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Fourth Five-Year Review Report
for
Murray Smelter Superfund Site
Murray, Utah
Salt Lake County, Utah

Prepared By:

Utah Department of Environmental Quality
Division of Environmental Response and Remediation

For
U.S. Environmental Protection Agency
Region 8, Denver, CO

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8/14/19

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

ACL	Alternate Concentration Limit
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CD	Consent Decree
CFR	Code of Federal Regulations
COC	Contaminant of Concern
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
FS	Feasibility Study
IAMP	Intermediate Aquifer Performance Monitoring
IC	Institutional Control
IMC	Intermountain Medical Center
MCL	Maximum Contaminant Level
NAM	Natural Attenuation Monitoring
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M Plan	Operations & Maintenance Plan
OU	Operable Unit
PS	Performance Standard
PURR	Primary Under Roadway Repository
RA	Remedial Action
RAO	Remedial Action Objective
RCM	Repository Compliance Monitoring
RDM	Repository Detection Monitoring
RI	Remedial Investigation
RDR	Remedial Design Report
ROD	Record of Decision
SAP	Sampling Analysis Plan
SAPM	Shallow Aquifer Performance Monitoring
Site	Murray Smelter Superfund Site
SSOD	Smelter Site Overlay District

SWMP	Surface Water Monitoring Plan
SWRE	Southwest Repository Extension
Trust	ASARCO Multi-State Environmental Custodial Trust
UDEQ	Utah Department of Environmental Quality, Division of Environmental Remediation (DERR)
UTA	Utah Transit Authority
UTAFRE	UTA facility repository extension

I. INTRODUCTION

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

The Utah Department of Environmental Quality (UDEQ), in coordination with the U.S. Environmental Protection Agency (EPA) conducted this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fourth FYR for the Murray Smelter Superfund Site (Site). The triggering action for this statutory review is the completion of the Third FYR in September 2014. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

There were no Operational Units (OUs) defined in the Record of Decision (1998). Therefore, the entire site will be reviewed in this document.

The Murray Smelter Superfund Site Five-Year Review was led by Michael Storck, Environmental Scientist for UDEQ. Participants included Dave Allison (UDEQ), Scott Everett (UDEQ), and Erna Waterman (EPA).

EPA has determined in the five-year review that the cleanup at the Murray Smelter Site is protective. This means that the implemented remedy is protective of human health and the environment and allows for commercial reuse. Murray City staff inspect and monitor the site as required under the Smelter Site Overlay District (SSOD) ordinance for the properties including Costco Wholesale Warehouse, Intermountain Medical Center, and the Utah Transit Authority Environmental Compliance Department. To ensure that the ordinance is being properly managed and enforced by the City, the Division of Environmental Response and Remediation (DERR) meets with City representatives on a regular basis to discuss and answer questions related to new construction development and compliance with the SSOD.

Site Background

The Murray Smelter Site is located in Murray, Salt Lake County, Utah (see Figure 1-1). The Site includes the former operational areas of the Murray Smelter and adjacent

Germania Smelter, which are referred to as the on-facility area, as well as surrounding residential and commercial areas. These surrounding areas are referred to as the off-facility area, where air dispersion and deposition modeling indicated airborne emissions from the smelters impacted the environment. Both areas are defined in the Former Murray Smelter Site Location Map, see Figure 1.

The on-facility area is approximately 142 acres. Its boundaries are 5300 South Street to the south, State Street to the east, Little Cottonwood Creek to the north, and the west set of the Denver & Rio Grande Western railroad tracks to the west. The off-facility area is approximately 30 acres to the west of the on-facility area, approximately 106 acres south and southeast of the on-facility area, and a small area between 5200 South Street and Little Cottonwood Creek to the east of the on-facility area. The west portion of the off-facility area is bounded by Little Cottonwood Creek to the north, 300 West Street to the west, 5300 South Street to the south, and the on-facility boundary to the east. The south/southwest portion is bounded by 5300 South Street to the north and Wilson Avenue to the south. See Figure 2 for site boundaries.

Surface water at the Site is represented by Little Cottonwood Creek, a perennial stream that flows along the north/northeast boundary of the Site and discharges into the Jordan River approximately one mile downstream of the Site.

The boundaries of the off-facility area are based on the results of air dispersion modeling performed in November of 1994. The purpose of the modeling was to identify the area that potentially would have received the greatest amount of deposition resulting from lead and arsenic emissions from the Murray Smelter during its operating period. The small off-facility area between 5200 South Street and Little Cottonwood Creek to the east of the on-facility area was added in 1998 to encompass the shallow groundwater flow path from the former baghouse area to its discharge into the creek.

Groundwater at the Site is comprised of three distinct aquifers.

- The shallow aquifer is unconfined with a saturated thickness ranging from 2.5 feet to 25 feet. The average depth to water is approximately ten feet. Shallow groundwater flows generally north-northeast toward Little Cottonwood Creek.
- The intermediate aquifer is separated from the shallow aquifer by the Bonneville blue clay that is continuous across the Site. Beneath the Bonneville blue clay, the intermediate and deep aquifers are separated by more than 200 feet of inter-bedded fine- and coarse-grained silty clay and alluvial deposits. Groundwater in the intermediate aquifer flows north-northwest across the Site and the intermediate aquifer is not hydraulically connected to surface water bodies in the vicinity of the Site.
- The deep aquifer located several hundred feet below the intermediate aquifer is the main source of drinking water for most residents in the Salt Lake Valley.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Murray Smelter		
EPA ID: UTD980951420		
Region: 8	**State:** UT	**City/County:** Murray/Salt Lake County

SITE STATUS	
NPL Status: Proposed	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: State *[If "Other Federal Agency", enter Agency name]*:
Author name (Federal or State Project Manager): Michael Storck
Author affiliation: Environmental Scientist, UDEQ/ DERR
Review period: 10/1/2014 – 4/30/2019
Date of site inspection: 2/13/2019
Type of review: Statutory
Review number: 4
Triggering action date: 9/30/2014
Due date *(five years after triggering action date)*: 9/30/2019

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The Site Characterization Report completed by Hydrometrics in 1996 determined that metal concentrations were elevated in soils primarily due to the presence of residual smelter materials (on-facility area) and deposition of smelter air emissions during the period of operation (off-facility area). The report identified lead and arsenic as the primary COCs in the on-facility area soils and lead in the off-facility soils. The report also identified that shallow groundwater within the on-facility area was contaminated with arsenic and selenium. Elevated arsenic concentrations were also measured in Little Cottonwood Creek (surface water).

The Site Characterization Report (August 1996) and the Baseline Risk Assessment (May 1997) identified four types of smelter material within the on-facility area:

- Category I material. Residual smelter material associated with the arsenic trioxide production process consisting of relatively undiluted flue dust was designated Category I. This material contained the highest arsenic concentrations (highest concentration approximately 760,000 mg/Kg), was present in relatively small volumes (approximately 580 tons) and was associated with distinctly elevated arsenic concentrations in underlying shallow groundwater. Category I material was identified as posing a potential health risk and was considered by EPA to be a principal threat waste and a major source of arsenic contamination to shallow groundwater.
- Category II material. Residual smelter material associated with smelter flue dust operations (blast furnace flues, baghouse, roasting plant flues and Cottrell electrostatic precipitator) and consisting of diluted flue dust mixed with soil, new fill, or debris from former smelter flues. This material contained lower arsenic concentrations than Category I material (average of approximately 9,000 mg/Kg), but was present in larger quantities (approximately 90,000 cubic yards). Category II material was identified as posing a potential direct contact health risk and as being a source of arsenic to groundwater.
- Category III Material. Residual smelter material and contaminated soils that contained arsenic or lead at levels predicted to pose an unacceptable health risk to site workers within the on-facility area (arsenic greater than 1,200 mg/kg or lead greater than 5,600 mg/kg), but were not sources of arsenic to groundwater.
- Category IV Material. Smelter slag that was present primarily in the northern portion of the on-facility area and contained relatively high levels of lead (typically in the range of 8,000 to 16,000 mg/kg), in a physical form (vitrified iron silicate) that limits the release of metals. Slag was found not to be a source of metals to groundwater or surface water.

Contaminants of Concern (COCs) that have been released at the Site in each environmental media are summarized in the following table.

Table 1- Contaminants of Concern /Environmental Media

Contaminants of Concern	**Environmental media**
Lead and arsenic	Surface soil, subsurface soil and dust
Lead, arsenic, and selenium	Groundwater within on-facility area
Aluminum, arsenic, cadmium, lead, and zinc	Surface water in Little Cottonwood Creek
Aluminum, arsenic, cadmium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc	Sediment in Little Cottonwood Creek

Of these COCs, EPA identified lead and arsenic as the COCs for human exposure. EPA identified aluminum, arsenic, cadmium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc as the COCs for ecological receptors.

The baseline risk assessment provided the basis for EPA's decision that Remedial Action (RA) was necessary at the Site. Elevated and unacceptable risks were identified for both humans and ecological receptors:

- Risks to humans: unacceptable risks to current and future non-contact intensive workers, current contact intensive workers, and current and future residents through ingestion of arsenic and lead in dust and soil and ingestion of arsenic in groundwater.
- Risks to ecological receptors: exposure to lead in soils and sediment, selenium in plants.

Response Actions

Initial Response

- The Site was proposed for the National Priorities List in January of 1994 but the listing was never finalized, at the request of the city of Murray with concurrence from EPA and UDEQ.
- ASARCO agreed to perform an engineering evaluation/cost analysis (EE/CA) pursuant to the terms of an Administrative Order on Consent (AOC) (EPA, 1995). ASARCO initiated the EE/CA with investigations performed between April 1995 and February 1996.
- In September 1995, EPA and ASARCO entered into a separate AOC for a time-critical removal at the playground in the Grandview Trailer Park located on the on-facility area. Soils contaminated by lead and arsenic were excavated within and adjacent to the playground. The playground was backfilled with clean fill. This removal action was completed in November 1995.
- In 1997, EPA redirected what had been a non-time-critical removal action into the remedial action framework. ASARCO's obligation under the AOC to perform an EE/CA was changed to a feasibility study which was completed by ASARCO in August of 1997 (MFG, 1997).

In April 1996, EPA and Murray City signed a Memorandum of Understanding (MOU) creating a formal role for Murray in the assessment of potential land uses at the Site, the development of cleanup options, and the implementation/enforcement of institutional controls. To facilitate development of an acceptable remedy for the on-facility area, EPA and UDEQ initiated the formation of the Murray Smelter Working Group (Working Group) in October 1996. The Working Group included the EPA, UDEQ, Murray City, and ASARCO, along with land and business owners of the on-facility area. The purpose of the Working Group was to inform EPA and UDEQ about pending redevelopment plans and to provide a forum for discussing alternative cleanup strategies for the on-facility area. A commitment was made by the Working Group to integrate future remedial actions with redevelopment activities. Agreements among the members of the Working Group were incorporated in an Agreement in Principle signed in May of 1997.

Selected Remedy

The 1998 Record of Decision (ROD) selected a remedy to address the unacceptable risks posed to current and future human populations and ecological receptors identified in the Baseline Risk Assessment (BRA). The Ecological Risk Assessment (ERA) evaluated potential exposures of fish, birds, mallard ducks, frogs, and pocket gophers to smelter related chemicals of concern within likely habitat areas. Observation of the ecological receptors at the Site in the form of qualitative surveys documented in the ecological risk assessment suggests that the predicted effects are not occurring. Given that the remedy for the Site includes capping of all exposed surface areas including wetlands no ecological mitigation was warranted.

Remedial Action Objectives

The overarching Remedial Action Objective (RAO) is to develop a comprehensive remedy that protects human health and the environment, is consistent with the current and anticipated future land use, and removes obstacles to Site development associated with real or perceived environmental contamination.

The RAOs for the on-facility area are as follows:

- Soil/Smelter material: prevent unacceptable risks to current and future workers or to ecological receptors due to the ingestion of on-facility soil/smelter materials containing arsenic or lead. The remediation levels for soil/smelter material in the on-facility area are 1,200 milligrams per kilogram (mg/kg) arsenic and 5,600 mg/kg lead within any given exposure unit.
- Groundwater: minimize future transport of arsenic from source materials to the shallow aquifer, prevent exposure of human and ecological receptors to groundwater with arsenic concentrations that pose an unacceptable risk, and prevent unacceptable increases in the arsenic concentrations within the intermediate aquifer resulting from arsenic migration from the shallow aquifer. The remediation levels for groundwater are:
    - Meet the Maximum Contaminant Level (MCL) of 0.05 milligrams per liter (mg/L) for dissolved arsenic in the shallow groundwater at the east and west Site boundaries;
    - Meet the 0.05 mg/L MCL for arsenic in the intermediate aquifer; and
    - Meet the Alternate Concentration Limit (ACL) of 5.0 mg/L for dissolved arsenic within the unconfined shallow aquifer within the Site boundaries.
- Surface Water/Little Cottonwood Creek: prevent unacceptable increases of arsenic concentrations in surface water resulting from groundwater discharges or surface water run-off from the Site. The remediation levels for Little Cottonwood Creek surface water are:
    - Meet the Division of Water Quality (DWQ) standards of quality for waters of the state for trivalent arsenic of 190 micrograms per liter (ug/L) as a four-day average and 360 ug/L as a one-hour average; and

- Meet the DWQ standard of quality for waters of the state for dissolved arsenic of 100 ug/L

The RAOs for the off-facility area are as follows:

- Prevent unacceptable risks to current and future residents due to the ingestion of soil containing lead and prevent unacceptable risks to current and future non-contact intensive workers due to the ingestion of soil containing lead. The remediation levels for off-facility soils are:
  - The concentration of lead in surface soils within residential areas shall not exceed 1,200 mg/kg as the mean within any given residential property; and
  - The concentration of lead in surface soils within commercial areas of the site shall not exceed 5,600 mg/kg as an arithmetic mean within any given commercial property.

Status of Implementation

Selected Remedy for On-Facility Area

The selected remedy for the on-facility area was source control and Monitored Natural Attenuation (MNA) to achieve the RAO for on-facility groundwater, barrier placement to achieve the RAO for on-facility soil/smelter materials, and institutional controls. The main components of the remedy for the on-facility area were as follows:

- Category I material. Excavation and off-Site disposal of approximately 580 tons of Category I material considered principal threat waste. This material was transported to a permitted hazardous waste treatment, storage and disposal facility;
- Category II material. Excavation and on-site consolidation of approximately 90,000 cubic yards of low-level threat waste. The excavated Category II material was consolidated in a fully-encapsulated repository system constructed within the Site boundaries and acts as a barrier to prevent direct contact. The repository was designed as the base for a new access road through the Site. The selected remedy includes Operations & Maintenance (O&M) of the on-site source control (repository) system with Site development over the repository.
- Category III material. The covering of Category III materials in place, with barriers to prevent direct contact. Such barriers may include pavement, landscaping, soil caps, or sidewalks.
- Category IV material. Although no unacceptable risks associated with exposure to slag were identified by EPA, Site development resulted in the construction of barriers over the slag ensuring no exposure to slag in the future.
- Groundwater. MNA shall continue until shallow groundwater achieves the ACL for dissolved arsenic of 5.0 mg/L. The intermediate aquifer will be monitored to determine compliance with the MCL for dissolved arsenic of 0.05 mg/L.
- Surface water. Monitoring of surface water in Little Cottonwood Creek to ensure continued compliance with applicable water quality standards.
- Institutional Controls. The remedy also included institutional controls (ICs). ICs were adopted as a Murray City ordinance establishing an Smelter Site Overlay

District (SSOD) and restrictive easements that run with the land, which prohibit the construction of new wells or use of existing wells within the on-facility area and the western and eastern portions of the off- facility area except for EPA-approved monitoring wells. The SSOD prevents residential and contact intensive industrial land use and requires maintenance of the barriers and controls over the Category II, Category III and Category IV materials.

Off-Facility Area

For the off-facility area, the selected remedy was removal of soil to 18 inches in depth with lead levels exceeding 1,200 mg/kg in residential yards or with lead levels exceeding 5,600 mg/kg in commercial areas and replacement with clean fill. The excavated soil was used as sub-grade material during construction of the repository system.

Remedy Implementation

Remedial action (RA) activities began in August 1998 and were completed in February 2001, in accordance with the ROD and the Consent Decree. RA activities were performed on an accelerated schedule to meet a series of interim deadlines to facilitate redevelopment. Excavation and off-Site disposal of Category I material was completed in August 1998.

Remedial action at the current UTA park-and-ride facility was conducted between 1998 and May 1999. The work included removal of Category II materials, construction of a portion of the lined repository system, and consolidation of Category II materials within the repository.

Construction of the repository system beneath Cottonwood and Woodrow Streets, which bisect the western side of the site, was conducted between September 1998 and November 1999. Concurrent with this effort, construction of the Southwest Repository Extension began in October 1999 and was completed a year later. Groundwater monitoring wells were installed in October 2000.

In addition to the remedial action activities, a removal action was conducted in August of 2000, to demolish the smelter smoke stacks in the on-facility area. A memorial garden was later constructed on the landscaped grounds of the Intermountain Health Care Hospital, where the largest stack once was located. It was intended to serve as both a historical marker as well as a dedication to leaders in the community. The installation of three shallow groundwater monitoring wells (MW-10, MW-11 and MW-12) was delayed until 2005 due to construction of Costco and Intermountain Health Care Hospital. In the off-facility area, soil from twelve residential yards with average lead concentrations greater than 1,200 mg/kg was removed and replaced with clean fill.

IC Summary Table

Table 2: Summary of Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil	Yes	Yes	On-Facility Off-Facility	Land use restrictions	Restrictive Easements August 2000 Smelter Site Overlay District (SSOD) April 1998
Groundwater	Yes	Yes	Site	Prohibit construction of new wells or use of existing wells	SSOD April 1998

In accordance with the ROD, Murray City created the SSOD with the passage of Ordinance 98-07 on April 14, 1998 and subsequently hired a development site coordinator to oversee the district. The SSOD established the necessary public and private ICs to protect human health and the environment from the remaining contamination at the Site and to protect the integrity of current and future barriers/caps.

The SSOD specifically requires a development permit be obtained that includes a grading and drainage plan; monitoring and maintenance plan to assure all caps and barriers will be maintained; and prohibits the use of existing wells or construction of new wells.

Systems Operations - Operation/Maintenance

ASARCO originally developed the Operations and Maintenance Plan (O&M Plan), which became final in July 2003. The O&M Plan includes all requirements for operations and maintenance of the on-facility repository system and other on-facility remedial components including repository barrier maintenance, repository surface drainage and controls, repository settlement monitoring and groundwater/surface water monitoring. Beginning December 9, 2009, the O&M Plan has been implemented by the settling defendants, Asarco Multi-State Environmental Custodial Trust (Trust), Murray City, and UTA.

Pursuant to the O&M Plan, Murray City conducts bi-annual barrier inspections in May and November of each year and submits a SSOD annual report to EPA and UDEQ that includes annual reports from stakeholders and property owners. The City also conducts monthly inspections of the on-site repository. The UDEQ and EPA met with Murray City in February 2019, and went over the Institutional Controls and operation and maintenance requirements as outlined in the SSOD.

The Trust's contractor, Ramboll, conducts annual groundwater sampling and reporting to evaluate monitored natural attenuation to achieve arsenic MCLs in the shallow groundwater at the east and west Site boundaries; intermediate aquifer; and the ACL for arsenic within the unconfined shallow aquifer within the Site boundaries.

The annual reports include a statistical evaluation which is used to determine the effectiveness of source control activities (encapsulated repository and barriers) and natural attenuation relative to the performance standards described by the Remedial Design Report (RDR) and the Sampling and Analysis Plan (SAP).

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those determinations.

Table 3: Protectiveness Determinations/Statements from the 2014 FYR

Site	Protectiveness Determination	Protectiveness Statement
Sitewide	Protective	The remedy at the Murray Smelter Superfund Site currently protects human health and the Environment. Source control measures (repository system and barriers) are in place, are being Maintained as designed and are monitored regularly. Institutional controls for the Site are in place with the establishment and enforcement of the Smelter Site Overlay District. The institutional controls effectively restrict land use and groundwater use. In addition, residents and businesses in the area are connected to the municipal water system. There is no current exposure to on-Site groundwater.

Table 4: Status of Recommendations from the 2014 FYR

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
MCL for arsenic changed from .05 mg/L to .01 mg/L effective January 2006	Determine if changed MCL should be incorporated into current remedy	Addressed in Next FYR	UDEQ as lead agency and EPA as support agency have discussed modifying MCL to .01 mg/L. At the time the decision was made, it was determined that this would be evaluated in the next FYR.	3/4/2019
EPA Aquatic Life Ambient Water Quality Criteria for arsenic changed to 0.150 mg/l (4-day average) and 0.340 mg/l (1-hour average)	Determine if change aquatic ambient water quality criteria should be incorporated into current remedy	Considered But Not Implemented	UDEQ as lead agency and EPA as support agency have discussed modifying aquatic life ambient water quality for arsenic to 0.150 mg/l (4-day average) and 0.340 mg/l (1-hour average). At the time the decision was made, it was determined that this would be evaluated in the next FYR.	3/4/2019

In addition, under the SSOD, over the last five years, a number of redevelopment efforts have occurred.

One development activity completed during 2017-18 was a structured parking facility located at the northwest corner of the IMC campus. The parking facility was built as part of the Intermountain Transitional Institute. Since the parking structure is located within the SSOD, IMC and their consultants worked with Murray City to obtain two SSOD permits to complete work. The initial SSOD permit applied for in September 2016 was to advance six soil borings within the footprint of the proposed parking structure to collect geotechnical information to finalize foundation design for the parking structure. This permit addressed concerns of properly grouting any borings which may be in or close to the Bonneville Blue Clay that acts as a barrier to transportation of arsenic-impacted shallow groundwater to deeper aquifers, as well as the Health and Safety training of the drilling personnel.

The second SSOD permit applied for in December 2016 was for the parking structure construction. The project tasks included installation of construction fencing, installation of storm water pollution prevention controls, site preparation and grading, excavation of pad for foundation construction, and relocation of shallow/deep underground utilities

(water, fiber optics, power, storm sewer, sanitary sewer). Issues addressed included proposed dust control measures, stormwater pollution prevention procedures, covering of stockpiled soils to prevent run off and fugitive dust generation, weekly inspection methods designed to assess compliance with the SSOD permit, final replacement of clean soil barriers seeding, and landscaping of the disturbed areas. Construction activities began in May 2017, and were completed with the final hydroseeding and removal of the security fencing in October 2018.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was made available by a press release in the Deseret News and Salt lake Tribune newspapers on February 6, 2019, stating that there was a five-year review and inviting the public to submit any comments to the EPA and UDEQ. The results of the review and report will be made available at the Site information repository located at UDEQ. A copy of the announcement is provided in Appendix B.

During the FYR process, the UDEQ conducted interviews to document any perceived problems or successes with the remedy than has been implemented to date. Community interviews were conducted by UDEQ from January 24 through February 13, 2019. The UDEQ contacted representatives from Murray City, property owners Utah Transit Authority (UTA), Intermountain Medical Center (IMC), and Murray Costco Wholesale Warehouse. Specific interview questions and responses are provided in Appendix B.

None of the interviewees expressed any health or environmental concerns with the remedy and expressed the remedy remains protective. The only concerns or issues with the site management and the Smelter Site Overlay District (SSOD) were related to staff turnover at Murray City, Costco Wholesale Warehouse, IMC facility department, and at the UTA Environmental Compliance. Respective stakeholders and Murray City officials were knowledgeable of the SSOD and inspection requirements.

Data Review

The effectiveness of Monitored Natural Attenuation, attainment of performance standards for groundwater and surface water, and meeting the requirements for groundwater monitoring associated with the on-facility system for Category II materials was evaluated and the data was summarized in the 2018 Annual Monitoring Report completed by Ramboll.

In 2018 Ramboll completed the Data Evaluation Report (previously identified in third FYR as the Statistical Summary Report) for the years 2014 to 2018. The surface water and groundwater monitoring data are compared with applicable performance standards using the statistical standards developed in the Remedial Design Report (RDR).

Surface water sampling was conducted during the 2014 through 2016 annual sampling events. In accordance with the Sampling & Analysis Plan (Ramboll, 2016), surface water sampling will be conducted once every five years and will not be performed again until 2021. Surface water sampling is performed at three locations: the upstream boundary of

the Site (SW-13), within the Site boundary (SW-15) and downstream of the Site boundary (SW-5). Surface water sampling locations are shown on Figure 2. The point of compliance for the performance standards for surface water is SW-5. The performance standards were demonstrated for the surface water at the downstream point of compliance (SW-5).

The following is a statistical evaluation of data collected from 2014 through 2018 and compared against the MCLs (perimeter of the Site) and ACL's (within the unconfined shallow aquifer within the Site boundaries) for arsenic concentrations in the groundwater (See Figure 2 for groundwater sampling locations):

- Shallow groundwater: Monitoring wells SPM-1 and SPM-2 are used to monitor the western boundary of the Site. The MCL for arsenic is .05 mg/L and both SPM-1 and SPM-2 have shown compliance with this performance standard since 2004. In 2018 the arsenic concentrations for SPM-1 and SPM-2 were .0045 and non-detection, respectively. Monitoring wells SPM-3, SPM-4 and SPM-5 are used to monitor groundwater discharge to Little Cottonwood Creek and the performance standard for arsenic is the ACL of 5.0 mg/L. As of 2005 all analytical data for dissolved arsenic in the groundwater are below the performance standard. In 2018 the arsenic concentration for SPM-3 was .0441 mg/L; for SPM-4 the arsenic concentration was .0533; and the arsenic concentration for SPM-5 was .371 mg/L.
- Intermediate groundwater: Monitoring wells IPM-1, IPM-2, IPM-3 and IPM-5 (replacement well for IPM-4 that was abandon in 2016) are used to monitor the intermediate aquifer. Monitoring wells IPM-1, IPM-2, IPM-3 and IPM-5 show arsenic concentrations below the MCL of .05 mg/L. In 2014-2018 the arsenic concentrations for IPM-1 were non-detect (<.005 mg/L). In 2018 the arsenic concentration for IPM-2 was .0038 mg/L as compared to the 2017 arsenic concentration of .0079 mg/L (2014-2016 arsenic concentrations were non-detect). In 2018 the arsenic concentration for IPM-3 was .0090 mg/L as compared to the 2017 arsenic concentration of .0086 mg/L (2014-2016 arsenic concentrations were non-detect). In 2018 the arsenic concentration for IPM-5 was .0330 mg/L as compared to the 2017 arsenic concentration of .020 mg/L. The arsenic concentrations for IPM-5 in 2014-2016 were .034 mg/L, .028 mg/L and .030 mg/L, respectively. Overall the intermediate groundwater monitoring wells IPM-1, IPM-2, IPM-3 and IPM-5 did not show an exceedance of the MCL of .05 mg/L for 2014-2018. The arsenic concentration trends for 2014-2018 showed minor fluctuations but overall were stable.

In November 2018 Ramboll completed the 2018 Annual Monitoring Report that included monitoring/sampling field activities conducted July 15-18, 2018. Well inspections were done as part of the 2018 monitoring activities. Monitoring well MW-12 was found to have a compromised well screen and was abandoned and replaced with a new well labelled MW-12R in close proximity.

Site Inspection

The inspection of the Site was conducted on February 20, 2019. In attendance were Michael Storck and David Allison (UDEQ), Erna Waterman (EPA Region 8), Melinda Greenwood and James McNulty (Murray City), and Buffie Chournos (UTA). The purpose of the inspection was to assess the protectiveness of the remedy. The barrier system appeared to be in very good condition; it appeared to be maintained in accordance with the SSOD and applicable plans. No significant problems were encountered. The physical integrity of the monitoring wells surface flush mounts were well-maintained Inspections of the UTA and Costco parking areas showed minor cracks in the asphalt that are common due to use and wear and will be repaired in the Spring of 2018. See Appendix C, Site Inspection Checklist and Photos.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

The review of documents and results of the Site Inspection indicates that the remedies at the on-facility and off-facility areas are functioning as intended by the ROD.

Remedial Action Performance

The selected remedy for the on-facility area was source control and MNA to achieve the RAO for on-facility groundwater, barrier placement to achieve the RAO for on-facility soil/smelter materials, and institutional controls. The stabilization and covering with barriers for Category II, III and IV contaminated materials achieves the remedial action objectives by preventing exposure of arsenic contaminated smelter/soils through direct contact or inhalation of air-borne dust. Because this is a containment remedy, maintenance of the Site focuses on the effectiveness of the remedy. The SSOD prohibits the construction of new wells or use of existing wells for any purpose (except for monitoring wells). This includes zoning to prevent residential and contact intensive industrial uses within the former smelter operational areas and requires maintenance of the barriers/caps and controls on handling of excavated subsurface material.

System Operations/O&M

There are no active operating systems for the Site. O&M activities for the on-facility areas include biannual (November and May) barrier inspections for the on-facility repository system and other on-facility remedial components. Necessary maintenance/repairs may include the repository barrier, repository surface drainage and controls, and the repository settlement monuments.

Groundwater and surface water at the Site are monitored and sampled annually by the Trust's environmental contractor, Ramboll. The performance standards were demonstrated for the surface water at the downstream point of compliance (SW-5). Shallow groundwater met the performance standard of the ACL of 5.0 mg/L for arsenic

at the western boundary of the Site (SPM-1 and SPM-2) and in the vicinity of Little Cottonwood Creek (SPM-3, SPM-4 and SPM-5). The intermediate aquifer performance standard for the MCL for the arsenic concentration of .05 mg/L was met (IPM-1, IPM-2, IPM-3 and IPM-5). Concentrations of arsenic in the MNA monitoring wells generally remained constant (MW-10, MW-11 and MW-12).

Implementation of Institutional Controls and Other Measures

Murray City created the SSOD with the passage of Ordinance 98-07 on April 14, 1998 and subsequently hired a development site coordinator to oversee the district. The SSOD established the necessary public and private ICs to protect human health and the environment from the remaining contamination at the Site and to protect the integrity of current and future barriers/caps. Also, restrictive easements were developed associated with land use.

The SSOD specifically requires a development permit be obtained that includes a grading and drainage plan; monitoring and maintenance plan to assure all caps and barriers will be maintained; and prohibits the use of existing wells or construction of new wells. The SSOD prevents residential and contact intensive industrial land use and requires maintenance of the barriers and controls.

To ensure that the ordinance is being properly administrated and enforced by the City, UDEQ meets with City representatives on a regular basis to discuss and answer questions related new construction development and compliance with the SSOD.

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

Question B Summary

Are cleanup levels and toxicity data still valid?

The current soil cleanup levels selected in the ROD were based on the estimated risks defined in BHHRA. The On-Facility surface soil concentration remediation level for industrial use for lead is 5,600 ppm and for arsenic it is 1,200 ppm. The Off-Facility surface soil concentration remediation level for industrial use for lead is 1,200 ppm.

Under the current EPA Office of Land and Emergency Management policy, the soil lead screening level was established so that a typical child or similarly exposed group of children would have an estimated probability of no more than 5 percent of exceeding a blood lead level (BLL) of 10 micrograms per deciliter (μg/dL). The 10 μg/dL BLL target concentration is based (in part) on the 1991 Center for Disease Control's (CDC) blood lead "level of concern." In 2012, CDC accepted the recommendations of its Advisory Committee on Childhood Lead Poisoning Prevention that the "level of concern" be replaced by a reference value based on the 97.5th percentile of the National Health and Nutrition Examination Survey-generated BLL distribution in children 1-5 years old (currently 5 μg/dL).

In 2016, EPA's Office of Land and Emergency Management (OLEM) released directive 9200.2-167, which updates the scientific considerations to be used at lead cleanups conducted according to EPA's 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (Office of Solid Waste and Emergency Response [OSWER] Directive 9355.4-12) and the 1998 update to the 1994 guidance. A copy can be found at https://semspub.epa.gov/work/08/1884174.pdf.

Since issuing the 1994 and 1998 guidance, EPA's experience has demonstrated that lead-contaminated soil responses are more effective when they employ a multi-pathway approach. The 2016 directive highlights current science and risk assessment tools that EPA may consider when implementing lead cleanups.

As discussed in previous FYR Reports, the Maximum Contaminant Level (MCL) for arsenic changed from .05 mg/L to .01 mg/L and the arsenic criterion for aquatic wildlife (i.e.,ambient water quality criteria) changed from .190 mg/L to .150 mg/L. Analytical data collected for groundwater from 2014-2018 showed no arsenic concentrations above the MCL of .05 mg/L. Groundwater at the Site is not currently being used as a source of drinking water and ICs restricting groundwater use remain in place. Therefore, the remedy remains protective despite the change to the MCL.

Are there changes in other contaminant characteristics or exposure assumptions?

No new contaminants of concern or contaminant sources have been identified since the ROD and the commencement of the RA. There have been changes to the exposure assumptions and toxicity information since the document was issued. Because these documents were developed prior to EPA's RAGS Part F (2009) guidance, the exposure assumptions for the inhalation exposure pathway were conducted differently. The exposure metric that was used in the RODs and the BHHRA used inhalation concentrations that were based on ingestion rate and body weight (mg/kg-day). The updated methodology uses the concentration of chemical in the air, with the exposure metric of µg/m3. The inhalation pathway is minor compared to the soil ingestion pathway, which is the major risk factor at this Site. Revising the inhalation calculations to be consistent with the most recent EPA guidance would not change the current cleanup levels for the on-facility or off-facility areas. The current land use and reasonably expected future land use has not changed. The ICs (both the ordinance and land easements) would ensure that future development occurs in a manner that protects human health against exposure to contaminants of concern.

The ERA evaluated potential exposures of fish, birds, mallard ducks, frogs, and pocket gophers to smelter related chemicals of concern within likely habitat areas. Given that the remedy for the Site includes capping of all exposed surface areas including wetlands no ecological mitigation was warranted.

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

No.

VI. ISSUES/RECOMMENDATIONS

Issues and Recommendations Identified in the Five-Year Review:				
On-Facility Area	Issue Category: Remedy Performance			
	Issue: MCL for arsenic changed from .05 mg/L to .01 mg/L effective January 2006.			
	Recommendation: The UDEQ and EPA evaluated the MCL change in order to determine if the new MCL for arsenic should be adopted and agreed no change is necessary at this time and that change will be evaluated again during the next five-year review period.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	No	EPA	EPA	9/30/2024

On-Facility Area	Issue Category: Remedy Performance			
	Issue: Aquatic Life Ambient Water Quality Criteria for arsenic changed to 0.150 mg/l (4-day average) and 0.340 mg/l (1-hour average).			
	Recommendation: The UDEQ and EPA evaluated the Aquatic Life Ambient Water Quality Criteria change in order to determine if the new water quality criteria for arsenic should be adopted and agreed no change is necessary at this time and that change will be evaluated again during the next five-year review period.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	No	EPA	EPA	9/30/2024

On-Facility Area	Issue Category: Operations and Maintenance			
	Issue: Murray City did not conduct the 2018 biannual (May and November) inspection of the barrier system and did not complete the 2018 Annual Inspection Report (due to employee turnover).			
	Recommendation: The UDEQ and EPA met with Murray City in February 2019 and went over the Institutional Controls and Operation & Maintenance requirements as outlined in the SSOD and Murray City will conduct the 2019 biannual (May and November) inspection of the barrier system and submit the 2019 Annual Inspection Report.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	No	Murray City	UDEQ and EPA	3/4/2019

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement (if applicable)	
For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.	
Protectiveness Determination: Short –Term Protective	Addendum Due Date (if applicable):
Protectiveness Statement: The remedy at the Murray Smelter Superfund Site is currently protective of human health and the environment. Source control measures (repository system and barriers) are in place, are being maintained as designed, and are inspected regularly. Institutional controls for the Site are in place with the establishment and enforcement of the Smelter Site Overlay District. The ICs effectively restrict land use and groundwater use. In order for the remedy to be protective in the long term, the validity of the arsenic groundwater and surface water cleanup levels need to be evaluated.	

VIII. NEXT REVIEW

The next five-year review for the Murray Smelter Superfund Site is required five years from the completion date of this review.

FIGURES

Notes:
1. Aerial Source: ESRI ArcGIS Online - Imagery

RAMBOLL

B.Radakovich | Date: 12/26/2012

Former Murray Smelter Site Location Map

Murray, Utah

Figure 1

PROJECT: 1690011505-001

Notes:
1. Aerial Source: ESRI ArcGIS Online - Imagery
2. In the event that the Repository Detection Monitoring Program identifies a potential release from the repository, Well MW-5D will become the repository compliance monitoring point.

RAMBOLL

Groundwater and Surface Water Investigation Sampling Locations

Former Murray Smelter Site

Figure 2

Path: P:\ASARCO Murray Smelter\GIS\mxd\5-Year_Review\20131213_AllSampleLocations_landscape.mxd, Project Number: 21321GIR, Author: BRadzakovich, Date: 3/4/2014

APPENDIX A

RELEVANT DOCUMENTS REVIEWED DURING THE FIVE YEAR REVIEW

EPA Administrative Order on Consent for Removal Action with Asarco, Murray Smelter Site, September, 1995 SEMS# 373685

EPA, Baseline Ecological Risk Assessment, Former Murray Smelter Site, September, 1997, SEMS# 373940

EPA, Baseline Human Health Risk Assessment, Murray Smelter, May, 1997, SEMS# 373854

EPA, 2011. Preliminary Closeout Report, September 29, 2011

EPA, SSDS Institutional Control Process Plan, Operable Site. Attachment to the RD/RA Consent Decree, Civil No. 2:04 CV-843.

EPA, Superfund Record of Decision; Murray Smelter, UT, April, 1998, SEMS# 374026

Hydrometrics, Inc., Site Characterization Report for Former Murray Smelter Site, August, 1996, SEMS# 373865

Hydrometrics, Inc., Data Validation Report, Fonner Murray Smelter Site, November, 1996, SEMS# 373894

MFG, Inc. Feasibility Study Report, Murray Smelter, August, 1997, SEMS# 373943

MFG, Inc., Ground Water and Surface Water, Former Murray Smelter Site, April, 1998, SEMS# 374030

MFG, Inc., Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) 2000. SEMS# 484406

MFG, Inc., Site Characterization Report, Murray Smelter, August, 1996, SEMS# 373867

Murray City, Smelter Site Overlay District, Chapter 17.25, www.murray.utah.gov [Government menu/useful government links; City Code; Sterling Codifiers, Inc./Title 17-ZONING/Chapter 17.25].

Ramboll, Data Evaluation Report 2014-17, February 2018.

Ramboll, Monitoring Report, Second Quarter 2015, September 2015.

Ramboll, Monitoring Report, Second Quarter 2016, December 2016.

Ramboll, Monitoring Report, 2017 Annual Monitoring Report, February 2018.

Ramboll, Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP), November 2016.

UDEQ/DERR, Second Five-year Review Report for Murray Smelter Site, SEMS# 1096481

Weston, Baseline Risk Assessment, Fonner Murray Smelter Site, May, 1997 SEMS# 373854

APPENDIX B

PUBLIC NOTICE AND COMMUNITY INTERVIEWS

ENVIRONMENTAL RESPONSE
& REMEDIATION

EPA
United States
Environmental Protection
Agency

PUBLIC NOTICE
Five Year Review
Murray Smelter Superfund Site
Salt Lake County

The Utah Department of Environmental Quality, Division of Environmental Response and Remediation (UDEQ/DERR)—in cooperation with the U.S. Environmental Protection Agency (EPA)—is conducting a Five Year Review of the former Murray Smelter Superfund Site located near State Street north of 5300 South, Murray City, Utah.

The purpose of a Five Year Review is to determine whether or not the cleanup and other actions taken at the site remain protective of human health and the environment. Completed in 2001, the cleanup included the disposal of arsenic and lead contaminated soils, the demolition of the smelter facilities and smokestacks, and placement of less contaminated soils into lined repositories capped by new roadways. The 142-acre site was cleaned for reuse and redevelopment where a medical campus, light rail station, and retail stores now reside.

This is the fourth Five Year Review for site. During this review, UDEQ/DERR will examine current information and conduct a site inspection and community interviews to evaluate all remedy components. The review will be completed by September 2019. UDEQ and EPA will prepare a report summarizing the results.

The Administrative Record for the Site includes all reports and documents used for the Murray Smelter Superfund Site and is available for public review at the:

Utah Dept. Environmental Quality
Multi Agency State Office Building
195 North 1950 West (First Floor)
Salt Lake City, Utah 84116
Phone: 801-536-4100

EPA Superfund Records Center
1595 Wynkoop Street
Denver, Colorado 80202
Phone: 303-312-7273

Project information on the Murray Smelter Superfund Site is available online at: http://eqedocs.utah.gov using the search phrase "Murray Smelter."
If you would like more information about the review or would like to participate in an interview, please contact:

Michael Storck
UDEQ Project Manager
Phone: (801) 536-4179
Email: mstorck@utah.gov

Dave Allison
UDEQ Community Involvement
Phone: (801) 536-4479
Email: dallison@utah.gov

Murray Smelter Superfund Site
Five-Year Review
Interview of Local Community

Site Name: Murray Smelter EPA ID: UTD980951420	January 24, 2019
Type of Contact: Visit	Contact Made By: Dave Allison, UDEQ/DERR Community Involvement Coordinator and Michael Storck, UDEQ/DERR Project Manager
Person Contacted	
Name: Jim McNulty, Development Services Manager Melinda Greenwood, Community & Economic Development Director Jordan Knight, Risk Manager G.L. Critchfield, City Attorney Briant Farnsworth, Deputy City Attorney	Organization: Murray City 5025 S State Street Murray, UT 84107

1. **Is your organization/department aware of the Murray Smelter Superfund site and the actions underway to address environmental contamination?** The Murray City staff said they've experienced a lot of turnover regarding responsibilities for the former cleanup site over the last five years. The positions are re-established with some new personnel in the Development Services and Community and Economic Development offices. Murray officials said new staff are informed on site conditions and developing a working understanding of what is required to manage the former proposed Murray Smelter Superfund site. Murray City created a Smelter Site Overlay District (SSOD) to implement institutional controls prohibiting the construction of new ground water wells, protecting the site's soil remedy and guiding appropriate development. Murray City said they have employees (including the current Mayor and Chief Administration Officer) who were there before cleanup finished in 2001 to rely upon their institutional knowledge.

2. **What's your overall impression (your general sentiment) of the actions being performed at the Murray Smelter Superfund Site?** Murray City staff said the remedy continues to be protective of health and the environment and stringently enforce all of the institutional controls to keep barriers in place. Institutional controls remain effective primarily through the SSOD which manages any development or construction activities on the former cleanup site. The SSOD requires maintenance of the barriers, caps, and controls on excavated subsurface material within this area. Surface water and shallow arsenic contaminated groundwater is monitored and sampled annually in May.

3. **Does your office conduct routine communications and/or activities (site visits, inspections, reporting activities, participation in meetings, etc.) for the Murray Smelter Superfund Site? If so, please briefly summarize the purpose and results of these communications and/or activities over the past several years.** Murray City is required to do biannual barrier inspections, annual groundwater monitoring, and an annual inspection report for state and EPA review which was not completed in 2018 due to departmental personnel changes. Murray City officials acknowledged the reporting mistake, have coordinated with appropriate SSOD staff, collected 2018 reports, and will move forward with the 2019 inspections. Murray City had always submitted an annual report in subsequent years.

4. **Are you aware of any community concerns regarding the Murray Smelter Superfund Site or its operation and administration? If so, please give details.** Since cleanup in 2001, no one from the City staff had heard anything from the community or current property owners concerned about the health and environment of the former Murray Smelter site

5. **Over the past five years, have there been any complaints, violations, or other incidents (e.g., vandalism, trespassing, or emergency responses) at or related to the Murray Smelter Superfund Site requiring your office to respond? If so, please give details of the events and results of the response.** No incidents or an emergency response for the capped site over the years as the City said they keep a close watch on the area. Staff cited an example of stopping work noticing a contractor hand digging just within the SSOD and informed of the required permits before resuming work again. Murray City said the SSOD works great and triggers an extensive inter-departmental approval process necessary to build within the overlay district.

6. **Do you feel well informed about the site's activities and progress over the last five years? Do you know how to contact the Environmental Protection Agency if you have questions or concerns about the Murray Smelter Superfund Site?** Murray officials said they have always worked very well with EPA and UDEQ project managers and property owners with inspections and reporting. Any issues or concerns would be communicated without reservation to keep the SSOD compliant in every way possible.

7. **Over the past five years, have there been any changes in your department's policies or regulations that impact the Murray Smelter Superfund Site and/or your role? If so, please describe the changes and the impacts.** Other than new personnel, Murray officials have not had any changes to policy or regulations affecting the site. All permitting and SSOD requirements remain as originally established.

8. **Over the past five years, have there been any changes in land use surrounding the Murray Smelter Superfund Site? Are you aware of potential future changes in land use? If so, please describe.** Murray officials said there are no new plans for development other than existing property owners making modifications to parking or building structures. The Intermountain Medical Center built an underground parking area in 2017 which required SSOD coordination with the City. Costco had a road entrance widened for delivery trucks requiring curbing and landscaping alterations without digging into the cap in the fall of 2017. No construction since then and there is discussion of the Utah Transit Authority and Murray City possibly developing a transit city center in the distant future.

   All development options would require extensive review and coordination. Murray City said avoiding any major construction projects in the SSOD is the preferred path forward at this time.

9. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation (institutional controls)? If so, what types of future problems do you think (1) could occur; or (2) would concern you and/or your department?** Murray City said they are confident any and all communication gaps with staff positions are in place. Murray City has added risk management and attorney sign-off on SSOD reports and permitting tasks to help address future staff turnover. Murray City said the Annual Report for 2019 will be ready this summer.

Murray Smelter Superfund Site
Five-Year Review
Interview of Local Community

Site Name: Murray Smelter EPA ID: UTD980951420	February 5, 2019
Type of Contact: Visit	Contact Made By: Dave Allison, UDEQ/DERR Community Involvement Coordinator and Michael Storck, UDEQ/DERR Project Manager
Persons Contacted	
Name: Chris Quarnberg, Murray Costco #374 Store Manager	Organization: Costco Wholesale 5201 Intermountain Dr. Murray, UT 84107

1. **Is your organization/department aware of the Murray Smelter Superfund site and the actions underway to address environmental contamination?** Chris Quarnberg, the current Murray Costco Warehouse Manager, is aware of the cleanup site history and was not sure of the 2018 reporting status of barrier monitoring conducted annually. Quarnburg has managed at the Murray Costco for only a year and said Facilities Manager, Chad Efnor, was aware of the required barrier maintenance reports. Efnor coordinates landscaping duties regarding asphalt and sprinkler repairs.

   The Murray Costco Wholesale Store was opened at the former Murray Smelter Superfund Site covering 16-acres in 2003. The southeast corner of the site is now home to a 148,000-square-foot Costco store. Bricks from demolished smelter smokestacks became fill for construction of the store and parking areas. Costco leases the 16-acre property from IHC.

2. **What's your overall impression (your general sentiment) of the actions being performed at the Murray Smelter Superfund Site?** Quarenburg was not aware of any issues with the cleanup remedy and did not have any concerns regarding the site.

3. **Does your office conduct routine communications and/or activities (site visits, inspections, reporting activities, participation in meetings, etc.) for the Murray Smelter Superfund Site? If so, please briefly summarize the purpose and results of these communications and/or activities over the past several years.** Quarnberg said their environmental contractor, Kleinfelder, handles the annual compliance inspections and would check the status of the 2018 inspection report with Costco's contractor.

4. **Are you aware of any community concerns regarding the Murray Smelter Superfund Site or its operation and administration? If so, please give details.** Quarnberg said there have never been any concerns from the community regarding the store's location or history.

5. **Over the past five years, have there been any complaints, violations, or other incidents (e.g., vandalism, trespassing, or emergency responses) at or related to the Murray Smelter Superfund Site requiring your office to respond? If so, please give details of the events and results of the response.** In his one-year time as manager, Quarnberg said there haven't been any incidents regarding the parking lot cap. Quarnberg was not aware of a sinkhole repair conducted in 2014 to stop groundwater leakage into the storm drain and Costco has not had to respond or repair any related cap issues. Quarnberg said there have not been any recurring problems with groundwater and the Costco property since he's been at the Murray store.

6. **Do you feel well informed about the site's activities and progress over the last five years? Do you know how to contact the Environmental Protection Agency if you have questions or concerns about the Murray Smelter Superfund Site?** Quarnberg said store records and knowledgeable employees of the environmental responsibilities are in place with contacts at UDEQ, EPA, and Murray City. Quarenberg doesn't have any concerns and would know to communicate any issues as store compliance is a priority.

7. **Over the past five years, have there been any changes in your department's policies or regulations that impact the Murray Smelter Superfund Site and/or your role? If so, please describe the changes and the impacts.** Quarnberg said there are no changes to the way Costco has maintained site conditions. No construction has occurred outside the store with any future plans at this time to alter the parking lot cap.

8. **Over the past five years, have there been any changes in land use surrounding the Murray Smelter Superfund Site? Are you aware of potential future changes in land use? If so, please describe.** Quarnberg said the store does not have any plans to expand or reason dig into the cap and knows any construction permits would be coordinated for approval with Murray City.

9. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation (institutional controls)? If so, what types of future problems do you think (1) could occur; or (2) would concern you and/or your department?** Quarnberg requested the name of the Kleinfelder contractor to check on any the barrier inspection reports for 2018. On Quarnberg's follow-up, Corinne Hillard, the Kleinfelder Project Manager for the Murray, Utah Costco store #764, provided reports documenting the 2017 and 2018 Semi-Annual Barrier Monitoring conducted for the Murray City.

   The reports document the semi-annual barrier inspections were conducted in accordance with the Site Barrier Monitoring and Maintenance Plan (BMMP) designed to meet the requirements of Murray City Ordinance Number 9807 (Ordinance 9807). In general summary, the Site surface barriers are intact and do not present an exposure pathway to the metals-impacted soil or groundwater beneath the Site.

   Costco's contractor is scheduled to conduct the next Site barrier inspection in spring 2019 with an annual report prepared after the fall inspection. Also, Kleinfelder provided Utah DERR and the EPA documentation that the Site storm water drainage vaults were inspected as part of the monitoring program and were found to be intact with no apparent leakage of groundwater into the storm system.

Murray Smelter Superfund Site
Five-Year Review
Interview of Local Community

Site Name: Murray Smelter EPA ID: UTD980951420	February 13, 2019
Type of Contact: Visit	Contact Made By: Dave Allison, UDEQ/DERR Community Involvement Coordinator and Michael Storck, UDEQ/DERR Project Manager
Person Contacted	
Name: Braxton Hall, Facilities Manager Rob Rogalski, Landscape Supervisor Robert Smith Thomas Patterson	Organization: Intermountain Medical Center 5121 Cottonwood Street Murray, UT 84107

1. **Is your organization/department aware of the Murray Smelter Superfund site and the actions underway to address environmental contamination?** Braxton Hall, Intermountain Medical Center (IMC) Facilities Manager, has worked with the hospital for 11 years and involved with the Smelter Site overlay District from construction of the medical center to maintaining the remedy. Hall's facility staff conducts monthly barrier inspections and reports for the Murray City SSOD Annual Report.
   Intermountain Health Care purchased 100 acres at the site in 2000 for the construction of the new hospital. Following groundbreaking in September 2003, the facility opened in October 2007.

2. **What's your overall impression (your general sentiment) of the actions being performed at the Murray Smelter Superfund Site?** Hall and the IMC staff said the cap barrier has worked well with mainly minor maintenance of asphalt cracks in the parking areas and the property is in overall good shape.

3. **Does your office conduct routine communications and/or activities (site visits, inspections, reporting activities, participation in meetings, etc.) for the Murray Smelter Superfund Site? If so, please briefly summarize the purpose and results of these communications and/or activities over the past several years.** Hall said IMC provides monthly inspection reports to the Murray City Development Services Manager for an annual SSOD report. Regular oversight keeps the IMC staff aware of any conditions or issues. The IMC maintenance department also has assistance from their environmental contractor with barrier management advice throughout the year. It's a regular practice, Hall said to phone Murray City of any matters regarding the Smelter Site Overlay District guidance, from a small post installation to landscaping changes.

4. **Are you aware of any community concerns regarding the Murray Smelter Superfund Site or its operation and administration? If so, please give details.** Hall said there is no community concerns regarding the medical center located on a former smelter site. The IMC maintenance department has always made a committed effort to keep barrier conditions from becoming a problem for the medical center community.

5. **Over the past five years, have there been any complaints, violations, or other incidents (e.g., vandalism, trespassing, or emergency responses) at or related to the Murray Smelter Superfund Site requiring your office to respond? If so, please give details of the events and results of the response.** Hall could not recall any complaints or violations with the property. There was an issue during a parking lot expansion in 2017 with some uncovered soil during construction which was brought to IMC's attention by Murray City. Hall said his department was not involved with the construction oversight despite having

SSOD duties for the IMC property. Hall said he's advocated for more coordination with all IMC construction projects and IHC has wanted to keep some development projects within respective divisions and contractors. Hall understands the parking lot contractors immediately responded to the uncovered soil and said his department will push to have more involvement with management construction decisions on future projects.

6. **Do you feel well informed about the site's activities and progress over the last five years? Do you know how to contact the Environmental Protection Agency if you have questions or concerns about the Murray Smelter Superfund Site?** Hall said his department has experienced staff and is familiar with a variety of agencies regarding the SSOD. From Murray City, UDEQ, EPA, and IMC's environmental contractors, Hall said any issues and interaction are communicated appropriately. The inspection schedule keeps everyone regularly involved with property management.

7. **Over the past five years, have there been any changes in your department's policies or regulations that impact the Murray Smelter Superfund Site and/or your role? If so, please describe the changes and the impacts.** Hall said the IMC Facilities/Maintenance Department has undergone an extensive re-organization with different positions assigned new responsibilities. However, Hall said the department changes would not compromise the tasks associated with the SSOD ordinance just different managers over different areas of the campus.

8. **Over the past five years, have there been any changes in land use surrounding the Murray Smelter Superfund Site? Are you aware of potential future changes in land use? If so, please describe.** Hall said IMC property does not expect the hospital land use to change. There is always the prospect for expansion and has heard there may be an additional parking garages and a convalescent building in future planning. All projects which would have to be compliant with the existing SSOD plan and Murray City permits. Hall said he takes any potential development into consideration regarding the parking lot cap. Hall cited a grading/slope issue which may require repair on the west side of the parking lot to restrict potential storm runoff.

9. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation (institutional controls)? If so, what types of future problems do you think (1) could occur; or (2) would concern you and/or your department?** No comments or suggestions from the IMC department staff. There is an occasional issue with groundwater leaking into an underground utility tunnel which runs along the IMC campus. The water is minimal and sampled (with non- detection lab results to date) and comes from small cracks in the concrete. IMC repairs the cracks and has a sump pump to control water pooling and wondered what level of reporting may be required. UDEQ/DERR said unless a major issue develops such as a sink hole or erosion, repairing the cracks wouldn't require oversight and could be handled by the IMC facilities team.

Murray Smelter Superfund Site
Five-Year Review
Interview of Local Community

Site Name: Murray Smelter EPA ID: UTD980951420	February 4, 2019
Type of Contact: Visit	Contact Made By: Dave Allison, UDEQ/DERR Community Involvement Coordinator and Michael Storck, UDEQ/DERR Project Manager
Person Contacted	
Name: Buffie Chournos, Environmental Compliance Administrator	Organization: Utah Transit Authority 669 West 200 South Salt lake City, UT 84101

1. **Is your organization/department aware of the Murray Smelter Superfund site and the actions underway to address environmental contamination?** Buffie Chournos is the Environmental Compliance Administrator for the Utah Transit Authority (UTA) which has a light rail line and parking lot built on the former Murray Superfund site cleanup area. Chournos has worked at UTA for 2 ½ years and oversees the quarterly inspections required in the Smelter Site Overlay District (SSOD). Chournos compiles the UTA inspection reports with photos for submittal (usually in January) to Murray City to incorporate in the Murray Smelter Superfund Site Annual Report.

2. **What's your overall impression (your general sentiment) of the actions being performed at the Murray Smelter Superfund Site?** Chournos said the remedy is working without any major problems since she has worked on the site. UTA built the light-rail station on 6.5 acres on the southern end of the site in 2000. The parking lot asphalt is a constant battle for Chournos, a frequent repair, and one not going away anytime soon. The parking lot is a large area with frequent car traffic and a sloped grade which all contribute to cracking the asphalt barrier. No cap exposure issues have occurred along the UTA property.

   Chournos said UTA is required by the SSOD to inspect and report on areas 24-48 hours after a rain or precipitation event of more than a ¼--inch. Chournos has not experienced any related erosion to the barrier cap on UTA property. UTA also has a building directly west of the station, which is also located on site. Chournos has a maintenance person on call to help address any immediate repair problems.

3. **Does your office conduct routine communications and/or activities (site visits, inspections, reporting activities, participation in meetings, etc.) for the Murray Smelter Superfund Site? If so, please briefly summarize the purpose and results of these communications and/or activities over the past several years.** As part of the SSOD, Chournos conducts and compiles quarterly inspection reports with photos for submittal (usually in January) to Murray City to incorporate in the Smelter Superfund Site Annual Report. Chournos has had to assist contractors by watching for trains during well sampling activities in close proximity to UTA rail lines.

4. **Are you aware of any community concerns regarding the Murray Smelter Superfund Site or its operation and administration? If so, please give details.** There have not been any community concerns with the UTA property presented to Chournos attention over the last five years.

5. **Over the past five years, have there been any complaints, violations, or other incidents (e.g., vandalism, trespassing, or emergency responses) at or related to the Murray Smelter Superfund Site requiring your office to respond? If so, please give details of the events and results of the response.** No incidents to report other Chournos says she is doing everything possible to keep asphalt cracks filled. UTA has had

to repair an occasional sprinkler head and some curbing hit during snow removal. No incidents related to site remediation cap measures in place.

6. **Do you feel well informed about the site's activities and progress over the last five years? Do you know how to contact the Environmental Protection Agency if you have questions or concerns about the Murray Smelter Superfund Site?** Chournos said the inspection and reporting required of UTA property has resulted in staying up-to-date and in touch with everyone involved. Any staff turnover at Murray city didn't prevent any reporting issues and Chournos has met the UDEQ Project Manager Michael Storck and would call with any questions.

7. **Over the past five years, have there been any changes in your department's policies or regulations that impact the Murray Smelter Superfund Site and/or your role? If so, please describe the changes and the impacts.** Chournos said no UTA policies have changed regarding the UTA's property at the Murray site and UTA SSOD responsibilities are to remain diligent and compliant.

8. **Over the past five years, have there been any changes in land use surrounding the Murray Smelter Superfund Site? Are you aware of potential future changes in land use? If so, please describe.** No landscaping changes have occurred at the UTA site and there are occasional planning discussions over the years to expand the Murray Transit Center with commercial or parking structures in the future. UTA doesn't have any immediate plans at this time and Chournos recommends not altering the transit site at all. The SSOD also requires permits for any construction and future plans would require Murray City approval.

9. **Do you have any comments, suggestions, or recommendations regarding the site's management or operation (institutional controls)? If so, what types of future problems do you think (1) could occur; or (2) would concern you and/or your department?** Chournos said the UTA Murray Station has not posed any management problems as a part of responsibilities associated with the UTA environmental compliance department and the SSOD. However, Chournos doesn't want the parking lot asphalt cracks to become a bigger problem and will look into some funding to try a more substantial repair option.

APPENDIX C

SITE INSPECTION CHECKLIST/PHOTOS

PHOTOGRAPHIC LOG

Inspection Date: February 20, 2019	Murray Smelter Fourth Five Year Review	

Photo No.1	Date: 2/20/19

Description:IMC: from Cottonwood St./Looking North

Photo No.2	Date: 2/20/19

Description: UTA Parking Lot/Crack Asphalt

PHOTOGRAPHIC LOG

Inspection Date: February 20,2019	Murray Smelter Fourth Five Year Review	

Photo No.3	Date: 2/20/19

Description: UTA Parking Lot/Crack Asphalt

Photo No.4	Date: 2/20/19

Description: Monitoring Well MW-5D/North Parking Structure

I. SITE INFORMATION	
Site name: Murray Smelter Superfund Site	**Date of inspection:** February 20, 2019
Location and Region: Murray City, Salt Lake County, Region 8	**EPA ID:** UTD980951420
Agency, office, or company leading the five-year review: DERR	**Weather/temperature:** 30 degrees, cloudy, 30 mph winds

Remedy Includes: (Check all that apply)

- ☑ Landfill cover/containment
- ☑ Access controls
- ☑ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other_____
- ☑ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☑ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____New inspector_____ _____ _____

Name Title Date

Interviewed ☑ at site ☐ at office ☐ by phone Phone no. _____

Problems, suggestions; ☐ Report attached _____Conducting biannual inspections on time_____

2. **O&M staff** _____ _____ _____

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____

Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☑ O&M manual — ☑ Readily available — ☑ Up to date — ☐ N/A
   - ☑ As-built drawings — ☑ Readily available — ☑ Up to date — ☐ N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☐ Up to date — ☑ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☑ N/A

   Remarks_____

3. **O&M and OSHA Training Records** — ☐ Readily available — ☐ Up to date — ☑ N/A

   Remarks_____

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☑ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☑ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☑ N/A
   - ☑ Other permits__Building_____ — ☐ Readily available — ☑ Up to date — ☐ N/A

   Remarks_____

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☑ N/A

   Remarks_____

6. **Settlement Monument Records** — ☐ Readily available — ☑ Up to date — ☐ N/A

   Remarks_____

7. **Groundwater Monitoring Records** — ☑ Readily available — ☑ Up to date — ☐ N/A

   Remarks_____

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☑ N/A

   Remarks_____

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ☑ N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — ☑ N/A

   Remarks_____

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☑ N/A

    Remarks_____

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ PRP in-house
   - ☐ Federal Facility in-house
   - ☐ Contractor for State
   - ☑ Contractor for PRP
   - ☐ Contractor for Federal Facility
   - ☐ Other _____

2. **O&M Cost Records**
   - ☐ Readily available ☐ Up to date
   - ☑ Funding mechanism/agreement in place
   - Original O&M cost estimate _____ ☐ Breakdown attached

   Total annual cost by year for review period if available

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☑ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☑ N/A
   Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☑ N/A
   Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement- Murray City responsible for implementing ICs**

Site conditions imply ICs not properly implemented ☐ Yes ☑ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☑ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) __Biannual inspections of barriers_____
Frequency __November and May_____
Responsible party/agency __Murray City_____
Contact _ Melinda Greenwood_Community and Eco Dev Director_____

_____ _____ _____
Name Title Date Phone no.801-270-2428

Reporting is up-to-date ☑ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☑ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☑ N/A
Violations have been reported ☐ Yes ☐ No ☑ N/A
Other problems or suggestions: ☐ Report attached
_____Initial construction of IHC parking lot on north end of site observed stockpile materials were not covered as required in the SSOD. EPA and DERR met with contractor and resolved issue and stockpile materials were covered nightly until project was completed._____

2. **Adequacy** ☑ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☑ No vandalism evident
Remarks_____

2. **Land use changes on site** ☑ N/A
Remarks_____

3. **Land use changes off site** ☑ N/A
Remarks_____

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☑ Roads adequate ☐ N/A
Remarks_____

B. Other Site Conditions

Remarks _Some cracks observed on UTA Parking Lot that will be fixed in Spring 2019._____

VII. LANDFILL COVERS ☑ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☑ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** ☐ Location shown on site map Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks___Some cracks on UTA parking lot. Will be repaired in Spring 2019_____

3. **Erosion** ☐ Location shown on site map ☑ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** ☐ Location shown on site map ☑ Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☑ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks___Grass and landscape established and well maintained._____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks____Note existing buildings, parking lots, and paved roads act as barriers._____

7. **Bulges** ☐ Location shown on site map ☑ Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** ☑ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☑ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☑ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☑ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☑ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☑ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☑ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☑ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☑ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☑ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☑ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☑ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☑ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____

H. Retaining Walls ☐ Applicable ☑ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☑ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☑ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☑ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☑ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☑ N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

C. Treatment System ☐ Applicable ☑ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   ☑ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation			
1. Monitoring Wells (natural attenuation remedy)			
☐ Properly secured/locked	☑ Functioning	☑ Routinely sampled	☐ Good condition
☐ All required wells located	☐ Needs Maintenance		☐ N/A
Remarks			

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Remedy is capping with barriers to eliminate exposure pathway and monitored natural attenuation of groundwater. The remedy is functioning as designed. Institutional controls are in place that do not allow installation of new wells or use of existing wells. Groundwater monitoring/sampling is conducted on an annual basis.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

____O&M activities are adequate and remedy is currently protective.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

_____None noted during this five year review.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

____None noted.