM, which are described further in the QAPP (CDM Smith 2021b). These sections include brief descriptions of the site location and history, sources of contamination, the geologic and hydrogeologic framework, previous investigations, and ongoing remediation system operations.

1.3.1 Site History and Description

FHML is located on North Fort Hall Mine Road in Bannock County, Idaho, approximately 7 miles southeast and hydrologically upgradient of Pocatello, Idaho (**Figure 1-1**). The landfill is alternately known as the Fort Hall Canyon Landfill or Bannock County Landfill (IDEQ 2016a), and it has received hazardous and nonhazardous waste since 1943.

1.3.1.1 Landfill Construction and Use

FHML currently consists of four cells, as shown in **Figure 1-2** (IDEQ 2016a). Cell 1 is closed and unlined and has historically received hazardous waste. Cells 2 and 4 are lined and currently receive waste under RCRA Subtitle D regulations. Cell 3 began operations around 1993 and receives construction and demolition waste (IDEQ 2016a).

Cell 1 received domestic and MSW, construction and demolition debris, and unknown commercial and industrial waste during active operation from 1943 to 1993 (Brown and Caldwell 1992; Maxim 2000a, 2000b). There is no leachate collection system for Cell 1, but a final cover was installed in 1993 (Maxim 2000b). In 2012, landfill gas (LFG) extraction wells and associated piping were installed (Paragon Consulting Inc. [Paragon] 2015).

Cell 1 started operating in 1943 as an unpermitted valley-fill dump. No information is available regarding landfill base construction, but because of the nature of the dump, it is assumed that no base preparation was constructed. Based on LFG collection system record drawings for wells in the Old Landfill Well Field (Paragon 2015) and discussions in the geotechnical investigation for the LFG-to-energy project (American Geotechnics 2012), the thickness of waste in Cell 1 varies from minimal (less than 5 feet) at the fill area edges to greater than 85 feet. Based on observations from the LFG extraction well installations, the bottom of waste ranges from approximately 4,900 feet above mean sea level (amsl) in the southern and central portions of the cell to approximately 4,730 feet amsl in the northern and western portions. Cell 1 area encompasses approximately 60 acres (**Figure 1-2**).

Landfill operations in Cell 1 ceased in 1993. Based on closure plans provided in the *Final Revisions to Preliminary Engineering Report, Bannock County, Idaho* (Brown and Caldwell 1993), the landfill was proposed to be closed with a cover consisting of 12 inches of onsite loess material excavated from the Cell 2 area followed by an 18-inch barrier layer of compacted fill with a permeability of less than or equal to 10^{-5} centimeters per second (cm/s). The barrier layer was to consist of 12 inches of soil plus another 6 inches of topsoil. The cover was designed to prevent, via evapotranspiration, approximately 90 percent (%) of precipitation from infiltrating the cover during a normal precipitation and evaporation year (Brown and Caldwell 1993). No as-built information was available regarding the actual placement of the Cell 1 cover.

Cell 2 began operating in 1993 and currently receives compost and MSW as a Subtitle D cell, complete with a leachate collection system that gravity drains to a collection pond (IDEQ 2016b). Under RCRA, assessment-level monitoring is currently required at Cell 2. In 2012, LFG extraction wells were installed (Paragon 2015).

The Cell 2 area is approximately 24 acres (**Figure 1-2**). The first phase of Cell 2 (Phase 1A-P1) was constructed in 1993 and began receiving waste shortly thereafter. Cell 2 was constructed under the Subtitle D regulations. According to the *Preliminary Engineering Report* (Brown and Caldwell 1993), the landfill base was constructed with a 60-millimeter high-density polyethylene (HDPE) membrane liner above 2 feet of compacted soil with a permeability less than or equal to 10^{-7} cm/s. There is a 2-foot-thick sand/gravel drainage layer above the liner that directs leachate to the leachate collection system. A heavy nonwoven geotextile was placed between the liner and the drainage layer (Maxim 2000a). This liner design was used for the first two phases (1A-P1 and 1A-P2) of the Cell 2 landfill (Maxim 2003).

Reportedly, during construction of the 1A-P1 landfill, the liner was ripped during placement of the leachate drainage layer. The rip was repaired during construction of the 1A-P2 landfill by placing the 1A-P2 liner over the ripped area and welding to the 1A-P1 liner below the rip (Maxim 2000a).

An alternative liner demonstration was submitted in 2000 for Phase 3 (1A-P3) construction (Maxim 2000a). The alternative liner demonstration recommended the use of a 0.25-inch geocomposite clay liner (GCL) as a replacement for the 2 feet of compacted soil below the HDPE liner. The GCL is reported to have a hydrated hydraulic conductivity of approximately 5×10^{-9} cm/s (Maxim 2000a). IDEQ approved the alternative liner prior to construction of the Phase 3 expansion (1A-P3) (elevation from 5,110 to 5,150 feet amsl). The alternative liner is reported to be constructed with 1 foot of compacted silt or native soil, GCL, 60-millimeter textured HDPE, a nonwoven geotextile, and 1.5 to 2 feet of well-graded sand (Maxim 2003). The Phase 4 expansion (1A-P4) was constructed with the same alternative liner as Phase 3 (1A-P3).

Leachate in the Cell 2 landfill is collected via a gravity drain system. The leachate collection system gravity drains from the cell sump to the Cell 2 lined leachate collection pond. Based on hydrologic evaluation of landfill performance models completed by Brown and Caldwell during the Cell 2 design, leachate generation is anticipated to be minimal (between zero and 100,000 gallons per year) (Brown and Caldwell 1993). Leachate that discharges to the Cell 2 leachate pond is managed by evaporation. According to Bannock County personnel, during higher-than-normal precipitation, excess generated leachate is pumped from the leachate pond and reapplied to the Cell 2 landfill working areas for promotion of LFG generation and dust control. Current monthly leachate generation estimates are unknown.

As originally designed, Cell 2 was intended to operate through 2012; however, evaluation of the side slopes indicated that substantial permitted airspace was not being used. Recovery of the unused airspace extended the landfill life. Further slope stability and capacity analysis performed by Paragon indicated that the final landfill elevation buildout could be increased, thereby extending the landfill life (Paragon 2017). Currently, Cell 2 receives MSW but is nearing the end of its operational life.

Cell 4 opened in 2016 and receives MSW (IDEQ 2016a). It was constructed with an alternative base liner similar to the last two phases of the Cell 2 landfill. The liner construction consists of the following components (starting from the uppermost layer):

1. A 2-foot operations layer of native material provides liner protection,
2. A 1-foot drainage gravel layer provides lateral drainage to the cell sump,
3. A woven geotextile provides separation between the operations layer and the drainage gravel layer,
4. A 16-ounce nonwoven geotextile, placed directly under the gravel layer, provides puncture protection for the HDPE geomembrane.
5. A composite barrier layer consisting of a textured 60-mil HDPE geomembrane and a GCL provides leachate containment.
6. A prepared subgrade with a cushion material layer provides a smooth and uniform surface for the composite barrier layer.

A gravity drain system collects leachate. The leachate collection system gravity drains from the cell sump to the Cell 4 lined leachate collection pond, where leachate is managed by evaporation. Leachate generation quantities are not measured at FHML.

Currently, the Cell 4 landfill expansion is under construction and will provide airspace through 2025. Final design and buildout reportedly will provide landfill airspace through 2048. All stormwater is diverted to channels that ultimately discharge to a containment basin for evaporation. Under RCRA, detection-level monitoring is currently required at Cell 4.

1.3.1.2 Historical Contamination and Regulatory Actions

In October 1991, volatile organic compound (VOC) contamination was identified in monitoring wells installed immediately downgradient of Cell 1 (Brown and Caldwell 1992). By 1993, high concentrations of TCE were detected in downgradient domestic wells within the Portneuf Valley Aquifer (PVA), and two municipal supply wells #14 and #33 (shown in **Figure 1-3**) were subsequently closed because of high TCE concentrations (Brown and Caldwell 1994).

In May 1993, Bannock County entered into a CO with the Idaho Department of Health and Welfare (now IDEQ) pursuant to the Idaho Environmental Protection and Health Act, Idaho Code §39-108, to assess and mitigate the impacts of TCE, PCE, and other VOCs originating from Cell 1 of FHML (IDEQ 2016a). In 2002, Bannock County installed a groundwater remediation system downgradient of Cell 1, at the mouth of Fort Hall Canyon. The purpose of the remediation system has been to capture and treat groundwater impacted by the unlined Cell 1 before the groundwater enters the PVA. The PVA is the sole source of drinking water for the Pocatello and Chubbuck, Idaho, communities, as well as the surrounding unincorporated Bannock County land.

In March 2015, IDEQ reviewed the remediation system and found it to be ineffective at removing environmental contamination. Concentrations of COCs were reported to be trending upward in wells located both upgradient and downgradient of the remediation system. The CSM for FHML was determined to not accurately represent the nature and extent of groundwater contamination associated with FHML (IDEQ 2016a). Therefore, in November 2016, IDEQ and Bannock County terminated the 1993 CO and entered into a new CO for the systemic development of a revised remediation plan for Cell 1 (IDEQ 2016a). Separately, in November 2016, IDEQ and Bannock County entered into a CAS to address groundwater contamination and groundwater monitoring in compliance with RCRA at landfill Cells 2 and 4 (IDEQ 2016b).

Since 2018, CDM Smith has been conducting a groundwater monitoring program in accordance with the CAS and CO and reporting data in semiannual monitoring reports. In addition, site characterization activities, including surface and borehole geophysics, and a Cell 1 cap evaluation were performed under the *Final Site Characterization Plan* (CDM Smith 2019b) to fill data gaps and improve the CSM. Ultimately, the remedy will be optimized to achieve containment of the COC plume. An injection pilot study and tracer study were conducted in 2023 in accordance with the *Pilot Study Work Plan* (CDM Smith 2023c) to evaluate potential technologies for remedy optimization. Performance monitoring and data analysis are ongoing.

1.3.1.3 Groundwater Monitoring Well Network

An extensive monitoring well network has been established throughout FHML and the PVA to evaluate the impacts of FHML on groundwater (**Figures 1-3** and **1-4**).

The data quality objectives (DQOs) of the groundwater monitoring well network are the following:

- Monitor the Cell 1 impacts to groundwater within the FHML and the offsite plume.
- Monitor and report in accordance with RCRA Subtitle D MSW requirements for Cells 2 and 4, according to Idaho Solid Waste Rules (Idaho Code §39-74) and 40 CFR §258.
- Monitor remediation system performance.

To satisfy these DQOs, the monitoring well network consists of multiple well groups, as follows:

- Cell 1 Source and Offsite Plume Wells
  - **Cell 1 Monitoring Wells**. The Cell 1 monitoring well group currently consists of approximately 30 Bannock County groundwater monitoring wells sampled semiannually. These wells are downgradient of Cell 1 on FHML property (**Figure 1-4**) and are monitored to assess the extent of COCs immediately north-northeast of the Cell 1 boundary. Although Cell 1 is not regulated under the Subtitle D requirements in 40 CFR §258, a subset of monitoring wells is monitored for the parameters in Appendices I and II to evaluate whether the substantive requirements are being met and whether other COC impacts are observed downgradient from Cell 1. Additionally, the offsite monitoring well group comprises eight offsite monitoring wells located outside the FHML property boundary, three of which are monitored semiannually to assess the extent of offsite groundwater COC impacts.

- **Domestic Wells**. There are at least 46 domestic groundwater wells in the PVA that have been monitored at various frequencies between 1992 and 2023 to assess the extent of the offsite groundwater plume and monitor COC concentrations within and surrounding impacted domestic water wells.

- **Pocatello City Monitoring Wells**. The City of Pocatello (City) installed 16 groundwater monitoring wells to evaluate groundwater quality and track the COC plume migrating toward the municipal supply wells.

- **Pocatello City Municipal Supply Wells**. The City has 21 municipal supply wells. The City uses some of these wells to monitor the extent of the plume and the presence of COCs in the City's drinking water supply. Municipal supply wells #33 and #14 are the closest to FHML that have historically observed COC impacts. Neither well is currently operated for municipal supply.

- **Remediation System Wells**. Nine groundwater extraction wells and two injection wells (**Figure 1-4**) were installed as part of the remediation system for Cell 1. RW-16 was drilled but never hooked up to the remediation system.

- **Cell 2 and 4 Monitoring Well Network**. The Cell 2 monitoring well group consists of five Bannock County groundwater monitoring wells, and the Cell 4 monitoring well group consists of five groundwater monitoring wells. Nine wells were installed to evaluate compliance with RCRA Subtitle D requirements. Monitoring well MW-4 was originally a part of the monitoring network for Cell 1; however, upon IDEQ request, it was transferred to the Cell 4 monitoring network. MW-4 (Cell 4) and MW-7 (Cell 2) were impacted by waste originating from Cell 1 (AEEC 2018b); therefore, they are not used to evaluate RCRA compliance for Cells 2 and 4. MW-7 is no longer sampled. The monitoring wells in Cells 2 and 4 are sampled semiannually for the parameters listed in Appendices I and/or II from 40 CFR §258.

1.3.2 Site Geology

Mapped by Rodgers et al. (2006), the FHML site is underlain by four geologic units. In order from youngest to oldest, these units are as follows:

- Alluvial fan deposits (Qfp): Alluvial fan deposits consist of poorly consolidated mud, silt, sand, and gravel deposited by the Fort Hall Canyon Creek as it exits Fort Hall Canyon. This unit is up to 100-feet thick. The alluvial fan deposits extend northward from the mouth of Fort Hall Canyon, thinning toward the Portneuf River. The alluvial fan deposits grade into the Lower Portneuf River Valley (LPRV) fill deposits that predate upper gravels from the Bonneville Flood event and form the benches along the southwestern edge of the LPRV (AEEC 2018a).

- Alluvium (Qal): Alluvium consists of unconsolidated mud, silt, sand, and gravel deposited in the Fort Hall Canyon Creek valley and is up to 80-feet thick. Alluvium is found in the bottom of the canyon adjacent to Fort Hall Creek. These deposits grade into the alluvial fan deposits (Qfp) at the north end of the canyon.

- Loess (Ql): Loess is unconsolidated silt. Loess mantles the canyon hillsides, can be up to 70-feet thick, and overlies the Starlight Formation Conglomerate unit (Tsuc) in places onsite.

Lewis and Fosberg (1982) classified the loess in the Fort Hall Canyon area as the Fort Hall Geosol, consisting of more than 75% silt.

- Starlight Formation Conglomerate unit (Tsuc): This is a clast-supported, moderately indurated cobble conglomerate with clasts derived from pre-Tertiary rocks in the region. The matrix supporting the clasts is reddish orange to reddish brown and is typically sandy but locally tuffaceous. The Starlight Formation Conglomerate unit (Tsuc) contains two persistent but discontinuous air-fall tuff beds (Tsur3 and Tsur4) and other lenses of air-fall tuff (e.g., Tsur). The rhyolite air-fall tuff unit (Tsur), mapped by Rodgers et al. (2006), is laminated to thick-bedded, white to light-gray air-fall tuff, up to 18-feet thick in several outcrops in the canyon south of the landfill and dips 20 degrees east-northeast.

In September 2019, boring MW-1903 was advanced to a depth of 198 feet below ground surface (bgs) to characterize the Starlight Formation below the existing remediation system extraction wells, which are typically 100 feet deep or less. Boring MW-1903 is in the canyon bottom near existing well pairs MW-104 shallow/deep (S/D) screened intervals, MW-105S/D, and the remediation wells (**Figure 1-4**).

In September and October 2019, boring MW-1902, located near the existing well pair MW-111S/D, was advanced to 258 feet bgs to characterize the Starlight Formation on the western flank of the canyon at the northeast toe of Cell 1 (**Figure 1-4**). In September 2020, the boring for MW-123 was completed on the east bank of the Fort Hall Canyon Creek (inset on **Figure 1-4**), and MW-122 was completed on the west bank.

The Starlight Formation Conglomerate unit (Tsuc) observed in boreholes MW-1902, MW-1903, MW-122, and MW-123 consisted of loose-to-cohesive, moist-to-saturated, and sandy gravel and gravelly sand with silt and some clay with intercalated dry rhyolitic tuff. Saturated intervals of sandy gravel and gravelly sand were infrequent (13 were observed over 450 feet of drilling in the borings for MW-1092 and MW-1093) and thin (ranging from 1- to 5-feet thick, with most 1- or 2-feet thick). Rock was not observed in any of these four borings. **Section 2.3** includes additional information about the completion of the borings for wells MW-122 and MW-123.

As part of the initial site investigations at the mouth of the Fort Hall Canyon in 1992 and 1993, Brown and Caldwell (1992 and 1994) observed the Fort Hall Canyon fault in the seismic refraction geophysical surveys. In this survey, Brown and Caldwell (1992 and 1994) estimated the fault was located 100 to 200 feet bgs at the mouth of the canyon and was approximately 180-feet wide. Trimble (1976) mapped the Fort Hall Canyon fault as a thrust fault. Rodgers et al. (2006) determined that the fault was a normal fault, with the Fort Hall Canyon on the downthrown side, and mapped it trending north through the Fort Hall Canyon and then west-northwest as it exits the canyon. The fault is estimated to have a dip of 15 to 20 degrees southwest, and it has a surface exposure on the west-facing slope of the canyon.

Fort Hall Canyon intersects the LPRV. The following six lithologic groups have been defined in the southern portion of the LPRV by Welhan et al. (1996):

- Bedrock, of variable composition, dominated by pink to white quartzite and varicolored shale or argillite, predominantly of Proterozoic age (Caddy Canyon Formation)

- Middle to late Tertiary basin-filling sediments and volcaniclastics of the Starlight Formation
- Quaternary valley-fill and alluvial deposits composed of nonindurated silty gravels and cobbles with lenses of sand, silt, and intercalated clays
- Portneuf Basalt deposited along the eastern edge of the LPRV
- Coarse-grained clean gravel and cobbles in the center of the LPRV, known as the Upper Gravels (equivalent to the Michaud Gravels in the northern LPRV), deposited by the Bonneville Flood event that compromised the most productive portion of the underlying PVA
- Silt "mantle" of variable thickness (0 to 43 feet) that overlies the Upper Gravels, originating from overbank flood material from periodic Portneuf River flooding

1.3.3 Site Hydrogeology and Groundwater Discharge

The aquifer system beneath FHML consists of loess, alluvium (associated with Fort Hall Canyon Creek), the alluvial fan extending to the north of the canyon, and the underlying Starlight Formation. The aquifer system is primarily unconfined beneath FHML, but some areas have evidence of confined conditions, particularly on the west side of Fort Hall Canyon Creek near the landfill and on the east side of the creek near MW-123. The water table is situated within the Starlight Formation in some areas and in the alluvium or loess in other areas. Units in the aquifer system are hydraulically connected and chemicals are expected to migrate between them. Groundwater in the alluvium and the Starlight Formation discharges into the PVA near monitoring well pairs MW-103S/D, MW-118D, and MW-116S, downgradient of the remediation system.

During a site walk in 2020, CDM Smith observed that groundwater springs to the south, and at higher elevations, discharges along a line across the entire hillside. The line of springs corresponds to the contact between the Quaternary loess (Ql) and Starlight Formation (Tsuc) on the Inkom geologic map (Rodgers et al. 2006). These observations suggest that the up-canyon springs are discharging along an aquitard, which was also observed from 58.3 to 68 feet bgs at well MW-123. It is reasonable to assume that a tuff unit might serve as an aquitard because in the borings completed in 2019 and 2020, the tuff units are weakly cemented and dry. Moreover, tuffs are laterally extensive because they form from volcanic ash falls that cover large areas. To assess if the upper aquitard observed in the MW-123 boring corresponds to the line of springs, a plane was inserted into the Leapfrog 3D model, and the orientation was adjusted to intersect the aquitard observed from 58.3 to 68 feet bgs at MW-123 and the contact between the Quaternary loess and Starlight Formation up-canyon from MW-123. This plane strikes north 80 degrees east (N80E) and dips 7 degrees north. The orientation of the rhyolite air-fall tuff, Unit 3 (Tsur3) at three locations and the rhyolite air-fall tuff (Tsur) at one location are reported on the Inkom geologic map (Rodgers et al. 2006). The strike of the rhyolite air-fall tuff, Unit 3 is about N30E with dips ranging from 21 to 31 degrees east-southeast. The strike of the rhyolite air-fall tuff at one location is about N30W with a dip of 29 degrees east-northeast. Strike and dip data for the tuff along Fort Hall Mine Creek and closer to the MW network is necessary to determine whether the plane inserted in the model coincides with a mapped tuff unit.

Seventeen wells were slug tested in 2020 to estimate hydraulic conductivity within the alluvium and Starlight Formation. Of the 17 wells tested, 1 is screened completely within the alluvium, 6 are screened in the shallow Starlight Formation, 1 is screened in the deeper Starlight Formation, and 9 are screened across portions of the alluvium and shallow Starlight Formation. Wells screened across both the alluvium and Starlight Formation include MP-1, MP-2, MP-3, and MP-9 near the treatment system, three remediation extraction wells, and downgradient wells MW-118D and MW-120D.

Hydraulic conductivity estimates from slug tests conducted in these wells ranged from 0.3 to 20.5 feet per day (feet/day). The highest hydraulic conductivity was recorded at RW-15, which has historically been the most productive of the remedy wells. Hydraulic conductivity at nearby wells RW-17, MP-1, and RW-16 were estimated at 5.0, 9.7, and 6.2 feet/day, respectively. The hydraulic conductivity on the west and east sides of the site were estimated to be lower than in the central portion where RW-15 is located. The hydraulic conductivity at MP-2—the westernmost well screened within the alluvium that was tested—was estimated to be 0.3 feet/day, which was consistent with historically low yields from the colocated RW-3. On the eastern side of the canyon, MP-3 was estimated to have a hydraulic conductivity of 0.6 feet/day. Of the seven wells screened exclusively within the Starlight Formation, low hydraulic conductivity of 0.004 to 0.3 feet/day, with an average of 0.18 feet/day, was observed at all six locations.

Inflows to the aquifer system underlying the FHML area are direct recharge from precipitation and seepage from Fort Hall Canyon Creek. Average precipitation recorded at the landfill weather station was approximately 12 inches per year throughout the last six years of records. Welhan (1996) estimated average annual precipitation at Fort Hall Canyon to be 20.4 inches per year. Maxim (2000b) observed that nearly all the surface water flows within Fort Hall Canyon Creek seeped into the underlying aquifer upgradient of the mouth of the Fort Hall Canyon upgradient of the remedy wells and Cell 1 waste area. As noted, observation of surface water discharge via Fort Hall Canyon Creek downgradient of the remediation system is rare; however this discharge occurred as recently as 2023. Welhan (1996) estimated that evapotranspiration loss was approximately 80% of precipitation in nearby watersheds, with evapotranspiration loss assumed to be inversely proportional to altitude. Outflows from the aquifer system underlying the FHML and through the mouth of Fort Hall Canyon are primarily groundwater flux as remedial pumping is injected back into the aquifer and, as noted above, surface water discharge is rare.

Rainfall totals recorded at the weather station located onsite were as follows:

- 2017: 15.3 inches
- 2018: 11.3 inches
- 2019: 14.6 inches
- 2020: 11.1 inches
- 2021: 10.6 inches
- 2022: 11.8 inches

- 2023 (January through August): 6.7 inches

If 80% of this rainfall evapotranspires (Welhan 1996) and surface runoff downstream of the pumping and treat system is rare, approximately 2.2 to 3 inches per year would be estimated to have recharged the groundwater over the past 6 full years in the area upgradient of the pump-and-treat system.

A portion of the recharge is concentrated along the creek bed where surface water seepage is known to occur. Maxim (2000b) measured this seepage rate to range between 0.4 and 34.6 gallons per minute (gpm) for the period between April 5 and December 7, 1999. Creek seepage was measured again between June 17 and July 22, 2021, yielding a value of 4.6 gpm. As noted above, this was a dry period, with only one storm producing greater than 0.1 inches of rain. That storm occurred between July 21 and 22, totaling 0.21 inches, and it produced a peak seepage rate of 419 gpm and a total of approximately 10,000 gallons of infiltrated water to the creek over a 2-hour period. Precipitation continues to be collected to better understand this relationship.

Observations of borings in MW-1902, MW-1903, MW-122, and MW-123 showing thin and infrequent saturated intervals in the Starlight Formation are separated by dry rhyolitic tuff and loose-to-cohesive, dry-to-moist, sandy gravel and gravelly sand with silt and some clay. Similar lithology was observed in other borings completed into the Starlight Formation, which indicates that the vertical downward movement of groundwater near the remedy wells is limited by the lithology of the Starlight Formation. Therefore, groundwater flow near the RWs is predominately in the higher transmissivity alluvium and shallow Starlight Formation. During the spring, when recharge to the Starlight Formation from upgradient sources increases, the dry-to-moist sandy gravel and gravelly sand with silt units may become saturated, thereby increasing flow. At the same time, flow in the overlying alluvium and shallow Starlight will also increase.

Groundwater flowing through the mouth of Fort Hall Canyon discharges to the PVA. The PVA comprises northern, eastern, and southern subaquifers and is the sole source of drinking water for the communities of Pocatello and Chubbuck. In the southern portion of the PVA, wells have high yields because they are completed in coarse, clean, upper gravels at depths less than 100 to 150 feet bgs. The transmissivity of the upper gravels was estimated at approximately 10 square feet per second, with aquifer storage estimated at 0.005 (unitless), based on constant discharge pumping tests of municipal wells (CH2M HILL 1994).

1.3.4 Nature and Extent of Chemicals of Concern

As discussed in **Section 1.3.1.3**, the nature and extent of groundwater contamination are monitored via an extensive well network, which includes multiple well groups (shown in **Figures 1-3** and **1-4**). The primary COCs at the FHML and associated groundwater plume are VOCs, specifically PCE and TCE. The following sections briefly summarize the nature and extent of these COCs and select inorganic parameters in each well network. More detailed summaries and the extent of various contaminants, including metals, semivolatile organic compounds (SVOCs), pesticides, herbicides, polychlorinated biphenyls (PCBs), and dioxins/furans throughout FHML and the surrounding area can be found in recent CDM Smith monitoring reports (e.g. CDM Smith 2023a).

1.3.4.1 Cell 1 Source and Offsite Plume

PCE and TCE are frequently detected throughout the Cell 1 source area and offsite plume. Recent sampling results are summarized briefly below and are generally representative of site conditions over the past 5 years:

- In Cell 1 monitoring wells, PCE and TCE are detected at higher concentrations than elsewhere within or downgradient of FHML, with TCE commonly detected above 100 micrograms per liter (µg/L) in some wells. In sampling events over the last 5 years, TCE and PCE have been detected in all sampled Cell 1 MWs except for MW-111S and FW-1. PCE and TCE have exceeded the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) of 5 µg/L in most monitoring wells (except for MW-1 [PCE], MW-102S [PCE/TCE], MW-110D [PCE], MW-111D [PCE], and MW-121[PCE/TCE]).
- In remediation system extraction wells, TCE and PCE have frequently exceeded the MCLs.
- In offsite monitoring wells, TCE frequently exceeds the MCL in MW-103S and MW-116S. PCE has exceeded the MCL in MW-103S and MW-116S.
- In domestic wells in the PVA, PCE and TCE are detected frequently and have exceeded the MCLs in the following wells: RW-2076F, RW-2140H, RW-2151H (TCE only), RW-2172H, RW-2203H, RW-2237H (TCE only), RW-7677P (TCE only), and RW-8030P (TCE only).
- In City municipal supply wells #14 and #33, PCE and TCE have been detected; however, there has been no MCL exceedance since May 2018 (TCE in municipal supply well #33).

Reductive daughter products of PCE and TCE, such as cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride (VC), were also frequently detected, with some detections exceeding the MCLs for drinking water in the Cell 1 monitoring area.

Inorganic parameters are frequently detected throughout Cell 1 and the offsite plume when analyzed. Inorganic parameters are not analyzed in these wells for every sampling event. Recent results are as follows:

- Arsenic and barium have frequently exceeded MCLs, with the highest concentrations occurring in MW-111S/D.
- Mercury has exceeded the MCL in recent sampling (2018, 2019, and 2021). However, mercury has not been detected in Cell 1 monitoring wells since 2021. Cyanide and sulfide have been detected below the MCL in several wells.
- Elevated levels of major and trace elements (iron, manganese, barium, arsenic, chromium, cobalt, and/or nickel) have also been observed throughout the Cell 1 monitoring network.
- In offsite and domestic wells, antimony, arsenic, barium, beryllium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc have recently been detected, although no concentrations have exceeded the MCL.

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1.3.4.2 Cell 2

From 2020 to spring 2023, PCE and TCE were detected at low concentrations in Cell 2 compliance monitoring well MW-13. Results were below 1 µg/L and J-flagged (estimated). Other VOCs have also been detected at low concentrations in this well, MW-9, and MW-12. MCL exceedances for metals are rare and have not occurred in recent sampling.

1.3.4.3 Cell 4

From 2020 to spring 2023, several VOCs were detected in Cell 4 compliance monitoring wells. TCE was detected at low concentrations in MW-3A and MW-4A in 2020 and 2021, respectively. Several other VOCs were also detected in MW-3A in 2021. In new compliance monitoring well MW-5AR, carbon disulfide was detected in 2021 and 2022 and toluene was detected in 2021. VOCs are regularly detected at low concentrations in MW-4, which is not a compliance well. No metals have recently exceeded MCLs in the current Cell 4 network.

1.3.5 Fate and Transport of Chlorinated Ethenes

Natural biodegradation of chlorinated ethenes such as PCE and TCE is well established in peer-reviewed literature and is shown to occur most efficiently under anaerobic (without oxygen) conditions. PCE is considered recalcitrant (i.e., it does not degrade biologically) under aerobic conditions, and TCE degradation is very slow. This is part of the reason these chemicals persist in aerobic aquifers and tend to form relatively large plumes in transmissive aquifers.

Under anaerobic conditions, however, PCE and TCE can undergo biotic transformation via anaerobic reductive dechlorination, where bacteria use them as alternate electron acceptors in the absence of oxygen. During anaerobic dechlorination, sequential transformation most commonly occurs from PCE to TCE to cis-1,2-DCE to VC to ethene (**Figure 1-5**). At each step in this process, the organic molecule loses a chloride anion. A less common pathway includes the generation of 1,1-DCE or 1,2-trans-DCE in addition to 1,2-cis-DCE. Ethene is commonly transformed to ethane after reductive dechlorination.

In addition to the anaerobic pathway, other degradation mechanisms for the lower chlorinated ethenes and ethanes, such as cis-1,2-DCE and VC, include anaerobic oxidation coupled with sulfate or iron reduction and aerobic oxidation (i.e., use as a food source for aerobic microorganisms), generating carbon dioxide and water. These alternate degradation mechanisms are important when there is significant sulfate or iron available anaerobically, in redox transition zones where anaerobic groundwater comes into contact with aerobic groundwater in the downgradient/distal plumes, or there is periodic infiltration of aerobic precipitation during rain events. Areas where these alternate degradation mechanisms occur can be either downgradient or cross-gradient from the anaerobic source zone or below the anaerobic source zone if there is a vertical gradient resulting in vertical mixing with aerobic groundwater.

In addition to the chlorinated ethenes, reductive daughter products ethene and ethane can be oxidized (i.e., used as food sources) by aerobic and/or anaerobic sulfate-reducing or iron-reducing microorganisms. Under conditions in which reductive daughter products are directly oxidized, a complete mass balance to cis-1,2-DCE, VC, ethene, and/or ethane is not observed.

1.3.6 Mobilization of Redox-Sensitive Metals

Redox processes (oxidation and reduction) control the chemical speciation and subsequent mobility of many major and trace elements, including arsenic, barium, chromium, copper, iron, manganese, mercury, molybdenum, selenium, sulfur, and vanadium. The mobility of other redox-sensitive elements (e.g., sulfate) can be indirectly affected by redox transformations of organic matter and minerals, particularly iron and manganese oxyhydroxides, clays, and sulfur minerals. The oxidized form of iron (Fe[III]) is insoluble in near-neutral pH environments, and trace elements strongly sorb to Fe(III) (i.e., ferrous iron) minerals. Under reducing conditions, Fe(III) can be reduced to Fe(II), thereby dissolving iron minerals and releasing trace elements. Barium, as the insoluble salt barium sulfate ($BaSO_4$), can be mobilized under reducing conditions as sulfate is reduced to sulfide. Furthermore, many redox-sensitive elements are more mobile in their reduced speciation state (e.g., arsenic As[III] is more mobile than As[V]).

In environments with sources of carbon (e.g., landfill leachate), redox conditions become reduced and anaerobic reductive dechlorination is observed, resulting in increased concentrations of redox-sensitive major and trace elements. Conversely, where redox conditions become more oxidized, the redox-sensitive major and trace element concentrations are reduced. For example, arsenic and ferrous iron are typically observed in anaerobic groundwater environments (e.g., anaerobic areas impacted by landfill leachate) and concentrations are quickly reduced once oxidized (i.e., aerobic) conditions are reestablished downgradient from the landfill leachate discharge area.

1.3.7 Geochemical Conditions in the Cell 1 Source Area and Offsite Plume

The following geochemical parameters have been collected from wells in the Cell 1 source area and offsite plume: dissolved gases (methane, ethane, ethene), sulfate, alkalinity, total organic carbon (TOC), field parameters (dissolved oxygen [DO], pH, and oxidation-reduction potential [ORP]), and ferrous iron. These geochemical parameters and the concentrations of chlorinated ethenes (PCE, TCE, cis-1,2-DCE, and VC) were used in a principal component analysis (PCA). PCA enables the reduction of large data sets by revealing patterns in the data through identifying the principal components of the data. Only wells that have results for each of these geochemical parameters can be used in the PCA; therefore, only a subset of onsite and offsite wells were used in the analysis.

The PCA revealed groundwater sampled from monitoring wells at the site grouped in four distinct geochemical conditions:

- Methanogenic conditions were identified in the Cell 1 source area on the west side of the remediation system (MW-111S/D, MW-113S/D, and MW-105S).
- Iron- and sulfate-reducing conditions were identified in the Cell 1 source area near the remediation system (MW-119S, MW-120S/D, MW-110S, MW-104S/D, MW-118D, RW-3, RW-4, RW-9R, RW-15, and RW-17).
- Aerobic conditions were identified on the east side of the remediation system (MW-101S, MW-112M/D, MW-109S/D, RW-10, MW-119D) and in the PVA (MW-103 and RW-8030P).

- Aerobic conditions and low concentrations of chlorinated ethenes were identified in the PVA (RW-2203H, PA-1, PA-3, MW-38, RW7677P, and RW-2140H) and upgradient of the treatment system (MW-110D and MW-7).

1.3.8 Remediation System

The purpose of the remediation system is to extract groundwater contaminated by chemicals leaching from the old, unlined landfill area (Cell 1), remove VOCs, and then reinject the treated groundwater into the aquifer. The CO requires that the system remain in operation until otherwise directed by IDEQ. The system includes the following major components:

- A network of groundwater remediation wells currently consists of six pumping wells (RW-4, RW-5, RW-9R [replaced RW-9], RW-10, RW-15, and RW-17) and four non-pumping wells (RW-1, RW-2, RW-3, and RW-16). Each operating well is equipped with a submersible pump and a pressure transducer set above the pump. The pressure transducer monitors the water level in the well and allows the pump controller to tell the pump to speed up or slow down to maintain a water level setpoint. Maxim installed the first seven wells with the intent of intercepting as much of the contaminated groundwater as possible before it flowed through the mouth of the Fort Hall Mine Canyon and into the PVA. RW-15 and RW-17 were installed in 2012 to improve system performance. In 2018, RW-1 was taken offline, and in 2020, RW-2 and RW-3 were taken offline. The pumps in these wells were also removed. RW-16 was never connected to the treatment system.
- The monitoring well network includes wells within the groundwater remediation area located both upgradient and downgradient to the area. The network allows for evaluation of the system performance.
- Individual conveyance piping from the remediation wells directs water back to the remediation shed.
- A climate-controlled remediation shed contains all the ex situ treatment equipment.
- The influent manifold with pressure gauges, flowmeters, and sample ports allows for collecting process data and water samples from each of the remediation wells.
- A shallow tray air stripper volatilizes dissolved VOCs and discharges them to the atmosphere.
- A metering pump pulls antiscalant from a drum and injects it into the water to reduce inorganic buildup in the air stripper and injection wells.
- The shed houses the system's power distribution, control panels, variable frequency drives for each RW pump, and other associated equipment.
- Two injection wells and an overflow evaporation pond are downgradient of the remediation zone.

Periodic monitoring of the remediation wells and the air stripper influent is necessary to understand trends in VOC concentrations and the overall loading into the remediation system, respectively. Samples must be collected quarterly from the air stripper effluent to confirm that the air stripper is removing VOCs from the extracted groundwater prior to injection and that the effluent injection remains compliant with the injection permit.

The Injection Well Permit No. 29W-006-001 for INJ-1 and 29W-006-002 for INJ-1R, expiring March 15, 2025, specifies the following:

- Violating the water quality standards stated in Idaho Administrative Procedures Act (IDAPA) 37.03.03.070.05, degrading the quality of the groundwater, or impacting a beneficial use of the groundwater resource through the use of this injection well is prohibited and cause for cancellation of this permit.

- If the Idaho Department of Water Resources (IDWR) suspects existing or future points of diversion for beneficial use to be contaminated by injection activities at this well, IDWR will require injection activities at this well to cease immediately. The injection well owner is responsible for providing burden of proof that injection activities at this well are not contaminating existing or future points of diversion.

Currently, treated groundwater is only being injected via INJ-1R.

The IDAPA regulation specified in the permit, Class V Shallow Injection Well Requirements, includes the following general requirements:

- Compliance with all groundwater quality standards for injected water.

- No impact relative to the temperature, color, odor, turbidity, conductivity, pH, or other characteristics that may result in a reduction of suitability for beneficial uses of groundwater.

- Routine monitoring of the injection flow rate, volume, and injection pressure.

Given these general requirements, the air stripper effluent is sampled quarterly for site COCs and semiannually for other chemicals to compare against groundwater quality standards, as outlined in Worksheet #20 of the Quality Assurance Project Plan (QAPP) (CDM Smith 2021b).

Section 2
Field Activities

This section describes field activities that were completed at the site in spring 2023, including groundwater sampling and remediation system O&M. Spring groundwater sampling was performed in April and May. Because weather prevented access to Cell 2 and 4 wells in April, those wells had to be sampled in May when the snow had melted. Pilot study monitoring was also conducted in May 2023. Data and interpretation from these wells will be presented under a separate cover.

2.1 Groundwater Sampling

During the spring 2023 monitoring events, groundwater samples were collected from 44 locations from the Cell 1, Cell 2, Cell 4, and offsite monitoring well networks; the remediation extraction wells; and the air stripper effluent (INJ-1R). **Figure 2-1** presents the spring 2023 sample locations, and **Table 2-1** provides a summary of samples collected. The spring 2023 sampling activities were consistent with the QAPP (CDM Smith 2021b) and sampling plan (**Appendix A**), except as described in **Section 2.1.6**.

Appendix B contains the field documentation for the spring 2023 groundwater monitoring events, including equipment calibration forms, groundwater purge forms, synoptic water level forms, and the field logbook. The following sections describe groundwater sampling in further detail.

2.1.1 Private Property Access

Consent to access and collect samples from groundwater wells on private property was obtained from property owners prior to the spring 2023 sampling event via signed consent forms. Unrestricted access was granted previously to the following wells:

- MW-103S/D
- MW-106S/D
- MW-115S/D

Access to MW-116S for the spring 2023 groundwater monitoring event was not granted.

2.1.2 Water Level Measurement

Synoptic water levels were collected following procedures outlined in Standard Operating Procedure (SOP) 1-6, "Groundwater Level Measurement" (CDM Smith 2021b). Manual water level measurements were recorded for the wells at the landmark indicated on the casing (or, in the absence of a mark, the northern edge) using electronic water level meters. Water levels from domestic wells are not collected because of well construction. Domestic wells are closed, and water is only accessible by a spigot at the well head.

On April 10, 2023, water levels were measured while the treatment system was operational at 43 wells, as specified in **Table 2-1**.

2.1.3 Groundwater Sampling Procedures

2.1.3.1 Monitoring Wells

All monitoring wells and offline remediation system wells RW-1, RW-2, and RW-3 were sampled according to the procedures outlined in SOP 1-12, "Low-Stress (Low-Flow) Groundwater Sampling" (CDM Smith 2021b). The bladder pump was positioned within the screened interval and set to pump at flow rates of 50 to 500 milliliters per minute. Minimal drawdown and/or stabilized drawdown was used to ensure that the water to be sampled was representative of the formation surrounding the screened interval and not the stagnant water column. Purge volumes were calculated based on water column height, inner diameter of tubing and inner diameter of casing. During this event, tubing and casing inner diameters were confirmed and, in some cases, adjusted for accuracy. Water quality parameters were monitored continuously using a flow-through cell, and when stabilization was achieved, a groundwater sample was collected.

2.1.3.2 Remediation System Wells and Effluent

The online remediation system wells were sampled according to the procedures outlined in SOP 1-9, "Tap Water Sampling" (CDM Smith 2021b). Because extraction wells cycle on and off at varying intervals and the influent and effluent production are continuous, a set purge volume prior to sampling is not necessary. All remediation system well grab samples were collected from taps within the treatment building.

2.1.4 Sample Analysis

Samples were analyzed according to the sampling plan in **Appendix A** and as outlined subsequently. Water quality parameters were collected at each location prior to collecting groundwater samples using a YSI Pro Digital Sampling System (ProDDS) or YSI ProPlus multiparameter meter. Turbidity was measured using a stand-alone HACH turbidity meter. Water quality parameters included the following:

- DO
- ORP
- pH
- Turbidity
- Temperature
- Specific conductance

2.1.4.1 Cell 1 Source and Offsite Plume

Cell 1 and offsite monitoring well samples were analyzed for VOCs by EPA Method 8260D. Select wells were analyzed for dissolved metals by EPA Method 6020B/6010C, anions by EPA Method 9056A, dissolved gases by Method RSK-175, TOC by EPA Method 9060A, ferrous iron by HACH

Method 8146, compound specific isotope analysis, and microbial parameters, as shown in **Table 2-1**, consistent with the Pilot Study Work Plan (CDM Smith 2023c).

2.1.4.2 Remediation System

All sampled online and offline remediation system wells were analyzed for VOCs by EPA Method 8260D. Remediation system wells RW-1, RW-2, RW-3, and RW-15 were additionally analyzed for dissolved metals by EPA Method 6020B/6010C, anions by EPA Method 9056A, TOC by EPA Method 9060A, and ferrous iron by HACH Method 8146.

The groundwater treatment system effluent (INJ-1R) compliance samples were analyzed for the following during the spring 2023 quarterly permit monitoring:

- VOCs by EPA Methods 8260D and 8011
- Total metals by EPA Method 6020B/6010C
- SVOCs by EPA Methods 8270E and 8270E SIM
- Chlorinated pesticides by EPA Method 8081B
- Organophosphorus pesticides by EPA Method 8141A
- Chlorinated herbicides by EPA Methods 8321B
- PCBs by EPA Method 8082A
- Dioxin/furans by EPA Method 8290
- Mercury by EPA Method 7470A
- Cyanide by EPA Method SM4500-CN-E
- Sulfide by EPA Method SM4500-S-2

During the winter 2023 quarterly permit monitoring, INJ-1R was analyzed for only VOCs (8260D and 8011).

2.1.4.3 Cell 2

Samples collected from Cell 2 were analyzed for the following:

- VOCs by EPA Methods 8260D and 8011
- Total metals by EPA Method 6020A/6010C
- Sulfide by EPA Method SM4500-S-2

2.1.4.4 Cell 4

Samples collected from Cell 4 were analyzed for the following:

- VOCs by EPA Methods 8260D and 8011

- Total metals by EPA Method 6020B/6010C

All groundwater analytical samples were submitted to TestAmerica (Denver, Colorado) for analysis.

Field quality control (QC) samples, including trip blanks, rinsate blanks, field duplicates, and extra volume for matrix spike/matrix spike duplicate (MS/MSD) samples, were collected. QC sample results were evaluated as part of the data validation effort and are discussed in the data usability assessment in **Section 3.1**.

2.1.5 Decontamination and Investigation-Derived Waste

All nondedicated sampling equipment (e.g., bladder pump equipment, water level meters) were decontaminated following the procedure outlined in SOP 4-5, "Field Equipment Decontamination at Nonradioactive Sites" (CDM Smith 2021b). A triple-wash system was used, following decontamination procedures for groundwater sampling equipment. The first wash used potable water and laboratory-grade detergent, the second wash used potable water, and the third wash used distilled water for rinsing. Before use, reuse, and at the end of the sampling event, all bladder pump equipment was disassembled, scrubbed, and decontaminated using this triple-wash system. Decontamination water and purge water from monitoring well sampling were contained and disposed of onsite at the Cell 2 leachate pond. Personal protective equipment was disposed of onsite at the landfill.

2.1.6 Deviations

Except where noted below, sampling did not deviate from the sampling plan (**Appendix A**). **Section 3.1** provides information on any analytical data quality deviations.

2.1.6.1 Synoptic Water Level Measurement

Water level could not be measured at MW-121 because this well was paved over during previous road maintenance. Effort will be taken to find this well and uncover it, if possible, for future sampling events. RW-3 and none of the Cell 2 and Cell 4 monitoring wells, except for MW-6A and MW-13, were included in the April synoptic water level measurement event because they were inaccessible because of snow.

2.1.6.2 Cell 1 and Offsite Monitoring Wells

MW-117R and MW-122 were not sampled because these wells had insufficient water level for sample collection. MW-116S was not sampled because access was not granted for the property for this event, primarily because of weather.

2.1.6.3 Remediation System Wells and Effluent

At the time of the spring 2023 sampling event, RW-4 was offline because of dry run alarms; therefore, it was not sampled.

2.1.6.4 Cell 2 and 4 Monitoring Wells

Because of large amounts of snow, the sampling of Cell 2 and 4 monitoring wells was not performed in April and was conducted in May once site conditions allowed.

2.2 Remediation System Maintenance Activities

Remediation system maintenance activities were conducted during and prior to the current reporting period to support O&M of the remediation system. The following sections describe these field activities.

2.2.1 Remediation Well Rehabilitation

No record exists of rehabilitation of the remediation system wells prior to 2020. Based on an evaluation of remediation well performance and potential for fouling, a rehabilitation program was implemented in 2020 to optimize the performance of the extraction wells (CDM Smith 2020b and 2021a). Remediation well performance continues to be monitored to evaluate future well rehabilitation needs. No rehabilitation was performed during this reporting period (December 2, 2022, through August 3, 2023).

2.2.2 Remediation System Operation and Maintenance

The following activities describe and list the frequency of system O&M activities.

2.2.2.1 Operations

Daily inspection of mechanical and electrical equipment at the remediation shed was generally conducted daily by Bannock County staff. The following items were verified during the inspections:

- Water pipes inside the building were not leaking.
- The metering system was operational.
- Recovery well pumps were cycling as expected.
- The air stripper blower was operating.

Inspection of mechanical and electrical equipment at the remediation shed was generally conducted weekly by Bannock County staff. The following items were verified or recorded during the inspections:

- Operating pressure of the air stripper.
- Flow totals from each of the individual flowmeters and the system totalizer.
- Adequate antiscalant in the metering pump drum.

2.2.2.2 Maintenance

Each recovery well-level transducer was checked for proper pumping operations monthly. Each level transducer self-adjusts for variations in atmospheric pressure through the desiccant tube. The desiccant protects the transducer's electrical elements from moisture and if nearly exhausted must be replaced. Failure to do so will degrade the quality of the level data provided by the transducer and reduce the functionality of the associated recovery well pump. When CDM Smith staff visited the site, they inspected the desiccant within the tubes (it changes color when exhausted). No maintenance items were performed during the reporting period.

2.2.2.3 System Upgrades and Repairs

Dry run alarms were frequently happening for RW-4 from February 21, 2023, to May 20, 2023. This resulted in irregular running or altogether stoppage of the extraction well. To fix the issue, the dry run alarm wattage was decreased. RW-4 will continue to be monitored and additional troubleshooting will be conducted if the issue persists.

On June 20, 2023, the connection to INJ-1 was closed because of the water level rising to the top of the casing. Currently, INJ-1R remains open and is actively injecting treated groundwater. The capacity of the injection wells is consistently being monitored to identify rehabilitation needs or the potential need for the installation of a new injection well in the future.

2.3 Leachate Sampling and Landfill Gas Well Water Level Measurements

The pipe discharging into Cell 4 leachate pond was not sampled during the spring 2023 event. Because the discharge pipe to the Cell 2 leachate pond was inaccessible, Cell 2 leachate was not sampled. Landfill gas well water levels were measured at locations shown in **Figure 2-2**. The water level measurements for the landfill gas wells are presented in **Table 2-2**. These results will be discussed further in a forthcoming update to the Seepage Evaluation Report.

Section 3

Groundwater Monitoring Results

This section presents the groundwater monitoring results from the January 2023 injection well and spring 2023 sampling events. **Figure 3-1** presents the updated potentiometric surface map, and **Table 3-1** presents the corresponding water level measurement data. **Figures 3-2** through **3-6** and **Tables 3-2** through **3-6** present groundwater sampling results and updated treatment system monitoring data. **Appendix C** contains all groundwater analytical results.

3.1 Groundwater Data Usability Assessment

Data validation was performed in accordance with the analytical methods, *National Functional Guidelines for Inorganic Superfund Methods Data Review* (EPA 2020a), *National Functional Guidelines for Organic Superfund Methods Data Review* (EPA 2020b), and *National Functional Guidelines for High-Resolution Superfund Methods Data Review* (EPA 2020c), as applicable.

The review included holding times, sample preparation blanks (method, equipment, source, trip), duplicates (field), surrogate compound recovery, MS/MSDs, laboratory control sample/ laboratory control sample duplicates (LCS/LCSDs), interferences, reporting limits (RLs), and compound identification and quantification. The review for the 2,3,7,8-tetrachloro-p-dibenzodioxin (2,3,7,8-TCDD) included initial calibration and continuing calibration data.

CDM Smith validated laboratory analytical data using the EQuIS Data Quality Module for VOCs, SVOCs, organochlorine pesticides, PCBs, organophosphorus compounds, chlorinated herbicides, dioxin/furans (2,3,7,8-TCDD), total metals, total cyanide, and total sulfide. **Appendix D** provides the validation narrative, and **Appendix E** includes the final laboratory data packages for each laboratory sample delivery group. All data were received from the laboratory in final form, and validation was performed on the final data.

For the January 2023 effluent, April 2023 effluent, and April 2023 semiannual sampling events, all data are suitable for their intended use with the following exceptions:

- The nitrite results for samples MW-119D-20230413, RW-15-20230411, MW-105S-20230411, MW-105D-20230411, RW-3-20230413, and MW-119S-20230413, which were nondetections and were rejected because of exceedance of the analysis holding time.

Some of the usable results should be used with caution, as noted by the "J/J-/UJ" qualifiers applied during the data validation process, as discussed in **Appendix D**.

3.1.1 Precision

Precision was assessed by comparing the relative percent differences (RPDs) or absolute differences for laboratory duplicate samples, field duplicate samples, MS/MSD analyses, and LCS/LCSD analyses. Laboratory in-house limits were used for laboratory duplicate samples, LCS/LCSD, and MS/MSD duplicate analyses. An RPD field duplicate criterion of 30% was used for field duplicates. For field duplicates in which results were greater than five times the level of quantification, the RPD was calculated and compared with the 30% precision criterion. Where results were less than five times the RL, the absolute difference was calculated and compared with a precision criterion of less than or equal to the RL. **Table D-3** (**Appendix D**) presents comparisons of results for primary samples and associated field duplicates. All duplicate RPDs and absolute differences met their respective control limits, as noted in **Appendix D**.

3.1.2 Accuracy

Accuracy was assessed with percent recoveries in MS/MSD, LCS/LCSD, surrogate recoveries, and calibration data (2,3,7,8-TCDD only). Laboratory in-house control limits and EPA Method 8290A were used for evaluation of these parameters. All percent recoveries in LCS/LCSDs met the control limit criteria, with the exceptions noted in **Appendix D**; exceptions that required qualification of data ("J," "J-," or "UJ") are noted in **Appendix D**. All percent recoveries in MS/MSDs met the control limit criteria, when applicable, with the exceptions noted in **Appendix D**; exceptions that required qualification of data ("J," "J-," or "UJ") are noted in **Appendix D**. All surrogate recoveries met the control limit criteria. All 2,3,7,8-TCDD calibration data met the control limit. Selected semivolatile compounds and metals data were qualified as not detected at the reporting limit because of blank contamination, as noted in **Appendix D**.

3.1.3 Comparability

Comparability from one sampling event to another is achieved by structuring the field sampling program and protocol for sample collection and analyses. CDM Smith follows technical SOPs to ensure consistent sampling techniques. In addition, EPA-approved analytical methods and RLs are defined and used to ensure comparability of data.

All data included in this report have been validated and are considered acceptable for use, except for the rejected data previously discussed. **Appendix D** provides the full validation narrative and results.

3.1.4 Completeness

An analytical completeness goal of 90% for each analytical group was used to determine completeness. Analytical completeness was evaluated for each analytical group through a comparison of the number of nonrejected data to the number of requested analyses. For the spring 2023 sampling event, all analyses for field samples that were submitted to the laboratory were successfully analyzed, except for the rejected data previously discussed. A total of 66 results were obtained for the wet chemistry analyses (anions and sulfide), which yields a completeness value of 90.9%, meeting the 90% criterion.

3.1.5 Sensitivity

The RLs achieved for all samples were adequate to meet the DQOs.

3.2 Groundwater Elevations

During the spring 2023 sampling event, synoptic water levels were collected from monitoring wells following procedures outlined in SOP 1-6, "Groundwater Level Measurement" (CDM Smith 2021b). **Table 3-1** presents the water levels. Using data collected on April 11, 2023, **Figure 3-1** shows the potentiometric surface map, representing water levels while the treatment system was in operation.

3.2.1 Horizontal Gradient Evaluation

Groundwater flows in a northeastern direction through the valley of Fort Hall Mine Canyon, with a horizontal gradient of approximately 0.12 foot per foot (foot/foot) between MW-6A (the furthest upgradient well with data) and MW-102S (the furthest downgradient well with data within the Fort Hall Mine Canyon), based on April 11, 2023, water level elevation data.

3.2.2 Vertical Gradient Evaluation

The spring 2023 synoptic water level survey completed on April 11, 2023, included several sets of nested monitoring wells while the remediation system was operational. **Table 3-1** includes calculated vertical gradients for this data set. A review of these calculated values shows the following:

- Downward vertical gradients were observed at most well pairs, ranging from 0.01 to 0.38 feet/foot, with the strongest downward vertical gradient observed at MW-109S/D. In each of these instances, the shallower well is screened exclusively within the alluvium and the deeper well is screened within the top of the Starlight Formation.

- Negligible upward vertical gradients were observed for MW-103S/D and MW-113S/D at 0.04 and 0.02 feet/foot, respectively.

3.3 Cell 1 and Offsite Groundwater Results

This section presents analytical results from the spring 2023 groundwater monitoring event. Cell 1 is currently in corrective action monitoring (**Section 4.2**). Spring 2023 samples were analyzed for VOCs and field parameters. **Appendix C** contains all spring 2023 groundwater analytical results. Analytical results from the spring 2023 groundwater monitoring event are discussed subsequently. **Appendix F** presents time series plots for all chlorinated ethenes and corresponding field and redox parameter results for each well.

3.3.1 VOCs

Table 3-2 presents detections of VOCs in Cell 1 and offsite monitoring wells, screened against the EPA MCLs and Idaho Groundwater Rule (IDGW) primary and secondary standards for drinking water. **Figure 3-2** and **3-3** present results for PCE, TCE, cis-1,2-DCE, and VC.

3.3.1.1 Cell 1 Source and Dissolved Phase Plume

In the Cell 1 monitoring wells, the following was observed:

- PCE detections ranged from 0.91 J µg/L (MW-102S) to 37 µg/L (MW-105D). The MCL and IDGW primary standards (both 5 µg/L) were exceeded in all wells, except MW-102S, MW-111D, MW-113D, and MW-123.

- TCE detections ranged from 0.31 J µg/L (MW-113D) to 200 µg/L (MW-105D). The MCL and IDGW primary standards (both 5 µg/L) were exceeded in all Cell 1 monitoring wells, except MW-102S and MW-113D.

- Reductive daughter product cis-1,2-DCE detections ranged from 0.4 J µg/L (MW-112M) to 29 µg/L (MW-113S). MCL and IDGW primary standards (both 70 µg/L) were not exceeded in any wells.
- Reductive daughter product trans-1,2-DCE was detected at MW-111D (1.3 µg/L) and MW-113S (1.5 µg/L). MCL and IDGW primary standards (both 100 µg/L) were not exceeded in any wells.
- Reductive daughter product VC detections ranged from 1.4 J µg/L (MW-120D) to 92 µg/L (MW-113S). MCL and IDGW primary standards (both 2 µg/L) were exceeded in five wells (MP-2, MW-110S, MW-111D, MW-113S, and MW-124).
- Benzene standards of 5 µg/L were exceeded in MW-111D and MW-113S (both 7.3 µg/L).
- Chloroform exceeded its IDGW primary standard of 2 µg/L in MP-3 (2.1 µg/L).

3.3.1.2 Remediation System Extraction Wells

In the remediation system extraction wells, the following was observed:

- PCE detections ranged from 4.4 µg/L (RW-3) to 33 µg/L (RW-15). MCL and IDGW primary standards (both 5 µg/L) were exceeded in all wells except RW-3.
- TCE detections ranged from 7.2 µg/L (RW-3) to 250 µg/L (RW-1). MCL and IDGW primary standards (both 5 µg/L) were exceeded in all wells.
- cis-1,2-DCE detections ranged from 0.34 µg/L (RW-3) to 38 µg/L (RW-9R). MCL and IDGW primary standards (both 70 µg/L) were not exceeded in any wells.
- VC was detected and exceeded the MCL and IDGW primary standards (both 2 µg/L) in RW-1 (3.0 J µg/L) and RW-9R (4.9 J µg/L).
- Chloroform IDGW primary standard of 2 µg/L was exceeded in RW-1 at 2.6 µg/L.

3.3.1.3 Offsite Monitoring Wells

MW-103S and MW-115S were the only offsite monitoring wells sampled in April 2023. Results were as follows:

- PCE was detected at 5.2 µg/L in MW-103S, which exceeded MCL and IDGW primary standards, and was not detected in MW-115S.
- TCE was detected at 30 µg/L in MW-103S and exceeded MCL and IDGW primary standards. TCE was detected at 0.45 J µg/L in MW-115S and did not exceed MCL and IDGW primary standards
- Reductive daughter product cis-1,2-DCE was detected at 2.5 µg/L in MW-103S and not detected in MW-115S.
- No other VOCs were detected in either MW-103S or MW-115S.

3.3.2 Geochemical Parameters

Table 3-3 presents field and geochemical parameter results for Cell 1 and offsite monitoring wells and remediation system extraction wells. As discussed in **Section 1.3.7**, these results are used to assess conditions in groundwater affected by the landfill leachate/waste and to evaluate conditions that facilitate COC degradation.

3.3.2.1 Specific Conductance

Specific conductance was measured at all monitoring wells, and it ranged from 632 to 5,807 microSiemens per centimeter (µS/cm), as shown in **Table 3-4**. The following was observed:

- Low specific conductance (less than 1,000 µS/cm) was observed at MW-102S, MW-112D, MW-113D, and MW-115S.
- High specific conductance (2,000 to 3,000 µS/cm) was observed in MW-110S, MW-113S, MW-118D, MW-124, MW-125, RW-1, RW-2, RW-3, and RW-9R.
- Very high specific conductance (greater than 3,000 µS/cm) was observed in MP-4, MW-105S, and MW-111D.
- All other wells had specific conductance in the 1,000 to 2,000 µS/cm range, consistent with previous specific conductance observations.

3.3.2.2 Carbon

TOC is used as a general indicator of the amount of dissolved carbon within the system. TOC increases when there are inputs, such as leachate or waste originating from Cell 1. Spatial and temporal trends in TOC can be used to assess areas impacted by FHML leachate/waste. Because microbial metabolism results in depletion of DO, the presence of carbon corresponds to the development of more reducing redox conditions. Impacts by these carbon inputs are indicated in areas where TOC concentrations increase from baseline and persist.

Slightly elevated TOC concentration (greater than 10 milligrams per liter [mg/L]) was observed in MW-118D at 11 mg/L. At all other locations where analyzed, TOC ranged from 1.7 to 7.2 mg/L (**Table 3-3**).

3.3.2.3 Redox Conditions

DO, ORP, sulfate, nitrate, nitrite, ferrous iron, and methane are redox parameters used to evaluate the degree to which reducing conditions are established at a location. Reductive dechlorination of PCE and TCE to cis-1,2-DCE generally occurs under iron-reducing to sulfate-reducing conditions. Complete dechlorination to ethene and ethane typically occurs under sulfate-reducing to methanogenic conditions. Thus, understanding redox conditions provides key insight into the potential for anaerobic reductive dechlorination to occur at a site (Section 1.3.7).

Methanogenic conditions, typically ideal for complete reductive dechlorination of PCE and TCE to ethene or ethane, are indicated by the absence of oxygen, sulfate, and nitrate and the presence of methane and dissolved iron. In addition, methane production is used as a surrogate for ideal conditions for reductive dechlorination because methanogens and *Dehalococcoides*, one key group of bacteria that reductively dechlorinate TCE to ethene, generally require the same conditions (presence of hydrogen and carbon, reducing conditions, and pH greater than 6) for growth and activity. Therefore, the production of methane often coincides with the production of ethene/ethane from reductive dechlorination.

The following paragraphs summarize the concentrations of various electron acceptors, where analyzed (**Table 3-3**), to assess the redox conditions within FHML groundwater monitoring wells. Additional geochemical evaluation will be included under a separate cover as part of the pilot study evaluation reporting.

Anaerobic Wells: Monitoring wells that are likely anaerobic (DO less than 1.5 mg/L) include MP-2, MW-105S/D, MW-111D, MW-113S, MW-120S/D, MW-125, and RW-1. At these locations, DO ranged from 0.37 to 1.37 mg/L, and the lowest ORP was observed at MW-111D, at -154.8 millivolts. Where redox parameters were analyzed, nitrate ranged from 0.38 J to 18 mg/L, exceeding the MCL and ID GW primary standard in MW-125. Nitrite was not detected at any locations. Lower levels of nitrate, indicative of nitrate-reducing conditions, were observed in MP-2, MW-105D, MW-120S/D, and RW-1. Additionally, sulfate ranged from 71 to 200 mg/L. Lower levels of sulfate, indicative of sulfate-reducing conditions, were observed at MW-105D (79 mg/L) and MW-120D (71 mg/L). Methane was only analyzed in MW-125 and was not detected.

Aerobic/Anaerobic Wells: Some monitoring wells exhibited DO greater than 1.5 mg/L but exhibit other geochemical characteristics of anaerobic metabolism (e.g., nitrate reduction, sulfate/iron reduction, and methanogenesis). These wells are not considered to be strictly anaerobic and include MW-118D, MW-124, RW-2, and RW-3. At these locations, DO ranged from 1.99 to 2.67 mg/L, and the lowest ORP was observed at MW-124 (45.2 millivolts). Nitrate ranged from 2.2 to 5.6 mg/L, and nitrite was not detected at any locations. Lower levels of nitrate, observed at MW-118D, can indicate nitrate-reducing conditions. Additionally, sulfate ranged from 49 to 120 mg/L. Lower levels of sulfate, indicative of sulfate-reducing conditions, were observed at MW-118D (80 mg/L) and RW-3 (49 mg/L). Methane was analyzed in MW-124 and detected (0.013 and 0.014 mg/L).

Aerobic Wells: Wells with DO greater than 1.5 mg/L and no redox indicators of anaerobic metabolism (if analyzed) are considered to be aerobic. After spring 2023 sampling, aerobic wells include MP-3, MP-4, MW-101S, MW-102S, MW-103S, MW-109S/D, MW-110S, MW-112M/D, MW-113D, MW-115S, MW-119S/D, MW-123, RW-5, RW-9R, RW-10, RW-15, and RW-17. Of these, only MW-119S and RW-15 were analyzed for redox parameters in spring 2023. DO ranged from 1.10 to 11.23 mg/L, except at RW-9R, where DO was recorded to be 14.5 mg/L. DO measurements greater than 10 mg/L are possible where temperature is less than 15 degrees Celsius. However, the result in RW-9R is expected to be erroneous, likely because of aeration from the tap sampling method. The maximum ORP was observed at RW-5 (160.6 millivolts).

Redox conditions often control the mobility and subsequent concentration in groundwater of redox-sensitive metals such as iron, manganese, and arsenic. Under reducing conditions, these metals are transformed from their oxidized (and immobile) states to their more soluble, reduced forms. In addition, many metals that are not redox-sensitive are sorbed to iron and manganese oxyhydroxides, which may dissolve under reducing conditions, releasing sorbed metals. If site soil/sediments contain redox-sensitive metals, elevated concentrations in groundwater will be observed in areas with reducing conditions. The following summarizes the concentrations of redox-sensitive metals (**Table 3-3**):

- Arsenic concentration ranged from nondetect to 1.7 µg/L, with no elevated concentrations associated with reducing conditions.
- Chromium concentration ranged from nondetect to 2.3 J µg/L.
- Iron ranged from nondetect to 52 µg/L, except where elevated in MW-120S (510 µg/L). The iron concentration at MW-120S exceeded the IDGW secondary standard of 300 µg/L.
- Manganese ranged from nondetect to 5 µg/L, except where elevated in MW-105S (520 µg/L), MW-118D (23 µg/L), MW-120S (180 µg/L), MW-120D (220 µg/L), MW-124 (1,800 and 2,000), MW-125 (52 µg/L), RW-1 (390 µg/L), and RW-3 (280 µg/L). All these elevated concentrations, except at MW-118D, exceeded the IDGW secondary standard of 50 µg/L.

3.3.2.4 pH

pH is a key factor influencing both potential and rates of biotic and abiotic COC degradation reactions, but it can also influence metals mobility. A pH below 6.0 will inhibit the bacteria capable of complete reductive dechlorination to ethene, primarily the *Dehalococcoides* spp., with complete inhibition at pH of 5.5 or less. The pH ranged from 6.37 to 7.57 in Cell 1 and offsite groundwater monitoring wells (**Table 3-3**), indicating that pH is conducive to reductive dechlorination.

3.3.2.5 Chloride and Ethene/Ethane

In addition to being a naturally occurring chemical in groundwater systems, chloride is a byproduct of reductive dechlorination of chlorinated COCs. If reductive dechlorination is occurring and background chloride concentration is relatively low, elevated chloride can be used as an indicator for these degradation reactions.

Relatively high chloride was observed in MW-105S (470 mg/L), MW-118D (640 mg/L), and MW-125 (570 mg/L). Other locations had chloride concentration that ranged from 190 to 350 mg/L (**Table 3-3**).

Ethene/ethane are the end products of complete reductive dechlorination of PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, and/or VC. Ethene and ethane were analyzed in MW-124 and MW-125 only. Both were detected at low concentrations in MW-124 (**Table 3-3**).

3.4 Performance of the Remediation System

This section describes the performance of the remediation system as it relates to both main performance objectives of the system (Maxim 2001):

- Prevent further downgradient migration of contaminated groundwater through hydraulic containment and extraction of impacted groundwater.

- Treat extracted groundwater prior to reinjection in accordance with the injection permit (IDWR 2023).

The following sections provide additional information regarding the overall operation and functionality of the treatment system as it relates to these performance objectives.

3.4.1 Extraction Well Operations

The current reporting period for remediation system operation is December 2, 2022, through August 3, 2023. All permit compliance items summarized in **Section 1.3.8** were met for this reporting period.

The remediation well system and air stripper are inspected daily when operational and when Bannock County staff are onsite. Observations from daily inspections and weekly flowmeter readings are recorded on weekly operation and maintenance field forms. Flow data from these field forms are then entered into an online database to assess trends, identify abnormal data, and calculate overall groundwater extraction flow rates.

RW-4 had performance issues from February 21 through May 20, 2023, related to dry run alarms. The dry run alarm settings were changed, and the system is running regularly, as discussed in **Section 2.2.2.3**. The remediation system was shut down for the tracer study from May 8 through June 13, 2023. The tracer study data and evaluation will be presented under a separate cover after the pilot study performance monitoring period is completed. For the remainder of the current reporting period, the system was operational. More details on specific maintenance and repairs are provided in **Section 2.2.2**.

Table 3-4 presents well status and groundwater flow data.

Figure 3-4 shows injection, extraction, offline (not in use), and other monitoring wells near the remediation system. **Figure 3-5** shows calculated average extraction flow rates (Panel A), cumulative groundwater extraction volumes (Panel B), and cumulative TCE mass extracted (Panel C) for all wells and for the overall system influent.

The average of the weekly flow rates from December 2, 2022, through August 3, 2023, produced the following approximate data (Panel A):

- RW-4 – less than 1 gpm
- RW-5 – 3.5 gpm
- RW-9R – 1.4 gpm
- RW-10 – 6.3 gpm
- RW-15 – 11.0 gpm
- RW-17 – 4.8 gpm
- The average of the weekly combined air stripper influent flow rates from December 2, 2022, through August 3, 2023, was approximately 27.7 gpm.

Figure 3-5, Panel B shows the cumulative volume of groundwater extracted from each of the remediation wells and the system overall since September 26, 2018. Flowmeter data from prior to the replacement on April 2, 2019, are inaccurate and underrepresent the actual volume of water removed because of mechanical failure and fouling; therefore, the cumulative totals presented in this graph are low. Based on readings collected from December 2, 2022, through August 3, 2023, the system removed approximately 8.1 million gallons. **Table 3-4** presents estimates of average flow rates and cumulative volumes of groundwater removed.

3.4.2 Mass Removal

Remediation well groundwater extraction rates, volumes, and COC concentrations were evaluated to understand the relationship between groundwater and COC mass discharge from the subsurface. Following each weekly inspection, the amount of water estimated to have been removed by each remediation well was multiplied by the closest TCE concentration data point, whether it was before or after that specific week's flow total. The resulting weekly mass totals for each remediation well were then summed to estimate the mass removal from the wells and the total mass removal for the remediation system (**Figure 3-5**, Panel C). Mass removal prior to September 2018 was estimated by multiplying totalizer readings collected in September 2018 by concentrations measured in remediation well samples collected in October 2018.

Issues with inaccurate flow measurements caused the total mass removal estimates to underestimate similarly the amount of mass removed from the remediation wells prior to the April 2, 2019, flowmeter replacement. **Figure 3-5** (Panel C) shows the recent mass removal extraction rates. As shown in the figure, from December 2, 2022, through August 3, 2023, mass removal rates range in TCE removal from 0.18 to 4.86 pounds. RW-15 extracts the most mass. The estimated TCE mass removed from December 2, 2022, through August 3, 2023, was approximately 10.18 pounds.

3.4.3 Performance of Remediation System

As noted in **Section 1.3.8**, the main purpose of the remediation system is to remove VOCs in extracted groundwater prior to injection. According to the permits, it is necessary to confirm that injected water remains compliant with groundwater standards, and to monitor flow rate, volume, and injection pressure.

Table 3-5 presents analytical results for the system effluent compared against the EPA MCLs and IDGW primary and secondary standards for drinking water. There was a detection of TCE in the April 11, 2023, result for INJ-1R at 0.44 J µg/L. The detection is below the MCL of 5 µg/L.

Measurement of the injection flow rate and cumulative volume is tracked using the system influent flowmeter and the individual remediation well flowmeters. **Section 3.4.1** presents these data.

The system does not include an injection pressure gauge, because the discharge of the air stripper is by gravity and flows down the hill toward the injection wells (INJ-1 and INJ-1R). However, the piping to the injection wells prevents the wells from being pressurized, because any water that is not able to infiltrate via the well overflows to Bannock County's stormwater retention ponds south of the wells.

3.5 Cell 2 and 4 Groundwater Results

This section presents analytical results from the spring 2023 groundwater monitoring event. Cell 2 is in assessment monitoring (**Section 4.2**); Cell 2 monitoring wells include MW-8, MW-9, and MW-13, and background well MW-12. Spring 2023 samples were analyzed for the Appendix I parameters and sulfide (40 CFR §258) (**Table 2-1**).

Cell 4 is in detection monitoring (**Section 4.2**); Cell 4 monitoring wells include MW-3A, MW-5AR, and MW-6A, and background well MW-4A. MW-4 is monitored as a Cell 4 monitoring well but not as an RCRA compliance well because this well is impacted by waste originating from Cell 1. Spring 2023 samples were analyzed for the Appendix I parameter suite (**Table 2-1**).

Appendix C presents all spring 2023 groundwater analytical results, and **Appendix F** presents time series plots for all chlorinated ethenes and corresponding field and redox parameter results for each well.

Table 3-6 presents results for detected VOCs, inorganics, and field and redox parameters for Cell 2 and 4 monitoring wells. VOCs and inorganics were screened against the EPA MCLs and IDGW standards for drinking water. **Figure 3-6** presents results for PCE, TCE, cis-1,2-DCE, and VC.

3.5.1 Cell 2 VOCs

No detections of VOCs exceeded the EPA MCLs and IDGW standards in Cell 2. Detections included the following:

- 1,1-Dichloroethane at MW-13 (0.27 J and 0/29 J µg/L)
- Acetone at MW-9 (88 µg/L)
- Benzene at MW-9 (1.1 µg/L)
- cis-1,2-DCE at MW-13 (1.1 µg/L)
- Dichlorodifluoromethane at MW-13 (1.6 J µg/L)
- Trichlorofluoromethane at MW-13 (0.65 J µg/L)
- VC at MW-9 (1.0 J µg/L)

3.5.2 Cell 4 VOCs

VC exceeded the EPA MCL and IDGW standard in MW-4, which is not a compliance well. Other VOCs were detected in this well. No VOCs were detected in Cell 4 compliance monitoring wells.

3.5.3 Cell 2 Inorganics

There were no detections that exceeded MCLs or primary IDGW standards. Iron and manganese exceeded the IDGW secondary standard in MW-9. **Section 4** includes an analysis background levels for inorganic chemicals.

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3.5.4 Cell 4 Inorganics

There were no detections that exceeded MCLs or primary IDGW standards. Iron and manganese exceeded the IDGW secondary standards in MW-4, which is not a RCRA compliance well. **Section 4** includes an analysis of background levels for inorganic chemicals.

3.5.5 Geochemical Parameters

Table 3-6 presents field parameters (conductivity, pH, temperature, turbidity, DO, and ORP). Consistent with the sampling plan (**Appendix A**), TOC, anions, alkalinity, ferrous iron, and dissolved gases were not collected in Cell 2 and 4 monitoring wells.

3.5.5.1 Specific Conductance

Specific conductance was measured at all monitoring wells in Cells 2 and 4 (**Table 3-6**). Low specific conductance (557 to 924 µS/cm) was observed in the Cell 2 wells MW-8, MW-12, MW-13, and Cell 4 wells MW-3A, MW-4A, and MW-6A. Higher specific conductance (1,327 to 8,807 µS/cm) was observed at the remaining Cell 2 and Cell 4 wells.

3.5.5.2 Redox Conditions

MW-4, and MW-9 were the only locations where anaerobic conditions were observed with low DO (less than 1 mg/L) and low or negative ORP. In general, other well locations in Cells 2 and 4 were aerobic, as indicated by DO greater than 1 mg/L and positive ORP (**Table 3-6**).

3.5.5.3 pH

pH values ranged from 6.14 to 7.40 in Cell 2 and 4 monitoring wells, as presented in **Table 3-6**.

Section 4

Groundwater Data Analysis

Spring 2023 data were used to update the groundwater PCE and TCE plume extents (Section 4.1) and the statistical analysis of parameters analyzed at the site (Sections 4.3 through 4.5) according to specific monitoring requirements for each area (Section 4.2). **Appendix F** presents time series data plots for chlorinated ethenes, geochemical parameters, and inorganic parameters for wells sampled in spring 2023. **Appendix G** presents the statistical methods and comprehensive statistical results for wells sampled in spring 2023.

4.1 Updated Plume Extent

Groundwater sampling results from the spring 2023 semiannual monitoring event were used to update the lateral extents of PCE and TCE groundwater plumes via data interpolation with the modeling software Leapfrog Works, v.2021.2. The data used for isoconcentration interpolation include annual 2023 sampling results from domestic wells, city monitoring wells, and municipal supply wells (#14 and #33) (to be presented under a separate cover), and spring 2023 sampling results from Cells 1, 2, and 4 (presented herein). Thus, approximately 100 locations onsite and offsite contribute to the contouring. Data from wells not sampled during the spring 2023 event are presented in previous CDM Smith monitoring reports (CDM Smith 2023a).

Figures 4-1 and **4-2** present the updated PCE and TCE plume extents, respectively, and include spring 2023 analytical results and statistical trends results, where evaluated. Plume extents are presented as isoconcentration contours for 5 μg/L (both PCE and TCE) and 100 μg/L (TCE only).

As shown in **Figure 4-1**, PCE above 5 μg/L is present predominantly in the groundwater along the eastern boundary of Cell 1, throughout the remediation system area, and along the Fort Hall Mine Canyon into the PVA, extending north-northwest from the base of the landfill. The highest PCE concentration observed and used in the contouring through spring 2023 was 37 μg/L at MW-105D, near treatment system pumping wells. The distal edge of the plume is estimated to be slightly past MW-118D and MW-119S/D.

As shown in **Figure 4-2,** the TCE plume has a similar footprint to PCE, but the isoconcentration contour is wider in the mouth of the canyon near the remediation system, and it extends farther to the northwest, offsite and along the PVA northwest toward the city of Pocatello. The highest TCE concentration observed and used in the contouring through spring 2023 was 200 μg/L at both MW-105D and RW-9R.

For both PCE and TCE plume extents, relatively higher concentrations are found at the base of Cell 1 near the remediation system. There are poor bounding data available west of the remediation system in the offsite area between the FHML property boundary and MW-116S because of (1) no access to the private properties located there and (2) a steep slope on the northern boundary of Cell 1 with no monitoring or domestic wells.

A description of the model development is provided in the Final QAPP (CDM Smith 2021b). The PCE and TCE plume contours were estimated with a kriging algorithm to create a contour map of the most recent PCE and TCE plumes available through 2023. A three-dimensional representation of TCE concentrations in groundwater is shown at the 5 and 100 µg/L isoconcentration levels. Nondetect results are entered as one-tenth of the reporting detection limit, with some nondetect results omitted because of high RLs. Analytical data were log transformed as part of the interpolation process. The interpolations are accurate at each data point but are estimated between data points. Groundwater interpolations have a dynamic surface resolution of 50 feet, and horizontal-to-vertical anisotropy is 10:1. Model settings were revised according to site conditions, and contours were further revised manually in reported data figures. For instance, there are limited bounding data in the distal portions of the plume, on the western side of the plume as mentioned above, and to the east of the remediation system; therefore, the original interpolations were revised to adjust for this.

4.2 Landfill Monitoring Requirements

Monitoring requirements for landfills, including FHML Cell 2 and 4, are set forth by the *Criteria for Municipal Solid Waste Landfills* (40 CFR §258, Subpart E). Appendix I and Appendix II parameters mentioned herein correspond to the parameter lists provided in Appendices I and II of 40 CFR §258, Subpart E. There are three tiers of monitoring for RCRA compliance, briefly described in the following sections.

4.2.1 Detection Monitoring

Cell 4 is currently managed under detection monitoring requirements. Under detection monitoring, semiannual monitoring of Appendix I parameters is conducted. Appendix I parameters include VOCs and metals.

Background threshold values are developed for the parameters and periodically updated with ongoing data collection as appropriate. Detectable background concentrations of metals are expected, whereas background concentrations of anthropogenic organic compounds are typically considered to be the method detection limit (MDL).

If a statistically significant increase over background for an inorganic chemical or a statistically significant detection of an organic chemical is observed that cannot be attributed to sampling or analytical error, natural variation, or a source outside of the landfill cell, then assessment monitoring is initiated within 90 days.

4.2.2 Assessment Monitoring

Cell 2 is currently managed under assessment monitoring requirements. Under assessment monitoring, the analytical list is expanded to include the Appendix II parameters, which include SVOCs, mercury, tin, cyanide, sulfide, pesticides, herbicides, PCBs, and 2,3,7,8-TCDD, in addition to all Appendix I parameters required by detection monitoring. The monitoring is conducted semiannually; during one event (i.e., fall), all Appendix II parameters are analyzed, and during the other event (i.e., spring), all Appendix I parameters are analyzed, along with any additional Appendix II parameters detected during the prior event.

Background threshold values are developed for any detected Appendix II parameter. Detectable background concentrations of metals are expected, whereas background concentrations of anthropogenic organic compounds are typically considered to be the MDL. Groundwater protection standards are used for comparison against statistical results; these standards are typically federal MCLs or state-specific standards.

If concentrations of all Appendix II parameters are at or below background for two consecutive sampling events, then the groundwater monitoring program for the area can revert back to semiannual detection monitoring. However, if concentrations of any of the Appendix II parameters are significantly greater than background but less than the groundwater protection standard, then assessment monitoring continues. If any parameter exceeds a groundwater protection standard and the exceedance cannot be explained as a statistical anomaly, alternate sources, or natural background, corrective measures must be initiated.

4.2.3 Corrective Action

Cleanup measures must be undertaken at that site. Rather than creating a rigid regulatory framework, the RCRA corrective action cleanup process focuses on results instead of specific steps and is flexible, depending on site-specific conditions. A typical cleanup may include steps such as initial site assessment, site characterization, interim actions, evaluation of remedial alternatives, and implementation of the selected remedy. Cell 1 is currently managed under corrective action requirements but is not regulated under RCRA.

4.3 Cell 1 Source Area

Cell 1 is currently in corrective action monitoring, which includes semiannual sampling of VOCs, metals, geochemical parameters, and other parameters sampled to support evaluation of the ongoing injection pilot study, discussed under a separate cover, and the current groundwater treatment system. A pump-and-treat groundwater extraction system has been in operation since 2002.

This section presents the statistical analysis of VOCs and inorganics for wells related to the Cell 1 source area that were sampled in spring 2023, combining the discussion of Cell 1 onsite and offsite Bannock County monitoring wells and remediation system extraction wells because they are all sampled for corrective action monitoring purposes (Section 4.2.3). Data sets for monitoring wells not sampled in spring 2023 have been previously analyzed and presented in respective groundwater monitoring reports and are not discussed herein.

Appendix F provides comprehensive time series plots for chlorinated ethenes, daughter products, geochemical parameters, and inorganics.

4.3.1 Statistical Approach

Appendix G presents the complete statistical approach (**Section G.2.1**) and analysis, which is summarized below.

- ***Cell 1 Statistical Tests***

  - Comparison of upper confidence limit (UCL) of the mean to standard if the standard is available.
  - Mann–Kendall trend analysis and Theil–Sen regression.
  - Parameters with data sets consisting entirely of MDL values were not analyzed and are not shown.

- ***Analyzed Data Range***: August 2017 through April 2023
- ***Exceedance Criteria***: UCL of the mean of a COC exceeds the standard in Cell 1 or offsite monitoring well (does not apply to remediation system wells). Cell 1 is not regulated under RCRA; however, the organic and inorganic parameter lists match the RCRA Appendix I list.
- ***Source Background Data***: Not applicable to Cell 1 or offsite wells.
- ***Confidence Limits Criteria***: UCL of the mean is calculated with a 95% confidence interval for data sets at least two distinct detected results.
- ***Trend Analysis Criteria***:
  - Trends are only calculated for data sets with at least 50% detected results and at least six data points. Additionally, trends are only calculated for data sets where the UCL of the mean exceeds the standard.
  - A statistically significant trend is present if the confidence level is greater than 95% for increasing and decreasing results, with a direction corresponding to the sign of S. As described in **Appendix G**, Mann-Kendall test results for Cell 1 wells uses a range for alpha to define probably significant trends where the confidence level is between 90% and 95%. Additionally, the COV is used to distinguish between no trend and no trend with stable concentrations (i.e., low variability) for datasets with confidence levels below 90% and for which no statistically significant trend has been identified (Connor et al. 2012).

The following sections provide a results summary for the statistical analysis of Cell 1, organized by parameter group.

4.3.2 VOCs

Tables G-1 through **G-3** present the complete statistical analysis for VOCs in Cell 1, offsite, and remediation system wells. **Tables 4-1** through **4-3** summarize key statistical results.

4.3.2.1 Comparison Latest Value to Standard

Consistent with past results, benzene, PCE, TCE, and VC exceeded MCLs in one or more Cell 1 monitoring wells in spring 2023 (**Table 3-2**). The maximum concentrations were detected in the following wells:

- Benzene: MW-111S (18.0 J µg/L)
- Chloroform: MP-3 (2.1 µg/L)

- PCE: MW-105D (37 µg/L)
- TCE: MW-105D (200 µg/L)
- VC: MW-113S (92 µg/L)

4.3.2.2 Comparison of UCL to Standard

UCLs of the mean exceeded the standard in the following Cell 1 monitoring well PCE and TCE data sets: MP-2, MP-3, MP-4, MW-101S, MW-102S (TCE only), MW-105S/D, MW-109S/D, MW-110S, MW-111D (TCE only), MW-112M/D, MW-113S/D, MW-118D, MW-119S/D, MW-120S/D, and MW-123 (TCE only) (**Table 4-1**).

Other parameters analyzed in spring 2023 with a UCL exceeding the standard were as follows:

- Benzene in MW-111D and MW-113S
- Chloroform in MW-113S
- VC in MP-2, MW-105S, MW-110S, MW-111D, MW-113S/D, and MW-120D

Additionally, the UCL of the mean exceeded the standard for TCE in offsite MW-103S (**Table 4-2**).

These results are generally consistent with previous results presented in recent CDM Smith monitoring reports (e.g. CDM Smith 2023a).

4.3.2.3 Trend Analysis

In addition to the statistical results tables, **Figures 4-1** and **4-2** present a visual trend analysis summary for PCE and TCE in the Cell 1 monitoring wells and remediation system extraction wells. Only PCE and TCE are evaluated in remediation system extraction wells.

The following VOC trends were evaluated in Cell 1 monitoring wells (**Table 4-1**):

- PCE exhibited increasing trends in MW-101S, MW-110S, MW-112M, and MW-119S/D. PCE exhibited decreasing trends in MW-113S, MW-118D, and MW-120S. MP-2 and MW-120D exhibited stable trends. MP-3, MP-4, and MW-109D exhibited probably increasing trends, and MW-113D exhibited a probably decreasing trend. The remainder of the evaluated datasets yielded no significant trends.
- TCE exhibited increasing trends in MW-101S, MW-110S, MW-119S/D, and MW-120D and probably increasing trends in MW-111D and MW-112M. TCE exhibited stable trends (no identifiable trend, low variability in concentration) in MP-2, MW-105D, MW-109D, MW-112D, and MW-123. TCE exhibited decreasing trends in MW-105S, MW-113S/D, and MW-118D and a probably decreasing trend in MW-120S. The remainder of the evaluated datasets yielded no significant trends. However, TCE concentrations in MW-109S have fluctuated over the last few years, where concentrations are lower in the spring than in the fall (**Appendix F**). If data continue in this apparent seasonal trend, an alternative statistical approach may be used to identify concentration trends in this well.

- VC exhibited decreasing trends in MW-113D and MW-120D and a probably decreasing trend in MW-105S. VC exhibited stable trends in MP-2, MW-110S, and MW-113S and a probably increasing trend in MW-111D. The remainder of the evaluated datasets yielded no significant trends.
- Benzene exhibited a decreasing trend and a stable trend in MW-111D and MW-113S, respectively.
- Chloroform exhibited a decreasing trend in MW-113S.

The following trends were evaluated in offsite monitoring wells (**Table 4-2**):

- TCE exhibited an increasing trend in MW-103S.

The following trends were evaluated in remediation system wells (**Table 4-3**):

- PCE exhibited increasing trends in RW-10, RW-15, RW-17, and RW-5, stable trend in RW-3, and no trend in RW-9R.
- TCE exhibited increasing trends in RW-10, RW-17, and RW-5, a probably increasing trend in RW-15, a stable trend in RW-3, and no significant trend in RW-9R.

Monitoring wells MW-101S, MW-110S, MW-112M, MW-119S/D, and MW-120D now exhibit increasing trends of PCE or TCE, whereas no trend was previously reported (CDM Smith 2023b). The higher prevalence of increasing trend results reported now is because of the date range selected for evaluation (Section 4.3.1). Most datasets have higher concentrations prior to 2018 followed by lower concentrations around 2018, which have been slowly increasing in concentration; now that the evaluation time frame starts mid-2017 or 2018, depending on available data for the well, the statistical confidence level for the Mann–Kendall trend analysis has now reached the level where a trend is considered statistically relevant for the evaluated time frame. However, for most of these datasets, the Theil–Sen slope is relatively shallow (**Appendix G** tables), indicating a slow increase in concentration. **Appendix F** includes all COC time series plots. CDM Smith will continue to evaluate changes in concentration to understand these shifts.

4.3.3 Inorganics

Dissolved metals were analyzed in select Cell 1 monitoring wells to support the pilot study monitoring, which will be presented under a separate cover. Because total metals are typically analyzed at this site, the statistical analysis for inorganic parameters was not updated herein to avoid mixing total and dissolved fraction metals data. The statistical evaluation will be updated the next time total metals are analyzed in Cell 1 monitoring wells as part of the semiannual monitoring events.

4.3.4 Cell 1 Statistical Summary

Cell 1 is currently managed under corrective action requirements. Statistical analyses for VOCs were updated during this event and are presented in **Table 4-1** and **Figures 4-1** and **4-2**.

Cell 1 monitoring wells are located throughout the FHML site—upgradient, cross-gradient, and downgradient of the remediation system. If the remediation system effectively captured COC mass from Cell 1, downgradient Cell 1 monitoring wells would be expected to have lower concentrations of COCs than upgradient and cross-gradient wells. Furthermore, downgradient wells would be expected to have decreasing trends along the time period of effective remediation system operation.

However, PCE and TCE exceedances above the MCL persist in Cell 1 monitoring wells to the west, east, and downgradient of the remediation system, and PCE and TCE exhibit statistically increasing trends in some Cell 1 monitoring wells, which indicates a continuing source of contamination and incomplete capture of the remediation system, consistent with previous interpretations (CDM Smith 2023b). As shown in **Figures 4-1** and **4-2**, trends from August 2017 to April 2023 generally vary from decreasing to increasing in monitoring wells from west to east, respectively.

Climate conditions of 2023 will be assessed the forthcoming fall 2023 semiannual monitoring report to help evaluate possible contribution of precipitation to higher COC concentrations observed in some monitoring wells in 2023.

Thus, corrective action management is currently appropriate for Cell 1.

4.4 Cell 2

Cell 2 is currently in assessment monitoring. MW-12 is the background well, and MW-8, MW-9, and MW-13 are downgradient compliance wells. MW-7 is not a compliance well and has been impacted by waste in the Cell 1 area; therefore, it was not sampled or evaluated herein. Samples collected from Cell 2 monitoring wells during the spring 2023 monitoring event were analyzed for Appendix II VOCs and inorganics, according to assessment monitoring requirements (Section 4.2.2).

This section presents the statistical analysis of Appendix II organic and inorganic parameters in Cell 2 monitoring wells sampled in spring 2023. **Appendix F** provides comprehensive time series plots for chlorinated ethenes, daughter products, geochemical parameters, and inorganics.

4.4.1 Statistical Approach

Appendix G presents the complete statistical approach and analysis, which is summarized below.

- ***Cell 2 Statistical Analyses***:
  - Comparison of latest value to standard if available.
  - Comparison of lower confidence limit (LCL) of the mean to standard if available.
  - Comparison of latest value to upper prediction limit (UPL) of background for inorganics if the standard is not available.
  - Mann–Kendall trend analysis and Theil–Sen regression.
  - Parameters with data sets consisting entirely of MDL values were not statistically analyzed and are not shown. The only data sets presented with 100% MDL values are

those for inorganic parameters in background well MW-12, which are shown for comparison to downgradient compliance wells.

- ***Analyzed Data Range***: August 2017 through May 2023
- ***Exceedance Criteria***:
  - LCL of the mean that exceeds the promulgated standard may trigger corrective action.
  - Either a spring 2023 Appendix II inorganic result that exceeds UPL of background or a spring 2023 detection (exceedance of background) of Appendix II organic requires continuation of the assessment monitoring management tier.
- ***Source of Background Data***:
  - Organic parameters: Not applicable. All detections of organic Appendix I or Appendix II parameters (40 CFR §258, Subpart E) are considered exceedances of background.
  - Inorganic parameters: Background compliance well MW-12, interwell method.
- ***UPL of Background Criteria***: The UPL is calculated for background data sets with at least two distinct detected results.
- ***Confidence Limits Criteria***: LCL of the mean is calculated with a 95% confidence interval for data sets with at least two distinct detected results.
- ***Trend Analysis Criteria***:
  - Trends are only calculated for data sets with more than 50% detected results and at least six results. Additionally, in compliance wells, the trend is only calculated for a data set with an exceedance of the standard (LCL) or background (detection for organics).
  - A statistically significant trend is present if the confidence level is greater than 95% for increasing and decreasing results, with a direction corresponding to the sign of S. No trend is established for confidence levels below 95%.

The following sections provide a results summary for the statistical analysis of Cell 2 wells, organized by parameter group.

4.4.2 VOCs

Table G-4 presents the complete statistical analysis for VOCs in Cell 2. **Table 4-4** summarizes key statistical results.

4.4.2.1 Comparison of Latest Value and LCLs to Standard

No Cell 2 Appendix II VOC exceeded its promulgated standard in spring 2023. Additionally, no Appendix II VOC data set had an LCL of the mean that exceeded the promulgated standard.

4.4.2.2 Comparison of Latest Value to Background

Background concentrations of Appendix II organic parameters are considered to be the MDL; therefore, any detections constitute an exceedance of background (Section 4.2.2). **Appendix G** presents time series plot data for chemicals exceeding background, which include the following datasets:

- MW-13: 1,1-dichloroethane, dichlorodifluoromethane, and trichlorofluoromethane (J-qualified, no standards apply) and cis-1,2-dichloroethene (below standard). cis-1,2-DCE and dichlorodifluoromethane have consistently been detected in recent sampling at low concentrations. 1,1-dichloroethane and trichlorofluoromethane are not frequently detected.
- MW-9: acetone (no standard), benzene (below standard), and VC (J-qualified, below standard). Acetone and VC have been detected MW-9 in recent years. Acetone is a common laboratory contaminant. This was the first detection of benzene.

4.4.2.3 Trend Analysis

Mann–Kendall trend results were as follows (**Table 4-4**):

- MW-13: no significant trend for dichlorodifluoromethane; increasing trend for cis-1,2-DCE
- MW-9: no significant trends for acetone or VC

4.4.3 Inorganics

Table G-5 presents the complete statistical analysis for inorganics in Cell 2. **Table 4-5** summarizes key statistical results.

4.4.3.1 Comparison of Latest Value and Standards and LCLs

No Appendix II inorganic parameter exceeded its promulgated standard in spring 2023. Additionally, LCLs of the mean in Cell 2 compliance wells did not exceed RCRA Appendix II parameters for inorganics. Parameters without a standard include cobalt, nickel, sulfide, tin, and vanadium.

In MW-9, iron and manganese spring 2023 results and LCLs of the mean exceeded the IDGW secondary standards. Inorganics with secondary IDGW standards include iron, manganese, silver, and zinc.

4.4.3.2 Comparison of Latest Value to Background

All spring 2023 inorganics results were compared to background, which is defined by the UPL of the background data sets for MW-12. **Appendix G** presents time series plot data for RCRA parameters exceeding background, which include the following datasets:

- MW-8: arsenic and nickel. Arsenic is commonly detected in this well, but nickel has not been detected since 2020.
- MW-9: arsenic, barium, lead, nickel, and zinc. Arsenic and lead have not been detected since 2020; barium and nickel and zinc are frequently detected.

- MW-13: Arsenic and barium are both frequently detected.

Spring 2023 results exceeding background were one to two orders of magnitude lower than the standard for the respective parameter. Nickel is the only parameter without a standard.

Other inorganics with exceedances of background included iron and manganese in MW-9 and MW-13; these metals have secondary IDGW standards but are not regulated under RCRA.

4.4.3.3 Trend Analysis

A Mann–Kendall trend analysis was performed for RCRA parameters per Section 4.4.1.

Downgradient Compliance Wells

The following concentration trends were observed for Cell 2 compliance wells in which the spring 2023 result exceeded background (**Table 4-5**):

- MW-8: Arsenic is decreasing.
- MW-9: Arsenic, nickel, and zinc are decreasing; barium is increasing.
- MW-13: Neither arsenic nor barium exhibit a statistically significant trend.

Upgradient Background Well

Background compliance well MW-12 exhibited no statistically significant trends for arsenic, barium, chromium, or selenium. Cobalt exhibited a decreasing trend. Other parameters were not evaluated for trends in MW-12 because of the high percentage of MDL results in the evaluated period.

4.4.4 Cell 2 Statistical Summary

In assessment monitoring, if any RCRA Appendix II parameter exceeds a promulgated standard and the exceedance cannot be explained as a statistical anomaly, alternate sources, or natural background, then corrective measures must be initiated. However, if concentrations of any of the Appendix II parameters are significantly greater than background but less than the groundwater protection standard, then assessment monitoring continues. Exceedances of background do not trigger corrective action unless there is a statistically significant increasing trend, which highlights COCs with future potential to exceed their standard (Section 4.2).

In Cell 2 monitoring wells, no Appendix II parameters exceeded promulgated standards in spring 2023. However, VOCs were detected (i.e., exceeded background) below standards in MW-9 and MW-13, and several inorganics exceeded background in MW-8, MW-9, and MW-13 (**Tables 4-4** and **4-5**). These results are generally consistent with recent evaluations, and exceedances of background (both UPL and MDL) require the continuation of assessment monitoring management for Cell 2 (Section 4.2.2).

4.5 Cell 4

Cell 4 is currently in detection monitoring. MW-4A is the background well, and MW-3A, MW-5AR, and MW-6A are the downgradient compliance wells. MW-4 is not a compliance well, but it is part of the monitoring network for Cell 2 and is used in the Cell 1 performance monitoring program.

Samples collected from Cell 4 monitoring wells during the spring 2023 monitoring event were analyzed for Appendix I VOCs and metals, according to detection monitoring requirements (Section 4.2.1).

This section includes a discussion on the statistical analysis of Appendix I organic and inorganic parameters in Cell 4 compliance monitoring wells sampled in spring 2023. **Appendix F** provides comprehensive time series plots for chlorinated ethenes, daughter products, geochemical parameters, and inorganics.

4.5.1 Statistical Approach

Appendix G presents the complete statistical approach and analysis, which is summarized below.

- ***Cell 4 Statistical Analyses***:
  - Comparison of latest value to standard, if the standard is available
    - *If latest value exceeds the standard, comparison of LCL to standard*
  - Comparison of latest value to MDL for organics
  - Comparison UPL of background for inorganics
  - Mann–Kendall trend analysis and Theil–Sen regression
  - Parameters with data sets consisting entirely of MDL values were not statistically analyzed and are not shown. The only data sets presented with 100% MDL values are those for inorganic parameters in background wells, which are shown for comparison to downgradient compliance wells.
- ***Analyzed Date Range***: August 2017 through May 2023
- ***Exceedance Criteria***:
  - Spring 2023 result or LCL of the mean exceeds the promulgated standard (may trigger corrective action).
  - Spring 2023 result exceeds the UPL of background (inorganic) or MDL of the parameter (organic) (may trigger assessment monitoring)
- ***Source of Background Data:***
  - Organic parameters: Not applicable. All detections of organic Appendix I parameters (40 CFR §258, Subpart E) are considered exceedances of background.
  - Inorganic parameters: Background compliance well MW-4A, interwell method.
- ***UPL of Background Criteria***: The UPL is calculated for background data sets with at least two distinct detected results.

- ***Confidence Limits Criteria***: LCL of the mean is calculated with a 95% confidence interval for data sets at least two distinct detected results.
- ***Trend Analysis Criteria***:
  - Trends are only calculated for data sets with more than 50% detected results and at least six results. Additionally, in compliance wells, the trend is only calculated for data sets with an exceedance of background.
  - A statistically significant trend is present if the confidence level is greater than 95% for increasing and decreasing results, with a direction corresponding to the sign of S. No trend is established for confidence levels below 95%.

The following sections provide a results summary for the statistical analysis of Cell 4 wells, organized by parameter group.

4.5.2 VOCs

Table G-6 presents the complete statistical analysis for VOCs in Cell 4. **Table 4-6** summarizes key statistical results.

4.5.2.1 Comparison of Latest Value to MDL and Standard

Background concentrations of Appendix I organic parameters are typically considered to be the MDL; therefore, any detection constitutes an exceedance of background (Section 4.2.1). VOCs were not detected in compliance wells; however, several VOCs were detected in MW-4 (not a compliance well), and VC exceeded its promulgated standard in spring 2023.

4.5.2.2 Trend Analysis

Mann–Kendall analysis was not performed for any VOC data from the compliance and background wells because there were no VOC detections (i.e., exceedances of background) in wells with sufficient data to perform the test. Several VOCs exhibited statistically significant trends in MW-4 (not a compliance well), as shown in **Table 4-6**.

4.5.3 Inorganics

The Appendix I inorganics group consists of 15 metals. Tin, an Appendix II parameter, was also analyzed in Cell 4 samples. **Table G-7** presents the complete statistical analysis for inorganics in Cell 4. **Table 4-7** summarizes key statistical results.

4.5.3.1 Comparison of Latest Value to Standards

No Appendix I inorganic parameter value exceeded promulgated standards in Cell 4 monitoring wells, which is consistent with recent results. Cobalt, nickel, and vanadium do not have standards.

In MW-4, iron and manganese results exceeded the ID GW secondary standards.

4.5.3.2 Comparison of Latest Value to Background

All spring 2023 inorganics results were compared to background, which is defined by the UPL of the data sets from background well MW-4A. The following RCRA parameters exceeded background in compliance wells in spring 2023, and **Appendix G** presents time series plot data for these chemicals, starting at 2002, where data are available:

- MW-6A: Barium, which is frequently detected around 200 µg/L, an order of magnitude below the standard near the UPL of background (190 µg/L).

In MW-4, (not a compliance well), cobalt and vanadium exceeded background.

Additionally, inorganics with secondary IDGW standards that exceeded background included iron in MW-4 and manganese in MW-4 and MW-5AR.

4.5.3.3 Trend Analysis

A Mann–Kendall trend analysis was performed for RCRA parameters per Section 4.5.1.

Downgradient Wells

The following results were identified for evaluated data sets (**Table 4-7**):

- MW-6A: Barium did not exhibit a statistically significant trend.
- MW-4 (noncompliance): Cobalt displays a decreasing trend and vanadium displays an increasing trend.

Upgradient Background Well

Background compliance well MW-4A exhibited no statistically significant trends for arsenic, barium, or selenium. Vanadium exhibited an increasing trend. Other parameters were not evaluated for trends in MW-4A because of the high percentage of MDL results in the evaluated period.

4.5.4 Cell 4 Statistical Summary

In detection monitoring, if a statistically significant increase over background or a detection above the standard cannot be attributed to sampling or analytical error, natural variation, or a source outside of the landfill cell, then assessment monitoring is initiated within 90 days. For FHML, background levels are considered to be the MDL for organic Appendix II parameters, because no background levels are expected for these chemicals; therefore, detections of organics constitute an exceedance of background.

In Cell 4 monitoring wells, no Appendix I parameters exceeded promulgated standards in spring 2023 (**Tables 4-6** and **4-7**). VOCs were not detected (i.e., did not exceed background) in compliance wells. Inorganics did not exceed background in compliance wells, except for barium in MW-6A. Barium concentrations have been consistently one order of magnitude lower than the standard over the monitoring period, and concentrations are close to the UPL of background. These results are generally consistent with recent evaluations, and the exceedance of barium above background will require continuing evaluation under the detection monitoring tier to determine whether any change is required in the monitoring program for Cell 4.

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Section 5

Conclusions and Recommendations

Groundwater samples were collected in April and May during the spring 2023 sampling event to evaluate conditions to achieve the following objectives:

- Evaluate groundwater gradients and flow within and downgradient from the FHML Cell 1 source area and offsite plume and within Cell 2 and 4 areas.
- Evaluate the Cell 1 remedy and determine the current nature and extent of the PCE and TCE plume discharging from Cell 1, the impact of the remediation system, and impacts within PVA.
- Provide the status of RCRA compliance monitoring at Cells 2 and 4 and statistical analysis of detected Appendix I and/or II parameters against promulgated standards and/or background levels.
- Evaluate the spatial and time trends for COCs identified for (1) Cell 1 source area and offsite plume and (2) Cells 2 and 4 above MDLs and/or background and determine whether they are significantly increasing or decreasing.
- Evaluate geochemical data to provide evidence for natural attenuation processes throughout the Cell 1 PCE and TCE plume.
- Evaluate the COC mass and groundwater volume removed by the remediation system.
- Determine whether the air stripper remediation system is meeting the discharge permit requirements.

5.1 Cell 1 Source Area and Offsite Plume

Increasing and decreasing trends of PCE and TCE have been observed in PCE and TCE concentration datasets from wells upgradient, downgradient, and in the remediation area. An offsite PCE and TCE plume extends through the mouth of the Fort Hall Canyon into PVA and migrates northwest toward the city of Pocatello approximately 0.6 miles.

VOCs were analyzed from all sampled locations in spring 2023. PCE, TCE, benzene, and VC all had UCLs of the mean that exceeded promulgated standards, as discussed in **Section 4.3**. Chemicals that exceeded MCLs in monitoring wells at the landfill boundary (i.e., MW-118D, MW-119D, and MW-120D) included PCE and TCE.

Table 5-1 presents the recommended monitoring well sampling plan for Cell 1 for the fall 2023 sampling event. In summary:

- A comprehensive synoptic groundwater level measurement will be performed across Cells 1, 2, and 4.

- The following monitoring wells downgradient of the Cell 1 remediation system and near the boundaries of the FHML property boundary are recommended for performance monitoring: MP-3, MP-4, MW-102S, MW-117R, MW-118D, MW-119S/D, MW-120S/D, and MW-123. These wells will be sampled for VOCs in fall 2023.
- The following monitoring wells are near the Cell 1 source and will be monitored to evaluate COC discharge to the groundwater plume: all operating RW wells (i.e., RW-4, RW-5, RW-9R, RW-10, RW-15, and RW-17), MP-1, MP-2, MW-105S/D, MW-112M/D, MW-111S/D, MW-113S/D, and RW-16. These wells will be sampled for VOCs in fall 2023.
- The following monitoring wells are upgradient of the remediation system and will be monitored for input tracking to the remediation system: MW-101S, MW-109S/D, MW-110S, and MW-122. These wells will be sampled for VOCs in fall 2023.
- The air stripper effluent (injection well INJ-1R) will be sampled for VOCs quarterly. Additional parameters as required by the injection permit (total metals, SVOCs, pesticides, herbicides, PCBs, dioxins/furans, mercury, cyanide, and total sulfide) will be collected during fall 2023.
- Offsite monitoring wells MW-103S, MW-115S, and MW-116S will be used for performance monitoring in the distal plume. These wells will be sampled for VOCs during fall 2023.
- To date, all monitoring wells have been sampled with low flow sampling via bladder pumps. In fall 2023, select locations will be sampled via both low flow sampling and passive methods, in accordance with a passive sampling approach memorandum (CDM Smith 2023d). Based on comparison of concentration results from each method, select wells are anticipated to be sampled henceforth via passive sampling methods only. No changes would occur in sampling methods for monitoring wells that currently have a dedicated bladder pump. The passive samplers are an effective, economical alternative to wells that do not have dedicated pumps (CDM Smith 2023d).
- The fall 2023 sampling plan also includes additional parameters to be analyzed for select wells, including planned new monitoring wells, based upon the 2023 pilot study performance monitoring program presented under a separate cover.

The statistical approach will be adjusted to fix the start date of August 2017 (where data is available) and continue to add new data with each sampling event, rather than allow the start date to move with the set timeframe. This will increase the count of data results in each statistically evaluated dataset, increase statistical confidence in tests, and reduce the likelihood of Type I and Type II errors in statistical analysis.

Additionally, climate conditions of 2023 will be assessed the forthcoming fall 2023 semiannual monitoring report to help evaluate possible contribution of precipitation to higher COC concentrations observed in some monitoring wells in 2023.

5.2 Cells 2 and 4

Table 5-2 presents the recommendations for the fall 2023 sampling event for Cells 2 and 4.

Cell 2 (MW-12, MW-13, MW-8, and MW-9) is in assessment monitoring, which is the appropriate monitoring tier based on the statistical evaluate (Section 4.4). Cell 2 monitoring wells will be sampled for Appendix II parameters in fall 2023.

Cell 4 (MW-3A, MW-4, MW-4A, MW-5AR, and MW-6A) is in detection monitoring, which is the appropriate monitoring tier based on the statistical evaluation (Section 4.5). Cell 4 monitoring wells will be sampled for Appendix I parameters (i.e., VOCs and total metals) in fall 2023.

5.3 Operation of Pump-and-Treat System

Operation of the remediation system will continue throughout 2024 to ensure that the system will continue operating to meet requirements of the CO, including the following:

- Operation and maintenance of the system:
  - Operators will continue to confirm the system is operating as intended.
  - Operators will confirm continued operation of the air stripper and blower, continued level control of extraction pumps, and continued operation of the antiscalant metering pump.
  - Operators will collect weekly extraction well data, including flow totals, instantaneous flow rates, instantaneous pump speeds, operational runtime, and pump starts/stops.

If appropriate, the following maintenance and optimization activities may be considered for the remainder of 2023 and 2024, based on their expected value:

- Further optimization of pumping based on operational data.
- Operational data listed above will be supplemented with periodic evaluation of well-specific capacity for analysis to determine when well efficiency is dropping and when additional rehabilitation may be needed. Rehabilitation may also be considered for wells that have not been recently rehabilitated.
- Flowmeters and pumps will be evaluated and replaced as needed, depending on performance.

Performance and compliance monitoring will be continued, with quarterly sampling of the injection well. In the first and third quarter of each year, VOCs will be analyzed using EPA Method 8260. In the second and fourth quarter of each year, VOCs will be analyzed using EPA Methods 8260 and 8011 and the extended suite of parameters (**Tables 5-1** and **5-2**).

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Section 6

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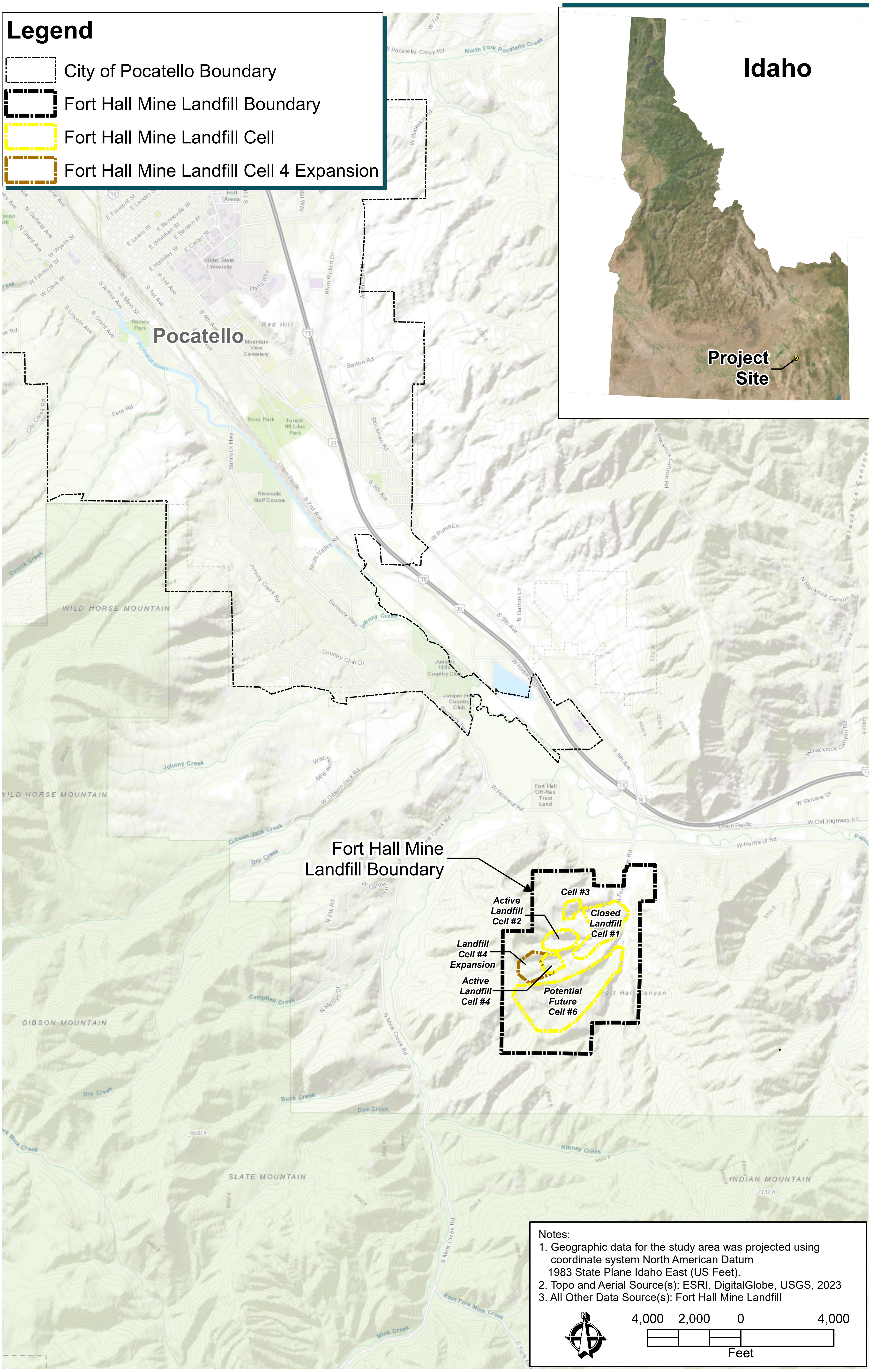
FIGURES



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2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring
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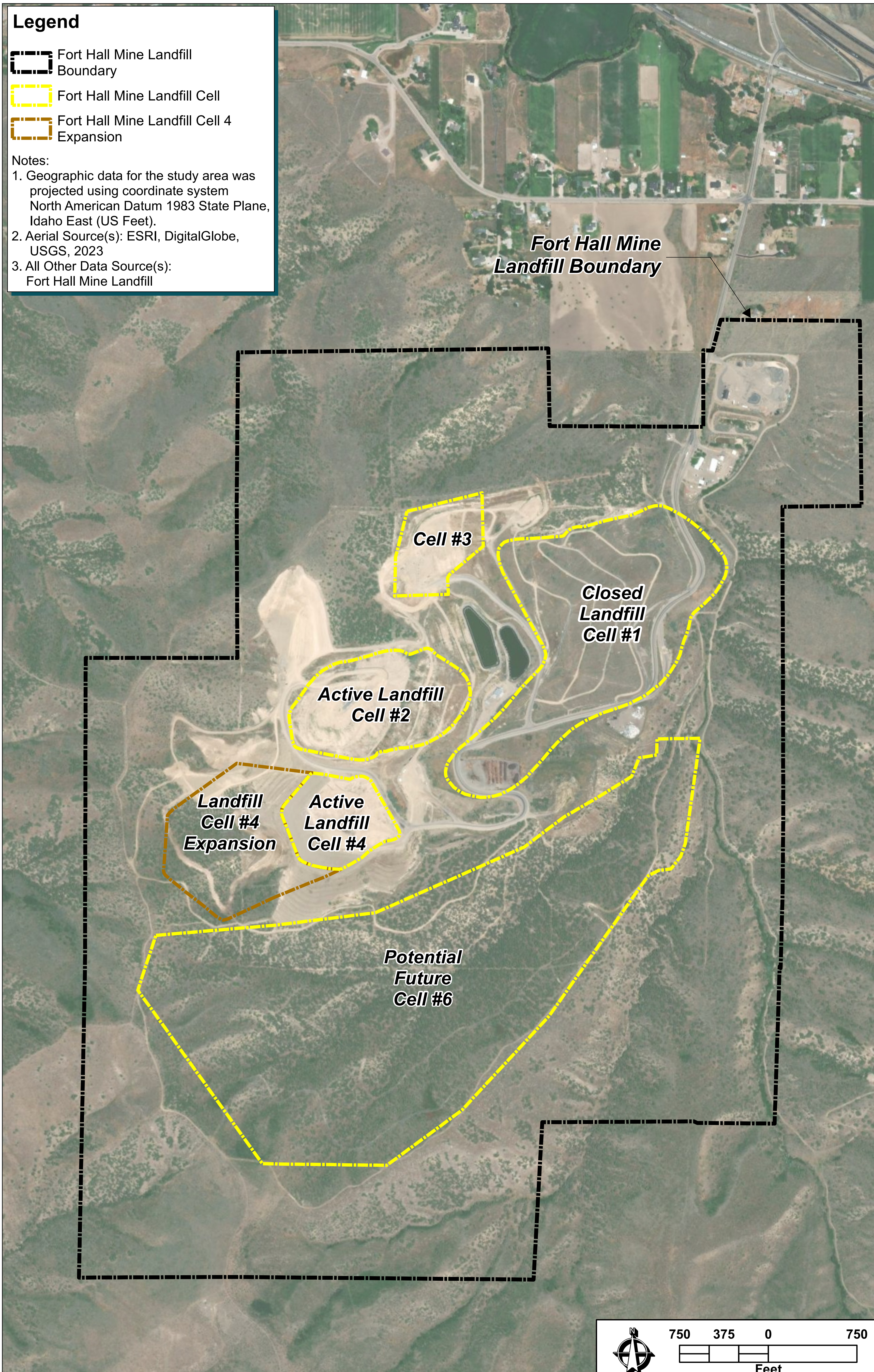
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 1-1
Site Location Map



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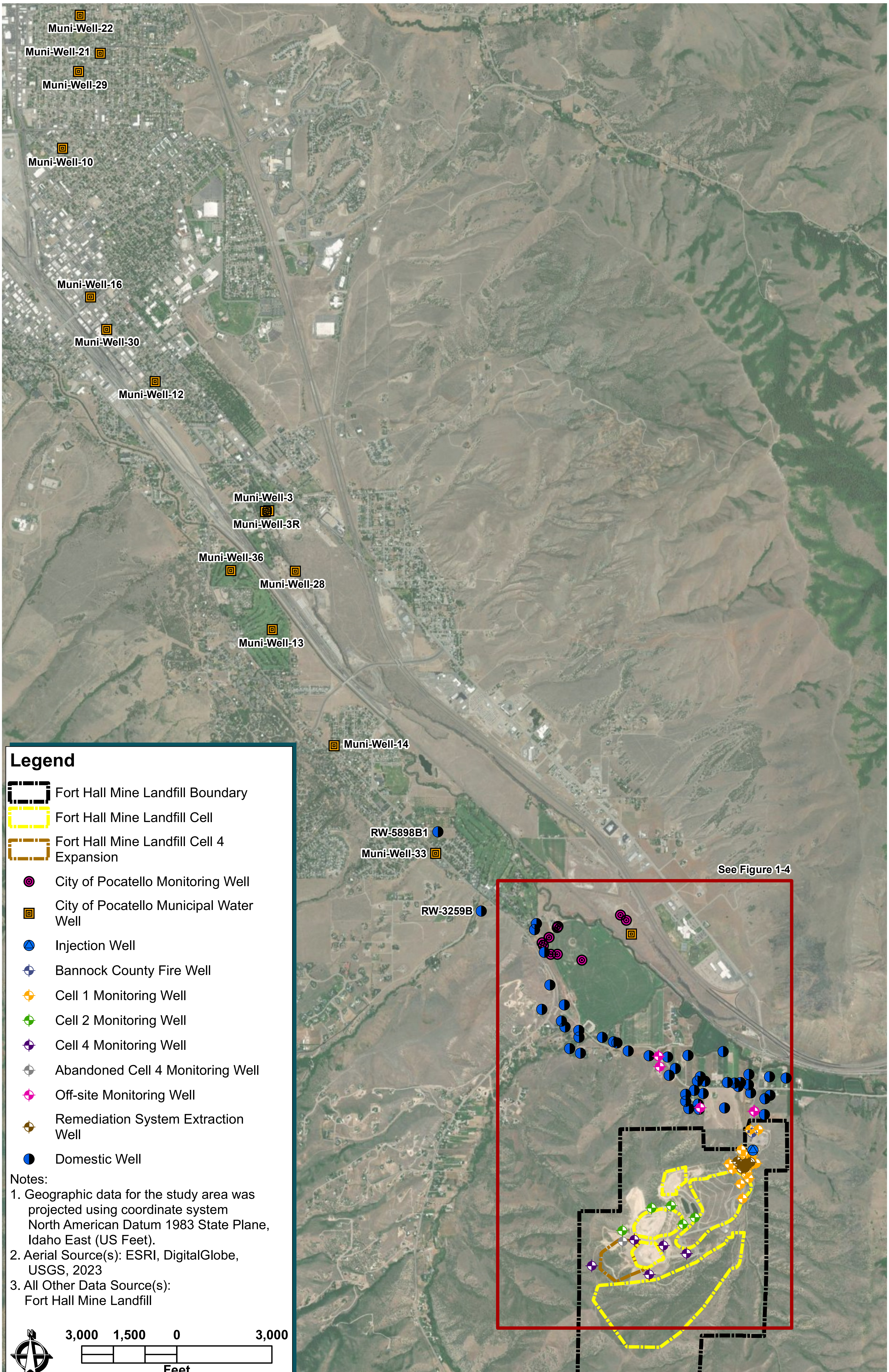
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 1-2
Fort Hall Mine Landfill



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2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring
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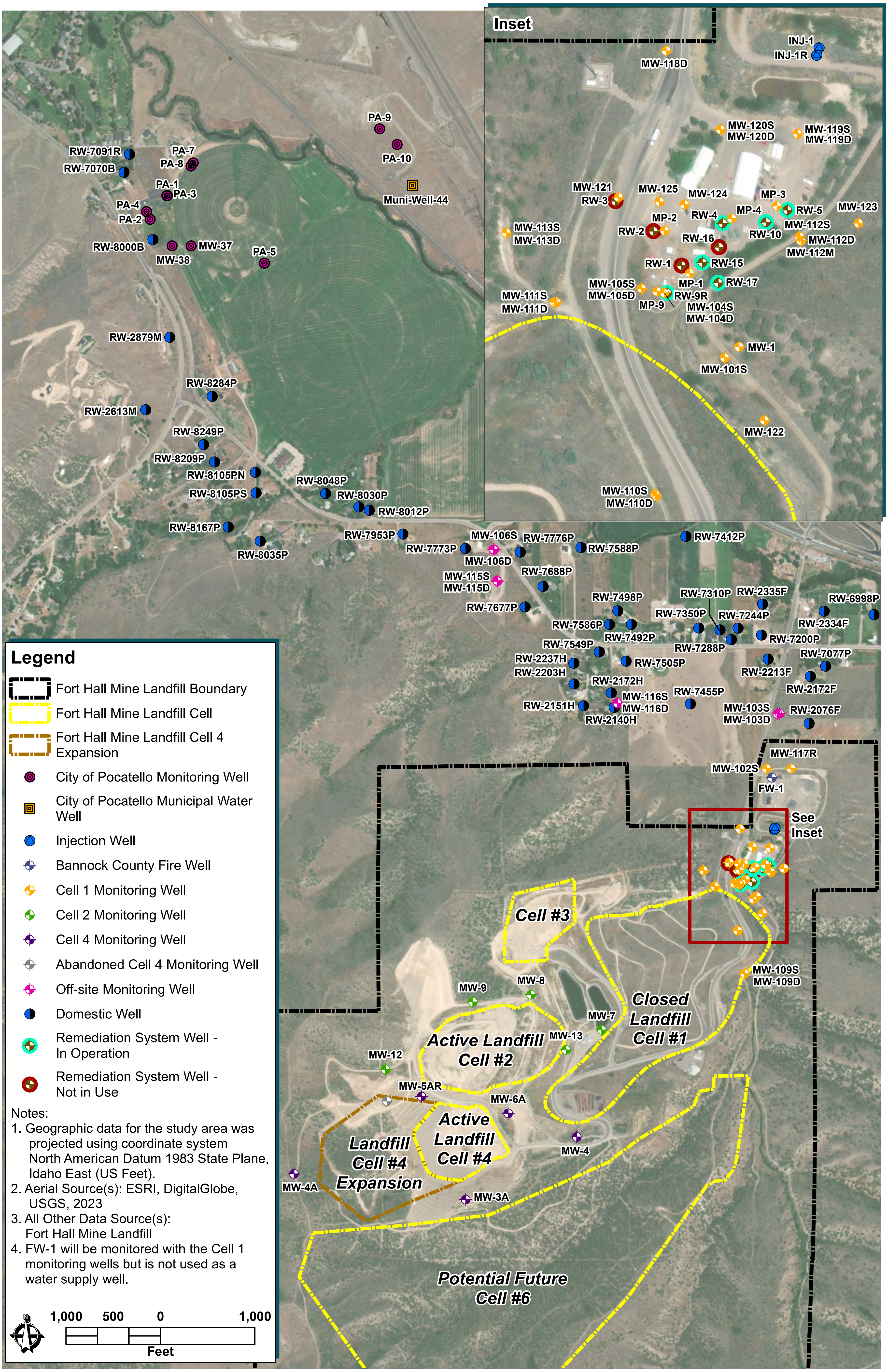
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 1-3
Groundwater Monitoring
Well Network of the
Fort Hall Mine Landfill



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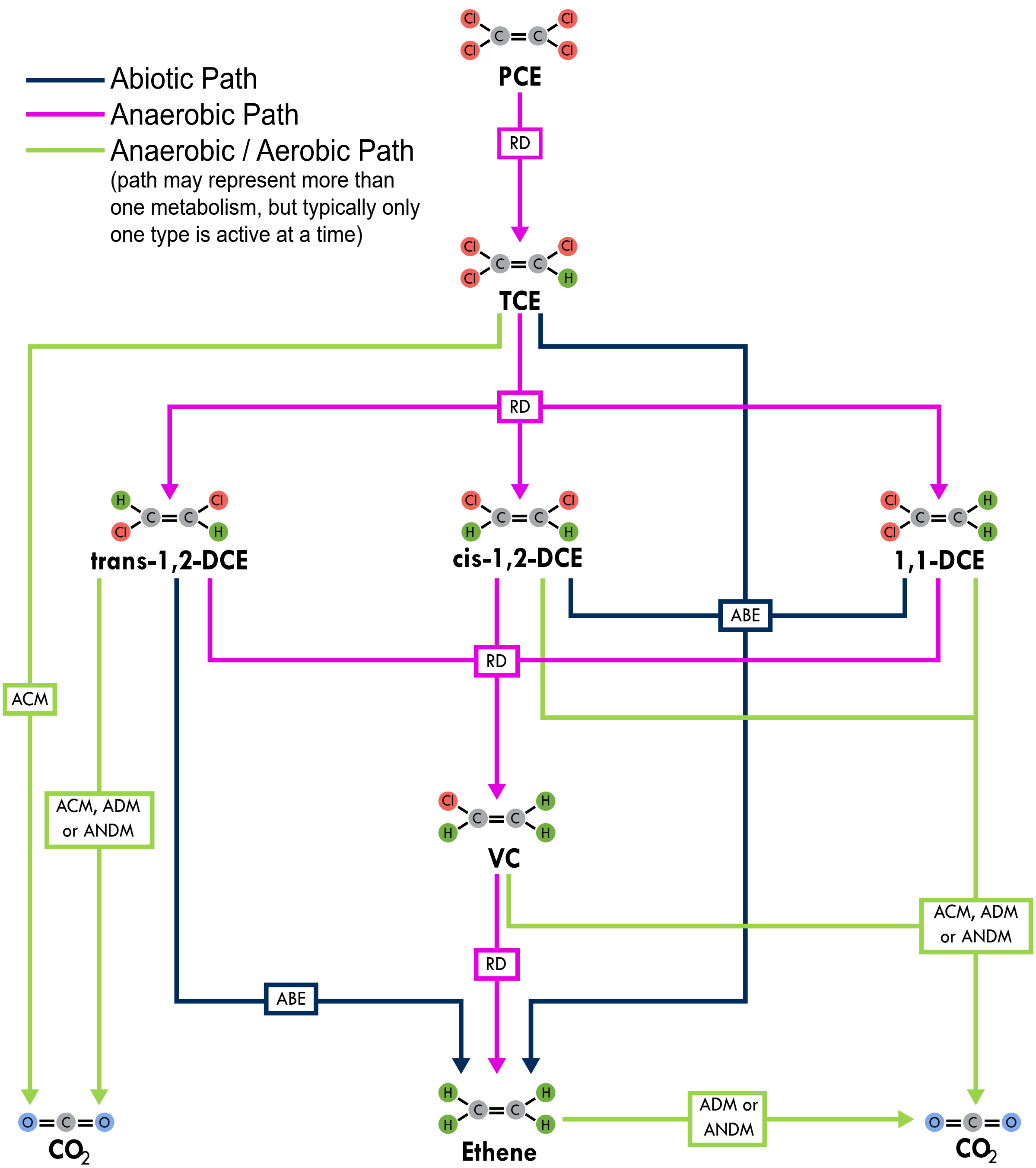
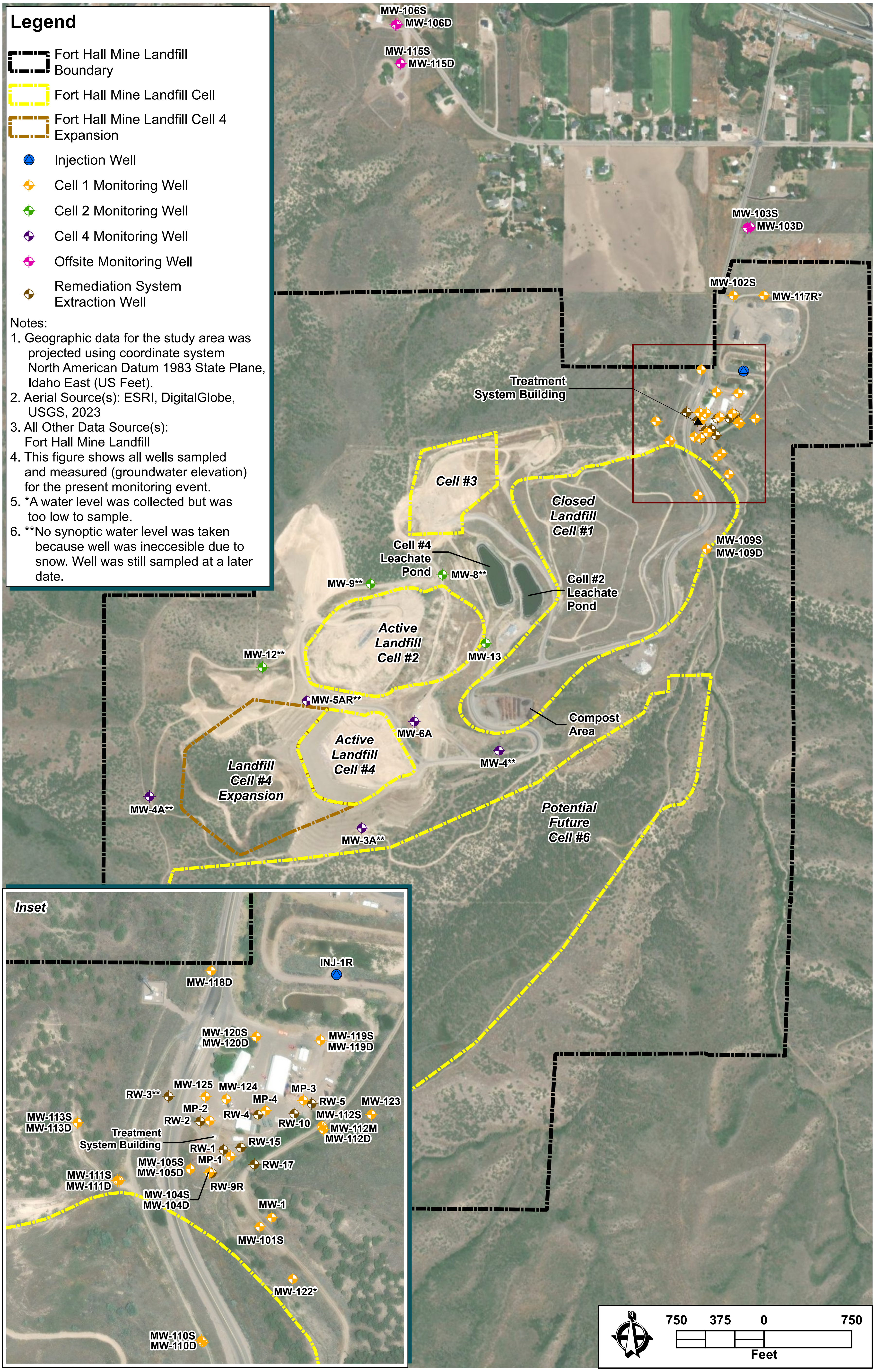
2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring and Remediation System Operation and Maintenance Report
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 1-4
Groundwater Monitoring Well Network of the Fort Hall Mine Landfill



Acronyms

ABE	Abiotic Beta-Elimination	Cl	Chloride
ACM	Aerobic Cometabolism	CO_2	Carbon Dioxide
ADM	Aerobic Direct Metabolism	H	Hydrogen
ANDM	Anaerobic Direct Metabolism	O	Oxygen
RD	Reductive Dechlorination (Biotic)	PCE	Tetrachlorothene
1,1-DCE	1-1-Dichloroethene	TCE	Trichloroethene
cis-1,2-DCE	cis-1,2-Dichloroethene	trans-1,2-DCE	trans-1,2-Dichloroethene
C	Carbon	VC	Vinyl Chloride



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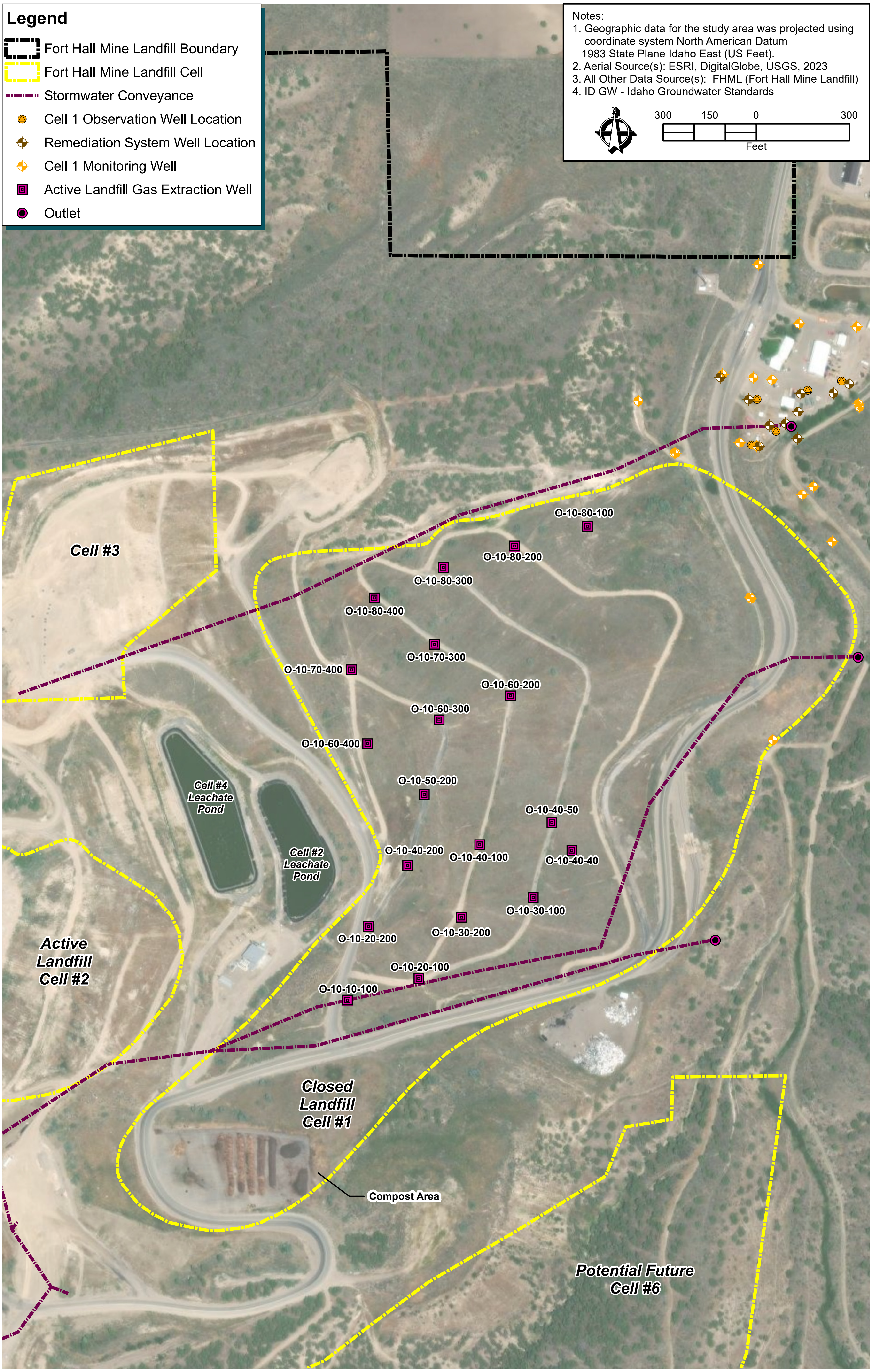
2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring
and Remediation System Operation and Maintenance Report
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 2-1
Spring 2023 Onsite Groundwater
Sample Locations



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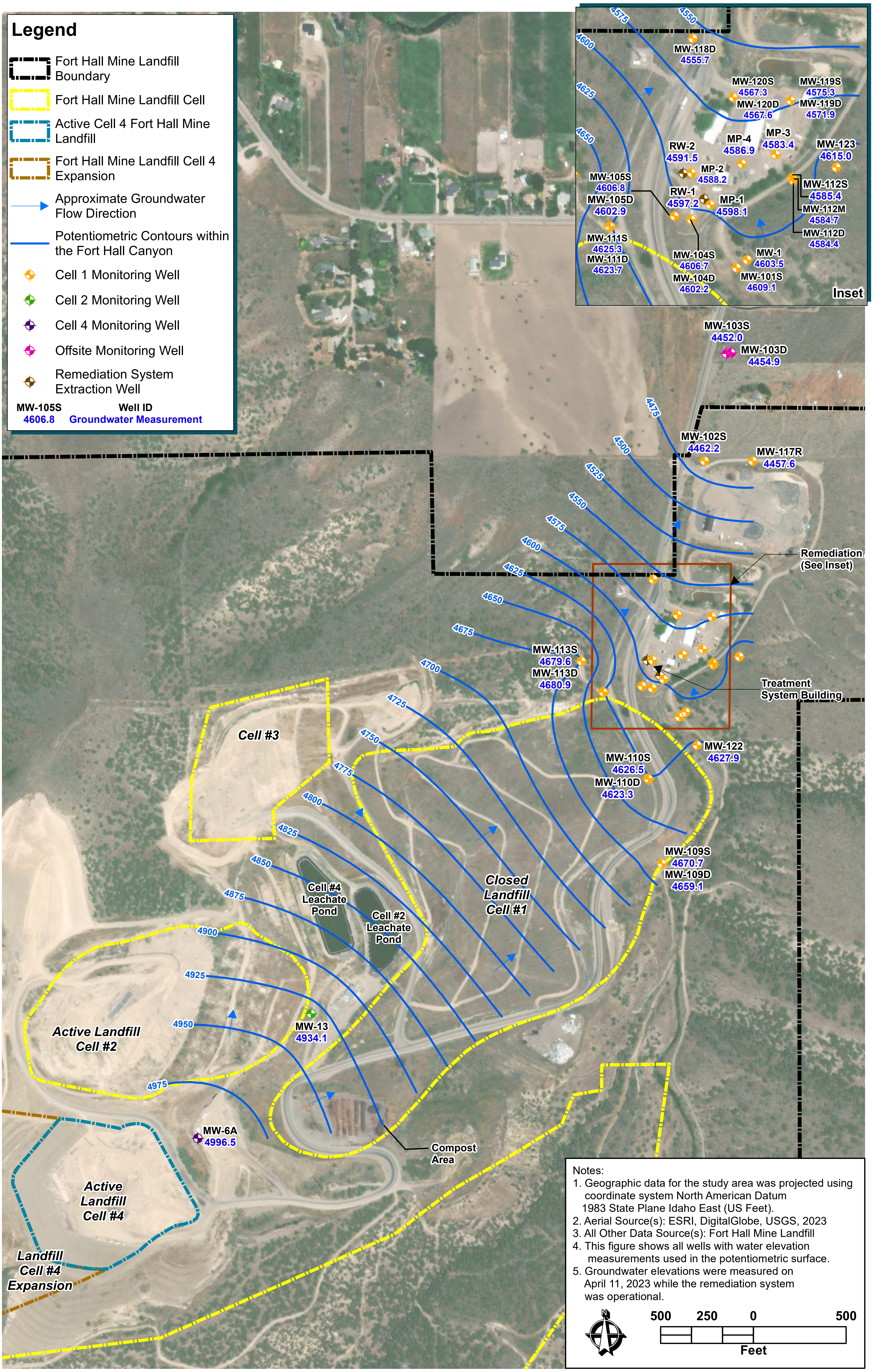
2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring and Remediation System Operation and Maintenance Report
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 2-2
Landfill Gas Extraction Well Locations



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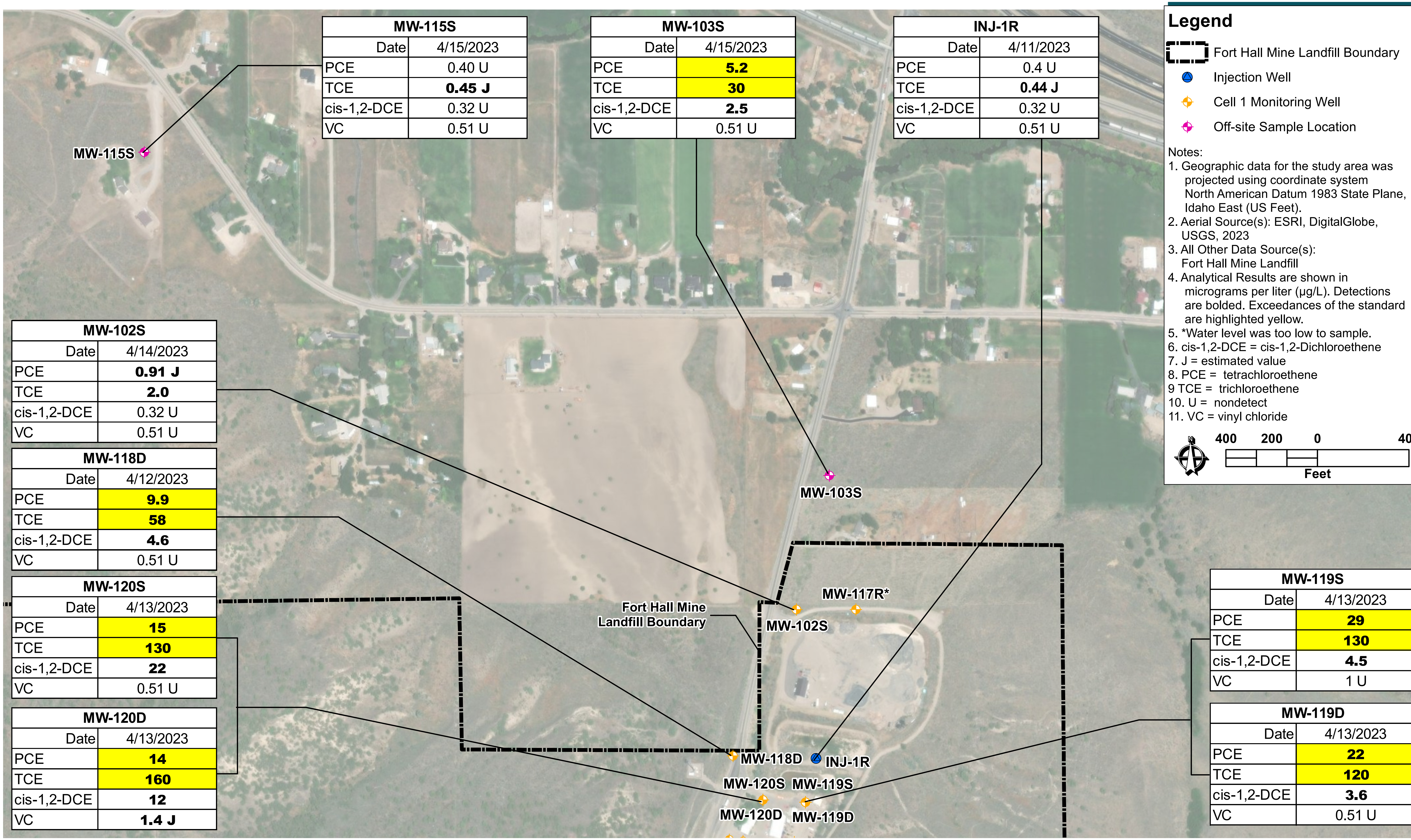
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 3-1
Onsite Potentiometric Contour Map



MW-115S	
Date	4/15/2023
PCE	0.40 U
TCE	**0.45 J**
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-103S	
Date	4/15/2023
PCE	**5.2**
TCE	**30**
cis-1,2-DCE	**2.5**
VC	0.51 U

INJ-1R	
Date	4/11/2023
PCE	0.4 U
TCE	**0.44 J**
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-102S	
Date	4/14/2023
PCE	**0.91 J**
TCE	**2.0**
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-118D	
Date	4/12/2023
PCE	**9.9**
TCE	**58**
cis-1,2-DCE	**4.6**
VC	0.51 U

MW-120S	
Date	4/13/2023
PCE	**15**
TCE	**130**
cis-1,2-DCE	**22**
VC	0.51 U

MW-120D	
Date	4/13/2023
PCE	**14**
TCE	**160**
cis-1,2-DCE	**12**
VC	**1.4 J**

MW-119S	
Date	4/13/2023
PCE	**29**
TCE	**130**
cis-1,2-DCE	**4.5**
VC	1 U

MW-119D	
Date	4/13/2023
PCE	**22**
TCE	**120**
cis-1,2-DCE	**3.6**
VC	0.51 U

Legend

- Fort Hall Mine Landfill Boundary
- Injection Well
- Cell 1 Monitoring Well
- Off-site Sample Location

Notes:
1. Geographic data for the study area was projected using coordinate system North American Datum 1983 State Plane, Idaho East (US Feet).
2. Aerial Source(s): ESRI, DigitalGlobe, USGS, 2023
3. All Other Data Source(s): Fort Hall Mine Landfill
4. Analytical Results are shown in micrograms per liter (µg/L). Detections are bolded. Exceedances of the standard are highlighted yellow.
5. *Water level was too low to sample.
6. cis-1,2-DCE = cis-1,2-Dichloroethene
7. J = estimated value
8. PCE = tetrachloroethene
9 TCE = trichloroethene
10. U = nondetect
11. VC = vinyl chloride

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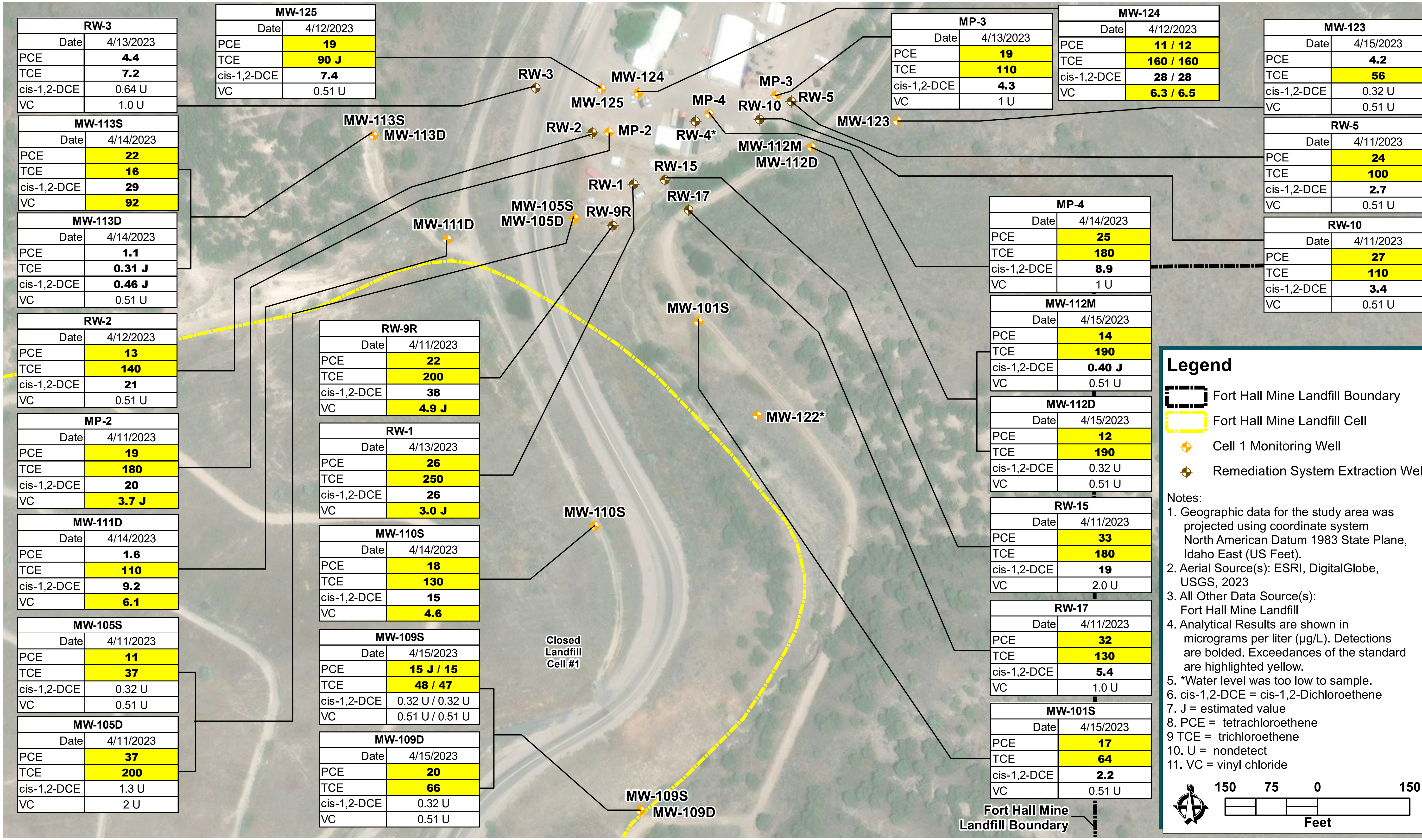
2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring and Remediation System Operation and Maintenance Report
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 3-2
Spring 2023 Chlorinated Ethene Results for Cell 1 North and Offsite Wells



RW-3	
Date	4/13/2023
PCE	**4.4**
TCE	**7.2**
cis-1,2-DCE	0.64 U
VC	1.0 U

MW-125	
Date	4/12/2023
PCE	**19**
TCE	**90 J**
cis-1,2-DCE	**7.4**
VC	0.51 U

MP-3	
Date	4/13/2023
PCE	**19**
TCE	**110**
cis-1,2-DCE	**4.3**
VC	1 U

MW-124	
Date	4/12/2023
PCE	**11 / 12**
TCE	**160 / 160**
cis-1,2-DCE	**28 / 28**
VC	**6.3 / 6.5**

MW-123	
Date	4/15/2023
PCE	**4.2**
TCE	**56**
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-113S	
Date	4/14/2023
PCE	**22**
TCE	**16**
cis-1,2-DCE	**29**
VC	**92**

MW-113D	
Date	4/14/2023
PCE	**1.1**
TCE	**0.31 J**
cis-1,2-DCE	**0.46 J**
VC	0.51 U

RW-5	
Date	4/11/2023
PCE	**24**
TCE	**100**
cis-1,2-DCE	**2.7**
VC	0.51 U

RW-10	
Date	4/11/2023
PCE	**27**
TCE	**110**
cis-1,2-DCE	**3.4**
VC	0.51 U

MP-4	
Date	4/14/2023
PCE	**25**
TCE	**180**
cis-1,2-DCE	**8.9**
VC	1 U

RW-2	
Date	4/12/2023
PCE	**13**
TCE	**140**
cis-1,2-DCE	**21**
VC	0.51 U

RW-9R	
Date	4/11/2023
PCE	**22**
TCE	**200**
cis-1,2-DCE	**38**
VC	**4.9 J**

MW-112M	
Date	4/15/2023
PCE	**14**
TCE	**190**
cis-1,2-DCE	**0.40 J**
VC	0.51 U

MP-2	
Date	4/11/2023
PCE	**19**
TCE	**180**
cis-1,2-DCE	**20**
VC	**3.7 J**

RW-1	
Date	4/13/2023
PCE	**26**
TCE	**250**
cis-1,2-DCE	**26**
VC	**3.0 J**

MW-112D	
Date	4/15/2023
PCE	**12**
TCE	**190**
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-111D	
Date	4/14/2023
PCE	**1.6**
TCE	**110**
cis-1,2-DCE	**9.2**
VC	**6.1**

MW-110S	
Date	4/14/2023
PCE	**18**
TCE	**130**
cis-1,2-DCE	**15**
VC	**4.6**

RW-15	
Date	4/11/2023
PCE	**33**
TCE	**180**
cis-1,2-DCE	**19**
VC	2.0 U

MW-105S	
Date	4/11/2023
PCE	**11**
TCE	**37**
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-109S	
Date	4/15/2023
PCE	**15 J / 15**
TCE	**48 / 47**
cis-1,2-DCE	0.32 U / 0.32 U
VC	0.51 U / 0.51 U

RW-17	
Date	4/11/2023
PCE	**32**
TCE	**130**
cis-1,2-DCE	**5.4**
VC	1.0 U

MW-105D	
Date	4/11/2023
PCE	**37**
TCE	**200**
cis-1,2-DCE	1.3 U
VC	2 U

MW-109D	
Date	4/15/2023
PCE	**20**
TCE	**66**
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-101S	
Date	4/15/2023
PCE	**17**
TCE	**64**
cis-1,2-DCE	**2.2**
VC	0.51 U

Legend

- Fort Hall Mine Landfill Boundary
- Fort Hall Mine Landfill Cell
- Cell 1 Monitoring Well
- Remediation System Extraction Well

Notes:
1. Geographic data for the study area was projected using coordinate system North American Datum 1983 State Plane, Idaho East (US Feet).
2. Aerial Source(s): ESRI, DigitalGlobe, USGS, 2023
3. All Other Data Source(s): Fort Hall Mine Landfill
4. Analytical Results are shown in micrograms per liter (µg/L). Detections are bolded. Exceedances of the standard are highlighted yellow.
5. *Water level was too low to sample.
6. cis-1,2-DCE = cis-1,2-Dichloroethene
7. J = estimated value
8. PCE = tetrachloroethene
9 TCE = trichloroethene
10. U = nondetect
11. VC = vinyl chloride

Draft By: K. Scheller Date: 11/08/2023 | Check By: D. Savage Date: 11/28/2023 | Update By: K. Scheller Date: 12/07/2023 | Backcheck By: ______ Date: ______

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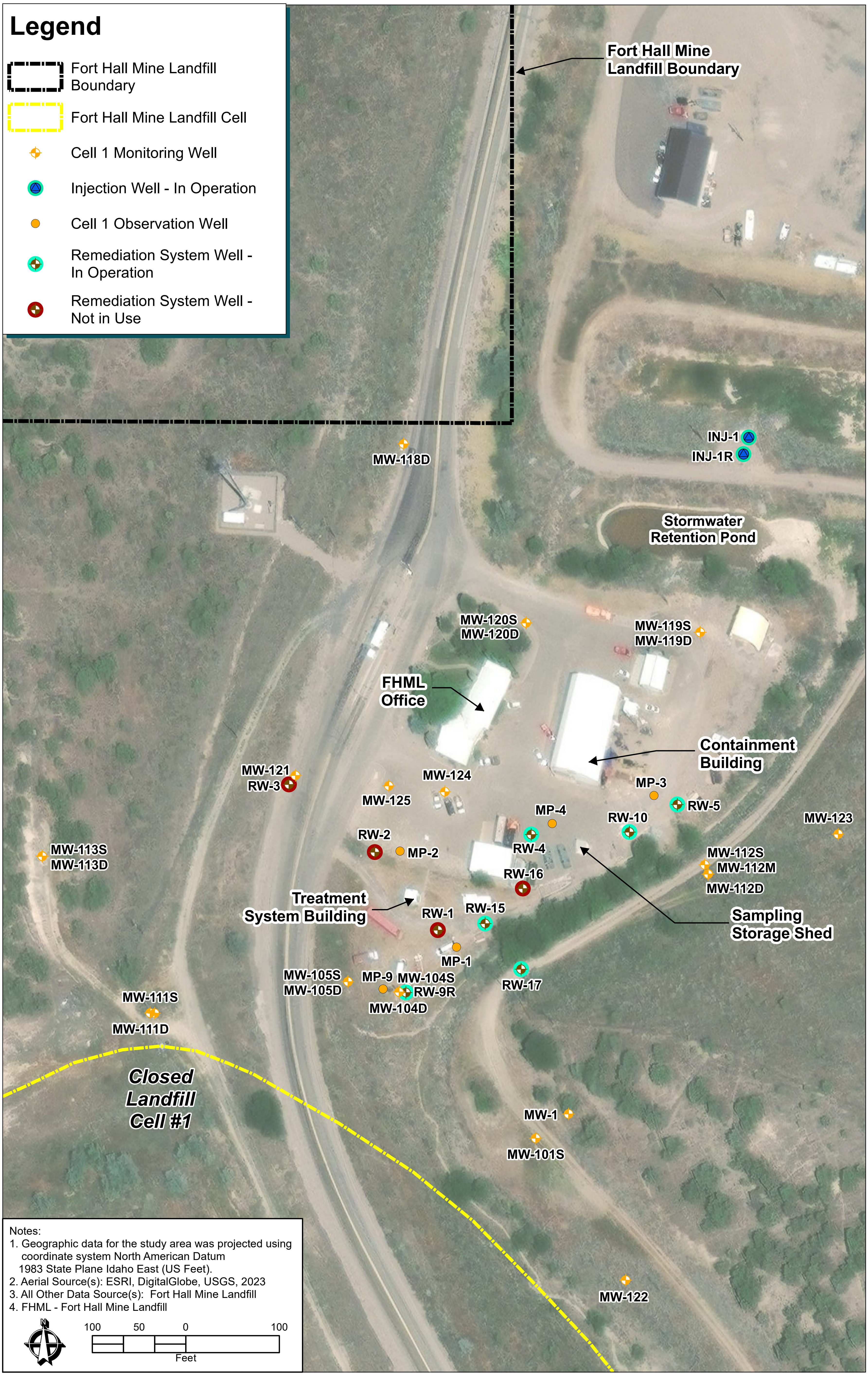
2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring and Remediation System Operation and Maintenance Report
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 3-3
Spring 2023 Chlorinated Ethene Results for Cell 1 South



Notes:
1. Geographic data for the study area was projected using coordinate system North American Datum 1983 State Plane Idaho East (US Feet).
2. Aerial Source(s): ESRI, DigitalGlobe, USGS, 2023
3. All Other Data Source(s): Fort Hall Mine Landfill
4. FHML - Fort Hall Mine Landfill

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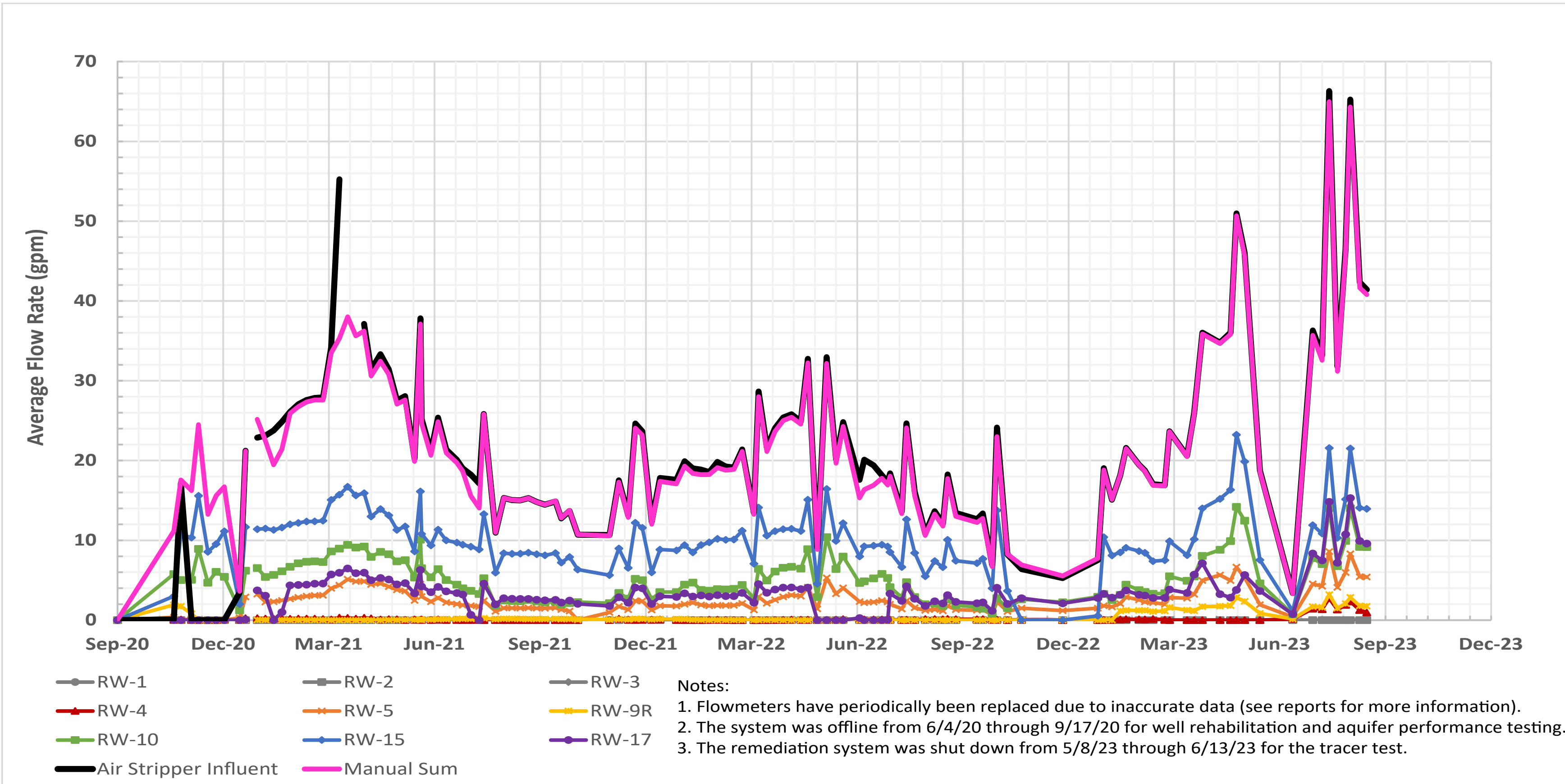
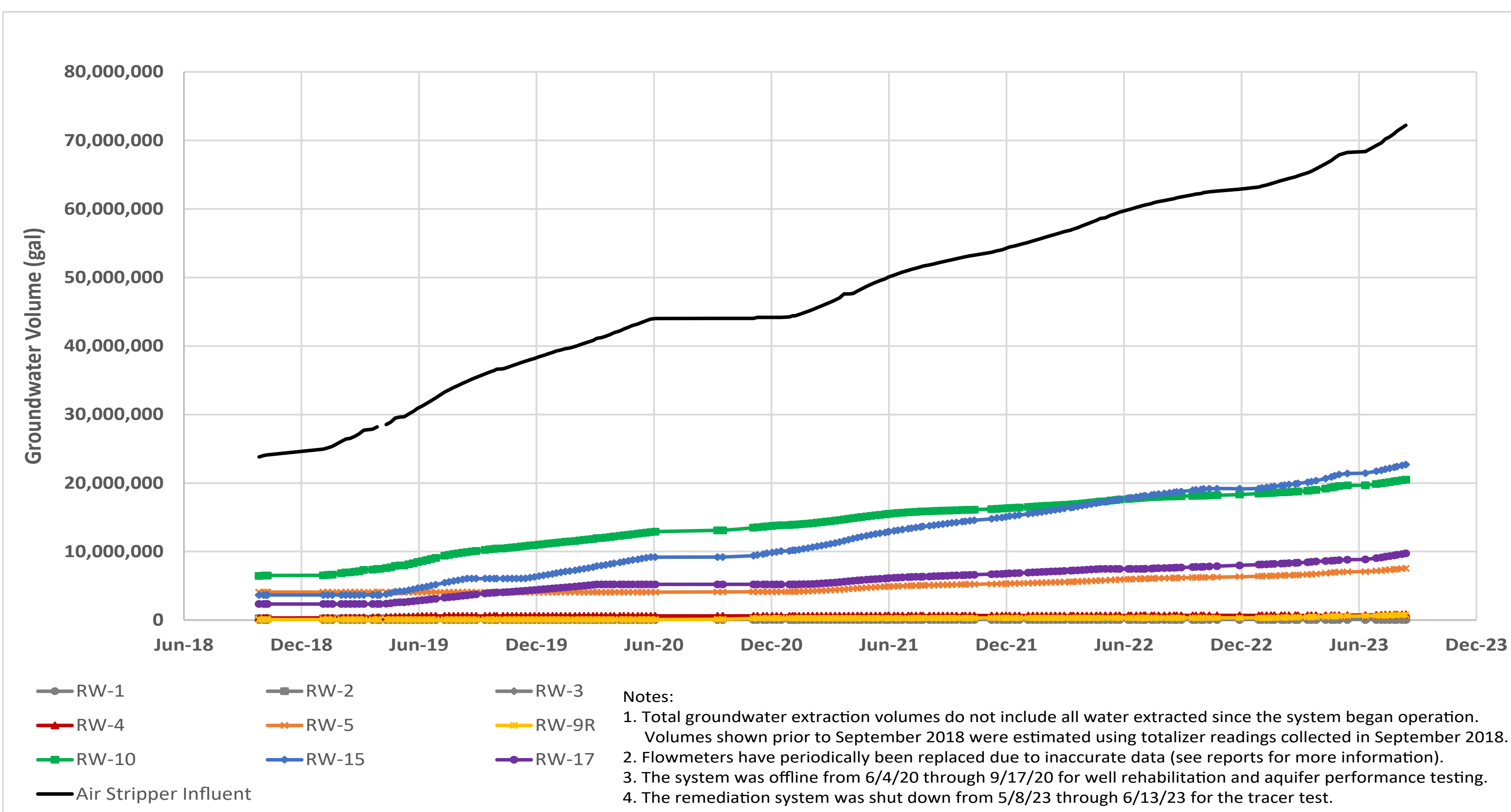
2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring
and Remediation System Operation and Maintenance Report
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 3-4
Remediation System
Well Locations

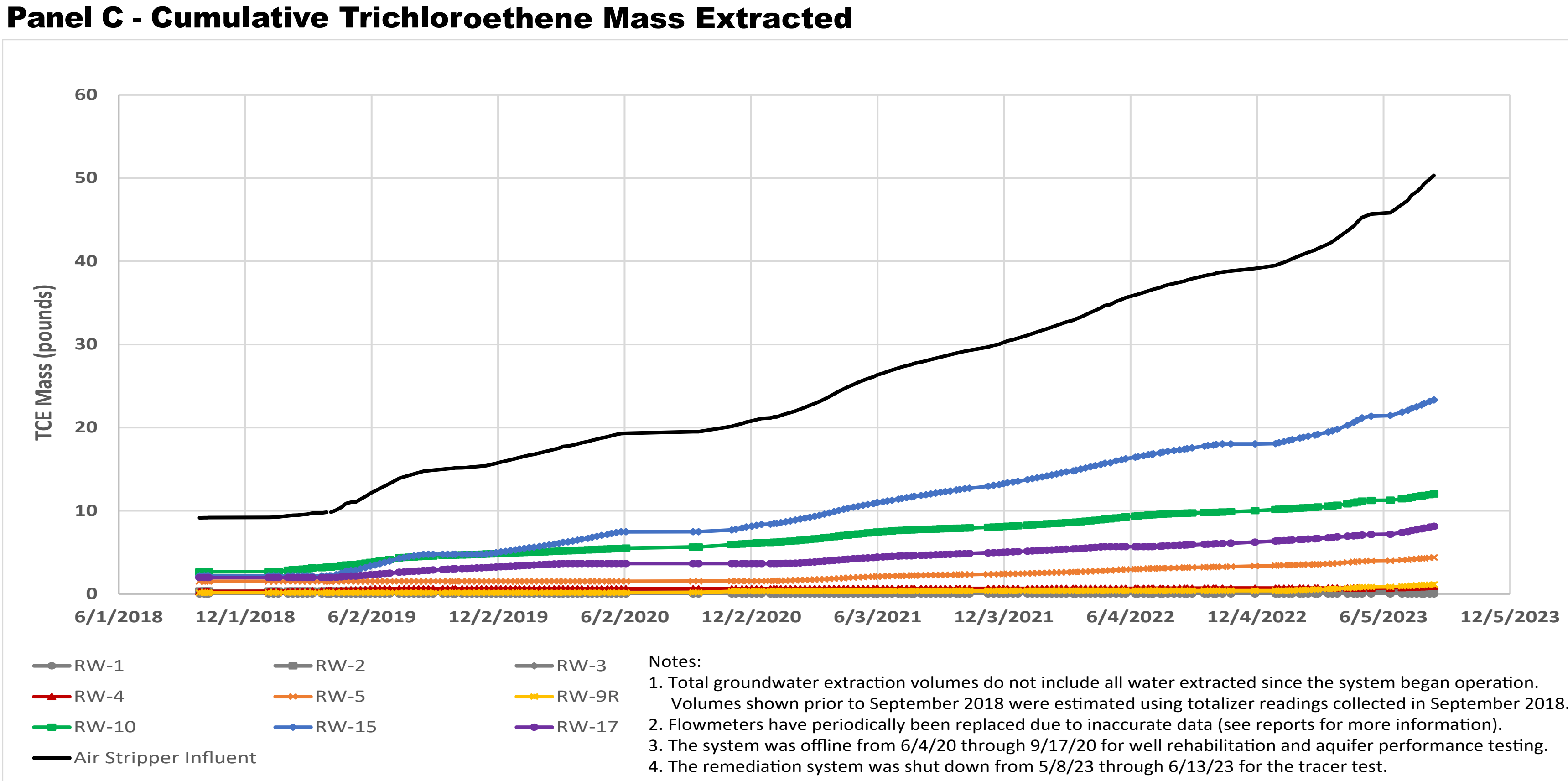
Panel A - Average Groundwater Extraction Flow Rates

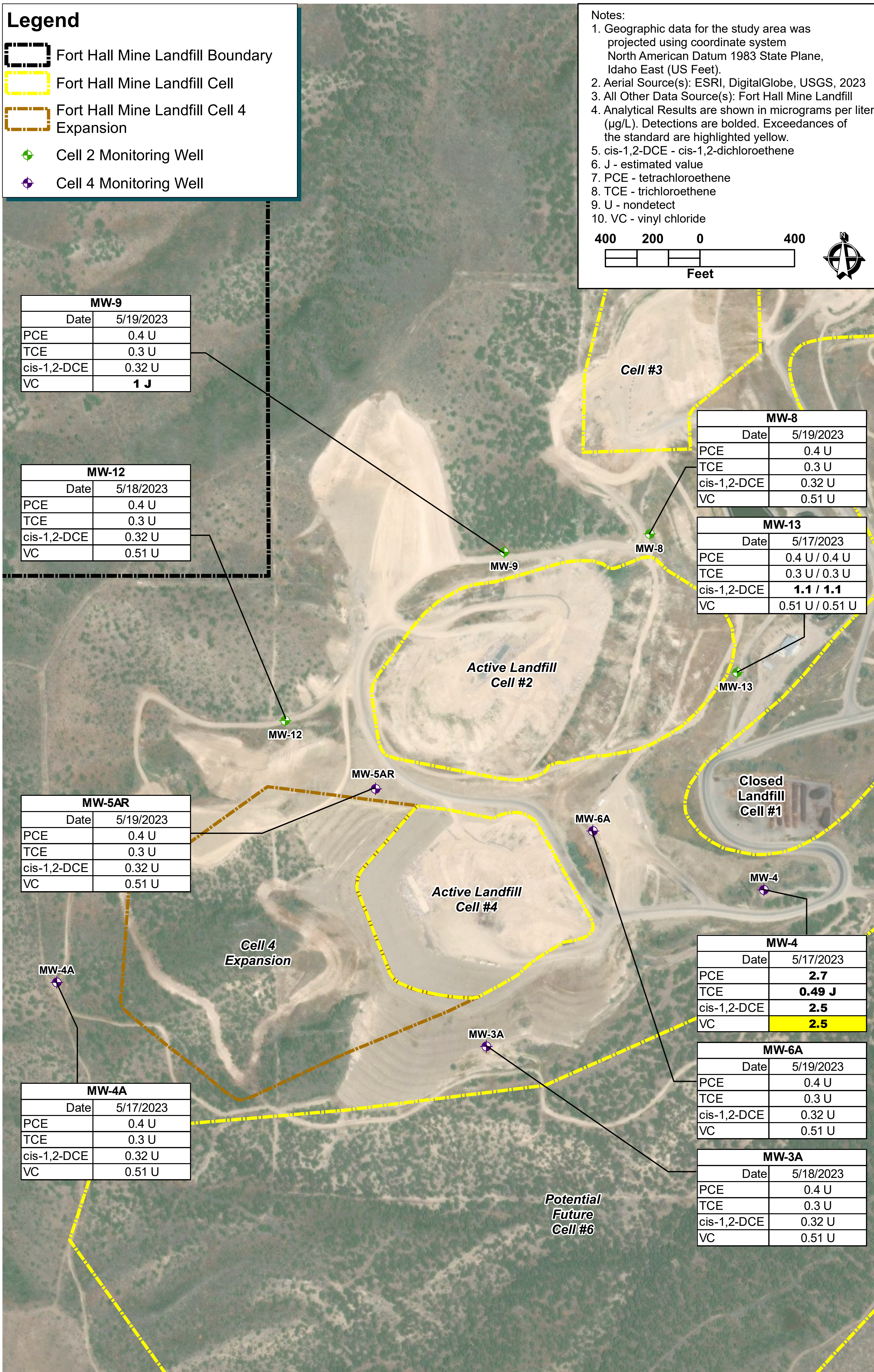


Panel B - Cumulative Groundwater Extracted



Panel C - Cumulative Trichloroethene Mass Extracted





MW-9	
Date	5/19/2023
PCE	0.4 U
TCE	0.3 U
cis-1,2-DCE	0.32 U
VC	**1 J**

MW-12	
Date	5/18/2023
PCE	0.4 U
TCE	0.3 U
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-5AR	
Date	5/19/2023
PCE	0.4 U
TCE	0.3 U
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-4A	
Date	5/17/2023
PCE	0.4 U
TCE	0.3 U
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-8	
Date	5/19/2023
PCE	0.4 U
TCE	0.3 U
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-13	
Date	5/17/2023
PCE	0.4 U / 0.4 U
TCE	0.3 U / 0.3 U
cis-1,2-DCE	**1.1 / 1.1**
VC	0.51 U / 0.51 U

MW-4	
Date	5/17/2023
PCE	**2.7**
TCE	**0.49 J**
cis-1,2-DCE	**2.5**
VC	**2.5**

MW-6A	
Date	5/19/2023
PCE	0.4 U
TCE	0.3 U
cis-1,2-DCE	0.32 U
VC	0.51 U

MW-3A	
Date	5/18/2023
PCE	0.4 U
TCE	0.3 U
cis-1,2-DCE	0.32 U
VC	0.51 U

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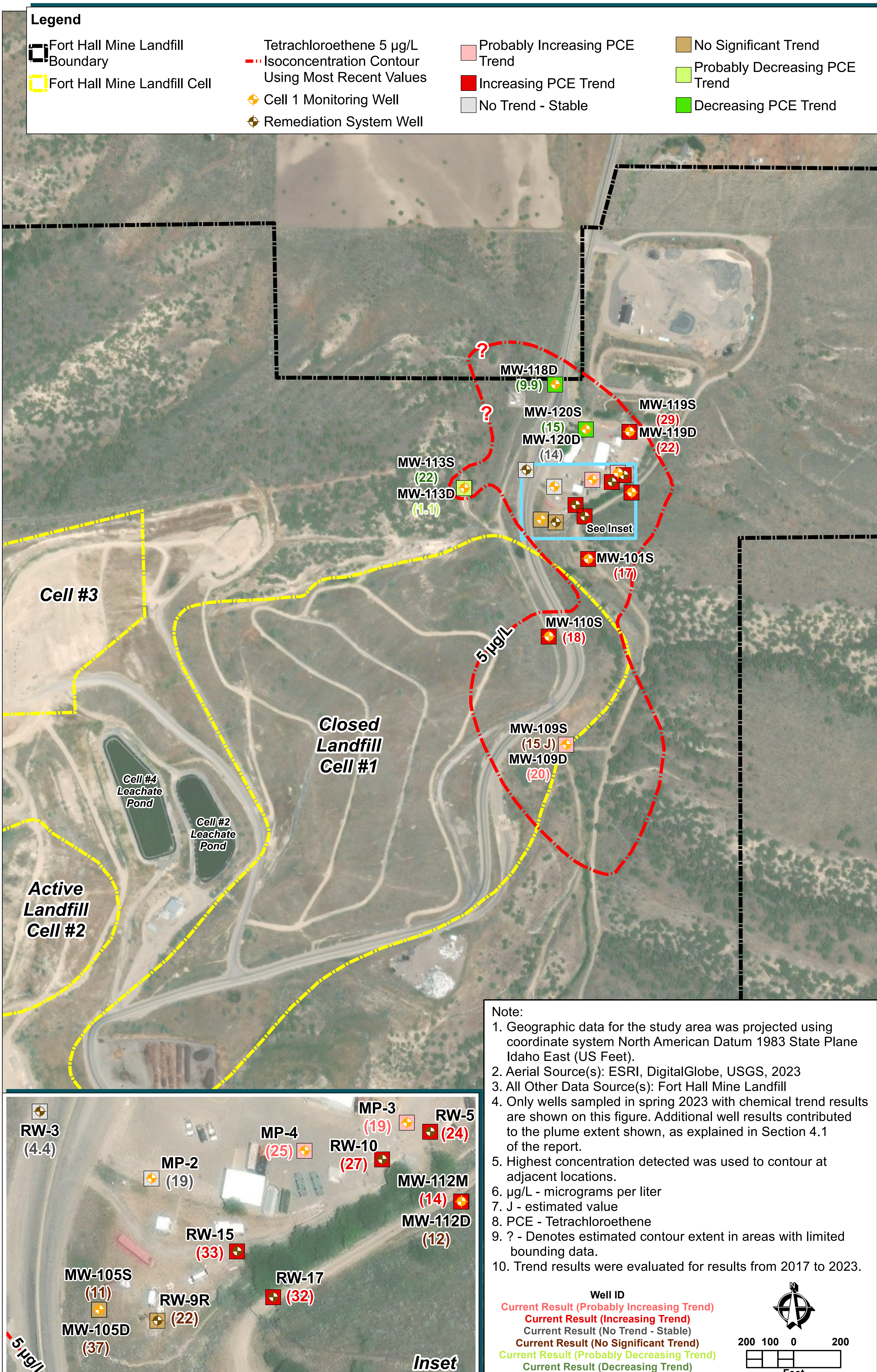
2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring and Remediation System Operation and Maintenance Report
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 3-6
Spring 2023
Chlorinated Ethene Results for Cell 2 and 4 Wells



Draft By: K. Scheller Date: 11/06/2023 | Check By: E. Ehret Date: 12/15/2023 | Update By: K. Scheller Date: 12/20/2023 | Backcheck By: D. Savage Date: 12/20/2023

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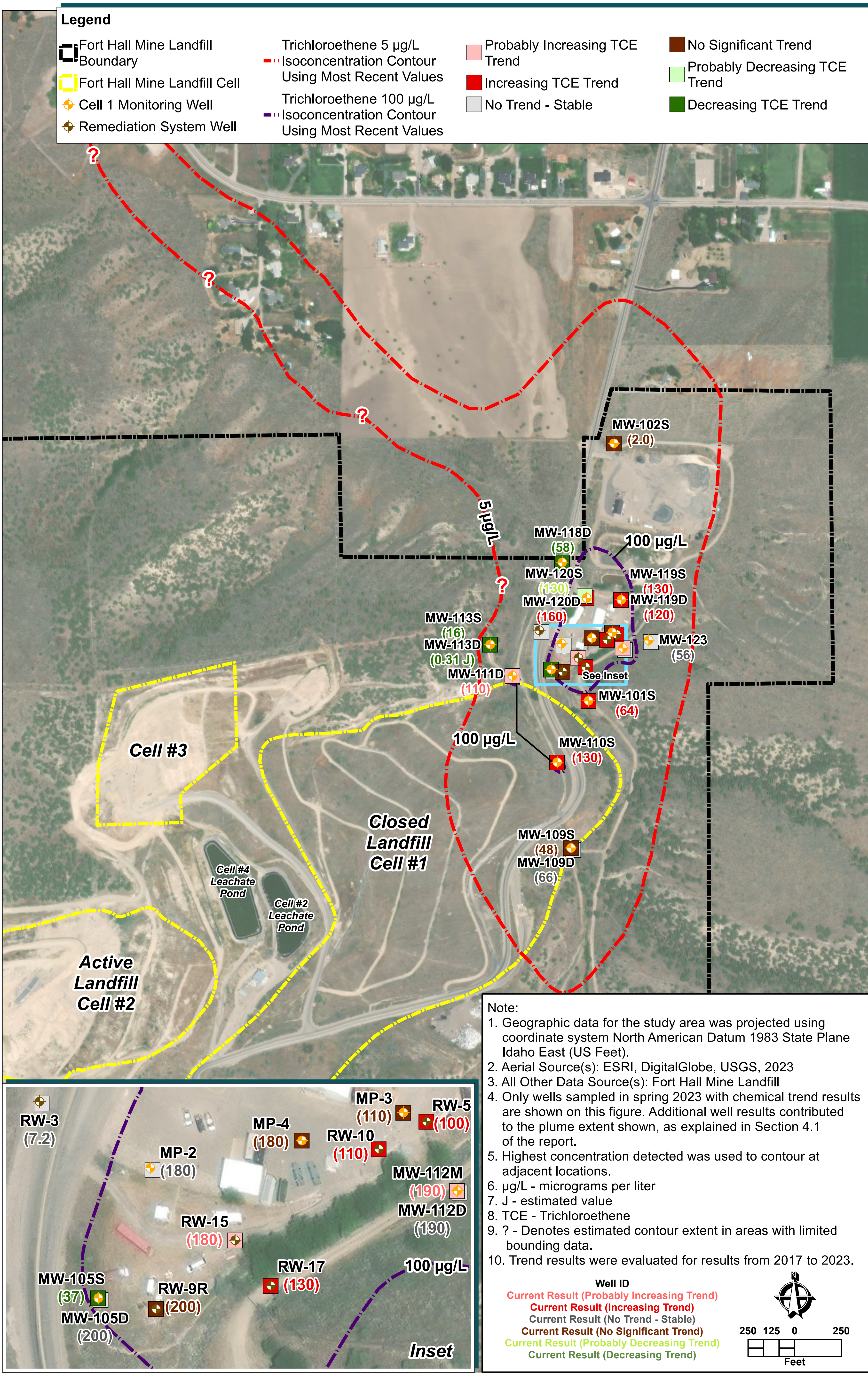
2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring
and Remediation System Operation and Maintenance Report
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 4-1
Tetrachloroethene Plume Extent
and Trend Analysis



Note:
1. Geographic data for the study area was projected using coordinate system North American Datum 1983 State Plane Idaho East (US Feet).
2. Aerial Source(s): ESRI, DigitalGlobe, USGS, 2023
3. All Other Data Source(s): Fort Hall Mine Landfill
4. Only wells sampled in spring 2023 with chemical trend results are shown on this figure. Additional well results contributed to the plume extent shown, as explained in Section 4.1 of the report.
5. Highest concentration detected was used to contour at adjacent locations.
6. µg/L - micrograms per liter
7. J - estimated value
8. TCE - Trichloroethene
9. ? - Denotes estimated contour extent in areas with limited bounding data.
10. Trend results were evaluated for results from 2017 to 2023.

Draft By: K. Scheller Date: 11/06/2023 | Check By: E. Ehret Date: 12/15/2023 | Update By: K. Scheller Date: 12/20/2023 | Backcheck By: D. Savage Date: 12/20/2023

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2023 Spring Semiannual Cell 1, 2 and 4 Groundwater Monitoring and Remediation System Operation and Maintenance Report
Fort Hall Mine Landfill, Bannock County, Idaho

Figure 4-2
Trichloroethene Plume Extent and Trend Analysis

TABLES

Table 2-1
Summary of Sample Locations and Analysis Spring 2023

Well ID	Water Levels	Field parameters[1]	Appendix I			Appendix II										Geochemical/Microbial					
			VOCs		Metals[2]	SVOCs		O/C Pest[3]	O/P Pest	Chlorinated Herbicides	PCBs[3]	Dioxins/ Furans	Mercury	Cyanide	Total Sulfide	Anions[4]	Dissolved Gases	TOC	Ferrous Iron	CSIA	Dhc & genes
			8260D	8011	6020B/ 6010C	8270E	8270E SIM	8081B	8141A	8321B	8082A	8290	7470A	SM4500-CN-E	SM 4500S-2	9056A	RSK-175	9060A	HACH 8146	U of O	M.I.
Cell 1 (Low-flow sampling method)																					
MW-1	1																				
MW-101S	1	1	1																		
MW-102S	1	1	1																		
MW-104D	1																				
MW-104S	1																				
MW-105D	1	1	1		1											1		1	1		
MW-105S	1	1	1		1											1		1	1		
MW-109D	1	1	1																		
MW-109S	1	1	1																		
MW-110D	1																				
MW-110S	1	1	1																		
MW-111D	1	1	1																		
MW-111S	1																				
MW-112D	1	1	1																		
MW-112M	1	1	1																		
MW-112S	1																				
MW-113D	1	1	1																		
MW-113S	1	1	1																		
MW-117R	1	dry	dry																		
MW-118D	1	1	1		1											1		1	1		
MW-119D	1	1	1		1											1		1	1		
MW-119S	1	1	1		1											1		1	1		
MW-120D	1	1	1		1											1		1	1		
MW-120S	1	1	1		1											1		1	1		
MW-122	1	dry	dry																		
MW-123	1	1	1																		
MW-124	1	1	1		1											1	1	1	1	1	1
MW-125	1	1	1		1											1	1	1	1	1	1
MP-1	1																				
MP-2	1	1	1		1											1		1	1		
MP-3	1	1	1																		
MP-4	1	1	1																		
Remediation System (Low-flow sampling method)																					
RW-1	1	1	1		1											1		1	1		
RW-2	1	1	1		1											1		1	1		
RW-3		1	1		1											1		1	1		
Remediation System (Grab Sampling)																					
INJ-1R			1	1	1	1	1	1	1	1	1	1	1	1	1						
RW-4		offline	offline																		
RW-5		1	1																		
RW-9R		1	1																		
RW-10		1	1																		
RW-15		1	1		1											1		1	1		
RW-17		1	1																		

Table 2-1
Summary of Sample Locations and Analysis Spring 2023

Well ID	Water Levels	Field parameters[1]	Appendix I			Appendix II										Geochemical/Microbial					
			VOCs		Metals[2]	SVOCs		O/C Pest[3]	O/P Pest	Chlorinated Herbicides	PCBs[3]	Dioxins/ Furans	Mercury	Cyanide	Total Sulfide	Anions[4]	Dissolved Gases	TOC	Ferrous Iron	CSIA	Dhc & genes
			8260D	8011	6020B/ 6010C	8270E	8270E SIM	8081B	8141A	8321B	8082A	8290	7470A	SM4500-CN-E	SM 4500S-2	9056A	RSK-175	9060A	HACH 8146	U of O	M.I.
Offsite (Low-flow sampling method)																					
MW-103D	1																				
MW-103S	1	1	1																		
MW-106D	1																				
MW-106S	1																				
MW-115D	1																				
MW-115S	1	1	1																		
Cell 2 (Low-flow sampling method)																					
MW-12		1	1	1	1										1						
MW-13	1	1	1	1	1										1						
MW-8		1	1	1	1										1						
MW-9		1	1	1	1										1						
Cell 4 (Low-flow sampling method)																					
MW-3A		1	1	1	1																
MW-4A		1	1	1	1																
MW-4		1	1	1	1																
MW-5AR		1	1	1	1																
MW-6A	1	1	1	1	1																

Notes:

[1] Field parameters include pH, oxidation-reduction potential, turbidity, dissolved oxygen, specific conductivity, and temperature

[2] Dissolved metals were collected for Cell 1 wells, RW-1, RW-2, RW-3, and RW-15. Total metals were collected for Cell 2 & 4 wells, INJ-1R, and RW-2. Dissolved metals were field filtered

[3] O/C Pest and PCBs are collected in the same bottle

[4] Anions list includes chloride, sulfate, and bromide

dry = water level too low for measurement
O/C Pest = organochlorine pesticides
O/P Pest = organophosphorus pesticides
VOCs = volatile organic compounds
PCBs = polychlorinated biphenyls
SVOCs = semivolatile organic compounds

Table 2-2
Landfill Gas Well Water Levels

Well ID	Date	Time	Depth to Water (ft btoc)	Total Depth (ft btoc)	Water Column (feet)
O-10-10-100	5/3/2023	12:16	28.79	29.08	0.29
O-10-20-100	5/3/2023	11:30	27.19	27.65	0.46
O-10-20-200	5/3/2023	12:24	43.62	44.32	0.70
O-10-30-100	5/3/2023	11:18	70.55	71.52	0.97
O-10-30-200	5/3/2023	11:36	81.41	82.07	0.66
O-10-40-100	5/3/2023	11:45	61.86	62.60	0.74
O-10-40-200	5/3/2023	12:32	42.23	44.76	2.53
O-10-40-40	5/3/2023	11:10	45.57	46.20	0.63
O-10-40-50	5/3/2023	11:05	40.60	44.52	3.92
O-10-50-200	5/3/2023	12:38	36.72	38.96	2.24
O-10-60-200	5/3/2023	11:53	31.18	31.39	0.21
O-10-60-300	5/3/2023	12:42	39.23	39.96	0.73
O-10-60-400	5/3/2023	12:57	31.27	31.88	0.61
O-10-70-300	5/3/2023	11:58	27.30	27.77	0.47
O-10-70-400	5/3/2023	--	--	--	--
O-10-80-100	5/3/2023	10:30	36.80	42.08	5.28
O-10-80-200	5/3/2023	10:50	43.12	47.93	4.81
O-10-80-300	5/3/2023	10:56	44.53	55.53	11.00
O-10-80-400	5/3/2023	12:06	59.05	72.67	13.62

Table 2-2
Landfill Gas Well Water Levels

Well ID	Date	Time	Depth to Water (ft btoc)	Total Depth (ft btoc)	Water Column (feet)
O-10-10-100	6/19/2023	12:04	28.04	29.08	1.04
O-10-20-100	6/19/2023	11:58	26.56	27.65	1.09
O-10-20-200	6/19/2023	--	--	--	--
O-10-30-100	6/19/2023	11:53	69.83	71.52	1.69
O-10-30-200	6/19/2023	12:36	80.42	82.07	1.65
O-10-40-100	6/19/2023	12:40	61.09	62.60	1.51
O-10-40-200	6/19/2023	12:13	42.20	44.76	2.56
O-10-40-40	6/19/2023	11:47	44.24	46.20	1.96
O-10-40-50	6/19/2023	11:42	39.75	44.52	4.77
O-10-50-200	6/19/2023	12:17	36.92	38.96	2.04
O-10-60-200	6/19/2023	12:43	30.45	31.39	0.94
O-10-60-300	6/19/2023	12:21	39.20	39.96	0.76
O-10-60-400	6/19/2023	12:31	31.32	31.88	0.56
O-10-70-300	6/19/2023	12:48	27.27	27.77	0.50
O-10-70-400	6/19/2023	12:27	36.61	37.19	0.58
O-10-80-100	6/19/2023	11:20	39.70	42.08	2.38
O-10-80-200	6/19/2023	11:28	42.66	47.93	5.27
O-10-80-300	6/19/2023	11:34	45.46	55.53	10.07
O-10-80-400	6/19/2023	12:53	63.92	72.67	8.75

Notes:
1. -- = well not measured.
2. Acronyms: ft btoc = feet below top of casing

Tables Notes

Highlight indicates values greater than the MCL

Underline indicates values greater than IDGW Standard (or outside range for pH)

Bold indicates detected values

Italics indicates nondetected values

µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
EPA = U.S. Environmental Protection Agency
ID GW = Idaho Groundwater Standards
J = Result is estimated
MCL = maximum contaminant level
mg/L = milligrams per liter
NTU = Nephelometric Turbidity Unit
PCB = Polychlorinated Biphenyl
pg/L = picograms per liter
Q = qualifier
R = Result is Rejected
su = standard unit
SVOCs = semivolatile organic compounds
U = Analyte was not detected at the associated value
UJ = The non-detection at the associated value is an estimate
VOCs = volatile organic compounds

Table 3-1
Monitoring Well Water Levels, Screened Intervals, and Vertical Gradients

Well ID	X Coordinate (Idaho State Plane East, feet)	Y Coordinate (Idaho State Plane East, feet)	Surface Elevation (ft amsl)	Screened Interval (ft bgs)	Remediation System On			Direction of Gradient^	Gradient^ (ft/ft)
					Measurement Date and Time	Water Level Depth (ft btoc)	Water Level Elevation (ft amsl)		
MP-1	602761.69	408352.38	4654.5	60-100	4/11/23 8:40 AM	58.6	4598.1	NA	NA
MP-2	602701.14	408455.07	4653.6	50-90	4/10/23 5:35 PM	67.0	4588.2	NA	NA
MP-3	602977.01	408513.44	4643.7	60-100	4/11/23 10:19 AM	59.8	4583.4	NA	NA
MP-4	602866.15	408483.99	4646.1	60-100	4/11/23 10:16 AM	58.7	4586.9	NA	NA
MW-1	602884.14	408171.01	4662.0	77-97	4/10/23 3:55 PM	61.4	4603.5	NA	NA
MW-101S	602849.09	408144.91	4664.3	55-75	4/10/23 3:50 PM	57.4	4609.1	NA	NA
MW-102S	602985.40	409527.94	4592.0	125-145	4/11/23 9:35 AM	132.0	4462.2	NA	NA
MW-103D	603103.39	410107.66	4557.6	173.5-183.5	4/11/23 9:35 AM	105.2	4454.9	up	-0.04
MW-103S	603129.08	410112.39	4558.4	90-110	4/11/23 10:10 AM	108.0	4452.0		
MW-104D	602701.80	408302.41	4659.1	79-89	4/11/23 8:19 AM	57.6	4602.2	down	0.19
MW-104S	602701.58	408302.37	4659.4	47-67	4/11/23 8:27 AM	53.6	4606.7		
MW-105D	602648.19	408312.73	4661.9	72-82	4/11/23 9:05 AM	59.7	4602.9	down	0.23
MW-105S	602647.98	408312.75	4661.8	45-65	4/11/23 9:07 AM	55.8	4606.8		
MW-106D	600093.80	411850.82	4514.2	89-99	4/11/23 9:53 AM	65.9	4450.2	none	0.00
MW-106S	600104.55	411853.60	4514.2	55-75	4/11/23 9:45 AM	66.7	4450.3		
MW-109D	602755.03	407352.69	4718.0	75-95	4/11/23 11:24 AM	60.5	4659.1	down	0.38
MW-109S	602754.98	407352.97	4717.6	42-62	4/11/23 11:20 AM	49.0	4670.7		
MW-110D	602682.88	407809.65	4745.8	154-159	4/11/23 10:40 AM	124.5	4623.3	down	0.10
MW-110S	602679.68	407814.61	4745.5	107.5-127.5	4/11/23 10:35 AM	120.7	4626.5		
MW-111D	602441.43	408278.97	4697.6	104-124	4/11/23 10:02 AM	75.5	4623.7	down	0.04
MW-111S	602436.53	408279.31	4697.2	54-74	4/11/23 10:10 AM	74.1	4625.3		
MW-112D	603032.31	408428.91	4646.3	93-103	4/10/23 3:28 PM	63.9	4584.4	down	0.01
MW-112M	603032.11	408428.81	4646.7	66-76	4/11/23 11:05 AM	63.5	4584.7		
MW-112S	603028.35	408438.57	4645.9	41-61	4/10/23 3:22 PM	62.1	4585.4	NA	NA
MW-113D	602321.07	408447.20	4709.6	115-135	4/11/23 10:17 AM	30.8	4680.9	up	-0.02
MW-113S	602321.27	408446.94	4709.7	74-94	4/11/23 10:20 AM	32.0	4679.6		
MW-115D	600137.10	411517.23	4537.0	100-120	4/11/23 9:57 AM	88.5	4450.3	none	0.00
MW-115S	600134.12	411522.93	4536.9	80-90	4/11/23 9:55 AM	88.4	4450.4		
MW-117R	603245.33	409527.52	4580.5	113-123	4/11/23 9:48 AM	125.5	4457.6	NA	NA
MW-118D	602707.80	408888.74	4640.1	82-102	4/11/23 12:00 AM	85.8	4555.7	NA	NA
MW-119D	603024.86	408687.13	4639.9	90-100	4/11/23 12:00 AM	69.5	4571.9	down	0.15
MW-119S	603024.89	408687.06	4639.8	70-80	4/11/23 12:00 AM	65.8	4575.3		

Table 3-1
Monitoring Well Water Levels, Screened Intervals, and Vertical Gradients

Well ID	X Coordinate (Idaho State Plane East, feet)	Y Coordinate (Idaho State Plane East, feet)	Surface Elevation (ft amsl)	Screened Interval (ft bgs)	Remediation System On			Direction of Gradient^	Gradient^ (ft/ft)
					Measurement Date and Time	Water Level Depth (ft btoc)	Water Level Elevation (ft amsl)		
MW-120D	602838.95	408697.20	4642.5	90-100	4/11/23 12:00 AM	75.9	4567.6	--	--
MW-120S	602838.70	408697.16	4642.4	70-80	4/11/23 12:00 AM	76.2	4567.3		
MW-122	602945.48	407993.05	4675.9	38-48	4/10/23 4:00 PM	51.2	4627.9	NA	NA
MW-123	603172.68	408470.89	4651.0	67.3-71.3	4/11/23 11:40 AM	38.7	4615.0	NA	NA
MW-124	602756.71	408520.91	4646.0	60-90	4/11/23 11:00 AM	63.7	--	NA	NA
MW-125	602691.63	408525.43	4647.8	60-90	4/11/23 11:10 AM	69.5	--	NA	NA
MW-13	600863.67	406542.90	5008.6	157-177	4/11/23 9:03 AM	76.6	4934.1	NA	NA
MW-6A	600252.50	405869.49	5084.6	145.4-165.4	4/11/23 8:32 AM	91.5	4996.5	NA	NA
RW-1	602744.15	408367.93	4654.3	60-100	4/11/23 9:41 AM	58.2	4597.2	NA	NA
RW-2	602676.91	408451.36	4653.8	70-90	4/11/23 10:28 AM	63.8	4591.5	NA	NA

Notes
ft btoc = feet below top of casing
ft amsl = feet above mean sea level
ft bgs = feet below ground surface
NA = not applicable
^Direction and magnitude of gradient is calculated between shallow and deep paired wells

Table 3-2
Cell 1 and Offsite Monitoring Wells Organics Results

Analyte	EPA MCL	ID GW - PRIMARY	ID GW - SECONDARY	Area	Cell 1 Monitoring Wells													
				Well ID	MP-2		MP-3		MP-4		MW-101S		MW-102S		MW-105D		MW-105S	
				Sample Name	MP-2-20230411		MP-3-20230413		MP-4-20230414		MW-101S-20230415		MW-102S-20230414		MW-105D-20230411		MW-105S-20230411	
				Sample Date	4/11/2023		4/13/2023		4/14/2023		4/15/2023		4/14/2023		4/11/2023		4/11/2023	
				Unit	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organic Compounds																		
1,1,1-Trichloroethane	200	200	--	µg/L	*1.6*	*U*	*0.78*	*U*	*0.78*	*U*	*0.39*	*U*	*0.39*	*U*	*1.6*	*U*	*0.39*	*U*
1,1-Dichloroethane	--	--	--	µg/L	**1.7**	**J**	*0.44*	*U*	**0.79**	**J**	*0.22*	*U*	*0.22*	*U*	**3.3**	**J**	**0.44**	**J**
1,1-Dichloroethene	7	7	--	µg/L	*0.92*	*U*	*0.46*	*U*	*0.46*	*U*	*0.23*	*U*	*0.23*	*U*	*0.92*	*U*	*0.23*	*U*
1,2-Dichlorobenzene	600	600	--	µg/L	*1.5*	*U*	*0.74*	*U*	*0.74*	*U*	*0.37*	*U*	*0.37*	*U*	*1.5*	*U*	*0.37*	*U*
1,2-Dichloroethane	5	5	--	µg/L	*2.2*	*U*	*1.1*	*U*	*1.1*	*U*	*0.54*	*U*	*0.54*	*U*	*2.2*	*U*	*0.54*	*U*
1,2-Dichloropropane	5	5	--	µg/L	*2.1*	*U*	*1*	*U*	*1*	*U*	*0.52*	*U*	*0.52*	*U*	*2.1*	*U*	*0.52*	*U*
1,4-Dichlorobenzene	75	75	--	µg/L	*1.6*	*U*	*0.78*	*U*	*0.78*	*U*	*0.39*	*U*	*0.39*	*U*	*1.6*	*U*	*0.39*	*U*
Benzene	5	5	--	µg/L	*1.2*	*U*	*0.62*	*U*	*0.62*	*U*	*0.31*	*U*	*0.31*	*U*	*1.2*	*U*	*0.31*	*U*
Chlorobenzene	100	100	--	µg/L	*1.7*	*U*	*0.84*	*U*	*0.84*	*U*	*0.42*	*U*	*0.42*	*U*	*1.7*	*U*	*0.42*	*U*
Chloroform	80	2	--	µg/L	**1.6**	**J**	**2.1**		*0.72*	*U*	**0.97**	**J**	*0.36*	*U*	*1.4*	*U*	**1.5**	
cis-1,2-Dichloroethene	70	70	--	µg/L	**20**		**4.3**		**8.9**		**2.2**		*0.32*	*U*	*1.3*	*U*	*0.32*	*U*
Dichlorodifluoromethane	--	--	--	µg/L	*3.8*	*U*	*1.9*	*U*	*1.9*	*U*	*0.96*	*U*	*0.96*	*U*	*3.8*	*U*	*0.96*	*U*
Methylene Chloride	5	5	--	µg/L	*3.8*	*U*	*1.9*	*U*	*1.9*	*U*	*0.94*	*U*	*0.94*	*U*	*3.8*	*U*	*0.94*	*U*
o-xylene (1,2-dimethylbenzene)	10000	--	--	µg/L	*1.3*	*U*	*0.66*	*U*	*0.66*	*U*	*0.33*	*U*	*0.33*	*U*	*1.3*	*U*	*0.33*	*U*
Tetrachloroethene	5	5	--	µg/L	**19**		**19**		**25**		**17**		**0.91**	**J**	**37**		**11**	
trans-1,2-Dichloroethene	100	100	--	µg/L	*1.5*	*U*	*0.74*	*U*	*0.74*	*U*	*0.37*	*U*	*0.37*	*U*	*1.5*	*U*	*0.37*	*U*
Trichloroethene	5	5	--	µg/L	**180**		**110**		**180**		**64**		**2**		**200**		**37**	
Trichlorofluoromethane	--	--	--	µg/L	*2.3*	*U*	*1.1*	*U*	*1.1*	*U*	*0.57*	*U*	*0.57*	*U*	*2.3*	*U*	*0.57*	*U*
Vinyl chloride	2	2	--	µg/L	**3.7**	**J**	*1*	*U*	*1*	*U*	*0.51*	*U*	*0.51*	*U*	*2*	*U*	*0.51*	*U*
Xylene (Total)	10000	10000	--	µg/L	*1.3*	*U*	*0.66*	*U*	*0.66*	*U*	*0.33*	*U*	*0.33*	*U*	*1.3*	*U*	*0.33*	*U*

Table 3-2
Cell 1 and Offsite Monitoring Wells Organics Results

				Area	Cell 1 Monitoring Wells													
				Well ID	MW-109D		MW-109S		MW-109S		MW-110S		MW-111D		MW-112D		MW-112M	
				Sample Name	MW-109D-20230415		MW-109S-20230415		MW-109S-Q-20230415		MW-110S-20230414		MW-111D-20230414		MW-112D-20230415		MW-112M-20230415	
		ID GW -	ID GW -	Sample Date	4/15/2023		4/15/2023		4/15/2023		4/14/2023		4/14/2023		4/15/2023		4/15/2023	
Analyte	EPA MCL	PRIMARY	SECONDARY	Unit	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organic Compounds																		
1,1,1-Trichloroethane	200	200	--	µg/L	0.39	U	0.39	U	0.39	U	0.78	U	0.39	U	0.58	J	0.39	U
1,1-Dichloroethane	--	--	--	µg/L	0.22	U	0.22	U	0.22	U	1	J	24		0.48	J	0.79	J
1,1-Dichloroethene	7	7	--	µg/L	0.23	U	0.23	U	0.23	U	0.46	U	0.43	J	1.1		0.23	U
1,2-Dichlorobenzene	600	600	--	µg/L	0.37	U	0.37	U	0.37	U	2.7		8.9		0.37	U	0.37	U
1,2-Dichloroethane	5	5	--	µg/L	0.54	U	0.54	U	0.54	U	1.1	U	0.54	U	0.54	U	0.54	U
1,2-Dichloropropane	5	5	--	µg/L	0.52	U	0.52	U	0.52	U	1	J	2.4		0.52	U	0.52	U
1,4-Dichlorobenzene	75	75	--	µg/L	0.39	U	0.39	U	0.39	U	0.79	J	3.6		0.39	U	0.39	U
Benzene	5	5	--	µg/L	0.31	U	0.31	U	0.31	U	0.63	J	7.3		0.31	U	0.31	U
Chlorobenzene	100	100	--	µg/L	0.42	U	0.42	U	0.42	U	0.84	U	6.7		0.42	U	0.42	U
Chloroform	80	2	--	µg/L	0.55	J	0.65	J	0.62	J	0.72	U	0.48	J	0.36	U	1.2	
cis-1,2-Dichloroethene	70	70	--	µg/L	0.32	U	0.32	U	0.32	U	15		9.2		0.32	U	0.4	J
Dichlorodifluoromethane	--	--	--	µg/L	0.96	U	0.96	U	0.96	U	1.9	U	6.5		2.8	J	0.96	U
Methylene Chloride	5	5	--	µg/L	0.94	U	0.94	U	0.94	U	1.9	U	0.94	U	0.94	U	0.94	U
o-xylene (1,2-dimethylbenzene)	10000	--	--	µg/L	0.33	U	0.33	U	0.33	U	0.66	U	0.74	J	0.33	U	0.33	U
Tetrachloroethene	5	5	--	µg/L	20		15	J	15		18		1.6		12		14	
trans-1,2-Dichloroethene	100	100	--	µg/L	0.37	U	0.37	U	0.37	U	0.74	U	1.3		0.37	U	0.37	U
Trichloroethene	5	5	--	µg/L	66		48		47		130		110		190		190	
Trichlorofluoromethane	--	--	--	µg/L	0.57	U	0.57	U	0.57	U	1.1	U	0.57	U	2		0.57	U
Vinyl chloride	2	2	--	µg/L	0.51	U	0.51	U	0.51	U	4.6		6.1		0.51	U	0.51	U
Xylene (Total)	10000	10000	--	µg/L	0.33	U	0.33	U	0.33	U	0.66	U	0.74	J	0.33	U	0.33	U

Table 3-2
Cell 1 and Offsite Monitoring Wells Organics Results

				Area	Cell 1 Monitoring Wells													
				Well ID	MW-113D		MW-113S		MW-118D		MW-119D		MW-119S		MW-120D		MW-120S	
				Sample Name	MW-113D-20230414		MW-113S-20230414		MW-118D-20230412		MW-119D-20230413		MW-119S-20230413		MW-120D-20230413		MW-120S-20230413	
		ID GW -	ID GW -	Sample Date	4/14/2023		4/14/2023		4/12/2023		4/13/2023		4/13/2023		4/13/2023		4/13/2023	
Analyte	EPA MCL	PRIMARY	SECONDARY	Unit	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organic Compounds																		
1,1,1-Trichloroethane	200	200	--	µg/L	0.39	U	0.39	U	0.39	U	0.39	U	0.78	U	0.39	U	0.39	U
1,1-Dichloroethane	--	--	--	µg/L	0.41	J	26		7.8		0.22	U	0.44	U	1.1		1.2	
1,1-Dichloroethene	7	7	--	µg/L	0.23	U	0.82	J	0.48	J	0.23	U	0.46	U	1.1		0.23	U
1,2-Dichlorobenzene	600	600	--	µg/L	0.37	U	11		1.1		0.37	U	0.74	U	0.72	J	2.9	
1,2-Dichloroethane	5	5	--	µg/L	0.54	U	3.9		0.54	U	0.54	U	1.1	U	0.54	U	0.54	U
1,2-Dichloropropane	5	5	--	µg/L	0.52	U	5		0.9	J	0.52	U	1	U	0.52	U	0.65	J
1,4-Dichlorobenzene	75	75	--	µg/L	0.39	U	5.8		0.52	J	0.39	U	0.78	U	0.39	U	0.42	J
Benzene	5	5	--	µg/L	0.31	U	7.3		0.47	J	0.31	U	0.62	U	0.31	U	0.31	U
Chlorobenzene	100	100	--	µg/L	0.42	U	0.46	J	0.42	U	0.42	U	0.84	U	0.42	U	0.42	U
Chloroform	80	2	--	µg/L	0.36	U	1.4		0.37	J	1.3		1.8	J	0.4	J	0.69	J
cis-1,2-Dichloroethene	70	70	--	µg/L	0.46	J	29		4.6		3.6		4.5		12		22	
Dichlorodifluoromethane	--	--	--	µg/L	1.1	J	24		3.2		0.96	U	1.9	U	3.3		0.96	U
Methylene Chloride	5	5	--	µg/L	0.94	U	1.1	J	0.94	U	0.94	U	1.9	U	0.94	U	0.94	U
o-xylene (1,2-dimethylbenzene)	10000	--	--	µg/L	0.33	U	1		0.33	U	0.33	U	0.66	U	0.33	U	0.33	U
Tetrachloroethene	5	5	--	µg/L	1.1		22		9.9		22		29		14		15	
trans-1,2-Dichloroethene	100	100	--	µg/L	0.37	U	1.5		0.37	U	0.37	U	0.74	U	0.37	U	0.37	U
Trichloroethene	5	5	--	µg/L	0.31	J	16		58		120		130		160		130	
Trichlorofluoromethane	--	--	--	µg/L	0.57	U	2.6		0.57	U	0.57	U	1.1	U	1.8	J	0.57	U
Vinyl chloride	2	2	--	µg/L	0.51	U	92		0.51	U	0.51	U	1	U	1.4	J	0.51	U
Xylene (Total)	10000	10000	--	µg/L	0.33	U	1		0.33	U	0.33	U	0.66	U	0.33	U	0.33	U

Table 3-2
Cell 1 and Offsite Monitoring Wells Organics Results

				Area	Cell 1 Monitoring Wells								Offsite Monitoring Wells			
				Well ID	MW-123		MW-124		MW-124		MW-125		MW-103S		MW-115S	
				Sample Name	MW-123-20230415		MW-124-20230412		MW-124-Q-20230412		MW-125-20230412		MW-103S-20230415		MW-115S-20230415	
		ID GW -	ID GW -	Sample Date	4/15/2023		4/12/2023		4/12/2023		4/12/2023		4/15/2023		4/15/2023	
Analyte	EPA MCL	PRIMARY	SECONDARY	Unit	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organic Compounds																
1,1,1-Trichloroethane	200	200	--	µg/L	0.39	U	0.78	U	0.78	U	0.39	U	0.39	U	0.39	U
1,1-Dichloroethane	--	--	--	µg/L	0.22	U	**1.7**	J	**1.5**	J	**1.1**		0.22	U	0.22	U
1,1-Dichloroethene	7	7	--	µg/L	0.23	U	0.46	UJ	**0.47**	J	**0.25**	J	0.23	U	0.23	U
1,2-Dichlorobenzene	600	600	--	µg/L	0.37	U	**2.2**		**2**		0.37	U	0.37	U	0.37	U
1,2-Dichloroethane	5	5	--	µg/L	0.54	U	1.1	U	1.1	U	0.54	U	0.54	U	0.54	U
1,2-Dichloropropane	5	5	--	µg/L	0.52	U	1	U	1	U	0.52	U	0.52	U	0.52	U
1,4-Dichlorobenzene	75	75	--	µg/L	0.39	U	0.78	UJ	**0.78**	J	0.39	U	0.39	U	0.39	U
Benzene	5	5	--	µg/L	0.31	U	0.62	U	0.62	U	0.31	U	0.31	U	0.31	U
Chlorobenzene	100	100	--	µg/L	0.42	U	0.84	U	0.84	U	0.42	U	0.42	U	0.42	U
Chloroform	80	2	--	µg/L	0.36	U	**0.89**	J	**0.99**	J	**1.7**		0.36	U	0.36	U
cis-1,2-Dichloroethene	70	70	--	µg/L	0.32	U	**28**		**28**		**7.4**		**2.5**		0.32	U
Dichlorodifluoromethane	--	--	--	µg/L	0.96	U	1.9	U	1.9	U	**1.9**	J	0.96	U	0.96	U
Methylene Chloride	5	5	--	µg/L	0.94	U	1.9	U	1.9	U	0.94	U	0.94	U	0.94	U
o-xylene (1,2-dimethylbenzene)	10000	--	--	µg/L	0.33	U	0.66	U	0.66	U	0.33	U	0.33	U	0.33	U
Tetrachloroethene	5	5	--	µg/L	**4.2**		**11**		**12**		**19**		**5.2**		0.4	U
trans-1,2-Dichloroethene	100	100	--	µg/L	0.37	U	0.74	U	0.74	U	0.37	U	0.37	U	0.37	U
Trichloroethene	5	5	--	µg/L	**56**		**160**		**160**		**90**	J	**30**		**0.45**	J
Trichlorofluoromethane	--	--	--	µg/L	0.57	U	1.1	U	1.1	U	0.57	U	0.57	U	0.57	U
Vinyl chloride	2	2	--	µg/L	0.51	U	**6.3**		**6.5**		0.51	U	0.51	U	0.51	U
Xylene (Total)	10000	10000	--	µg/L	0.33	U	0.66	U	0.66	U	0.33	U	0.33	U	0.33	U

Table 3-2
Cell 1 and Offsite Monitoring Wells Organics Results

				Area	Remediation System Wells															
				Well ID	RW-1		RW-10		RW-15		RW-17		RW-2		RW-3		RW-5		RW-9R	
				Sample Name	RW-1-20230413		RW-10-20230411		RW-15-20230411		RW-17-20230411		RW-2-20230412		RW-3-20230413		RW-5-20230411		RW-9R-20230411	
		ID GW -	ID GW -	Sample Date	4/13/2023		4/11/2023		4/11/2023		4/11/2023		4/12/2023		4/13/2023		4/11/2023		4/11/2023	
Analyte	EPA MCL	PRIMARY	SECONDARY	Unit	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organic Compounds																				
1,1,1-Trichloroethane	200	200	--	µg/L	*1.6*	*U*	*0.39*	*U*	*1.6*	*U*	*0.78*	*U*	*0.39*	*U*	*0.78*	*U*	*0.39*	*U*	*1.6*	*U*
1,1-Dichloroethane	--	--	--	µg/L	**1.8**	**J**	**0.33**	**J**	**0.92**	**J**	*0.44*	*U*	**1.2**		*0.44*	*U*	**0.35**	**J**	**1.5**	**J**
1,1-Dichloroethene	7	7	--	µg/L	*0.92*	*U*	*0.23*	*U*	*0.92*	*U*	*0.46*	*U*	*0.23*	*U*	*0.46*	*U*	*0.23*	*U*	*0.92*	*U*
1,2-Dichlorobenzene	600	600	--	µg/L	**2.2**	**J**	*0.37*	*U*	**2.4**	**J**	*0.74*	*U*	**1.6**		*0.74*	*U*	*0.37*	*U*	**7**	
1,2-Dichloroethane	5	5	--	µg/L	*2.2*	*U*	*0.54*	*U*	*2.2*	*U*	*1.1*	*U*	*0.54*	*U*	*1.1*	*U*	*0.54*	*U*	*2.2*	*U*
1,2-Dichloropropane	5	5	--	µg/L	*2.1*	*U*	*0.52*	*U*	*2.1*	*U*	*1*	*U*	*0.52*	*U*	*1*	*U*	*0.52*	*U*	*2.1*	*U*
1,4-Dichlorobenzene	75	75	--	µg/L	*1.6*	*U*	*0.39*	*U*	*1.6*	*U*	*0.78*	*U*	*0.39*	*U*	*0.78*	*U*	*0.39*	*U*	**2**	**J**
Benzene	5	5	--	µg/L	*1.2*	*U*	*0.31*	*U*	*1.2*	*U*	*0.62*	*U*	*0.31*	*U*	*0.62*	*U*	*0.31*	*U*	*1.2*	*U*
Chlorobenzene	100	100	--	µg/L	*1.7*	*U*	*0.42*	*U*	*1.7*	*U*	*0.84*	*U*	*0.42*	*U*	*0.84*	*U*	*0.42*	*U*	*1.7*	*U*
Chloroform	80	2	--	µg/L	**2.6**	**J**	**1.7**		**1.9**	**J**	**2**		**1.3**		*0.72*	*U*	**1.6**		**1.5**	**J**
cis-1,2-Dichloroethene	70	70	--	µg/L	**26**		**3.4**		**19**		**5.4**		**21**		*0.64*	*U*	**2.7**		**38**	
Dichlorodifluoromethane	--	--	--	µg/L	*3.8*	*U*	*0.96*	*U*	*3.8*	*U*	*1.9*	*U*	*0.96*	*U*	*1.9*	*U*	*0.96*	*U*	*3.8*	*U*
Methylene Chloride	5	5	--	µg/L	*3.8*	*U*	*0.94*	*U*	*3.8*	*U*	*1.9*	*U*	*0.94*	*U*	*1.9*	*U*	*0.94*	*U*	*3.8*	*U*
o-xylene (1,2-dimethylbenzene)	10000	--	--	µg/L	*1.3*	*U*	*0.33*	*U*	*1.3*	*U*	*0.66*	*U*	*0.33*	*U*	*0.66*	*U*	*0.33*	*U*	*1.3*	*U*
Tetrachloroethene	5	5	--	µg/L	**26**		**27**		**33**		**32**		**13**		**4.4**		**24**		**22**	
trans-1,2-Dichloroethene	100	100	--	µg/L	*1.5*	*U*	*0.37*	*U*	*1.5*	*U*	*0.74*	*U*	*0.37*	*U*	*0.74*	*U*	*0.37*	*U*	*1.5*	*U*
Trichloroethene	5	5	--	µg/L	**250**		**110**		**180**		**130**		**140**		**7.2**		**100**		**200**	
Trichlorofluoromethane	--	--	--	µg/L	*2.3*	*U*	*0.57*	*U*	*2.3*	*U*	*1.1*	*U*	*0.57*	*U*	*1.1*	*U*	*0.57*	*U*	*2.3*	*U*
Vinyl chloride	2	2	--	µg/L	**3**	**J**	*0.51*	*U*	*2*	*U*	*1*	*U*	*0.51*	*U*	*1*	*U*	*0.51*	*U*	**4.9**	**J**
Xylene (Total)	10000	10000	--	µg/L	*1.3*	*U*	*0.33*	*U*	*1.3*	*U*	*0.66*	*U*	*0.33*	*U*	*0.66*	*U*	*0.33*	*U*	*1.3*	*U*

Table 3-3
Cell 1 and Offsite Monitoring Wells Inorganics Results

Analyte	EPA MCL	ID GW - PRIMARY	ID GW - SECONDARY	Area	Cell 1 Monitoring Wells																			
				Well ID	MP-2		MP-3		MP-4		MW-101S		MW-102S		MW-105D		MW-105S		MW-109D		MW-109S		MW-110S	
				Sample Name	MP-2-20230411		MP-3-20230413		MP-4-20230414		MW-101S-20230415		MW-102S-20230414		MW-105D-20230411		MW-105S-20230411		MW-109D-20230415		MW-109S-20230415		MW-110S-20230414	
				Sample Date	4/11/2023		4/13/2023		4/14/2023		4/15/2023		4/14/2023		4/11/2023		4/11/2023		4/15/2023		4/15/2023		4/14/2023	
				Unit	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Inorganics																								
Antimony	6	6	--	µg/L	*0.4*	U	--		--		--		--		*0.4*	U	*0.4*	U	--		--		--	
Arsenic	10	50	--	µg/L	**0.91**	J	--		--		--		--		**0.72**	J	**0.66**	J	--		--		--	
Barium	2000	2000	--	µg/L	**370**		--		--		--		--		**310**		**250**		--		--		--	
Cadmium	5	5	--	µg/L	*0.19*	U	--		--		--		--		*0.19*	U	*0.19*	U	--		--		--	
Calcium	--	--	--	µg/L	**210000**		--		--		--		--		**230000**		**230000**		--		--		--	
Chromium	100	100	--	µg/L	*0.5*	U	--		--		--		--		*0.5*	U	**2.3**	J	--		--		--	
Cobalt	--	--	--	µg/L	*0.33*	U	--		--		--		--		*0.33*	U	**11**		--		--		--	
Copper	1300	1300	--	µg/L	**1.1**	J	--		--		--		--		**1**	J	**3**		--		--		--	
Iron	--	--	300	µg/L	**8.8**	J	--		--		--		--		*8.7*	U	**15**	J	--		--		--	
Lead	15	15	--	µg/L	*0.23*	U	--		--		--		--		*0.23*	U	*0.23*	U	--		--		--	
Magnesium	--	--	--	µg/L	**67000**		--		--		--		--		**69000**		**80000**		--		--		--	
Manganese	--	--	50	µg/L	**3.5**		--		--		--		--		**5**		**520**		--		--		--	
Nickel	--	--	--	µg/L	**2**	J	--		--		--		--		*0.83*	U	**50**		--		--		--	
Potassium	--	--	--	µg/L	**4200**		--		--		--		--		**3800**		**5000**		--		--		--	
Selenium	50	50	--	µg/L	*1*	U	--		--		--		--		*1*	U	*1*	U	--		--		--	
Silver	--	--	100	µg/L	*0.045*	U	--		--		--		--		*0.045*	U	*0.045*	U	--		--		--	
Sodium	--	--	--	µg/L	**86000**		--		--		--		--		**64000**		**410000**		--		--		--	
Tin	--	--	--	µg/L	*0.58*	U	--		--		--		--		*0.58*	U	*0.58*	U	--		--		--	
Vanadium	--	--	--	µg/L	**2.5**	J	--		--		--		--		**1.2**	J	*1.1*	U	--		--		--	
Zinc	--	--	5000	µg/L	*2*	U	--		--		--		--		*2*	U	*2*	U	--		--		--	
Field and Redox Parameters																								
Acetylene	--	--	--	µg/L	--		--		--		--		--		--		--		--		--		--	
Bromide	--	--	--	mg/L	**2.1**	J-	--		--		--		--		**0.76**		**1.4**		--		--		--	
Chloride	--	--	250	mg/L	**310**		--		--		--		--		**280**		**470**		--		--		--	
Dissolved Oxygen	--	--	--	mg/L	**1.37**		**4.06**		**5.55**		**5.26**		**5.32**		**0.39**		**1.1**		**3.15**		**6.83**		**1.85**	
Ethane	--	--	--	µg/L	--		--		--		--		--		--		--		--		--		--	
Ethene	--	--	--	µg/L	--		--		--		--		--		--		--		--		--		--	
FERROUS IRON	--	--	--	mg/L	--		--		--		--		--		--		--		--		--		--	
Manganese	--	--	0.05	mg/L	**0.0035**		--		--		--		--		**0.005**		**0.52**		--		--		--	
Methane	--	--	--	mg/L	--		--		--		--		--		--		--		--		--		--	
Nitrate	10	10	--	mg/L	**2.2**		--		--		--		--		**0.71**	J-	**13**	J-	--		--		--	
Nitrite	1	1	--	mg/L	*0.049*	U	--		--		--		--		0.049	R	0.049	R	--		--		--	
Oxidation-Reduction Potential	--	--	--	millivolts	**126.6**		**78.9**		**137.8**		**103.7**		**63.3**		**-57**		**29.9**		**85.4**		**106.2**		**102.2**	
pH	--	--	6.5 - 8.5	su	**6.84**		**6.7**		**6.56**		**6.97**		**7.43**		**6.75**		**6.85**		**7.2**		**7.07**		**6.64**	
Propane	--	--	--	µg/L	--		--		--		--		--		--		--		--		--		--	
Specific Conductance	--	--	--	µS/cm	**1855**		**1523**		**5807**		**1100**		**632**		**1909**		**3451**		**1085**		**1315**		**2586**	
Sulfate	--	--	250	mg/L	**120**		--		--		--		--		**79**		**200**		--		--		--	
Sulfide	--	--	--	mg/L	--		--		--		--		--		--		--		--		--		--	
Temperature	--	--	--	Celsius	**16.51**		**9.7**		**11.2**		**9**		**9.82**		**12.73**		**12.98**		**10.4**		**10.7**		**12.3**	
Total Organic Carbon	--	--	--	mg/L	**3.9**		--		--		--		--		**1.9**		**7.2**		--		--		--	
Turbidity	--	--	--	ntu	**0.78**		**20.3**		**32.6**		**1.37**		**0.17**		**0.11**		**0.52**		**0.61**		**0.81**		**0.39**	

Table 3-3
Cell 1 and Offsite Monitoring Wells Inorganics Results

				Area	Cell 1 Monitoring Wells																	
				Well ID	MW-111D		MW-112D		MW-112M		MW-113D		MW-113S		MW-118D		MW-119D		MW-119S		MW-120D	
				Sample Name	MW-111D-20230414		MW-112D-20230415		MW-112M-20230415		MW-113D-20230414		MW-113S-20230414		MW-118D-20230412		MW-119D-20230413		MW-119S-20230413		MW-120D-20230413	
		ID GW -	ID GW -	Sample Date	4/14/2023		4/15/2023		4/15/2023		4/14/2023		4/14/2023		4/12/2023		4/13/2023		4/13/2023		4/13/2023	
Analyte	EPA MCL	PRIMARY	SECONDARY	Unit	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Inorganics																						
Antimony	6	6	--	µg/L	--		--		--		--		--		0.4	U	0.4	U	0.4	U	0.4	U
Arsenic	10	50	--	µg/L	--		--		--		--		--		1.2	J	0.5	U	0.58	J	0.84	J
Barium	2000	2000	--	µg/L	--		--		--		--		--		520		220		250		280	
Cadmium	5	5	--	µg/L	--		--		--		--		--		0.19	U	0.19	U	0.19	U	0.19	U
Calcium	--	--	--	µg/L	--		--		--		--		--		270000		120000		140000		140000	
Chromium	100	100	--	µg/L	--		--		--		--		--		0.62	J	0.5	U	0.5	U	1.2	J
Cobalt	--	--	--	µg/L	--		--		--		--		--		4		0.33	U	0.33	U	0.68	J
Copper	1300	1300	--	µg/L	--		--		--		--		--		4		0.71	U	0.96	J	1	J
Iron	--	--	300	µg/L	--		--		--		--		--		23	J	9.9	J	8.7	U	8.7	U
Lead	15	15	--	µg/L	--		--		--		--		--		2.8		0.23	U	0.23	U	0.23	U
Magnesium	--	--	--	µg/L	--		--		--		--		--		96000		54000		63000		43000	
Manganese	--	--	50	µg/L	--		--		--		--		--		23		0.52	J	0.51	U	220	
Nickel	--	--	--	µg/L	--		--		--		--		--		70		0.83	U	0.83	U	2.5	J
Potassium	--	--	--	µg/L	--		--		--		--		--		5700		3500		4400		6000	
Selenium	50	50	--	µg/L	--		--		--		--		--		1	U	1	U	1	U	1	U
Silver	--	--	100	µg/L	--		--		--		--		--		0.045	U	0.045	U	0.045	U	0.045	U
Sodium	--	--	--	µg/L	--		--		--		--		--		170000		68000		78000		54000	
Tin	--	--	--	µg/L	--		--		--		--		--		0.58	U	0.58	U	0.58	U	0.58	U
Vanadium	--	--	--	µg/L	--		--		--		--		--		2.6	J	1.1	U	1.1	U	1.4	J
Zinc	--	--	5000	µg/L	--		--		--		--		--		2	U	2	U	2	U	10	U
Field and Redox Parameters																						
Acetylene	--	--	--	µg/L	--		--		--		--		--		--		--		--		--	
Bromide	--	--	--	mg/L	--		--		--		--		--		3.8	J-	1.2		1.3		1.6	
Chloride	--	--	250	mg/L	--		--		--		--		--		640		210		270		190	
Dissolved Oxygen	--	--	--	mg/L	0.37		4.52		6.46		11.23		0.39		1.99		2.72		4.38		0.62	
Ethane	--	--	--	µg/L	--		--		--		--		--		--		--		--		--	
Ethene	--	--	--	µg/L	--		--		--		--		--		--		--		--		--	
FERROUS IRON	--	--	--	mg/L	--		--		--		--		--		--		0.01		--		--	
Manganese	--	--	0.05	mg/L	--		--		--		--		--		0.023		0.00052	J	0.00051	U	0.22	
Methane	--	--	--	mg/L	--		--		--		--		--		--		--		--		--	
Nitrate	10	10	--	mg/L	--		--		--		--		--		2.2		2.5	J-	4.1	J-	0.38	J
Nitrite	1	1	--	mg/L	--		--		--		--		--		0.049	U	0.049	R	0.049	R	0.049	UJ
Oxidation-Reduction Potential	--	--	--	millivolts	-154.8		85		86.8		58.3		58.5		155.6		98.3		91.5		36.5	
pH	--	--	6.5 - 8.5	su	6.87		7.57		7.08		7.36		6.48		6.73		6.51		6.44		6.91	
Propane	--	--	--	µg/L	--		--		--		--		--		--		--		--		--	
Specific Conductance	--	--	--	µS/cm	4367		875		1015		656		2984		2971		1450		1649		1285	
Sulfate	--	--	250	mg/L	--		--		--		--		--		80		100		110		71	
Sulfide	--	--	--	mg/L	--		--		--		--		--		--		--		--		--	
Temperature	--	--	--	Celsius	10.8		10.9		11.3		10.56		10.21		12.21		9		10.75		9.7	
Total Organic Carbon	--	--	--	mg/L	--		--		--		--		--		11		1.7		2.2		2.5	
Turbidity	--	--	--	ntu	0.96		4.46		15.5		5.83		2.21		0.49		0.21		0.39		2.26	

Table 3-3
Cell 1 and Offsite Monitoring Wells Inorganics Results

				Area	Cell 1 Monitoring Wells										Offsite Monitoring Wells			
				Well ID	MW-120S		MW-123		MW-124		MW-124		MW-125		MW-103S		MW-115S	
				Sample Name	MW-120S-20230413		MW-123-20230415		MW-124-20230412		MW-124-Q-20230412		MW-125-20230412		MW-103S-20230415		MW-115S-20230415	
		ID GW -	ID GW -	Sample Date	4/13/2023		4/15/2023		4/12/2023		4/12/2023		4/12/2023		4/15/2023		4/15/2023	
Analyte	EPA MCL	PRIMARY	SECONDARY	Unit	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Inorganics																		
Antimony	6	6	--	µg/L	0.4	U	--		0.4	UJ	0.42	J	0.4	U	--		--	
Arsenic	10	50	--	µg/L	0.84	J	--		0.5	U	0.5	U	1.2	J	--		--	
Barium	2000	2000	--	µg/L	340		--		420		400		490		--		--	
Cadmium	5	5	--	µg/L	0.19	U	--		0.29	J	0.3	J	0.19	U	--		--	
Calcium	--	--	--	µg/L	210000		--		220000		210000		300000		--		--	
Chromium	100	100	--	µg/L	0.5	U	--		0.5	U	0.5	U	0.85	J	--		--	
Cobalt	--	--	--	µg/L	3.1		--		2.8		2.6		0.43	J-	--		--	
Copper	1300	1300	--	µg/L	1.1	J	--		3.1		3		2.4		--		--	
Iron	--	--	300	µg/L	510		--		24	J	21	J	8.9	J	--		--	
Lead	15	15	--	µg/L	0.29	J	--		0.23	U	0.23	U	0.23	UJ	--		--	
Magnesium	--	--	--	µg/L	72000		--		73000		69000		92000		--		--	
Manganese	--	--	50	µg/L	180		--		2000		1800		52		--		--	
Nickel	--	--	--	µg/L	5		--		15		15		1.9	J-	--		--	
Potassium	--	--	--	µg/L	5800		--		4800		4600		5100		--		--	
Selenium	50	50	--	µg/L	1	U	--		1	U	1	U	1	U	--		--	
Silver	--	--	100	µg/L	0.045	U	--		0.045	U	0.045	U	0.045	U	--		--	
Sodium	--	--	--	µg/L	99000		--		100000		95000		120000		--		--	
Tin	--	--	--	µg/L	2.4	J	--		0.58	U	0.58	U	0.58	U	--		--	
Vanadium	--	--	--	µg/L	1.5	J	--		1.1	U	1.1	U	1.7	J	--		--	
Zinc	--	--	5000	µg/L	10	U	--		9.3	J	9.9	J	2	U	--		--	
Field and Redox Parameters																		
Acetylene	--	--	--	µg/L	--		--		0.73	U	0.73	U	0.73	U	--		--	
Bromide	--	--	--	mg/L	0.96		--		1.4		1.4		1.2		--		--	
Chloride	--	--	250	mg/L	330		--		310		330		570		--		--	
Dissolved Oxygen	--	--	--	mg/L	0.52		3.98		2.67		--		1.08		6.9		8.98	
Ethane	--	--	--	µg/L	--		--		1	J	0.94	J	0.57	U	--		--	
Ethene	--	--	--	µg/L	--		--		0.42	J	0.4	U	0.4	U	--		--	
FERROUS IRON	--	--	--	mg/L	--		--		0.04		--		0.03		--		--	
Manganese	--	--	0.05	mg/L	0.18		--		2		1.8		0.052		--		--	
Methane	--	--	--	mg/L	--		--		0.013		0.014		0.00063	U	--		--	
Nitrate	10	10	--	mg/L	1.5	J	--		5.6		5.6		18		--		--	
Nitrite	1	1	--	mg/L	0.049	UJ	--		0.049	UJ	0.049	UJ	0.049	U	--		--	
Oxidation-Reduction Potential	--	--	--	millivolts	-39.1		67.9		45.2		--		22		72.2		76.3	
pH	--	--	6.5 - 8.5	su	6.67		7.17		6.62		--		6.64		7.06		7.12	
Propane	--	--	--	µg/L	--		--		0.68	J	0.64	J	0.56	U	--		--	
Specific Conductance	--	--	--	µS/cm	1912		1001		2063		--		2760		1486		845	
Sulfate	--	--	250	mg/L	100		--		120		120		150		--		--	
Sulfide	--	--	--	mg/L	--		--		--		--		--		--		--	
Temperature	--	--	--	Celsius	9		12.21		11.58		--		12.96		11.2		10	
Total Organic Carbon	--	--	--	mg/L	5.2		--		5.1		4.9		4.6		--		--	
Turbidity	--	--	--	ntu	2.12		3.45		19.6		--		0.83		0.29		0.75	

Table 3-3
Cell 1 and Offsite Monitoring Wells Inorganics Results

Analyte	EPA MCL	ID GW - PRIMARY	ID GW - SECONDARY	Area	Remediation System Wells															
				Well ID	RW-1		RW-10		RW-15		RW-17		RW-2		RW-3		RW-5		RW-9R	
				Sample Name	RW-1-20230413		RW-10-20230411		RW-15-20230411		RW-17-20230411		RW-2-20230412		RW-3-20230413		RW-5-20230411		RW-9R-20230411	
				Sample Date	4/13/2023		4/11/2023		4/11/2023		4/11/2023		4/12/2023		4/13/2023		4/11/2023		4/11/2023	
				Unit	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Inorganics																				
Antimony	6	6	--	µg/L	0.4	U	--		0.4	U	--		0.4	U	0.4	U	--		--	
Arsenic	10	50	--	µg/L	0.62	J	--		0.5	U	--		1.7	J	1.4	J	--		--	
Barium	2000	2000	--	µg/L	340		--		300		--		350		410		--		--	
Cadmium	5	5	--	µg/L	0.19	U	--		0.19	U	--		0.19	U	0.19	U	--		--	
Calcium	--	--	--	µg/L	210000		--		200000		--		220000		210000		--		--	
Chromium	100	100	--	µg/L	0.5	U	--		0.5	U	--		0.98	J	0.8	J	--		--	
Cobalt	--	--	--	µg/L	0.33	U	--		0.33	U	--		0.33	U	1.6		--		--	
Copper	1300	1300	--	µg/L	1.3	J	--		7.6		--		1.7	J	1.2	J	--		--	
Iron	--	--	300	µg/L	44	J	--		8.7	U	--		34	J	52	J	--		--	
Lead	15	15	--	µg/L	0.23	U	--		0.25	J	--		0.23	U	0.23	U	--		--	
Magnesium	--	--	--	µg/L	74000		--		78000		--		73000		60000		--		--	
Manganese	--	--	50	µg/L	390		--		1.2	J	--		3.6		280		--		--	
Nickel	--	--	--	µg/L	8.7		--		2.6	J	--		3.5		39		--		--	
Potassium	--	--	--	µg/L	4800		--		4200		--		4700		4800		--		--	
Selenium	50	50	--	µg/L	1	U	--		1	U	--		1	U	1	U	--		--	
Silver	--	--	100	µg/L	0.045	U	--		0.045	U	--		0.045	U	0.045	U	--		--	
Sodium	--	--	--	µg/L	100000		--		96000		--		100000		160000		--		--	
Tin	--	--	--	µg/L	0.58	U	--		0.58	U	--		0.58	U	0.58	U	--		--	
Vanadium	--	--	--	µg/L	1.2	J	--		1.1	U	--		2.7	J	2.9	J	--		--	
Zinc	--	--	5000	µg/L	2	U	--		47		--		10	U	10	U	--		--	
Field and Redox Parameters																				
Acetylene	--	--	--	µg/L	--		--		--		--		--		--		--		--	
Bromide	--	--	--	mg/L	2.8	J-	--		1.5		--		2.4		0.23	U	--		--	
Chloride	--	--	250	mg/L	350		--		310		--		330		340		--		--	
Dissolved Oxygen	--	--	--	mg/L	0.39		7.75		3.79		3.4		1.69		1.99		6.02		14.5	
Ethane	--	--	--	µg/L	--		--		--		--		--		--		--		--	
Ethene	--	--	--	µg/L	--		--		--		--		--		--		--		--	
FERROUS IRON	--	--	--	mg/L	0.04		--		--		--		0.01		0.04		--		--	
Manganese	--	--	0.05	mg/L	0.39		--		0.0012	J	--		0.0036		0.28		--		--	
Methane	--	--	--	mg/L	--		--		--		--		--		--		--		--	
Nitrate	10	10	--	mg/L	2.3		--		2.2	J-	--		5.8	J	5.6	J-	--		--	
Nitrite	1	1	--	mg/L	0.049	U	--		0.049	R	--		0.049	UJ	0.049	R	--		--	
Oxidation-Reduction Potential	--	--	--	millivolts	115.6		139.5		139.6		155.6		155.5		93		160.6		144	
pH	--	--	6.5 - 8.5	su	6.37		6.7		6.5		6.58		6.56		6.69		6.67		6.7	
Propane	--	--	--	µg/L	--		--		--		--		--		--		--		--	
Specific Conductance	--	--	--	µS/cm	2094		1512		1913		1642		2175		2260		1426		2150	
Sulfate	--	--	250	mg/L	110		--		98		--		120		49		--		--	
Sulfide	--	--	--	mg/L	--		--		--		--		--		--		--		--	
Temperature	--	--	--	Celsius	10.73		13.88		12.5		12.39		12.78		10.7		12.17		13.18	
Total Organic Carbon	--	--	--	mg/L	5.1		--		4.4		--		4.6		3.8		--		--	
Turbidity	--	--	--	ntu	1.47		2.32		11.6		5.74		0.31		20.8		0.22		2.13	

Table 3-4
Remediation Well Status and Groundwater Production Summary

Well ID	Total Depth (ft bgs)	Screened Interval (ft bgs)	Status (as of 8/03/23)	Cumulative Groundwater Removed (gal) 12/02/22 - 08/03/23	Average Flow Rate (gpm) 12/02/22 - 08/03/23
RW-4	100’	50’ to 100’	Operating	118,951	0.4
RW-5	100’	60’ to 100’	Operating	1,069,070	3.5
RW-9R	78’	51’ to 76’	Operating	389,509	1.4
RW-10	85’	50’ to 85’	Operating	1,889,411	6.3
RW-15	105’	42’ to 105’	Operating	3,117,876	11.0
RW-17	103.5’	43.5’ to 103.5’	Operating	1,469,365	4.8
Air Stripper Influent			Operating	8,118,008	27.7

Notes:

1. Groundwater volumes reported prior to 9/26/19 are based on flowmeter totalizer readings collected on 9/26/19, and represent only the amount of water removed since the flowmeter was installed. These flowmeters were not the original flowmeters installed in 2001.
2. Flowmeters for RW-4, RW-9R, RW-10, RW-15, and RW-17 were replaced on September 9th, 2020. The entire stripper influent manifold was replaced with SCH80 PVC on this date. Air stripper influent flow meter was replaced December 17, 2020. Prior to the influent flow meter replacement, individual well batch totals were used to estimate total influent volume. RW-17 flowmeter replaced January 8, 2021.
3. The remediation system was shut down from 6/4/20 until 9/17/20 for well rehabilitation, aquifer performance testing, and remediation system O&M.
4. A leak was detected in the conveyance piping of RW-9R on May 4, 2022. In addition, significant fouling of the pump was discovered. The conveyance piping was repaired and a new pump was installed January 12, 2023. The well is currently online.
5. RW-4 was irregularly running from 2/21/23 through 5/20/23 due to repeated dry run alarms. These issues were troubleshooted and resolved.
6. The remediation system was shut down from 5/8/23 through 6/13/23 for the tracer test.
7. Acronyms:
   - ft bgs = feet below ground surface
   - gal = gallons
   - gpm = gallons per minute

Table 3-5
Injection Well Analytical Results

Analyte	EPA MCL	ID GW - PRIMARY	ID GW - SECONDARY	Area	Remediation System			
				Well ID	INJ-1R		INJ-1R	
				Sample Name	INJ-1R-20230125		INJ-1R-20230411	
				Sample Date	1/25/2023		4/11/2023	
				Unit	Result	Q	Result	Q
Volatile Organic Compounds (VOCs)								
1,1,1,2-Tetrachloroethane	--	--	--	µg/L	0.58	U	0.58	U
1,1,1-Trichloroethane	200	200	--	µg/L	0.39	U	0.39	U
1,1,2,2-Tetrachloroethane	--	--	--	µg/L	0.21	U	0.21	U
1,1,2-Trichloroethane	5	5	--	µg/L	0.27	U	0.27	U
1,1-Dichloroethane	--	--	--	µg/L	0.22	U	0.22	U
1,1-Dichloroethene	7	7	--	µg/L	0.23	U	0.23	U
1,1-Dichloropropene	--	--	--	µg/L	0.42	U	0.42	U
1,2,3-Trichloropropane	--	--	--	µg/L	0.86	U	0.005	U
1,2,4-Trichlorobenzene	70	70	--	µg/L	0.58	U	0.58	U
1,2-Dibromo-3-Chloropropane	0.2	0.2	--	µg/L	1.8	U	0.0067	U
1,2-Dibromoethane	0.05	0.05	--	µg/L	0.4	U	0.0037	U
1,2-Dichlorobenzene	600	600	--	µg/L	0.37	U	0.37	U
1,2-Dichloroethane	5	5	--	µg/L	0.54	U	0.54	U
1,2-Dichloropropane	5	5	--	µg/L	0.52	U	0.52	U
1,3-Dichlorobenzene	--	600	--	µg/L	0.33	U	0.33	U
1,3-Dichloropropane	--	--	--	µg/L	0.38	U	0.38	U
1,4-Dichlorobenzene	75	75	--	µg/L	0.39	U	0.39	U
2,2-Dichloropropane	--	--	--	µg/L	0.38	U	0.38	U
2-Butanone (MEK)	--	--	--	µg/L	5.9	U	6	U
2-Hexanone	--	--	--	µg/L	1.7	U	1.7	U
4-Methyl-2-pentanone (MIBK)	--	--	--	µg/L	0.98	U	0.98	U
Acetone	--	--	--	µg/L	6.6	U	6.6	U
Acetonitrile; methyl cyanide	--	--	--	µg/L	9.6	U	9.6	U
Acrolein	--	--	--	µg/L	4.9	U	4.9	U
Acrylonitrile	--	--	--	µg/L	4.5	U	4.5	U
Allyl chloride	--	--	--	µg/L	0.17	U	0.17	U
Benzene	5	5	--	µg/L	0.31	U	0.31	U
Bromochloromethane	--	--	--	µg/L	0.4	U	0.4	U
Bromodichloromethane	80	100	--	µg/L	0.39	U	0.39	U
Bromoform	80	100	--	µg/L	1.2	U	1.2	U
Bromomethane	--	--	--	µg/L	2.4	U	2.4	U
Carbon disulfide	--	--	--	µg/L	0.63	U	0.63	U
Carbon tetrachloride	5	5	--	µg/L	0.57	U	0.57	U
Chlorobenzene	100	100	--	µg/L	0.42	U	0.42	U
Chlorodibromomethane	80	100	--	µg/L	0.62	U	0.62	U
Chloroethane	--	--	--	µg/L	1.4	U	1.4	U
Chloroform	80	2	--	µg/L	0.36	U	0.36	U
Chloromethane	--	--	--	µg/L	0.75	U	0.75	U
Chloroprene	--	--	--	µg/L	1.2	U	1.2	U
cis-1,2-Dichloroethene	70	70	--	µg/L	0.32	U	0.32	U
cis-1,3-Dichloropropene	--	--	--	µg/L	0.63	U	0.63	U
Dibromomethane	--	--	--	µg/L	0.34	U	0.34	U
Dichlorodifluoromethane	--	--	--	µg/L	0.96	U	0.96	U
Ethyl methacrylate	--	--	--	µg/L	0.86	U	0.86	U
Ethylbenzene	700	700	--	µg/L	0.3	U	0.3	U
Iodomethane	--	--	--	µg/L	2.6	U	2.6	U
Isobutanol; Isobutyl alcohol	--	--	--	µg/L	37	U	37	U
m,p-Xylene	10000	--	--	µg/L	0.36	U	0.36	U
Methacrylonitrile	--	--	--	µg/L	5.3	U	5.3	U
Methyl methacrylate	--	--	--	µg/L	1.1	U	1.1	U
Methylene Chloride	5	5	--	µg/L	0.94	U	0.94	U
o-xylene (1,2-dimethylbenzene)	10000	--	--	µg/L	0.33	U	0.33	U
Propionitrile; ethyl cyanide	--	--	--	µg/L	3.7	U	3.7	U
Styrene	100	100	--	µg/L	0.36	U	0.36	U
Tetrachloroethene	5	5	--	µg/L	0.4	U	0.4	U
Toluene	1000	1000	--	µg/L	0.32	U	0.32	U
trans-1,2-Dichloroethene	100	100	--	µg/L	0.37	U	0.37	U
trans-1,3-Dichloropropene	--	--	--	µg/L	0.65	U	0.65	U
trans-1,4-Dichloro-2-butene	--	--	--	µg/L	1.4	U	1.4	U
Trichloroethene	5	5	--	µg/L	0.3	U	**0.44**	J
Trichlorofluoromethane	--	--	--	µg/L	0.57	U	0.57	U
Vinyl acetate	--	--	--	µg/L	0.94	U	0.94	U
Vinyl chloride	2	2	--	µg/L	0.51	U	0.51	U
Xylene (Total)	10000	10000	--	µg/L	0.33	U	0.33	U
Inorganics								
Antimony	6	6	--	µg/L	--		0.4	U
Arsenic	10	50	--	µg/L	--		**0.84**	J
Barium	2000	2000	--	µg/L	--		**280**	

Table 3-5
Injection Well Analytical Results

Analyte	EPA MCL	ID GW - PRIMARY	ID GW - SECONDARY	Area	Remediation System			
				Well ID	INJ-1R		INJ-1R	
				Sample Name	INJ-1R-20230125		INJ-1R-20230411	
				Sample Date	1/25/2023		4/11/2023	
				Unit	Result	Q	Result	Q
Beryllium	4	4	--	µg/L	--		*0.3*	*U*
Cadmium	5	5	--	µg/L	--		*0.19*	*U*
Calcium	--	--	--	µg/L	--		**160000**	
Chromium	100	100	--	µg/L	--		*0.5*	*U*
Cobalt	--	--	--	µg/L	--		*0.33*	*U*
Copper	1300	1300	--	µg/L	--		**9.6**	
Cyanide	0.2	0.2	--	mg/L	--		*0.005*	*U*
Iron	--	--	300	µg/L	--		**11**	**J**
Lead	15	15	--	µg/L	--		**1.1**	
Magnesium	--	--	--	µg/L	--		**69000**	
Manganese	--	--	50	µg/L	--		**180**	
Mercury	2	2	--	µg/L	--		**0.071**	**J**
Nickel	--	--	--	µg/L	--		**2.3**	**J**
Potassium	--	--	--	µg/L	--		**4600**	
Selenium	50	50	--	µg/L	--		*1*	*U*
Silver	--	--	100	µg/L	--		**0.2**	**J**
Sodium	--	--	--	µg/L	--		**85000**	
Sulfide	--	--	--	mg/L	--		*0.022*	*U*
Thallium	2	2	--	µg/L	--		*0.21*	*U*
Tin	--	--	--	µg/L	--		**1.7**	**J**
Vanadium	--	--	--	µg/L	--		**1.5**	**J**
Zinc	--	--	5000	µg/L	--		**20**	
Semivolatile Organic Compounds (SVOCs)								
1,2,4,5-Tetrachlorobenzene	--	--	--	µg/L	--		*1.8*	*U*
1,3,5-Trinitrobenzene	--	--	--	µg/L	--		*5.4*	*U*
1,3-Dinitrobenzene	--	--	--	µg/L	--		*5.4*	*U*
1,4-Naphthoquinone	--	--	--	µg/L	--		*5.6*	*U*
1-Naphthylamine	--	--	--	µg/L	--		*3.8*	*U*
2,3,4,6-Tetrachlorophenol	--	--	--	µg/L	--		*7.3*	*U*
2,4,5-Trichlorophenol	--	--	--	µg/L	--		*0.93*	*U*
2,4,6-Trichlorophenol	--	--	--	µg/L	--		*0.74*	*U*
2,4-Dichlorophenol	--	--	--	µg/L	--		*0.66*	*U*
2,4-Dimethylphenol; m-Xylenol	--	--	--	µg/L	--		*1.4*	*U*
2,4-Dinitrophenol	--	--	--	µg/L	--		*13*	*U*
2,4-Dinitrotoluene	--	--	--	µg/L	--		*1.5*	*U*
2,6-Dichlorophenol	--	--	--	µg/L	--		*0.77*	*U*
2,6-Dinitrotoluene	--	--	--	µg/L	--		*1.5*	*U*
2-Acetylaminofluorene	--	--	--	µg/L	--		*8.4*	*U*
2-Chloronaphthalene	--	--	--	µg/L	--		*1.3*	*U*
2-Chlorophenol	--	--	--	µg/L	--		*0.71*	*U*
2-Methylnaphthalene	--	--	--	µg/L	--		*1.3*	*U*
2-Methylphenol (o-cresol)	--	--	--	µg/L	--		*0.8*	*U*
2-Naphthylamine	--	--	--	µg/L	--		*1.4*	*U*
2-Nitroaniline; o-Nitroaniline	--	--	--	µg/L	--		*2.7*	*U*
2-Nitrophenol; o-Nitrophenol	--	--	--	µg/L	--		*3.6*	*U*
3,3'-Dichlorobenzidine	--	--	--	µg/L	--		*3.5*	*UJ*
3,3'-Dimethylbenzidine	--	--	--	µg/L	--		*15*	*U*
3-Methylcholanthrene	--	--	--	µg/L	--		*4*	*U*
3-METHYLPHENOL & 4-METHYLPHENOL (M&P-CRESOL)	--	--	--	µg/L	--		*0.83*	*U*
3-Nitroaniline; m-Nitroaniline	--	--	--	µg/L	--		*3.5*	*U*
4,6-Dinitro-2-methylphenol	--	--	--	µg/L	--		*4.2*	*U*
4-Aminobiphenyl	--	--	--	µg/L	--		*8.1*	*U*
4-Bromophenyl phenyl ether	--	--	--	µg/L	--		*1*	*U*
4-Chloro-3-methylphenol	--	--	--	µg/L	--		*0.72*	*U*
4-Chloroaniline; p-Chloroaniline	--	--	--	µg/L	--		*6.5*	*U*
4-Chlorophenyl phenyl ether	--	--	--	µg/L	--		*1.3*	*U*
4-Nitroaniline; p-Nitroaniline	--	--	--	µg/L	--		*2.7*	*U*
4-Nitrophenol; p-Nitrophenol	--	--	--	µg/L	--		*9.4*	*U*
5-Nitro-o-toluidine	--	--	--	µg/L	--		*4.4*	*U*
7,12-Dimethylbenz[a]anthracene	--	--	--	µg/L	--		*7.9*	*U*
Acenaphthene	--	--	--	µg/L	--		*1*	*U*
Acenaphthylene	--	--	--	µg/L	--		*0.77*	*U*
Acetophenone	--	--	--	µg/L	--		*0.71*	*U*
Anthracene	--	--	--	µg/L	--		*0.6*	*U*
Benzo[a]anthracene	--	--	--	µg/L	--		*0.4*	*U*
Benzo[a]pyrene	0.2	0.2	--	µg/L	--		*0.027*	*U*
Benzo[b]fluoranthene	--	--	--	µg/L	--		*1.2*	*U*
Benzo[ghi]perylene	--	--	--	µg/L	--		*0.53*	*U*
Benzo[k]fluoranthene	--	--	--	µg/L	--		*0.41*	*U*

Table 3-5
Injection Well Analytical Results

Analyte	EPA MCL	ID GW - PRIMARY	ID GW - SECONDARY	Area	Remediation System			
				Well ID	INJ-1R		INJ-1R	
				Sample Name	INJ-1R-20230125		INJ-1R-20230411	
				Sample Date	1/25/2023		4/11/2023	
				Unit	Result	Q	Result	Q
Benzyl alcohol	--	--	--	µg/L	--		2.6	U
Bis(2-chloroethoxy)methane	--	--	--	µg/L	--		0.84	U
Bis(2-chloroethyl)ether	--	--	--	µg/L	--		2.1	U
Bis(2-chloroisopropyl)ether	--	--	--	µg/L	--		1.4	U
Bis(2-ethylhexyl) phthalate	6	6	--	µg/L	--		10	U
Butyl benzyl phthalate	--	--	--	µg/L	--		1.6	U
Chlorobenzilate	--	--	--	µg/L	--		1.9	U
Chrysene	--	--	--	µg/L	--		2.1	U
Diallate	--	--	--	µg/L	--		4.1	U
Dibenz[a,h]anthracene	--	--	--	µg/L	--		0.6	U
Dibenzofuran	--	--	--	µg/L	--		0.99	U
Diethyl phthalate	--	--	--	µg/L	--		0.61	U
Dimethyl phthalate	--	--	--	µg/L	--		0.78	U
Di-n-butyl phthalate	--	--	--	µg/L	--		4.1	U
Di-n-octyl phthalate	--	--	--	µg/L	--		3.7	U
Diphenylamine	--	--	--	µg/L	--		0.72	U
Ethyl methanesulfonate	--	--	--	µg/L	--		0.57	U
Famphur	--	--	--	µg/L	--		0.17	UJ
Fluoranthene	--	--	--	µg/L	--		0.52	U
Fluorene	--	--	--	µg/L	--		0.81	U
Hexachloro-1,3-butadiene	--	--	--	µg/L	--		3	U
Hexachlorobenzene	1	1	--	µg/L	--		0.89	U
Hexachlorocyclopentadiene	50	50	--	µg/L	--		17	U
Hexachloroethane	--	--	--	µg/L	--		4.6	U
Hexachloropropene	--	--	--	µg/L	--		1.7	UJ
Indeno(1,2,3-cd)pyrene	--	--	--	µg/L	--		1.4	U
Isodrin	--	--	--	µg/L	--		0.013	U
Isophorone	--	--	--	µg/L	--		2.1	U
Isosafrole	--	--	--	µg/L	--		3.6	U
Kepone	--	--	--	µg/L	--		0.91	U
Methapyrilene	--	--	--	µg/L	--		9.9	U
Methyl methanesulfonate	--	--	--	µg/L	--		0.45	U
Naphthalene	--	--	--	µg/L	--		1.6	U
Nitrobenzene	--	--	--	µg/L	--		1.3	U
N-Nitrosodiethylamine	--	--	--	µg/L	--		0.35	U
N-Nitrosodimethylamine	--	--	--	µg/L	--		0.59	U
N-Nitrosodi-n-butylamine	--	--	--	µg/L	--		1.3	U
N-Nitrosodi-n-propylamine	--	--	--	µg/L	--		2	U
N-Nitrosodiphenylamine	--	--	--	µg/L	--		0.8	U
N-Nitrosomethylethylamine	--	--	--	µg/L	--		1.9	U
N-Nitrosopiperidine	--	--	--	µg/L	--		5.5	U
N-Nitrosopyrrolidine	--	--	--	µg/L	--		5.1	U
O,O,O-Triethyl phosphorothioate	--	--	--	µg/L	--		5	U
o-Toluidine	--	--	--	µg/L	--		2.1	U
p-(Dimethylamino)azobenzene	--	--	--	µg/L	--		0.91	U
Pentachlorobenzene	--	--	--	µg/L	--		1.2	U
Pentachloronitrobenzene	--	--	--	µg/L	--		8.6	U
Pentachlorophenol	1	1	--	µg/L	--		0.075	U
Phenacetin	--	--	--	µg/L	--		4.7	U
Phenanthrene	--	--	--	µg/L	--		1.6	U
Phenol	--	--	--	µg/L	--		0.95	U
Phorate	--	--	--	µg/L	--		0.15	UJ
Pronamide	--	--	--	µg/L	--		1.3	U
Pyrene	--	--	--	µg/L	--		0.55	U
Safrole, Total	--	--	--	µg/L	--		4.2	U
Thionazin	--	--	--	µg/L	--		4.3	U
Organochlorine Pesticides								
4,4'-DDD	--	--	--	µg/L	--		0.0043	U
4,4'-DDE	--	--	--	µg/L	--		0.0043	U
4,4'-DDT	--	--	--	µg/L	--		0.024	U
Aldrin	--	--	--	µg/L	--		0.0063	U
alpha-BHC	--	--	--	µg/L	--		0.0098	U
beta-BHC	--	--	--	µg/L	--		0.0093	U
Chlordane - constituents	2	2	--	µg/L	--		0.12	U
delta-BHC	--	--	--	µg/L	--		0.0079	U
Dieldrin	--	--	--	µg/L	--		0.0047	U
Endosulfan I	--	--	--	µg/L	--		0.0059	U
Endosulfan II	--	--	--	µg/L	--		0.0067	U
Endosulfan sulfate	--	--	--	µg/L	--		0.005	U

Table 3-5
Injection Well Analytical Results

Analyte	EPA MCL	ID GW - PRIMARY	ID GW - SECONDARY	Area	Remediation System			
				Well ID	INJ-1R		INJ-1R	
				Sample Name	INJ-1R-20230125		INJ-1R-20230411	
				Sample Date	1/25/2023		4/11/2023	
				Unit	Result	Q	Result	Q
Endrin	2	2	--	µg/L	--		*0.0087*	*U*
Endrin aldehyde	--	--	--	µg/L	--		*0.0088*	*U*
gamma-BHC (lindane)	0.2	0.2	--	µg/L	--		*0.01*	*U*
Heptachlor	0.4	0.4	--	µg/L	--		*0.01*	*U*
Heptachlor epoxide	0.2	0.2	--	µg/L	--		*0.0033*	*U*
Methoxychlor	40	40	--	µg/L	--		*0.014*	*U*
Toxaphene	3	3	--	µg/L	--		*1.5*	*U*
Organophosphorous Pesticides								
Dimethoate	--	--	--	µg/L	--		*0.43*	*UJ*
Disulfoton	--	--	--	µg/L	--		*0.31*	*UJ*
Methyl parathion	--	--	--	µg/L	--		*0.14*	*UJ*
Parathion	--	--	--	µg/L	--		*0.14*	*UJ*
Polychlorinated Biphenyls (PCBs)								
PCB 1016	0.5	--	--	µg/L	--		*0.17*	*U*
PCB 1221	0.5	--	--	µg/L	--		*0.18*	*U*
PCB 1232	0.5	--	--	µg/L	--		*0.13*	*U*
PCB 1242	0.5	--	--	µg/L	--		*0.11*	*U*
PCB 1248	0.5	--	--	µg/L	--		*0.17*	*U*
PCB 1254	0.5	--	--	µg/L	--		*0.14*	*U*
PCB 1260	0.5	--	--	µg/L	--		*0.09*	*U*
Polychlorinated Biphenyl (PCBs)	0.5	0.5	--	µg/L	--		*0.074*	*U*
Chlorinated Herbicides								
2,4,5-TP (Silvex)	50	50	--	µg/L	--		*0.33*	*U*
2,4,5-Trichlorophenoxyacetic acid	--	--	--	µg/L	--		*0.33*	*U*
2,4-Dichlorophenoxyacetic acid	70	70	--	µg/L	--		*0.21*	*U*
Dinoseb; 2-sec-Butyl-4,6-dinitrophenol	7	7	--	µg/L	--		*0.23*	*U*
Dioxins/Furans								
2,3,7,8-TCDD	30	30	--	pg/L	--		*0.47*	*U*
Field and Redox Parameters								
Manganese	--	--	0.05	mg/L	--		**0.18**	
Sulfide	--	--	--	mg/L	--		*0.022*	*U*

Table 3-6
Cell 2 and 4 Monitoring Wells Organics and Inorganics Results

				Area	Cell 2 Monitoring Wells										Cell 4 Monitoring Wells									
				Well ID	MW-8		MW-9		MW-12		MW-13		MW-13		MW-3A		MW-4		MW-4A		MW-5AR		MW-6A	
				Sample Name	MW-8-20230519		MW-9-20230519		MW-12-20230518		MW-13-20230517		MW-13-Q-20230517		MW-3A-20230518		MW-4-20230517		MW-4A-20230517		MW-5AR-20230519		MW-6A-20230519	
		ID GW -	ID GW -	Sample Date	5/19/2023		5/19/2023		5/18/2023		5/17/2023		5/17/2023		5/18/2023		5/17/2023		5/17/2023		5/19/2023		5/19/2023	
Analyte	EPA MCL	PRIMARY	SECONDARY	Unit	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Volatile Organic Compounds (VOCs)																								
1,1-Dichloroethane	--	--	--	µg/L	0.22	U	0.22	U	0.22	U	0.27	J	0.29	J	0.22	U	1.1		0.22	U	0.22	U	0.22	U
1,2-Dichloroethane	5	5	--	µg/L	0.54	U	0.54	U	0.54	U	0.54	U	0.54	U	0.54	U	0.87	J	0.54	U	0.54	U	0.54	U
Acetone	--	--	--	µg/L	6.6	U	88		6.6	U	6.6	U	6.6	U	6.6	U	6.6	U	6.6	U	6.6	U	6.6	U
Benzene	5	5	--	µg/L	0.31	U	1.1		0.31	U	0.31	U	0.31	U	0.31	U	0.89	J	0.31	U	0.31	U	0.31	U
cis-1,2-Dichloroethene	70	70	--	µg/L	0.32	U	0.32	U	0.32	U	1.1		1.1		0.32	U	2.5		0.32	U	0.32	U	0.32	U
Dichlorodifluoromethane	--	--	--	µg/L	0.96	U	0.96	U	0.96	U	1.6	J	1.6	J	0.96	U	1	J	0.96	U	0.96	U	0.96	U
Tetrachloroethene	5	5	--	µg/L	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	2.7		0.4	U	0.4	U	0.4	U
trans-1,2-Dichloroethene	100	100	--	µg/L	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U	0.43	J	0.37	U	0.37	U	0.37	U
Trichloroethene	5	5	--	µg/L	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U	0.49	J	0.3	U	0.3	U	0.3	U
Trichlorofluoromethane	--	--	--	µg/L	0.57	U	0.57	U	0.57	U	0.65	J	0.57	U	0.57	U	0.57	U	0.57	U	0.57	U	0.57	U
Vinyl chloride	2	2	--	µg/L	0.51	U	1	J	0.51	U	0.51	U	0.51	U	0.51	U	2.5		0.51	U	0.51	U	0.51	U
Inorganics																								
Arsenic	10	50	--	µg/L	3.2	J	1.8	J	0.82	J	3.9	J	4.1	J	0.5	U	2.2	J	1.6	J	0.5	U	0.63	J
Barium	2000	2000	--	µg/L	33		80		54		110		110		150		210		170		100		200	
Calcium	--	--	--	µg/L	59000		490000		64000		45000		46000		53000		170000		85000		77000		73000	
Chromium	100	100	--	µg/L	0.5	U	0.5	U	0.5	U	0.83	J	0.71	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Cobalt	--	--	--	µg/L	0.33	U	1.2		2.6		0.36	J	0.35	J	0.33	U	0.49	J	0.33	U	0.33	U	0.33	U
Copper	1300	1300	--	µg/L	0.71	U	2.2		0.71	U	0.71	U	0.71	U	0.71	U	0.71	U	0.71	U	0.71	U	0.71	U
Iron	--	--	300	µg/L	200	U	5400		8.7	U	200	U	200	U	200	U	360		200	U	200	U	200	U
Lead	15	15	--	µg/L	0.23	U	0.4	J	0.23	U	0.23	U	0.23	U	0.23	U	0.23	U	0.23	U	0.23	U	0.23	U
Magnesium	--	--	--	µg/L	22000		370000		17000		40000		40000		28000		66000		18000		25000		42000	
Manganese	--	--	50	µg/L	0.61	J	4400		0.51	U	1.5	J	2.2	J	1.1	J	66		0.51	U	9.3		0.51	U
Nickel	--	--	--	µg/L	1.3	J	4		0.83	U	0.83	U	0.83	U	0.83	U	0.83	U	0.83	U	0.83	U	0.83	U
Potassium	--	--	--	µg/L	580	J	8200		1000		2700		2600		2300		3300		3400		3100		1900	
Selenium	50	50	--	µg/L	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Sodium	--	--	--	µg/L	45000		1300000		34000		37000		36000		44000		56000		60000		250000		49000	
Tin	--	--	--	µg/L	1.1	J	0.58	U	1.3	J	0.58	U	0.58	U	1	J	0.77	J	0.58	U	0.58	U	0.58	U
Vanadium	--	--	--	µg/L	1.2	J	1.4	J	1.1	U	1.6	J	1.5	J	1.1	U	3.8	J	1.8	J	1.1	U	1.1	U
Zinc	--	--	5000	µg/L	2.2	J	48		2	U	2	U	2	U	6.4	J	2	U	2.2	J	2	U	2	U
Field and Redox Parameters																								
Dissolved Oxygen	--	--	--	mg/L	9.13		0.06		9		8.21		--		6.26		0.27		8.68		3.79		8.06	
Manganese	--	--	0.05	mg/L	0.00061	J	4.4		0.00051	U	0.0015	J	0.0022	J	0.0011	J	0.066		0.00051	U	0.0093		0.00051	U
Oxidation-Reduction Potential	--	--	--	millivolts	59.9		-139		151.5		90.1		--		96.5		11.3		102.2		14		87.1	
pH	--	--	6.5 - 8.5	su	7.22		6.25		7.19		7.4		--		7.28		6.14		7.28		7.21		7.14	
Specific Conductance	--	--	--	µS/cm	609		8807		557		685		--		646		1327		830		1689		924	
Sulfide	--	--	--	mg/L	0.022	UJ	0.022	UJ	0.022	UJ	0.022	U	0.022	U	--		--		--		--		--	
Temperature	--	--	--	Celsius	14.5		12.7		11.4		16		--		15		12.3		14.4		13		16.9	
Turbidity	--	--	--	ntu	6.96		12		4.04		16.1		--		4.81		5.05		16.9		3.57		6.38	

Section 4 Tables
Statistical Definitions
Fort Hall Mine Landfill

Abbreviation or Expression	Definition
µg/L	microgram per liter
Confidence Level	confidence level of the Mann Kendall Trend Test
Direction	Mann Kendall trend result
J	estimated result
Last Q	laboratory qualifier for the most recent result (if any)
Latest Result	most recent result
LCL	lower confidence limit of the data set mean
Max Date	most recent date in the analyzed dataset
mg/L	milligram per liter
Min Date	earliest date in the analyzed dataset
NA	not applicable
NC	not calculated
Q	qualifier
RCRA	Resource Conservation and Recovery Act
RCRA regulated chemical	Whether the chemical is RCRA regulated
U	nondetect result
UCL	upper confidence limit of the data set mean
UJ	result estimated to be nondetect
UPL	upper prediction limit
UPL of background	UPL of the mean of the background well (if applicable)

Table 4-1
Cell 1 Statistical Summary - VOCs
Spring 2023 Semiannual Monitoring Report
Fort Hall Mine Landfill

Dataset			General				Confidence Limits		Trend Analysis	
Well ID	Chemical	Unit	Min Date	Max Date	Latest Result	Latest Result Qualifier	UCL of mean	UCL > Standard	Confidence Level	GSI Toolkit Trend
MW-111D	Benzene	µg/L	01/24/2018	04/14/2023	7.3		16.9	Yes	100.0%	Decreasing
MW-113S	Benzene	µg/L	01/24/2018	04/14/2023	7.3		7.62	Yes	87.9%	Stable
MW-113S	Chloroform	µg/L	01/24/2018	04/14/2023	1.4		2.58	Yes	99.0%	Decreasing
MP-2	Tetrachloroethene	µg/L	09/13/2020	04/11/2023	19		18.3	Yes	57.6%	Stable
MP-3	Tetrachloroethene	µg/L	09/13/2020	04/13/2023	19		19	Yes	91.0%	Probably Increasing
MP-4	Tetrachloroethene	µg/L	09/13/2020	04/14/2023	25		23	Yes	91.0%	Probably Increasing
MW-101S	Tetrachloroethene	µg/L	10/05/2018	04/15/2023	17		11.2	Yes	97.6%	Increasing
MW-105D	Tetrachloroethene	µg/L	01/23/2018	04/11/2023	37		37.5	Yes	86.7%	No trend
MW-105S	Tetrachloroethene	µg/L	01/23/2018	04/11/2023	11		12.5	Yes	66.1%	No trend
MW-109D	Tetrachloroethene	µg/L	10/06/2018	04/15/2023	20		16	Yes	91.5%	Probably Increasing
MW-109S	Tetrachloroethene	µg/L	10/06/2018	04/15/2023	15	J	29.9	Yes	76.3%	No trend
MW-110S	Tetrachloroethene	µg/L	10/06/2018	04/14/2023	18		14.7	Yes	96.4%	Increasing
MW-112D	Tetrachloroethene	µg/L	01/24/2018	04/15/2023	12		12.8	Yes	64.1%	No trend
MW-112M	Tetrachloroethene	µg/L	10/05/2018	04/15/2023	14		10.8	Yes	95.6%	Increasing
MW-113D	Tetrachloroethene	µg/L	10/04/2018	04/14/2023	1.1		9.7	Yes	92.4%	Probably Decreasing
MW-113S	Tetrachloroethene	µg/L	01/24/2018	04/14/2023	22		30.8	Yes	99.8%	Decreasing
MW-118D	Tetrachloroethene	µg/L	01/23/2018	04/12/2023	9.9		18.6	Yes	99.6%	Decreasing
MW-119D	Tetrachloroethene	µg/L	01/25/2018	04/13/2023	22		17.8	Yes	99.9%	Increasing
MW-119S	Tetrachloroethene	µg/L	01/25/2018	04/13/2023	29		21.8	Yes	99.2%	Increasing
MW-120D	Tetrachloroethene	µg/L	01/25/2018	04/13/2023	14		16.9	Yes	61.0%	Stable
MW-120S	Tetrachloroethene	µg/L	01/25/2018	04/13/2023	15		18.7	Yes	97.8%	Decreasing
MP-2	Trichloroethene	µg/L	09/13/2020	04/11/2023	180		178	Yes	72.7%	Stable
MP-3	Trichloroethene	µg/L	09/13/2020	04/13/2023	110		101	Yes	87.0%	No trend
MP-4	Trichloroethene	µg/L	09/13/2020	04/14/2023	180		153	Yes	83.1%	No trend
MW-101S	Trichloroethene	µg/L	10/05/2018	04/15/2023	64		38.3	Yes	97.0%	Increasing
MW-102S	Trichloroethene	µg/L	01/24/2018	04/14/2023	2		6.65	Yes	64.6%	No Trend
MW-105D	Trichloroethene	µg/L	01/23/2018	04/11/2023	200		228	Yes	55.6%	Stable
MW-105S	Trichloroethene	µg/L	01/23/2018	04/11/2023	37		73.3	Yes	99.6%	Decreasing
MW-109D	Trichloroethene	µg/L	10/06/2018	04/15/2023	66		62.5	Yes	50.0%	Stable
MW-109S	Trichloroethene	µg/L	10/06/2018	04/15/2023	48		83.3	Yes	57.2%	No trend
MW-110S	Trichloroethene	µg/L	10/06/2018	04/14/2023	130		119	Yes	99.6%	Increasing
MW-111D	Trichloroethene	µg/L	01/24/2018	04/14/2023	110		49.7	Yes	91.5%	Probably Increasing
MW-112D	Trichloroethene	µg/L	01/24/2018	04/15/2023	190		198	Yes	71.2%	Stable
MW-112M	Trichloroethene	µg/L	10/05/2018	04/15/2023	190		186	Yes	94.3%	Probably Increasing
MW-113D	Trichloroethene	µg/L	10/04/2018	04/14/2023	0.31	J	7.6	Yes	96.3%	Decreasing

Table 4-1
Cell 1 Statistical Summary - VOCs
Spring 2023 Semiannual Monitoring Report
Fort Hall Mine Landfill

Dataset			General				Confidence Limits		Trend Analysis	
Well ID	Chemical	Unit	Min Date	Max Date	Latest Result	Latest Result Qualifier	UCL of mean	UCL > Standard	Confidence Level	GSI Toolkit Trend
MW-113S	Trichloroethene	µg/L	01/24/2018	04/14/2023	16		23.9	Yes	100.0%	Decreasing
MW-118D	Trichloroethene	µg/L	01/23/2018	04/12/2023	58		138	Yes	99.7%	Decreasing
MW-119D	Trichloroethene	µg/L	01/25/2018	04/13/2023	120		97.8	Yes	99.2%	Increasing
MW-119S	Trichloroethene	µg/L	01/25/2018	04/13/2023	130		97.7	Yes	99.9%	Increasing
MW-120D	Trichloroethene	µg/L	01/25/2018	04/13/2023	160		178	Yes	96.0%	Increasing
MW-120S	Trichloroethene	µg/L	01/25/2018	04/13/2023	130		155	Yes	90.9%	Probably Decreasing
MW-123	Trichloroethene	µg/L	09/08/2020	04/15/2023	56		72.9	Yes	81.6%	Stable
MP-2	Vinyl chloride	µg/L	09/13/2020	04/11/2023	3.7	J	3.88	Yes	50.0%	Stable
MW-105S	Vinyl chloride	µg/L	01/23/2018	04/11/2023	0.51	U	2.23	Yes	94.4%	Probably Decreasing
MW-110S	Vinyl chloride	µg/L	10/06/2018	04/14/2023	4.6		6.71	Yes	79.1%	Stable
MW-111D	Vinyl chloride	µg/L	01/24/2018	04/14/2023	6.1		3.43	Yes	92.7%	Probably Increasing
MW-113D	Vinyl chloride	µg/L	10/04/2018	04/14/2023	0.51	U	28	Yes	97.0%	Decreasing
MW-113S	Vinyl chloride	µg/L	01/24/2018	04/14/2023	92		91.8	Yes	86.4%	Stable
MW-120D	Vinyl chloride	µg/L	01/25/2018	04/13/2023	1.4	J	2.18	Yes	99.0%	Decreasing

See Section 4 Table Notes

Table 4-2
Offsite Statistical Summary - VOCs
Spring 2023 Semiannual Monitoring Report
Fort Hall Mine Landfill

Well ID	Chemical	Unit	Min Date	Max Date	Latest Result	Last Q	UCL of the mean	UCL > Standard	Confidence Level	Direction
MW-103S	1,2-Dichloroethane	µg/L	08/09/2017	04/15/2023	0.54	U	0.17	No	NC	NC
MW-103S	Chloroform	µg/L	08/09/2017	04/15/2023	0.36	U	NC	NC	NC	NC
MW-103S	cis-1,2-Dichloroethene	µg/L	08/09/2017	04/15/2023	2.5		1.15	No	96.4%	NC
MW-103S	Tetrachloroethene	µg/L	08/09/2017	04/15/2023	5.2		2.74	No	99.0%	NC
MW-103S	Trichloroethene	µg/L	08/09/2017	04/15/2023	30		15.7	**Yes**	99.5%	**Increasing**
MW-115S	Tetrachloroethene	µg/L	08/15/2017	04/15/2023	0.4	U	NC	NC	NC	NC
MW-115S	Trichloroethene	µg/L	08/15/2017	04/15/2023	0.45	J	3.71	No	91.3%	NC

See separate notes section.

Table 4-3
Remediation System Well Statistical Summary - VOCs
Spring 2023 Semiannual Monitoring Report
Fort Hall Mine Landfill

Well ID	Chemical	Unit	Min Date	Max Date	Latest Result	Last Q	UCL > Standard	Confidence Level	Direction
RW-1	Tetrachloroethene	µg/L	01/26/2018	04/13/2023	26		Yes	NC	NC
RW-1	Trichloroethene	µg/L	01/26/2018	04/13/2023	250		Yes	NC	NC
RW-10	Tetrachloroethene	µg/L	01/26/2018	04/11/2023	27		Yes	99.2%	Increasing
RW-10	Trichloroethene	µg/L	01/26/2018	04/11/2023	110		Yes	99.7%	Increasing
RW-15	Tetrachloroethene	µg/L	01/26/2018	04/11/2023	33		Yes	96.3%	Increasing
RW-15	Trichloroethene	µg/L	01/26/2018	04/11/2023	180		Yes	92.5%	Probably Increasing
RW-17	Tetrachloroethene	µg/L	01/26/2018	04/11/2023	32		Yes	96.4%	Increasing
RW-17	Trichloroethene	µg/L	01/26/2018	04/11/2023	130		Yes	96.4%	Increasing
RW-2	Tetrachloroethene	µg/L	01/26/2018	04/12/2023	13		Yes	NC	NC
RW-2	Trichloroethene	µg/L	01/26/2018	04/12/2023	140		Yes	NC	NC
RW-3	Tetrachloroethene	µg/L	01/26/2018	04/13/2023	4.4		Yes	64.6%	No Trend - Stable
RW-3	Trichloroethene	µg/L	01/26/2018	04/13/2023	7.2		Yes	64.6%	No Trend - Stable
RW-5	Tetrachloroethene	µg/L	01/26/2018	04/11/2023	24		Yes	98.9%	Increasing
RW-5	Trichloroethene	µg/L	01/26/2018	04/11/2023	100		Yes	98.2%	Increasing
RW-9R	Tetrachloroethene	µg/L	01/26/2018	04/11/2023	22		Yes	85.3%	No Trend
RW-9R	Trichloroethene	µg/L	01/26/2018	04/11/2023	200		Yes	73.5%	No Trend

See Separate Notes Sheet

Table 4-4
Cell 2 Statistical Summary - VOCs
Spring 2023 Semiannual Monitoring Report
Fort Hall Mine Landfill

Well ID	RCRA regulated chemical	Chemical Name	Min Date	Max Date	Latest Result	Last Q	Latest Result > Standard	LCL > Standard	Confidence Level	Direction
MW-12	Yes	1,2,4-Trichlorobenzene	04/13/2018	05/18/2023	0.58	U	No	NC	NC	NC
MW-12	Yes	1,2-Dichloroethane	04/13/2018	05/18/2023	0.54	U	No	NC	NC	NC
MW-12	Yes	Iodomethane	04/13/2018	05/18/2023	2.6	U	No	NC	NC	NC
MW-13	Yes	1,1-Dichloroethane	04/12/2018	05/17/2023	0.29	J	No	NC	NC	NC
MW-13	Yes	1,2-Dichloroethane	04/12/2018	05/17/2023	0.54	U	No	NC	NC	NC
MW-13	Yes	Dichlorodifluoromethane	04/12/2018	05/17/2023	1.6	J	No	NC	90.0%	No Trend
MW-13	Yes	Iodomethane	04/12/2018	05/17/2023	2.6	U	No	NC	NC	NC
MW-13	Yes	Tetrachloroethene	04/12/2018	05/17/2023	0.4	U	No	No	97.4%	NC
MW-13	Yes	Trichloroethene	04/12/2018	05/17/2023	0.3	U	No	No	NC	NC
MW-13	Yes	Trichlorofluoromethane	04/12/2018	05/17/2023	0.65	J	No	NC	NC	NC
MW-13	Yes	cis-1,2-Dichloroethene	04/12/2018	05/17/2023	1.1		No	No	100.0%	**Increasing**
MW-8	Yes	Acetone	04/12/2018	05/19/2023	6.6	U	No	NC	NC	NC
MW-9	Yes	1,2-Dichloroethane	04/12/2018	05/19/2023	0.54	U	No	NC	NC	NC
MW-9	Yes	Acetone	04/12/2018	05/19/2023	88		No	NC	80.50%	No Trend
MW-9	Yes	Benzene	04/12/2018	05/19/2023	1.1		No	NC	NC	NC
MW-9	Yes	Dichlorodifluoromethane	04/12/2018	05/19/2023	0.96	U	No	NC	NC	NC
MW-9	Yes	Vinyl chloride	04/12/2018	05/19/2023	1	J	No	No	65.3%	No Trend

See separate notes

Table 4-5
Cell 2 Statistical Summary - Inorganics
Spring 2023 Semiannual Monitoring Report
Fort Hall Mine Landfill

Well ID	RCRA regulated chemical	Chemical Name	Unit	Min Date	Max Date	Latest Result	Last Q	Latest Result > Standard	LCL > Standard	Latest Result > UPL of background	Direction
MW-13	Yes	Arsenic	µg/L	04/12/2018	05/17/2023	4.1	J	No	No	Yes	No Trend
MW-13	Yes	Barium	µg/L	04/12/2018	05/17/2023	110		No	No	Yes	No Trend
MW-13	No	Iron	µg/L	04/12/2018	05/17/2023	190	JB	No	No	Yes	Decreasing
MW-13	No	Magnesium	µg/L	04/12/2018	05/17/2023	40000		No	NC	Yes	No Trend
MW-13	No	Manganese	µg/L	04/12/2018	05/17/2023	2.2	J	No	No	Yes	Decreasing
MW-8	Yes	Arsenic	µg/L	04/12/2018	05/19/2023	3.2	J	No	No	Yes	Decreasing
MW-8	No	Magnesium	µg/L	04/12/2018	05/19/2023	22000		No	NC	Yes	No Trend
MW-8	Yes	Nickel	µg/L	04/12/2018	05/19/2023	1.3	J	No	NC	Yes	NC
MW-8	No	Sodium	µg/L	04/12/2018	05/19/2023	45000		No	NC	Yes	Decreasing
MW-9	Yes	Arsenic	µg/L	04/12/2018	05/19/2023	1.8	J	No	No	Yes	Decreasing
MW-9	Yes	Barium	µg/L	04/12/2018	05/19/2023	80		No	No	Yes	Increasing
MW-9	No	Calcium	µg/L	04/12/2018	05/19/2023	490000		No	NC	Yes	Decreasing
MW-9	No	Iron	µg/L	04/12/2018	05/19/2023	5400		Yes	**Yes**	Yes	Increasing
MW-9	Yes	Lead	µg/L	04/12/2018	05/19/2023	0.4	J	No	No	Yes	NC
MW-9	No	Magnesium	µg/L	04/12/2018	05/19/2023	370000		No	NC	Yes	Decreasing
MW-9	No	Manganese	µg/L	04/12/2018	05/19/2023	4400		Yes	**Yes**	Yes	Decreasing
MW-9	Yes	Nickel	µg/L	04/12/2018	05/19/2023	4		No	NC	Yes	Decreasing
MW-9	No	Potassium	µg/L	04/12/2018	05/19/2023	8200		No	NC	Yes	Decreasing
MW-9	No	Potassium	µg/L	04/12/2018	05/19/2023	8200		No	NC	Yes	Decreasing
MW-9	No	Sodium	µg/L	04/12/2018	05/19/2023	1300000		No	NC	Yes	Decreasing
MW-9	Yes	Zinc	µg/L	04/12/2018	05/19/2023	48		No	No	Yes	Decreasing

See separate notes page.

Table 4-6
Cell 4 Statistical Summary - VOCs
Spring 2023 Semiannual Monitoring Report
Fort Hall Mine Landfill

Well ID	RCRA regulated chemical	Chemical Name	Unit	Min Date	Max Date	Latest Result	Last Q	LCL > Standard	Latest Result > Standard	Direction
MW-4	Yes	1,1-Dichloroethane	µg/L	04/11/2018	05/17/2023	1.1		NC	NC	Increasing
MW-4	Yes	1,2-Dichloroethane	µg/L	04/11/2018	05/17/2023	0.87	J	No	No	NC
MW-4	Yes	Benzene	µg/L	04/11/2018	05/17/2023	0.89	J	No	No	Increasing
MW-4	Yes	Dichlorodifluoromethane	µg/L	10/05/2018	05/17/2023	1	J	NC	NC	No Trend
MW-4	Yes	Tetrachloroethene	µg/L	04/11/2018	05/17/2023	2.7		No	No	Decreasing
MW-4	Yes	Trichloroethene	µg/L	04/11/2018	05/17/2023	0.49	J	No	No	Increasing
MW-4	Yes	Vinyl chloride	µg/L	04/11/2018	05/17/2023	2.5		No	Yes	Increasing
MW-4	Yes	trans-1,2-Dichloroethene	µg/L	04/11/2018	05/17/2023	0.43	J	No	No	Increasing

See separate notes page.

Table 4-7
Cell 4 Statistical Summary - Inorganics
Spring 2023 Semiannual Monitoring Report
Fort Hall Mine Landfill

Well ID	RCRA regulated chemical	Chemical Name	Unit	Min Date	Max Date	Latest Result	Last Q	Latest Result > Standard	Latest Result > UPL of background	Direction
MW-3A	Yes	Antimony	µg/L	04/11/2018	05/18/2023	0.4	U	No	NC	NC
MW-3A	Yes	Arsenic	µg/L	04/11/2018	05/18/2023	0.5	U	No	No	NC
MW-3A	Yes	Barium	µg/L	04/11/2018	05/18/2023	150		No	No	NC
MW-3A	Yes	Beryllium	µg/L	04/11/2018	05/18/2023	0.3	U	No	NC	NC
MW-3A	Yes	Cadmium	µg/L	04/11/2018	05/18/2023	0.19	U	No	NC	NC
MW-3A	No	Calcium	µg/L	04/11/2018	05/18/2023	53000		NC	No	NC
MW-3A	Yes	Chromium	µg/L	04/11/2018	05/18/2023	0.5	U	No	No	NC
MW-3A	Yes	Cobalt	µg/L	04/11/2018	05/18/2023	0.33	U	NC	No	NC
MW-3A	Yes	Copper	µg/L	04/11/2018	05/18/2023	0.71	U	No	No	NC
MW-3A	No	Iron	µg/L	04/11/2018	05/18/2023	200	U	No	No	NC
MW-3A	Yes	Lead	µg/L	04/11/2018	05/18/2023	0.23	U	No	NC	NC
MW-3A	No	Magnesium	µg/L	04/11/2018	05/18/2023	28000		NC	Yes	Decreasing
MW-3A	No	Manganese	µg/L	04/11/2018	05/18/2023	1.1	J	No	No	NC
MW-3A	Yes	Nickel	µg/L	04/11/2018	05/18/2023	0.83	U	NC	NC	NC
MW-3A	No	Potassium	µg/L	04/11/2018	05/18/2023	2300		NC	No	NC
MW-3A	No	Potassium	µg/L	04/11/2018	05/18/2023	2300		NC	No	NC
MW-3A	Yes	Selenium	µg/L	04/11/2018	05/18/2023	1	U	No	No	NC
MW-3A	Yes	Silver	µg/L	04/11/2018	05/18/2023	0.045	U	No	NC	NC
MW-3A	No	Sodium	µg/L	04/11/2018	05/18/2023	44000		NC	No	NC
MW-3A	Yes	Thallium	µg/L	04/11/2018	05/18/2023	0.21	U	No	NC	NC
MW-3A	Yes	Tin	µg/L	04/11/2018	05/18/2023	1	J	NC	NC	NC
MW-3A	Yes	Vanadium	µg/L	04/11/2018	05/18/2023	1.1	U	NC	No	NC
MW-3A	Yes	Zinc	µg/L	04/11/2018	05/18/2023	6.4	J	No	No	NC
MW-4	Yes	Antimony	µg/L	04/11/2018	05/17/2023	0.4	U	No	NC	NC
MW-4	Yes	Arsenic	µg/L	04/11/2018	05/17/2023	2.2	J	No	No	NC
MW-4	Yes	Barium	µg/L	04/11/2018	05/17/2023	0.38	U	No	No	NC
MW-4	Yes	Beryllium	µg/L	04/11/2018	05/17/2023	0.3	U	No	NC	NC
MW-4	Yes	Cadmium	µg/L	04/11/2018	05/17/2023	0.19	U	No	NC	NC
MW-4	No	Calcium	µg/L	04/11/2018	05/17/2023	32	U	NC	No	NC
MW-4	Yes	Chromium	µg/L	04/11/2018	05/17/2023	0.5	U	No	No	NC
MW-4	Yes	Cobalt	µg/L	04/11/2018	05/17/2023	0.49	J	NC	Yes	Decreasing

Table 4-7
Cell 4 Statistical Summary - Inorganics
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Fort Hall Mine Landfill

Well ID	RCRA regulated chemical	Chemical Name	Unit	Min Date	Max Date	Latest Result	Last Q	Latest Result > Standard	Latest Result > UPL of background	Direction
MW-4	Yes	Copper	µg/L	04/11/2018	05/17/2023	0.71	U	No	No	NC
MW-4	No	Iron	µg/L	04/11/2018	05/17/2023	360		Yes	Yes	No Trend
MW-4	Yes	Lead	µg/L	04/11/2018	05/17/2023	0.23	U	No	NC	NC
MW-4	No	Magnesium	µg/L	04/11/2018	05/17/2023	4.2	U	NC	No	NC
MW-4	No	Manganese	µg/L	04/11/2018	05/17/2023	66		Yes	Yes	Decreasing
MW-4	Yes	Nickel	µg/L	04/11/2018	05/17/2023	0.83	U	NC	NC	NC
MW-4	No	Potassium	µg/L	04/11/2018	05/17/2023	52	U	NC	No	NC
MW-4	No	Potassium	µg/L	04/11/2018	05/17/2023	52	U	NC	No	NC
MW-4	Yes	Selenium	µg/L	04/11/2018	05/17/2023	1	U	No	No	NC
MW-4	Yes	Silver	µg/L	04/11/2018	05/17/2023	0.045	U	No	NC	NC
MW-4	No	Sodium	µg/L	04/11/2018	05/17/2023	73	U	NC	No	NC
MW-4	Yes	Thallium	µg/L	04/11/2018	05/17/2023	0.21	U	No	NC	NC
MW-4	Yes	Tin	µg/L	04/11/2018	05/17/2023	0.77	J	NC	NC	NC
MW-4	Yes	Vanadium	µg/L	04/11/2018	05/17/2023	3.8	J	NC	Yes	Increasing
MW-4	Yes	Zinc	µg/L	04/11/2018	05/17/2023	2	U	No	No	NC
MW-5A	Yes	Antimony	µg/L	04/11/2018	04/23/2021	0.4	U	No	NC	NC
MW-5A	Yes	Arsenic	µg/L	04/11/2018	04/23/2021	1.1	J	No	No	Decreasing
MW-5A	Yes	Barium	µg/L	04/11/2018	04/23/2021	54		No	No	No Trend
MW-5A	Yes	Beryllium	µg/L	04/11/2018	04/23/2021	0.08	U	No	NC	NC
MW-5A	Yes	Cadmium	µg/L	04/11/2018	04/23/2021	0.27	U	No	NC	NC
MW-5A	No	Calcium	µg/L	04/11/2018	04/23/2021	61000		NC	No	No Trend
MW-5A	Yes	Chromium	µg/L	04/11/2018	04/23/2021	2		No	No	No Trend
MW-5A	Yes	Cobalt	µg/L	04/11/2018	04/23/2021	0.19	J	NC	No	No Trend
MW-5A	Yes	Copper	µg/L	04/11/2018	04/23/2021	0.56	U	No	No	No Trend
MW-5A	No	Iron	µg/L	04/11/2018	04/23/2021	100	U	No	No	No Trend
MW-5A	Yes	Lead	µg/L	04/11/2018	04/23/2021	0.23	J	No	NC	No Trend
MW-5A	No	Magnesium	µg/L	04/11/2018	04/23/2021	21000		NC	Yes	No Trend
MW-5A	No	Manganese	µg/L	04/11/2018	04/23/2021	5		No	No	No Trend
MW-5A	Yes	Nickel	µg/L	04/11/2018	04/23/2021	0.65	J	NC	NC	No Trend
MW-5A	No	Potassium	µg/L	04/11/2018	04/23/2021	630	J	NC	No	No Trend
MW-5A	No	Potassium	µg/L	04/11/2018	04/23/2021	630	J	NC	No	No Trend

Table 4-7
Cell 4 Statistical Summary - Inorganics
Spring 2023 Semiannual Monitoring Report
Fort Hall Mine Landfill

Well ID	RCRA regulated chemical	Chemical Name	Unit	Min Date	Max Date	Latest Result	Last Q	Latest Result > Standard	Latest Result > UPL of background	Direction
MW-5A	Yes	Selenium	µg/L	04/11/2018	04/23/2021	0.47	J	No	No	No Trend
MW-5A	Yes	Silver	µg/L	04/11/2018	04/23/2021	0.033	U	No	NC	NC
MW-5A	No	Sodium	µg/L	04/11/2018	04/23/2021	50000		NC	No	Increasing
MW-5A	Yes	Thallium	µg/L	04/11/2018	04/23/2021	0.089	U	No	NC	NC
MW-5A	Yes	Tin	µg/L	04/11/2018	04/23/2021	0.77	U	NC	NC	NC
MW-5A	Yes	Vanadium	µg/L	04/11/2018	04/23/2021	1.2	U	NC	No	NC
MW-5A	Yes	Zinc	µg/L	04/11/2018	04/23/2021	2.6	J	No	No	Decreasing
MW-5AR	Yes	Antimony	µg/L	07/21/2021	05/19/2023	0.4	U	No	NC	NC
MW-5AR	Yes	Arsenic	µg/L	07/21/2021	05/19/2023	0.5	U	No	No	NC
MW-5AR	Yes	Barium	µg/L	07/21/2021	05/19/2023	100		No	No	NC
MW-5AR	Yes	Beryllium	µg/L	07/21/2021	05/19/2023	0.3	U	No	NC	NC
MW-5AR	Yes	Cadmium	µg/L	07/21/2021	05/19/2023	0.19	U	No	NC	NC
MW-5AR	No	Calcium	µg/L	07/21/2021	05/19/2023	77000		NC	No	NC
MW-5AR	Yes	Chromium	µg/L	07/21/2021	05/19/2023	0.5	U	No	No	NC
MW-5AR	Yes	Cobalt	µg/L	07/21/2021	05/19/2023	0.33	U	NC	No	NC
MW-5AR	Yes	Copper	µg/L	07/21/2021	05/19/2023	0.71	U	No	No	NC
MW-5AR	No	Iron	µg/L	07/21/2021	05/19/2023	200	U	No	No	NC
MW-5AR	Yes	Lead	µg/L	07/21/2021	05/19/2023	0.23	U	No	NC	NC
MW-5AR	No	Magnesium	µg/L	07/21/2021	05/19/2023	25000		NC	Yes	NC
MW-5AR	No	Manganese	µg/L	07/21/2021	05/19/2023	9.3		No	Yes	NC
MW-5AR	Yes	Nickel	µg/L	07/21/2021	05/19/2023	0.83	U	NC	NC	NC
MW-5AR	No	Potassium	µg/L	07/21/2021	05/19/2023	3100		NC	No	NC
MW-5AR	Yes	Selenium	µg/L	07/21/2021	05/19/2023	1	U	No	No	NC
MW-5AR	Yes	Silver	µg/L	07/21/2021	05/19/2023	0.045	U	No	NC	NC
MW-5AR	No	Sodium	µg/L	07/21/2021	05/19/2023	250000		NC	Yes	NC
MW-5AR	Yes	Thallium	µg/L	07/21/2021	05/19/2023	0.21	U	No	NC	NC
MW-5AR	Yes	Tin	µg/L	07/21/2021	05/19/2023	0.58	U	NC	NC	NC
MW-5AR	Yes	Vanadium	µg/L	07/21/2021	05/19/2023	1.1	U	NC	No	NC
MW-5AR	Yes	Zinc	µg/L	07/21/2021	05/19/2023	2	U	No	No	NC
MW-6A	Yes	Antimony	µg/L	04/11/2018	05/19/2023	0.4	U	No	NC	NC
MW-6A	Yes	Arsenic	µg/L	04/11/2018	05/19/2023	0.63	J	No	No	No Trend

Table 4-7
Cell 4 Statistical Summary - Inorganics
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Fort Hall Mine Landfill

Well ID	RCRA regulated chemical	Chemical Name	Unit	Min Date	Max Date	Latest Result	Last Q	Latest Result > Standard	Latest Result > UPL of background	Direction
MW-6A	Yes	Barium	µg/L	04/11/2018	05/19/2023	200		No	Yes	No Trend
MW-6A	Yes	Beryllium	µg/L	04/11/2018	05/19/2023	0.3	U	No	NC	NC
MW-6A	Yes	Cadmium	µg/L	04/11/2018	05/19/2023	0.19	U	No	NC	NC
MW-6A	No	Calcium	µg/L	04/11/2018	05/19/2023	73000		NC	No	No Trend
MW-6A	Yes	Chromium	µg/L	04/11/2018	05/19/2023	0.5	U	No	No	NC
MW-6A	Yes	Cobalt	µg/L	04/11/2018	05/19/2023	0.33	U	NC	No	NC
MW-6A	Yes	Copper	µg/L	04/11/2018	05/19/2023	0.71	U	No	No	NC
MW-6A	No	Iron	µg/L	04/11/2018	05/19/2023	200	U	No	No	NC
MW-6A	Yes	Lead	µg/L	04/11/2018	05/19/2023	0.23	U	No	NC	NC
MW-6A	No	Magnesium	µg/L	04/11/2018	05/19/2023	42000		NC	Yes	No Trend
MW-6A	No	Manganese	µg/L	04/11/2018	05/19/2023	0.51	U	No	No	Decreasing
MW-6A	Yes	Nickel	µg/L	04/11/2018	05/19/2023	0.83	U	NC	NC	NC
MW-6A	No	Potassium	µg/L	04/11/2018	05/19/2023	1900		NC	No	Decreasing
MW-6A	No	Potassium	µg/L	04/11/2018	05/19/2023	1900		NC	No	Decreasing
MW-6A	Yes	Selenium	µg/L	04/11/2018	05/19/2023	1	U	No	No	No Trend
MW-6A	Yes	Silver	µg/L	04/11/2018	05/19/2023	0.045	U	No	NC	NC
MW-6A	No	Sodium	µg/L	04/11/2018	05/19/2023	49000		NC	No	No Trend
MW-6A	Yes	Thallium	µg/L	04/11/2018	05/19/2023	0.21	U	No	NC	NC
MW-6A	Yes	Tin	µg/L	04/11/2018	05/19/2023	0.58	U	NC	NC	NC
MW-6A	Yes	Vanadium	µg/L	04/11/2018	05/19/2023	1.1	U	NC	No	NC
MW-6A	Yes	Zinc	µg/L	04/11/2018	05/19/2023	2	U	No	No	NC

See separate notes page.

Table 5-1
Recommendations for Fall 2023 Sampling - Cell 1 and Offsite Wells

Well ID	Water Levels	Field parameters[1]	Appendix I			Appendix II										Pump Depth (ft btoc)	Allowable Drawdown (ft)	Volume of Water in Tubing[3] (gallons)	Minimum Purge Volume[4] (gallons)	Expected Flow Rate (mL/min)
			VOCs		Total metals	SVOCs		O/C Pest[2]	O/P Pest	Chlor Herb	PCBs[2]	Dioxin/ Furan	Mercury	Cyanide	Total Sulfide					
			8260D	8011	6020B/ 6010C	8270E	8270E SIM	8081B	8141B	8321B	8082A	8290	7470A	SM4500-CN-E	SM 4500S-2					
Cell 1 (Low-flow Sampling)																				
MW-1	1															Dedicated	--	--	--	--
MW-101S†	1	1	1													65	0.1	0.2	0.6	200-250
MW-102S†	1	1	1													136	0	0.3	1	50-70
MW-104D	1															79	--	--	--	--
MW-104S†	1															58.5	--	--	--	--
MW-105D	1	1	1													Dedicated	2	0.2	0.9	50-100
MW-105S†	1	1	1													Dedicated	0.1	0.1	0.4	150-200
MW-109D	1	1	1													85	2	0.2	1.0	50-100
MW-109S†	1	1	1													54	0.1	0.1	0.43	150-200
MW-110D	1															155.5	2	0.4	1.5	50-100
MW-110S†	1	1	1													125	0.1	0.3	1.0	200-250
MW-111D	1	1	1													Dedicated	2	0.3	1.2	50-100
MW-111S†	1	1	1													67	0.1	0.2	0.53	50-100
MW-112D	1	1	1													95	2	0.2	1.05	50-100
MW-112M	1	1	1													71	1	0.2	0.71	100-150
MW-112S	1															--	--	--	--	--
MW-113D	1	1	1													125	1	0.3	1.12	50-100
MW-113S	1	1	1													Dedicated	3.0	0.2	1.13	150-200
MW-117R	1	1	1													Dedicated	--	--	--	--
MW-118D†	1	1	1													Dedicated	0.1	0.2	0.72	300-400
MW-119D	1	1	1													Dedicated	1.0	0.2	0.9	150-200
MW-119S	1	1	1													Dedicated	0.3	0.2	0.62	300-400
MW-120D	1	1	1													Dedicated	0.3	0.2	0.8	200-250
MW-120S†	1	1	1													Dedicated	0.1	0.2	0.6	100-150
MW-122	1	1	1													43	0.1	0.1	0.4	--
MW-123	1	1	1													69	0.1	0.2	0.6	--
MW-124		1																		
MW-125		1																		
FW-1																--	--	--	--	--
MW-121	1															--	--	--	--	--
MP-1	1	1	1													80	0.3	0.2	0.81	250-300
MP-2†	1	1	1													80	0.1	0.2	0.7	150-200
MP-3	1	1	1													80	0.3	0.2	0.81	250-300
MP-4	1	1	1													80	0.3	0.2	0.81	250-300
MP-9	1															--	--	--	--	--
RW-16†																70	0.1	0.2	0.6	150-200
Remediation System (Grab Sampling)																				
INJ-1R*			1	1	1	1	1	1	1	1	1	1	1	1	1	--	--	--	--	--
RW-1																--	--	--	--	--
RW-10		1	1													--	--	--	--	--
RW-15		1	1													--	--	--	--	--

Table 5-1
Recommendations for Fall 2023 Sampling - Cell 1 and Offsite Wells

Well ID	Water Levels	Field parameters[1]	Appendix I			Appendix II										Pump Depth (ft btoc)	Allowable Drawdown (ft)	Volume of Water in Tubing[3] (gallons)	Minimum Purge Volume[4] (gallons)	Expected Flow Rate (mL/min)
			VOCs		Total metals	SVOCs		O/C Pest[2]	O/P Pest	Chlor Herb	PCBs[2]	Dioxin/ Furan	Mercury	Cyanide	Total Sulfide					
			8260D	8011	6020B/ 6010C	8270E	8270E SIM	8081B	8141B	8321B	8082A	8290	7470A	SM4500-CN-E	SM 4500S-2					
RW-17		1	1													--	--	--	--	--
RW-2																--	--	--	--	--
RW-3																--	--	--	--	--
RW-4		1	1													--	--	--	--	--
RW-5		1	1													--	--	--	--	--
RW-9R		1	1													--	--	--	--	--
Offsite (Low-flow Sampling)																				
MW-103D	1															175	--	--	--	--
MW-103S†	1	1	1													Dedicated	0.1	0.3	1.74	50-100
MW-106D	1															91.5	--	--	--	--
MW-106S†	1															70	--	--	--	--
MW-115D	1															110	--	--	--	--
MW-115S†	1	1	1													87	0.1	0.2	0.7	100-150
MW-116D																130	--	--	--	--
MW-116S†		1	1													85	0.1	0.2	0.7	50-100
Offsite (Tap Sampling)																				
RW-2140H		1	1													--	--	--	400	--

Notes:

†No allowable drawdown as water level is within screened interval

* INJ-1R will also be sampled for VOCs (8260B) in the winter and summer

[1] Field parameters include pH, oxidation reduction potential, turbidity, dissolved oxygen, specific conductivity, and temperature

[2] PCBs and O/C Pest are collected in the same bottle

[3] Volume of water in the tubing is the minimum volume that must be purged prior to the collection of purge parameters

[4] Minimum purge volume for low-flow sampling is volume in sampling tubing and volume of allowable drawdown

ft = feet

ft bgs = feet below ground surface

ft btoc = feet below top of casing

mL/min = milliliter per minute

VOCs = volatile organic compounds

SVOCs = semivolatile organic compounds

Chlor Herb = chlorinated herbicides

O/C Pest = organochlorine pesticides

O/P Pest = organophosphorus pesticides

PCBs = polychlorinated biphenyls

Table 5-2
Recommendations for Fall 2023 Sampling - Cell 2 and 4 Wells

Well ID	Water Levels	Field parameters[1]	Appendix I			Appendix II										Pump Depth (ft bgs)	Allowable Drawdown (feet)	Volume of Water in Tubing[3] (gallons)	Minimum Purge Volume[4] (gallons)	Expected Flow Rate (mL/min)
			VOCs		Total metals	SVOCs		O/C Pest[2]	O/P Pest	Chlor Herb	PCBs[2]	Dioxins/ Furans	Mercury	Cyanide	Total Sulfide					
			8260D	8011	6020B/ 6010C	8270E	8270E SIM	8081B	8141B	8321B	8082A	8290	7470A	SM4500-CN-E	SM 4500S-2					
Cell 2 (Low-flow sampling method)																				
MW-12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Dedicated	1.0	0.5	1.1	250-300
MW-13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Dedicated	2.5	0.4	2.1	200-250
MW-7	1															--	--	--	--	--
MW-8†	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Dedicated	0.1	0.5	0.6	100-150
MW-9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Dedicated	2.0	0.6	1.9	250-300
Cell 4 (Low-flow sampling method)																				
MW-3A	1	1	1	1	1											Dedicated	4.0	1.0	3.6	100-150
MW-4A	1	1	1	1	1											Dedicated	0.3	0.5	0.7	250-300
MW-4	1	1	1	1	1											Dedicated	1.0	0.4	1.1	150-200
MW-5AR	1	1	1	1	1											Dedicated	0.5	0.7	1.1	100-150
MW-6A	1	1	1	1	1											Dedicated	2.5	0.4	2.0	100-150
Cell 4 leachate			1		1	1		1	1	1	1	1	1	1	1					

Notes:

†No allowable drawdown as water level is within screened interval

[1] Field parameters include pH, oxidation reduction potential, turbidity, dissolved oxygen, specific conductivity, and temperature

[2] PCBs and O/C Pest are collected in the same bottle

[3] Volume of water in the tubing is the minimum volume that must be purged prior to the collection of purge parameters

[4] Minimum purge volume for low-flow sampling is volume in sampling tubing and volume of allowable drawdown

ft bgs = feet below ground surface

mL/min = milliliter per minute

VOCs = volatile organic compounds

SVOCs = semivolatile organic compounds

Chlor Herb = chlorinated herbicides

O/C Pest = organochlorine pesticides

O/P Pest = organophosphorus pesticides

PCBs = polychlorinated biphenyls