1551629 - R8 SDMS

Five-Year Review Report

Fourth Five-Year Review Report for Silver Bow Creek/Butte Area Superfund Site

EPA ID MTD980502777

Butte
Silver Bow and Deer Lodge Counties, Montana

January 2016

Prepared by:
United States Environmental Protection Agency
Region 8
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Approved by:

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List of Acronyms

ACMC	Anaconda Copper Mining Company
ARAR	Applicable or Relevant and Appropriate Requirement
BMFOU	Berkeley Pit/Mine Flooding Operable Unit
BMP	Best Management Practices BPSOU
	Butte Priority Soils Operable Unit
BRES	Butte Reclamation Evaluation System
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act, as amended
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CTEC	Citizens Technical Environmental Committee
DNRC	Montana Department of Natural Resources and Conservation EPA
	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
HSB	Horseshoe Bend
IC	Institutional Control
MCL	Maximum Contaminant Level
MDEQ	Montana Department of Environmental Quality
MTFWP	Montana Department of Fish, Wildlife and Parks
µg/dL	microgram per deciliter
µg/L	microgram per liter
µg/m^3	microgram per meter cubed
mg/kg	milligram per kilogram
mg/L	milligram per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan NPL
	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act of 1976
RI/FS	Remedial Investigation and Feasibility Study RMAP
	Residential Metals Abatement Program
ROD	Record of Decision
RPM	Remedial Project Manager SSTOU
	Streamside Tailings Operable Unit
TBC	To-Be-Considered
UAO	Unilateral Administrative Order WSPOUs
	Warm Springs Ponds Operable Units

Executive Summary

The Silver Bow Creek/Butte Area Superfund site (the Site) is a Superfund site in the upper Clark Fork River Basin, Silver Bow and Deer Lodge Counties, Montana. The Site includes approximately 26 miles of stream and streamside habitat, the urban centers of Butte and Walkerville, rural areas outside of Butte, the Berkeley Pit and the underground mine workings of the historic Butte Mining District, and the treatment/settling lagoons at the Warm Springs Ponds.

Historical mining activities in Butte, Montana, and the surrounding areas generated a variety of wastes. Mining waste disposal practices and mining activities contaminated soil, sediment, groundwater and surface water with arsenic and other heavy metals, leaving the natural landscape of the area void of vegetation and wildlife.

The selected remedies to date involve a variety of actions including removal of tailings and contaminated soils and sediment, treatment of contaminated areas, construction of water treatment plant and treatment of contaminated surface water, capping of contaminated areas, revegetation, installation of stormwater controls, groundwater capture and treatment, an alternative water supply system for the community of Rocker, institutional controls and a residential metals abatement program (RMAP) that provides a comprehensive cleanup of residential areas.

The triggering action for the Five-Year Review (FYR) was the signing of the previous FYR on June 27, 2011. The outstanding or ongoing issues and recommendations identified in that document will be monitored, and are expected to be addressed as the remedial actions are completed and final operation and maintenance plans are developed.

The remedy at SSTOU (OU 1) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.

The remedy at BMFOU (OU 3) is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled.

The interim remedy at Warm Springs Pond Active OU (OU 4) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks. A final remedy will be issued.

The interim remedy at Warm Springs Ponds Inactive OU (OU 12) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks. A final remedy will be issued.

A protectiveness determination of the remedy at the Rocker OU (OU 7) cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions: completion of the updated conceptual site model and further investigation of private domestic area wells. It is expected that these actions will take approximately 18 months to complete, at which time a protectiveness determination will be made.

The remedy at BPSOU (OU 8) is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Silver Bow Creek/Butte Area		
EPA ID: MTD980502777		
Region: 8	**State:** MT	**City/County:** Butte/ Silver Bow

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

REVIEW STATUS
Lead agency: EPA
Author name: Sara Sparks, Nikia Greene and Kristine Edwards with contractor support from Ryan Burdge and Treat Suomi
Author affiliation: EPA Region 8 and Skeo Solutions
Review period: 09/11/2014 – 12/15/2015
Date of site inspection: 10/01/2014 – 10/02/2014
Type of review: Statutory
Review number: 4
Triggering action date: 06/27/2011
Due date *(five years after triggering action date)*: 06/27/2016

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): SSTOU (OU 1)	**Issue Category: Institutional Controls**			
	Issue: An operation and maintenance plan has been submitted but not yet approved.			
	Recommendation: Finalize and approve the operation and maintenance plan.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	9/30/2017

OU(s): SSTOU (OU 1)	**Issue Category: Institutional Controls**			
	Issue: Institutional controls are not yet implemented.			
	Recommendation: Develop and implement an institutional controls plan.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	9/30/2017

OU(s): SSTOU (OU 1)	**Issue Category: Remedy Performance**			
	Issue: Areas of vegetation failure remain.			
	Recommendation: Identify and remove all remaining hot spots.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	9/30/2017

OU(s): SSTOU (OU 1)	Issue Category: Remedy Performance			
	Issue: The interaction between groundwater and surface water is not fully characterized.			
	Recommendation: Conduct a more detailed assessment of how metal COC concentrations in groundwater influence metal COC concentrations in surface water.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	9/30/2017

OU(s): SSTOU (OU 1)	Issue Category: Changed Site Conditions			
	Issue: The ecological risk assessment did not consider the current fauna now present at remediated areas.			
	Recommendation: Evaluate risk to ecological receptors.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	9/30/2017

OU(s): BMFOU (OU 3)	Issue Category: Changed Site Conditions			
	Issue: Rotational slumps have occurred at the Berkeley Pit and analysis indicates there will continue to be future slumps.			
	Recommendation: Complete implementation of the recommendations required by EPA regarding the 2014 slope stability study.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/MDEQ	9/30/2017

OU(s): BMFOU (OU 3)	Issue Category: Monitoring			
	Issue: Sampling of the water in the Berkeley Pit has been limited due to safety concerns of physically being on the surface of the water.			
	Recommendation: Implement current alternatives that are being developed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/MDEQ	9/30/2017

OU(s): BMFOU (OU 3)	Issue Category: Changed Site Conditions			
	Issue: A portion of the Waterfowl Mitigation Plan has been modified due to safety concerns related to slope stability at the Berkeley Pit.			
	Recommendation: After implementing recommendations required by EPA regarding the 2104 slope stability study, evaluate the remedy to determine any needed changes to the Waterfowl Mitigation Plan.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/MDEQ	9/30/2019

OU(s): Warm Springs Ponds (OUs 4 and 12)	Issue Category: Remedy Performance			
	Issue: Arsenic surface water standard seasonally exceeded in effluent.			
	Recommendation: Complete arsenic treatment optimization studies, and then determine if meeting RAOs is feasible.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2017

OU(s): Warm Springs Ponds (OUs 4 and 12)	Issue Category: Remedy Performance			
	Issue: New exposure pathways for wildlife/aquatic life may now be present.			
	Recommendation: Evaluate contaminant pathways.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	9/30/2017

OU(s): Rocker (OU 7)	Issue Category: Remedy Performance			
	Issue: There appears to be a gap in the monitoring network southwest of RH-05. In addition, during the most recent sampling event, arsenic was detected in tertiary well RH-72 at 230 µg/L, significantly exceeding the arsenic cleanup standard of 10 µg/L.			
	Recommendation: Upon completion of the conceptual site model, update, develop and review the conceptual site model to determine what additional investigation and/or action for this area is warranted to refine groundwater flow direction and to determine the extent of the plume in the southwest direction.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/MDEQ	9/30/2016

OU(s): Rocker (OU 7)	Issue Category: Remedy Performance			
	Issue: Arsenic contamination in the alluvium beneath the remediated area appears to be a continuing source of arsenic to the groundwater.			
	Recommendation: Evaluate the situation and determine any needed updates to the selected remedy.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/MDEQ	9/30/2016

OU(s): Rocker (OU 7)	Issue Category: Remedy Performance			
	Issue: A local private well has arsenic concentrations, at times, above the 10 µg/L standard.			
	Recommendation: Determine whether or not this well and all other domestic wells in the area meet drinking water standards and are not having an effect on the groundwater plume.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/MDEQ	9/30/2016

OU(s): Rocker (OU 7)	Issue Category: Monitoring			
	Issue: There is not a complete understanding of how the shallow groundwater interacts with surface water in Silver Bow Creek.			
	Recommendation: Update, develop and review the conceptual site model to determine the potential impact on Silver Bow Creek.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/MDEQ	9/30/2016

OU(s): BPSOU (OU 8)	Issue Category: Monitoring			
	Issue: Annual reports on the Butte Reclamation Evaluation System were limited in their analysis and summary.			
	Recommendation: Provide a Butte Reclamation Evaluation System annual report that is timely, has adequate tracking to maintain the caps, performs required O&M and meets the program schedule.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/MDEQ	12/31/2016

OU(s): BPSOU (OU 8)	Issue Category: Remedy Performance			
	Issue: Community members have information about site areas where damage from trespassing and stormwater occur without a centralized way to report this information.			
	Recommendation: Establish a means for community members to report illegal trespassing, significant stormwater damage and stormwater issues related to Superfund.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/MDEQ	9/30/2018

OU(s): BPSOU (OU 8)	Issue Category: Remedy Performance			
	Issue: The community involvement process highlighted that there is a fair amount of concern in the community regarding remedy implementation and maintenance at BPSOU.			
	Recommendation: Provide a written response to issues raised by community members concerning the alluvial aquifer groundwater rate of flow, the stability of the contaminated plume in the alluvial aquifer, and the functioning of the subdrain capture system.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/MDEQ	9/30/2017

Protectiveness Statement(s)

Operable Unit: SSTOU (OU 1)	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy at SSTOU (OU 1) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.		

Operable Unit: BMFOU (OU 3)	*Protectiveness Determination:* Will be Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy at BMFOU (OU 3) is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled.		

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
Warm Springs Ponds Active (OU 4)	Will be Protective	Click here to enter date.

Protectiveness Statement:
The remedy at Warm Springs Ponds Active OU (OU 4) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
Rocker OU (OU 7)	Protectiveness Deferred	9/30/2017

Protectiveness Statement:
A protectiveness determination of the remedy at the Rocker OU (OU 7) cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions: completion of the updated conceptual site model and further investigation of private domestic area wells. It is expected that these actions will take approximately 18 months to complete, at which time a protectiveness determination will be made.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
BPSOU (OU 8)	Will be Protective	Click here to enter date.

Protectiveness Statement:
The remedy at BPSOU (OU 8) is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
Warm Springs Ponds Inactive (OU 12)	Will be Protective	Click here to enter date.

Protectiveness Statement:
The remedy at Warm Springs Ponds Inactive OU (OU 12) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.

Fourth Five-Year Review Report
for
Silver Bow Creek/Butte Area Superfund Site

1.0 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 or will be protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation and Liability Act as amended (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

EPA Region 8 and Skeo Solutions, an EPA Region 8 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the Silver Bow Creek/Butte Area Superfund site (the Site) in Silver Bow and Deer Lodge Counties, Montana. EPA's contractor conducted this FYR from September 2014 to September 2015. EPA is the lead agency for overseeing and enforcing the cleanup at the Site with the exception of the Streamside Tailings Operable Unit (SSTOU). The Montana Department of Environmental Quality (MDEQ) is the support agency representing the State of Montana for all OUs except the SSTOU, where it is the lead agency. EPA is responsible for conducting the site-wide FYR. Potentially responsible parties (PRPs) finance and implement cleanup at the Site, with the exception of the Streamside Tailings OU (SSTOU) where MDEQ is implementing the remedy using funds provided by the

PRP. MDEQ has reviewed all supporting documentation for this report and provided input to EPA during the FYR process.

This is the fourth FYR for the Site. The triggering action for this statutory review is the previous FYR. The FYR is required due to the fact that hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site currently consists of seven operable units (OUs).[1] This FYR report addresses six site OUs (Table 1).[2]

Table 1. Site OUs

OU Number	OU Name	Included in FYR?	Notes
1	Streamside Tailings OU (SSTOU) (State of Montana lead)	Yes	None
3	Berkeley Pit/Mine Flooding OU (BMFOU)	Yes	None
4	Warm Springs Ponds Active OU	Yes	None
7	Rocker Timber Framing and Treating Plant OU (Rocker OU)	Yes	None
8	Butte Priority Soils OU (BPSOU)	Yes	Includes previously separate OUs 2, 5, 6, 10 and 11
12	Warm Springs Ponds Inactive OU	Yes	None
13	West Side Soils OU	No	In the planning stages for the remedial investigation/feasibility study (RI/FS) stage

Sections 1 through 4 provide site-wide overviews of information. Starting with Section 5, OU-specific information is provided as well as information supporting the technical assessment for each OU.

2.0 Site Chronology

Table 2 lists the dates of important events for the Site.

Table 2. Chronology of Site Events

Event	Date
Placer gold discovered in Silver Bow Creek	1864
Large-scale underground mining in Butte	1875-1955
Major smelting period in Butte	1879-1900
Rocker Timber Framing and Treatment Plant operates	1909-1977
Open-pit mining at Berkeley Pit began	1955
Anaconda Copper Mining Company (ACMC) merged with Atlantic Richfield Company with a full assumption of liability	1977
Discovery of mining-related contamination along Silver Bow Creek between Butte and Warm Springs, Montana	September 1, 1979

[1] The Clark Fork River OU (OU 9) became part of the Clark Fork River Superfund site.
[2] EPA has formally deferred Superfund action at an additional operable unit, the Active Mining Area, which is regulated by MDEQ pursuant to an active mine permit.

Event	Date
Mining at the Berkeley Pit ceased; the underground dewatering pumps in the Kelley mine were shut off; underground workings and Berkeley Pit began flooding with groundwater	1982
EPA proposed Silver Bow Creek site (original portion) for listing on Superfund program's National Priorities List (NPL)	December 30, 1982
Mining at the Continental Pit ceased; water from the Horseshoe Bend (HSB) seep was diverted into Berkeley Pit	1983
EPA adds Silver Bow Creek site (original portion) to NPL	September 8, 1983
Mining resumed in Continental Pit by Montana Resources; operations included heap leaching of old Berkeley Pit waste rock	1986
EPA issued Silver Bow Creek (original portion) site-wide Phase I Remedial Investigation Final Report	January 1987
Butte Area portion added to Silver Bow Creek site by Federal Register Notice	July 22, 1987
Walkerville time-critical removal action completed	February 1988
MDEQ directed cleanup of 1,000 cubic yards of contaminated soil at Rocker OU Timber Butte time-critical removal action completed West Camp non-time-critical removal action completed EPA completed RI/FS for Warm Springs Ponds Active Area OU 4	1989
EPA issued Administrative Order on Consent for Mill-Willow Bypass removal action at Warm Springs Ponds	June 1990
EPA issued Interim Record of Decision (ROD) for Warm Springs Ponds Active Area OU 4	September 28, 1990
BPSOU Soils time-critical removal action completed	1991
EPA issued Explanation of Significant Differences (ESD) for Warm Springs Ponds Active Area OU. Errata Sheets for the ESD were issued on September 1991 and July 1992.	June 24, 1991
PRP completed RI/FS for Rocker OU	August 2, 1991
EPA issued Unilateral Administrative Order for Warm Springs Ponds Active Area OU	September 25, 1991
PRP completed RI/FS for the SSTOU	September 30, 1991
Colorado Smelter time-critical removal action completed Anselmo Mine Yard and Late Acquisition/Silver Hill time-critical removal action completed Lower Area One non-time-critical removal action completed Manganese time-critical removal action completed	1992
EPA issued Interim ROD for Warm Springs Ponds Inactive Area OU PRP began remedial action for Warm Springs Ponds Active OU	June 30, 1992
EPA issued Unilateral Administrative Order for Warm Springs Ponds Inactive Area OU ROD implementation	June 17, 1993
Residential/source areas removal action: many residential yards and waste rock dumps throughout Butte and Walkerville have been or are being addressed	1994
PRP began remedial action for Warm Springs Ponds Inactive OU	May 18, 1994
PRP completed RI/FS for BMFOU in 1994; EPA issued a ROD for BMFOU	September 29, 1994
SSTOU RI/FS completed – 1995; EPA issued a ROD for SSTOU	November 29, 1995
Rocker OU RI/FS completed 1995; EPA issued a ROD for Rocker OU	December 22, 1995
HSB water diverted away from the Berkeley Pit and pumped up to the Yankee Doodle Tailings Pond	1996
Stormwater time-critical removal action began and continued until the BPSOU ROD was issued. This included the construction of catch basins and the reclamation of the Alice Pit	1997
Montana Resources ceased heap leaching and started pumping from the Berkeley Pit water to the precipitation plant to extract copper from the water Old Butte Landfill/Clark Mill Tailings removal and Resource Conservation and Recovery Act action completed	1998
EPA issued ESD for SSTOU	August 31, 1998
The United States issued Consent Decree for SSTOU, which provided for implementation of the 1996 SSTOU ROD as modified by 1998 ESD	November 13, 1998

Event	Date
Railroad beds time-critical removal action addressing contaminated soil on railroad beds and rail yards throughout Butte hills began	1999
Montana Resources temporarily ceased mining in Butte; HSB water started flowing into the Berkeley Pit, triggering planning and construction of the HSB water treatment plant	2000
EPA issued First FYR, with emphasis on Warm Springs Ponds OUs	March 23, 2000
Walkerville residential removal action	2000-2001
The United States issued Consent Decree for Rocker OU	November 7, 2000
EPA issued ESD for BMFOU	March 2002
The United States issued Consent Decree for BMFOU	August 14, 2002
PRP began construction of HSB water treatment plant	2002-2003
Montana Resources resumed mining; HSB water treatment plant started operating; treated HSB water recycled and used in mine operations	2003
Montana Resources resumed pumping Berkeley Pit water to the precipitation plant for copper extraction	2004
Railroad Beds time-critical removal action at BPSOU completed	2004
EPA issued Second FYR, with emphasis on Warm Springs Ponds OUs	September 30, 2005
PRP completed RI/FS for BPSOU EPA issued a ROD for BPSOU	September 21, 2006
HSB water treatment plant performance test conducted	November 2007
Residential Metals Abatement Program approved	March 2010
EPA issued Third FYR	June 27, 2011
EPA issued ESD for BPSOU	July 18, 2011
EPA issued Unilateral Administrative Order for remedy implementation at BPSOU	July 21, 2011
2010 Groundwater Data Analysis Report completed	February 2012
EPA issued a revised Community Involvement Plan for BPSOU	February 2013
EPA issued BPSOU Public Health Study Phase 1 Report	July 2014
EPA issues ESD for Rocker OU	September 30, 2014

3.0 Background

3.1 Physical Characteristics

Site-Wide

The Silver Bow Creek/Butte Area Superfund site (the Site) is one of four contiguous Superfund sites in the upper Clark Fork River Basin in southwestern Montana (Figure 1). The other sites are the Anaconda Smelter Superfund site, the Milltown reservoir/Clark Fork River Superfund site and the Montana Pole Treating Plant Superfund site. The Site covers about 85 square miles, including the entire length of the Silver Bow Creek and associated land contamination from Silver Bow Creek above the confluence with Blacktail Creek westward approximately 26 miles to the Warm Springs Ponds near Anaconda, Montana.[3] The Site also includes the Berkeley Pit

[3] EPA has called the surface area from Texas Avenue to the confluence with Blacktail Creek the “Metro Storm Drain” in prior Superfund removal and remedial documents and publications, including the 2006 Butte Priority Soils Operable Unit Record of Decision (2006 BPSOU ROD) and the 2011 BPSOU ESD. MDEQ has requested that this document refer to this same area as Silver Bow Creek in light of the Montana Second Judicial District Court’s order in Silver Bow Creek Headwaters Coalition v. State of Montana, DV-10-431 (August 17, 2015) regarding the appropriate name to be applied by the State for this area under state law. See Appendix J at page J-3. Reference to the area as “Silver Bow Creek” should not be construed as an EPA admission or determination on any procedural or substantive issue. The United States retains and reserves all its rights and authorities.

and the underground mine workings of the historic Butte Mining District, the urban centers of Butte and Walkerville, rural areas outside of Butte, Silver Bow Creek and streamside habitat, and the treatment/settling lagoons at the Warm Springs Ponds.

The landscape surrounding the Site is characterized by high mountain peaks reaching elevations above 10,000 feet. Surface water and groundwater resources receive the most recharge in the spring and early summer due to melting mountain snow pack and spring rains.

Historically, Silver Bow Creek began at the Continental Divide and flowed through the area that is now the Berkeley Pit and the Montana Resources permitted mine area. Mining activity has permanently altered this uppermost reach of Silver Bow Creek. Currently, there is no surface water flow in the Silver Bow Creek above Blacktail Creek, except during storm runoff or snowmelt conditions. Downstream of Butte, Silver Bow Creek flows west into Durant Canyon. Within the canyon, the creek turns northward and enters the Southern Deer Lodge Valley and continues to flow for another 6.5 miles before entering the Warm Springs Ponds.

OU 1: Streamside Tailings OU (SSTOU)
The SSTOU surface area consists of about 26 linear miles of Silver Bow Creek and fluvially deposited tailings along the Creek, from just outside of Butte to the Warm Springs Ponds. It also includes associated groundwater contamination. Historically, the creek was used to impound smelter tailings and convey wastes out of Butte. Mining wastes carried from Butte were deposited in the floodplain, impacting water quality throughout Silver Bow Creek.

OU 3: Berkeley Pit/Mine Flooding (BMFOU)
The Berkeley Pit is BMFOU's major feature. It is 1,780 feet deep and encompasses 675 acres. The BMFOU consists of contaminated water in the Berkeley Pit, contaminated water in thousands of miles of associated underground mine workings (lying beneath the City of Butte and Town of Walkerville, as well as beneath the Montana Resources permitted active mine area), and other contaminated inflow to BMFOU. Active mining continues in the Continental Pit nearby, in Montana Resources' permitted area. The active mining operations use treated site water, which affects the water balance in the BMFOU.[4]

OUs 4 and 12: Warm Springs Ponds Active and Inactive OUs
The Warm Springs Ponds surface area include three ponds located at the downstream end of the Site that treat Silver Bow Creek water before discharge to Clark Fork. The Warm Springs Ponds OUs also include associated groundwater contamination and the nearby Mill-Willow Bypass. They cover about 2,500 acres.

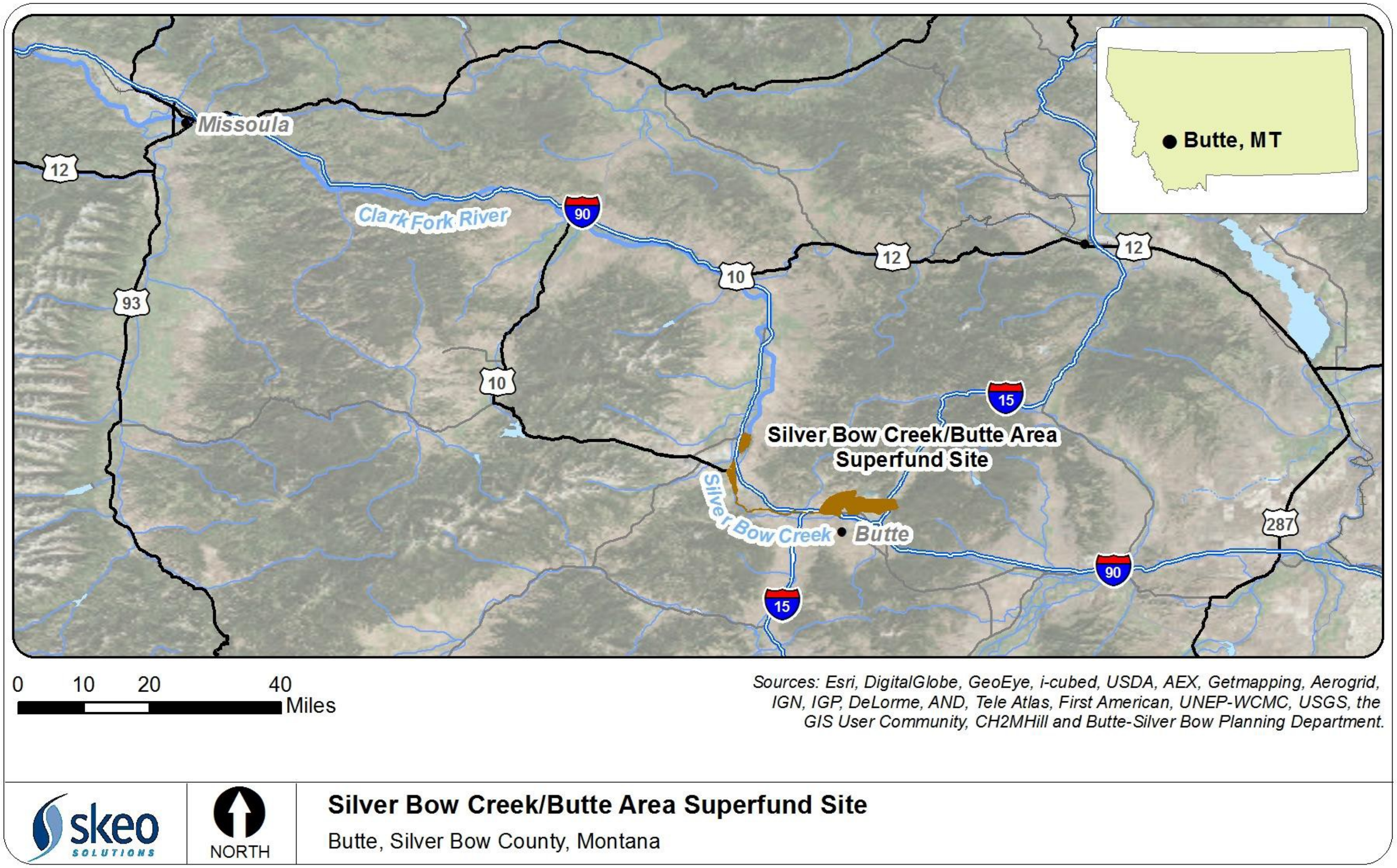
OU 7: Rocker Timber Treating and Framing OU
The Rocker OU surface area covers approximately 16 acres and is located south of U.S. Interstate 15/90 near Rocker, Montana, approximately 3 miles west of Butte (Figure 2). It includes soil and groundwater contamination associated with the former Rocker Timber Framing and Treating Plant. The surface boundary of the Rocker OU adjoins the SSTOU on one side.

OU 8: Butte Priority Soils OU (BPSOU)

[4] An active hardrock mining permit issued by MDEQ addresses reclamation of the active mining operations.

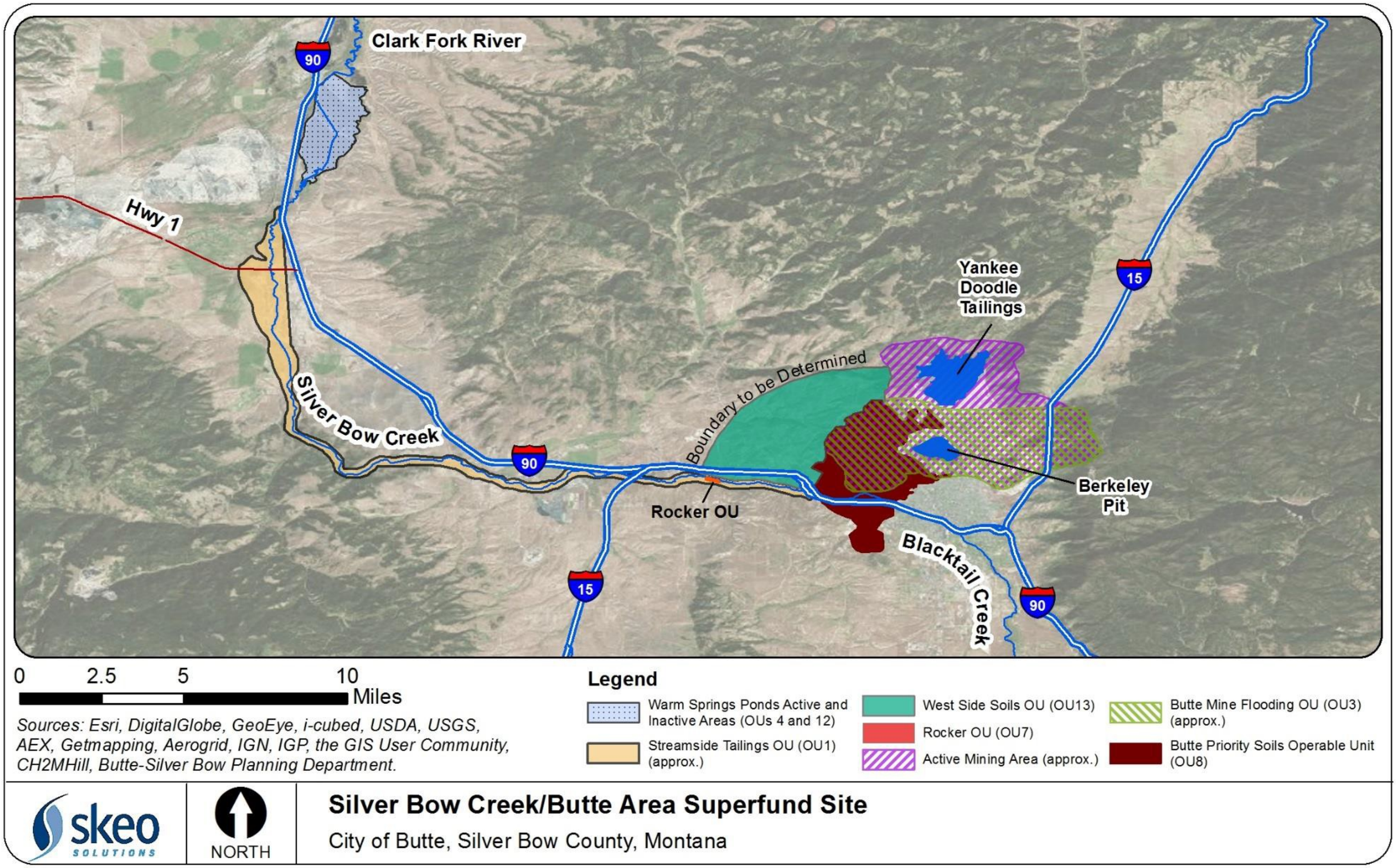
The BPSOU surface area covers a 5-square-mile area, and encompasses the Town of Walkerville and a large portion of the City of Butte, as well as associated alluvial aquifer contamination. It is located a few miles west of the Continental Divide at an elevation range of approximately 5,400 to 6,400 feet above mean sea level. The BPSOU is centered on Butte Hill, the location of the historic Butte Mining District.

Figure 1. Site Location Map



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

Figure 2. Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site. This map was amended from Silver Bow Creek/ Butte Soils Five Year Review 2011. CH2MHill

3.2 Site-Wide Land and Resource Use

The Site spans diverse land uses and resources. Uptown Butte, Walkerville, Rocker, and Ramsay include neighborhoods, commercial areas and industrial districts. The Site also encompasses the entire active mining area east of the Butte Hill. West and north of Butte, the Site includes stream and streamside habitat along the length of Silver Bow Creek between Butte and its confluence with Warm Springs Creek. Land in the Silver Bow Creek corridor is mostly privately owned and consists of sparsely populated open land used primarily for agriculture. The Warm Springs Ponds offer habitat for migrating waterfowl and breeding areas for dozens of songbird and osprey. The Warm Springs Ponds area is a designated wildlife management area administered by the Montana Department of Fish, Wildlife and Parks.

3.3 Site-Wide History of Contamination

Mining activities occurred in Butte, Montana, and the surrounding areas for over 100 years. Silver milling, as well as operation of copper and zinc smelters, generated a variety of wastes. By the late 1880s, Butte became one of the nation's prominent copper mining centers. Mining crews disposed of wastes generated from mining, milling and smelting operations directly into Silver Bow Creek and throughout the Butte Hill area. These waste disposal practices contaminated soil, sediment, groundwater and surface water with arsenic and heavy metals, leaving the natural landscape of the area void of vegetation and wildlife. Mining crews conducted waste disposal in this manner at the Site until the early 1970s. The largest flood in the area's history, which occurred in 1908, also contributed to the extensive dispersion of contaminants in the Creek and Clark Fork River from the cities of Butte to Milltown. Table 3 provides additional details.

Table 3. Site-Wide History of Contamination

1870	Dozens of silver and copper mining claims in place, leading to construction of mines and mills as well as smelters that refined arsenic-laden copper ores.
1881	Area has over 300 active copper mines, at least 10 silver mines, five smelters and over 4,000 posted claims.
1910	Butte was the largest producer of copper in North America. Large quantities of mine waste and tailings disposed of in ponds or dumped in Silver Bow Creek. Mining companies merged to form the Anaconda Copper Mining Company (Anaconda).
1920s	Milling and smelting in Butte continued; as Anaconda's copper smelting capacity grew, Butte became primarily a mining center. Butte's smelters and mills produced air emissions that contaminated yards and attics as well as large quantities of waste such as tailings and slag. Butte's mines also produced waste and overburden piles throughout Walkerville and Butte.
1955	Open pit mining began at the Berkeley Pit. All mining in Butte previously took place underground.
1964	Completion of Weed Concentrator (now the Montana Resources Concentrator) reduced the amount of ore sent to Anaconda. It also produced large quantities of waste in the active mining area and discharged large volumes of contaminated water to Silver Bow Creek above its confluence with Blacktail Creek.
1977	ARCO, now known as Atlantic Richfield Company (Atlantic Richfield), merged with ACMC. Open pit mining operations took place in Berkeley Pit until 1982 and in Continental Pit until 1983 when all mining operations were suspended.
1990s	Atlantic Richfield became a wholly-owned subsidiary that is part of the BP LLC collection of companies.

3.4 Site-Wide Initial Response

EPA designated the original Silver Bow Creek site as a Superfund site and listed it on the National Priorities List (NPL) in September 1983. Work began on a site-wide remedial investigation (RI) in 1984. Preliminary results indicated that upstream sources were partly responsible for the contamination observed in the creek. After a thorough analysis of the relationship between the two areas (Butte and Silver Bow Creek), EPA concluded that they should be treated as one site under CERCLA. EPA subsequently modified the existing Silver Bow Creek Site to include the Butte Area and the formal name was changed to the "Silver Bow Creek/Butte Area" Superfund Site in 1987.

A variety of enforcement actions and agreements have been undertaken at the Site. Table 4 gives a basic breakdown of current PRPs by OU.[5]

Table 4. PRPs by OU

Operable Unit	PRP
OU 1: SSTOU	Atlantic Richfield Company
OU 3: BMFOU	Atlantic Richfield Company Montana Resources Incorporated Montana Resources Dennis Washington[6]
OUs 4 and 12: Warm Springs Ponds (Active and Inactive Areas) OU	Atlantic Richfield Company
OU 7: Rocker OU	Atlantic Richfield Company
OU 8: BPSOU	Atlantic Richfield Company Butte-Silver Bow County Burlington Northern Santa Fe (BNSF) Railway Company Union Pacific Railroad Company Inland Properties Incorporated Rarus Railroad/Patriot Railway Company[7]

3.5 Site-Wide Basis for Taking Action

Screening studies and risk assessments since the early 1990s have identified contaminants of concern (COCs) and quantified human health and environmental risks from these COCs in solid media (including tailings, waste, sediment, soils and indoor dust), surface water and groundwater. Action levels were established for site COCs. Site COCs and corresponding media are presented in Table 5.

[5] Throughout site documents, the PRPs are often referred to as respondents or settling defendants. The BPSOU has two groups of respondents/settling defendants: Group 1 and Group 2.
[6] Asarco, Incorporated and AR Montana Corporation were also PRPs for this OU. Their respective liabilities for the BMFOU were addressed in a bankruptcy proceeding.
[7] Other parties were also named as PRPs for BPSOU through general notice letters, including Montana Resources Incorporated.

Table 5. COCs and Media Exposure Concerns

COC	Solid Media	Groundwater	Surface Water
Aluminum			X
Arsenic	X	X	X
Cadmium		X	X
Copper		X	X
Iron			X
Lead	X	X	X
Mercury	X	X	X
Silver			X
Zinc		X	X

For humans, primary exposure pathways at the Site include:

- Ingestion of surface soils (for residents, commercial workers and railroad workers).
- Ingestion of interior dust (for residents and commercial workers).
- Dermal exposure to surface water (for recreational visitors).
- Ingestion of surface water (for recreational visitors).
- Ingestion of alluvial groundwater was calculated although there are currently no exposures.

Assessments of ecological risks focused on aquatic habitat in Silver Bow Creek (terrestrial habitat is limited in the urban environment of the BPSOU and was not evaluated in an ecological risk assessment). Animals in the aquatic environment may be exposed to toxic levels of contamination in the following ways:

- Fish and benthic macroinvertebrates may be exposed by breathing or touching surface water and sediment and by ingestion of prey or sediment.
- Waterfowl may be exposed by direct ingestion of surface water and sediments or by ingestion of contaminated prey.

4.0 Five-Year Review Process

4.1 Administrative Components

EPA Region 8 initiated the FYR in September 2014. EPA remedial project manager (RPM) Sara Sparks led the EPA site review team, which also included EPA RPMs Kristine Edwards and Nikia Greene and contractor support provided to EPA by Skeo Solutions. In September 2014, EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. The review schedule established consisted of the following activities:

- Community notification
- Document review
- Data collection and review
- Site inspection
- Community interviews

- PRP and contractor interviews
- Stakeholder interviews
- FYR report development and review

A site visit for each of the OUs included in this FYR took place from September 29 to October 3, 2014. On September 30, 2014, Skeo Solutions staff visited the site repository at the Citizens' Technical Environmental Committee (CTEC) as part of the site inspection. Site-related documents were available on site and CTEC staff was present to assist in locating specific documents.

4.2 Community Involvement

Community involvement is an important and meaningful component of the activities at the Site. EPA is aware that the size and location of the various parts of the Site have a range of potential effects on community members. Community members are in a position to share information that may not otherwise come to light during a FYR process. EPA maintains and implements a community involvement plan for the Site, maintains an EPA Web page for the Site, works with CTEC, and participates in ensuring information is provided for the PitWatch.org website and periodic fact sheets.[8] As part of this FYR, EPA informed the community that the FYR was taking place and encouraged individuals to contact EPA staff with information that may help make a determination regarding the protectiveness and effectiveness of the implemented remedies at the Site. Table 6 summarizes these activities. Public notices published in local papers are available in Appendix I. Multiple people were interviewed, or provided comments, to EPA regarding their opinions on current site conditions, problems or related concerns. Various perspectives and points are summarized in Section 4.3.

[8] www.pitwatch.org is a website dedicated to providing the community information and news on the Berkeley Pit.

Table 6. Summary of Community Involvement Activities

Date	Activity
10/07/2014	EPA replied to community correspondence with information on the dates for the FYR process
10/15/2014	Press notices announcing the FYR and inviting community participation were published in the *Montana Standard* and *Butte Weekly* (Appendix I)
November 2014	EPA announced the start of the FYR and invited community participation on the Site's Web page, http://www2.epa.gov/region8/silver-bow-creek-butte-area
October 2014 – December 2014	EPA conducted interviews, in person and via phone, with individuals
11/13/2014	EPA replied to community correspondence regarding FYR concerns
12/17/2014	EPA replied to community correspondence with information on the FYR process
01/09/2015	EPA replied to community correspondence regarding FYR concerns
01/12/2015	EPA replied to community correspondence regarding community involvement in the FYR
01/21/2015	EPA replied to community correspondence regarding the status of the FYR
01/26/2015	EPA replied to community correspondence regarding the FYR (institutional controls and community involvement)
05/05/2015	EPA was interviewed by the *Montana Standard* and provided details about the FYR
05/07/2015	CTEC held a meeting to solicit input from the community for the FYR
05/13/2015	EPA provided an update on the FYR to Senator Tester's office staff
June 2015	Press notices describing the FYR and again inviting community participation were published in the *Montana Standard* and *Butte Weekly* (Appendix I)
06/29/2015	EPA met with community members at CTEC offices to discuss their concerns about the Site

EPA will make the final FYR Report available to the public. EPA will place copies of the document in the designated site repositories: CTEC, 27 West Park Street in Butte, Montana; the Montana Tech library, 1300 West Park Street in Butte, Montana; and the EPA Records Center in Helena, Montana. Upon completion of the FYR, EPA will place public notices in the local newspapers to announce the availability of the final FYR report in the Site's document repositories and post a notice of availability on the EPA Silver Bow Creek/Butte area website.

4.3 Interviews and Community Responses

The FYR process included interviews with parties affected by the Site, including community members, the current landowners and regulatory agencies involved in or affected by site activities. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. EPA reached out to site visit participants and an additional list of 10 local individuals. Not all of the individuals chose to participate in interviews. Some of the interviews took place during the week of the site inspection on September 30, 2014, others took place via phone or email. In addition, over 20 letters with comments from additional community members were sent to EPA. Interview summaries are presented below. Appendix J provides the complete interviews.

Many comments received from the community are related to ongoing remedy selection and design that is occurring at the Site. Several of the residents' comments and questions have been previously addressed by EPA.[9] All issues raised were considered, reviewed and are incorporated as appropriate into evaluations during this FYR.

Following is a summary of concerns expressed by public officials and community groups.

Matt Vincent: Matt Vincent is the Chief Executive for Butte-Silver Bow County. He has worked around Silver Bow Creek in various capacities since 1995. He reported that most of the project has been successful, and that he hoped that the rest of the OUs could be as successful as SSTOU. He reported that there have not been any problems with the remedy, but is concerned that long-term operations and maintenance plans are not in place. Mr. Vincent hopes that any surplus from the Trust Account will be used to address remaining contamination at the creek's headwaters.

Mr. Vincent wishes EPA would provide more frequent updates about the remedy performance at the Rocker OU and the Warm Springs Pond OU. He also feels that removal of the arsenic- and organic-contaminated soils should be considered at Rocker.

Mr. Vincent stated that the public is most concerned about the status of the Berkeley Pit and they need more information about it. He asks if there is a contingency plan in the event of a failure of the pit wall. Mr. Vincent also feels that the Horseshoe Bend Plant should be operating at full capacity, and that plant technology should be updated to ensure the best available treatment method will be used.

Mr. Vincent hopes that water quality standards and performance measures for the BPSOU remedy will be consistent with the standards the City and County will have to meet in the long term. He stated that the remedy must take into consideration impacts to current and future municipal wastewater collection and treatment operations. Mr. Vincent feels that a greater commitment is needed to integrate the BPSOU's remedy and restoration components, and that the 2004 set of criteria for groundwater and surface water cleanup and restoration actions that the City developed should be heeded.

Julia Crain: Julia Crain is Butte-Silver Bow County's Special Project Manager. She supports Superfund and administers some of the site-related tasks for Butte-Silver Bow County. She stated that EPA has done a good job at the Site. She reported that she receives a lot of questions via the PitWatch.org website. She reported that there have not been any issues with the remedy, although in 2013 there was trespassing in the building at the Mountain Con and Foreman Park in the BPSOU. The trespasser was quickly captured by law enforcement.

Albert Molignoni (Rocker OU): Albert Molignoni is the Chairman of the Board for the Rocker Water and Sewer District. He stated that EPA and Atlantic Richfield have not had success with the work they have completed. The community was supposed to be able to regain access to groundwater after five years of cleanup, but it has already been 12 years and restrictions remain in place. He stated that the community is disappointed. Mr. Molignoni did not feel well informed regarding the cleanup. He said that the best way to communicate information to the community

[9] EPA has addressed many of the issues raised by this resident in prior documents, including the 2002 RI/FS for BPSOU, the 2006 BPSOU ROD responsiveness summary and Appendix B of the 2014 Butte-Silver Bow Health Department's Butte Priority Soils Operable Unit Public Health Study Phase 1 Report.

is by having officials (EPA, MDEQ and Atlantic Richfield) meet with the Board. In particular, Mr. Molignoni felt that the Board had not received some well sampling information.

Citizens Technical Environmental Committee (CTEC): CTEC wrote a letter to EPA providing input for consideration during the FYR. CTEC recognizes that progress has been made at the Silver Bow Creek/Butte Area Superfund site, but certain aspects of the remedy are still a concern. CTEC hopes that these issues will be addressed during the current FYR. The following points outline the Committee's concerns:

- The Parrott Tailings and other buried waste at Silver Bow Creek above Blacktail Creek should be removed.
- Storm runoff needs to meet water quality standards.
- The ROD indicates that surface water standards shall be met at the BPSOU after 15 years. After 15 years, retention and lime treatment of storm runoff is required. CTEC opposes lime treatment, and recommends retention/detention basins be utilized immediately.
- Data from Atlantic Richfield shows that during wet weather, runoff total recoverable copper concentrations are always exceeding and commonly up to 40 times the standards.
- The downstream-first approach to remedy creates a risk of recontamination of restored areas:
    - Metals can migrate downstream and contaminate areas that have already been remediated. CTEC suggests including a section describing how the remedy is progressing site-wide, detailing how issues from one OU can affect remedy success at another OU.
- Remedial action levels/remedial goals need to be reviewed against current standards and science:
    - The FYR needs to describe how solid media action levels are being reviewed. New data from the CDC has been released, defining a new reference blood lead level of 5 micrograms per deciliter (µg/dL), down from 10 µg/dL. If solid media action levels are not changed by this information, the FYR needs to describe why and how public health is protected.
    - Residential areas sampled before the most recent ESD should be resampled under the new protocol.
- Environmental justice:
    - The FYR should address how the low-income residents of Butte are receiving information about the cleanup, and the challenges low-income residents face in minimizing exposure to toxins given limited financial resources, reliance on landlords, and run-down structures being prone to leaking toxic dust.
- Cap design should be improved where caps are compromised:
    - The FYR should update progress made on cap integrity. If cap integrity remains a problem, new design methods should be identified that would provide better protection. The FYR should also evaluate the effects that waste under the cap has on water quality.
- The community needs certainty that Berkeley Pit water treatment remedy is ready for use when the Pit reaches critical water level in 2023:

  - A rigorous test of the Horseshoe Bend Water Treatment Plant's capability is needed to ensure water quality standards will be met.
  - The FYR should specifically address what is being done to prevent gypsum scaling of Silver Bow Creek.
- Remedial investigation of the Westside Soils OU must begin:
  - This OU is a popular recreation area in Butte, and the public is concerned that the area has not been evaluated for contaminates and risks to public health. The Agency should present a timeline for remedial investigation.
- 2011 Unilateral Administrative Order (UAO) and Remedy Work Plan:
  - The 2011 UAO guided work through 2013. The public needs to know what requirements and schedule are driving current and future work at the Site.
- The FYR Protectiveness Statement needs transparency:
  - Connections between data and conclusions presented from previous FYRs need to be made clear. The FYR needs to evaluate the current status of the remedy and identify risks to the public and environment that currently exist.

<u>Citizens for Labor and Environmental Justice (CLEJ):</u> CLEJ wrote a letter to EPA, commenting on the selected remedy for groundwater at the BPSOU and in particular on the "Technical Impracticability Zone" consisting of Silver Bow Creek above Blacktail Creek, the Parrott Tailings, North Side Tailings and Diggings East. In the letter, CLEJ argues that the remedy selected in the ROD was based on an incorrect model of the alluvial aquifer in this area. CLEJ states that the State of Montana has responded to the situation and has proposed removal of the wastes, but CLEJ feels that EPA should amend the ROD to include removal of the threat wastes left in place.

<u>George Grant Chapter of Trout Unlimited:</u> Rich Day, President of the George Grant Chapter of Trout Unlimited, wrote a letter to EPA expressing the Chapter's concern about the groundwater remedy at BPSOU, Lower Area One. Mr. Day cites the Montana Bureau of Mines and Geology study and indicates he thinks it shows that the original operational model for the proposed remedy as outlined in the current ROD is incorrect, and that leaving wastes in place would not be an effective remedy for improved water quality. He feels that if wastes are left in place, Silver Bow Creek and the Clark Fork River will need to be continually dredged. The Chapter requests that EPA amend the ROD to include removal of wastes to ensure the health of Silver Bow Creek and the upper Clark Fork River.

<u>Coalition of Community Organizations:</u> Project Green, CTEC, CLEJ and the Butte Natural Resource Damage Restoration Council (BNRC) wrote a joint letter to EPA requesting the removal of Parrot, Northside, and Diggings East Tailings so that a greenway for the public could be built. The groups feel that contamination left in place will continue to contaminate Silver Bow Creek and will negatively impact the restoration work that has already occurred. The coalition has reviewed plans of a greenway that would expand the Greenway Trail from Texas Avenue to Montana Street.

Following is a summary of issues raised by individual citizens in interviews or in written or oral comments given to EPA.

Community Interviews and Correspondence: Five residents were interviewed as part of the FYR process, using the interview form in Appendix J. In addition, extensive comments, letters and petitions were received from the community (Appendix J). There were mixed opinions and perceptions related to the cleanup at the Site. A common theme among the interviews was that EPA is not doing enough community outreach, and in particular is failing to reach younger residents and low-income residents. Residents feel that EPA should use social media and other electronic forms of communication to reach these residents.

The biggest concern among the residents is EPA's decision to leave the Parrott, Northside and Diggings East Tailings in place. Residents cite research by the Montana Bureau of Mines and Geology that shows a large plume of copper that is moving 600 feet per day through the groundwater, and into the already cleaned up Silver Bow Creek below Butte. Residents express concern that the subdrain that was installed will not catch this contamination, and that it will make its way into the creek. Residents do not feel that installation of a cap on the waste is a sufficient remedy for this area. In addition, some residents feel that the local government and EPA are not enforcing stormwater controls, resulting in heavy metals and other toxins draining into Silver Bow Creek.

Another major concern is the future discharge of Berkeley Pit. The residents are concerned that the lime used in treating pit water will result in gypsum coating the creek bed of Silver Bow Creek when the water is discharged in five years. In addition, there was concern expressed regarding the stability of the Berkeley Pit wall and its potential danger to Butte.

Some highlights of additional concerns raised by community members include:

- Stormwater runoff is causing heavy metals and other toxins to drain into Silver Bow Creek.
- Local government and EPA are not enforcing stormwater controls.
- EPA does not consider the public's opinion on how best to deal with stormwater runoff. This resident suggests a stormwater runoff citizens' group to hold EPA, MDEQ and Butte-Silver Bow County accountable, and to inventory problematic stormwater runoff areas. The resident also suggests that EPA designate a compliance officer.
- Use of lime to treat the Berkeley Pit's water will result in carbonate scaling in Silver Bow Creek.
- The Berkeley Pit wall is unstable.
- The margin of error used in evaluating the filling of the Berkley Pit is too small and EPA will not consider alternative cleanup technologies.
- The migration of Parrott Tailings water is not conforming to EPA's model, and EPA is not changing its model to adapt to the migration.
- The use of caps and institutional controls in the BPSOU are not adequate or permanently protective.
- Some properties that are contaminated may be ignored due to absentee landlords/property owners.
- The medical monitoring program should be mandatory so that everyone is screened for contaminants.
- It is not clear if enough funds are available to complete the remedy.

- The remedy fails to consider the synergistic effects of site contaminants.
- The remedy does not address other toxins of concern (boron, lithium and manganese).
- The remedy fails to recognize and accommodate the unique health problems of low-income citizens, thus failing to meet the environmental justice mandate.
- There have been no outreach programs that target low-income citizens and EPA should develop a specific, targeted environmental justice community involvement plan for Butte.
- Traditional agency-conducted public hearings and informational meetings are inadequate.
- The success of the public outreach program needs to be measured, since public outreach is an integral part of the remedy.

Following is a summary of issues raised by MDEQ or PRP representatives.

Daryl Reed (BMFOU): Daryl Reed is the Remediation Division Project Officer at MDEQ, working on the BMFOU. Mr. Reed stated that the project team is working well together to evaluate the water treatment plant's efficacy. While he is currently satisfied with the remedy, future remedy protectiveness remains a concern. Reed felt that taking action now on items identified in the FYR Report would be a beneficial, proactive approach toward long-term protectiveness. He stated that citizens are concerned about the Berkley Pit wall slope failures that they think could potentially cause overflow of the pit water. Also of concern is the water treatment plant operating at a less-than-full capacity, resulting in insufficient evaluations of the long-term remedy. Reed is comfortable with the institutional controls and feels the project team is working well together to address the water treatment plant.

Atlantic Richfield (Tim Hilmo) and Montana Resources (Steve Walsh) (BMFOU): Tim Hilmo of Atlantic Richfield and Steve Walsh of Montana Resources represent the Site's PRPs. Mr. Hilmo and Mr. Walsh indicated that the PRPs believe the remedial action is effective. They also stated that they felt well informed about site activities and remedial progress, and indicated that the PRPs communicate frequently with EPA and MDEQ project managers. They stated that groundwater monitoring has been effective, the Horseshoe Bend water treatment plant operations have been effective, waterfowl mitigation efforts have been effective and institutional controls are protective. They noted that some community members question EPA's remedy strategy. They stated that the issues raised – the draining of the Berkeley Pit water and the Critical Water Level – are similar to those raised by the public in 1994 and have already been documented and considered by the agencies. They also mentioned recent renewed public interest in the slope stability of the walls of the Berkeley Pit. Site PRPs, at EPA's direction, have conducted investigations to provide additional information about this topic this year.

Josh Bryson (BPSOU): Josh Bryson is an engineer at Pioneer Technical Services, Inc, and is the operation and maintenance (O&M) contractor for the BPSOU. O&M duties are shared between Atlantic Richfield, Butte-Silver Bow County and Pioneer Technical Services. Mr. Bryson stated that, based on surface water monitoring results, the reclamation-driven cleanup has been successful. The maintenance program has continuously improved due to upgrades in instrumentation and controls. The upgrades allow O&M contractors to maintain consistency throughout all operations. Mr. Bryson stated that there is need for improvement in regard to meeting wet weather in-stream water quality standards for dissolved copper, but the majority of the site remedy has been effective. Recent monitoring data of surface water indicates that levels of zinc, copper, silver, iron and arsenic have decreased over time. Overall lime usage has also been decreased, resulting in a reduction of the amount of dredging material. Mr. Bryson recommends remaining consistent with the current O&M activities.

Loren Burmeister (BPSOU): Loren Burmeister is the Project Manager at BPSOU, representing Atlantic Richfield. Mr. Burmeister stated that the groundwater remedy has been effective in protecting surface water, while the surface water remedy is continuing to be improved upon. The solid media remedy at the Site is complete and is in compliance with the BPSOU ROD. He indicated that remedial activities have had a positive effect on the surrounding community due to the redevelopment of areas of the Site for public use and enjoyment. Residents have expressed concerns regarding the results and communication of the 2014 Butte-Silver Bow Health Department's Butte Priority Soils Operable Unit Public Health Study Phase 1 Report, as well as the completeness and effectiveness of the remedy completed to date. Mr. Burmeister feels that programs associated with the remedy should be continually evaluated for effectiveness, and that programs and inspections that do not support remedy improvement should be discontinued.

Joe Griffin (BPSOU): Joe Griffin formally represented MDEQ at the BPSOU. Mr. Griffin stated that the remedy has resulted in significant improvements towards protection of human health and the environment and compliance with applicable or relevant and appropriate requirement (ARARs) at the Site. However, further refinements are necessary. These include ensuring exposure standards conform to the most current information regarding protective human health levels, ongoing evaluations of the capping program and performance evaluations of revegetation efforts, and further removals on the banks and beds of Silver Bow Creek. Mr. Griffin disagrees with the groundwater remedy that left major sources of groundwater contamination in place and that further removal of these wastes would increase the permanence and long-term effectiveness of the remedy. He also recommends installation of detention/retention basins at the base of Buffalo Gulch and the Silver Bow Creek above Blacktail Creek and BPSOU subdrain areas to reduce the suspended-contaminant load. State water quality standards have not been met. Thus, additional technically practicable actions are necessary.

Mr. Griffin states that local citizens have expressed concerns regarding stormwater management at the Site, particularly water quality, the need for additional action and the long-term stewardship of waste left in place. Mr. Griffin recommends updating the institutional control program so that contaminated substances that may eventually affect future construction and infrastructure projects are managed effectively.

Brian Wilkins (Warm Springs Ponds OUs): Brian Wilkins is an engineer at Pioneer Technical Services, Inc. and was formerly the remedial contractor for the Warm Springs Ponds OUs. He stated that the remedy works as intended and the lime treatment system is efficient in precipitating heavy metals. He stated that Atlantic Richfield has incorporated routine inspection procedures for equipment and is updating equipment as needed.

Tim Hilmo (Warm Springs Ponds OUs): Tim Hilmo is a Project Coordinator at Atlantic Richfield Co., and is a representative of the PRP at the Warm Springs Ponds OUs. He stated that the Site has become a popular recreation area for the community. The remedy has helped support flourishing wildlife populations at the Site. He stated the majority of the community views the

Site as a recreational asset, but there are a few individuals in the community who provide critical comments at public meetings or in newspaper articles.

Daryl Reed (Warm Springs Ponds OUs): Daryl Reed is the Remediation Division Project Officer at MDEQ, working at the Warm Springs Ponds OU. Reed stated that the ponds have been mostly effective at removing divalent metals from the surface water, but that recent studies are showing elevated levels of arsenic, pH and ammonia in the discharge from the ponds. The cause of the elevated arsenic levels is known, and Atlantic Richfield is currently working toward a solution. The causes of the elevated pH and ammonia are not known, and concerns over this are heightened by recent trout density studies that show a decrease in trout population downstream from the Ponds. Reed feels that the remedy is being performed in a diligent manner, but he also encourages further investigation into the Ponds discharges to uncover the cause of the elevated pH and ammonia levels.

Daryl Reed (Rocker OU): Daryl Reed is the Remediation Division Project Officer at MDEQ, working at the Rocker OU. He stated that the remedy has failed to meet the remedial action objectives (RAOs), but that the rebounded arsenic found in groundwater has not been expanding. A group working with Atlantic Richfield is updating the conceptual site model and optimizing groundwater monitoring. Mr. Reed stated that the Rocker Water and Sewer District would like the Controlled Groundwater Area to be revised to release some of the groundwater for use by the community. Due to an ARARs change for arsenic, EPA signed the 2014 Rocker OU ESD that changed the ARAR for arsenic in groundwater standard from 18 micrograms per liter (µg/L) to 10 µg/L. Mr. Reed is comfortable with the current institutional controls at the Site, and feels that the collaborative efforts by the working group are encouraging.

Tina Donovan (Rocker OU): Tina Donovan is the Project Engineer at TREC, Inc., and is the O&M contractor for the Rocker OU. She stated that the project is well run and the Site is well maintained. She indicated that groundwater arsenic concentrations at 50 wells and four surface water sites have decreased, and recommends moving toward a semi-annual monitoring schedule, rather than the current quarterly monitoring schedule.

Tim Hilmo (Rocker OU): Tim Hilmo is a Project Coordinator at Atlantic Richfield Co., and is a representative of the PRP at the Rocker OU. He stated that there have not been any issues with the remedy, but the Rocker Water and Sewer District has expressed concerns regarding Butte-Silver Bow County tax rate increases, as well as the timeframe that their groundwater would be available again. Mr. Hilmo recommends moving toward a semi-annual water monitoring program, rather than the current quarterly program.

4.4 Document Review

This FYR included a review of relevant, site-related documents, including the RODs, remedial action reports and recent monitoring data. Appendix A provides a complete list of the documents reviewed.

ARARs Review

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate, unless waivers of those standards are appropriate.

- Applicable requirements are those cleanup standards, standards of control and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, remedial action, location or other circumstance found at a CERCLA site.
- Relevant and appropriate requirements are those standards that, while not "applicable," address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards more stringent than federal requirements may be applicable or relevant and appropriate.
- To-Be-Considered (TBC) criteria are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary remedial action. For example, TBCs may be particularly useful in determining health-based levels where no ARARs exist or in developing the appropriate method for conducting a remedial action.

Chemical-specific ARARs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Examples of chemical-specific ARARs include maximum contaminant levels (MCLs) under the federal Safe Drinking Water Act and similar standards enacted under the State of Montana Safe Drinking Water Act, and ambient water quality criteria promulgated under the federal Clean Water Act and similar standards promulgated under the State Water Quality Act.

Action-specific ARARs are technology- or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. These requirements are triggered by a particular remedial activity; such as discharge of contaminated groundwater or in-situ remediation.

Location-specific ARARs are restrictions on hazardous substances or the conduct of the response activities solely based on their location in a special geographic area. Examples include restrictions on activities in wetlands, sensitive habitats and historic places.

Remedial actions are required to comply with the chemical-specific ARARs identified in the ROD unless waived. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed. The purpose of the ARARs review is to determine whether regulations, laws or criteria identified in decision documents for the various OUs at the Site have been updated or changed, and whether these changes alter the protectiveness of the selected remedy. ARARs reviewed during this process were established in the ROD for each OU.

Groundwater ARARs
Site decision documents established federal MCLs and the Montana Water Quality Standards as ARARs for groundwater at the Site. Changes to the standards identified in the RODs are recorded in the 2014 ESD for the Rocker OU. The BPSOU ROD waived groundwater quality ARARs for the alluvial aquifer at BPSOU. The BMFOU waived groundwater quality ARARs for the bedrock aquifer in Butte. A controlled groundwater area (Butte Alluvial and Bedrock Controlled Groundwater Area – Butte-Silver Bow County 2009) prohibits domestic use of this water and prohibits any well development that would exacerbate or spread existing contamination.

Numerical values listed in decisions documents were compared to current federal and state standards to identify any changes that could affect protectiveness of the remedy (Table E-1). No changes were identified.

Surface Water ARARs
The decision documents established federal ambient water quality criteria and Montana Water Quality Standards as ARARs for surface water at the Site. Numerical values listed in decision documents were compared to current federal and state standards to identify any changes that could affect protectiveness of the remedy (Table E-2). No changes were identified.

The pH standard for the discharge from the Warm Springs Ponds, which is based on a state water quality standard, was waived.

<u>Institutional Controls Review</u>

Institutional controls are a critical component of the remedies selected for each of the OUs. OU-specific institutional controls are discussed as part of each individual OU below. In addition to OU specific institutional controls, the Montana Department of Natural Resources and Conservation (DNRC) also established three controlled groundwater areas that are part of several OUs. These controlled groundwater areas serve the Rocker OU and parts of the SSTOU, BMFOU and BPSOU. These areas are discussed in more detail in the review of each specific OU.

5.0 OU 1: SSTOU

5.1 Description

SSTOU consists of about 26 linear miles of Silver Bow Creek and fluvially deposited tailings along the Creek. The surrounding areas include private residences and ranches. Silver Bow Creek originates in Butte and flows west and north before entering Warm Springs Ponds. Historically, the creek was used to impound smelter tailings and convey wastes out of Butte. The SSTOU boundary begins at the upstream end just outside of the Butte city limits, and continues until Silver Bow Creek enters the Warm Springs Ponds.

Mining wastes and contamination carried from Butte were deposited in the floodplain, impacting water quality throughout Silver Bow Creek. Results from the initial 1984 RI indicated that upstream sources were at least partly responsible for contamination in the creek. This was confirmed in later studies, including the 1993 RI/FS report. The 1995 SSTOU ROD estimated that 2.5 million to 2.8 million cubic yards of tailings and contaminated soils covered about 1,300 acres. In some areas, the tailings were several feet thick. Mining wastes caused acidic conditions and contaminated the stream and floodplain with arsenic and metals, including cadmium, copper, lead, mercury and zinc. The human health risk assessment conducted during the RI/FS identified the primary carcinogenic risk to people living in or near the area as potential exposure to arsenic in soil and groundwater.

5.2 Remedial Actions

<u>Remedy Selection</u>

EPA and MDEQ selected the remedy for SSTOU in the November 1995 ROD. SSTOU RAOs identified in the ROD include:

- Meet the more restrictive of the aquatic life or human health standards for surface water identified in MDEQ-7 Circular (formerly MDEQ Circular WQB-7) through application of I-classification requirements.
- Meet the applicable MDEQ-7 Circular, federal MCLs and federal non-zero MCL goals for groundwater.
- Prevent exposure of humans and aquatic species to in-stream sediments having concentrations of inorganic contamination in excess of risk-based standards. A physical criterion is used to define sediments posing the greatest risk to receptor species. A contingency is established to develop metal-specific concentrations that would be risk-based, and allow sediment cleanup standards if the physical criterion standard cannot be employed appropriately.
- Attain the RAO to improve the quality of Silver Bow Creek’s surface water and in-stream sediments to the point that the creek could support the growth and propagation of fishes and associated aquatic life, including a self-sustaining population of trout species.

The major components of the SSTOU remedy, as described in the ROD, include:

- Removal of tailings and impacted soils from most areas in the 100-year floodplain. Excavated tailings/impacted soils will be placed in mine waste relocation repositories at locations to be determined during the remedial design/remedial action. To meet RAOs, removal will include tailings and impacted soils where: (a) they are saturated by groundwater; (b) in-place treatment would not be effective because of thickness of tailings or lack of buffer material between the tailings and groundwater; or (c) treated tailings/impacted soils could be eroded into Silver Bow Creek.
- All waste left in place will be treated in place and protected from washout or erosion from lateral stream migration and flood flows.
- Fine-grained in-stream sediments in depositional areas are to be removed and placed in repositories with the excavated tailings and impacted soils. After removal of contaminated in-stream sediments, the channel bed and streambank will be reconstructed.
- All contaminated railroad materials that pose a risk to human health or the environment will be excavated, treated and/or capped. Excavated railroad materials will be placed in repositories.
- No separate remedial action is planned for groundwater or surface water. Remedial activities for SSTOU tailings and impacted soils and for sources of contaminants upstream or off site under other cleanup actions are expected to reduce contaminant releases to groundwater and surface water with the goal of ultimately attaining state water quality standards.
- The ROD called for an institutional controls program.

EPA and MDEQ updated the remedy in a 1998 ESD. Changes included:

- The volume of SSTOU tailings and impacted soil was increased based on additional information.
- Modifications to the alignment and channel profile of Silver Bow Creek were documented.
- Use of a temporary stream diversion to facilitate dewatering and excavation of near-stream tailings and to enhance floodplain and streambank revegetation efforts was allowed.
- Changes in in-stream sediment removal criteria based on other remedial design changes were documented.
- Modifications to the mine waste relocation repository design were documented.
- Inclusion of sediment basins to capture contaminated overland flows from off-site mine waste sources were allowed.
- Elimination of treatment wetlands as the final land use in Subarea 1 was documented.
- Revision of the proposed schedule for SSTOU remedy implementation was shown.
- Revision and increase in the estimated cost of the SSTOU remedy was documented.

No remedy was applied to surface water or groundwater, since their cleanup is directly dependent on the successful remediation of the floodplain soils. The target remedial action goal for soil and sediments is to remove 90 percent of tailings/impacted soils with 95 percent confidence. Removal goals are considered achieved if at least four out of six of the COCs achieve the removal goal (Table 7).

The 1998 ESD adopted new criteria for sediment removal, which provided for removal of the streambed and replacement with clean material throughout the OU.

Table 7. Tailings and Impacted Soil Removal Goals

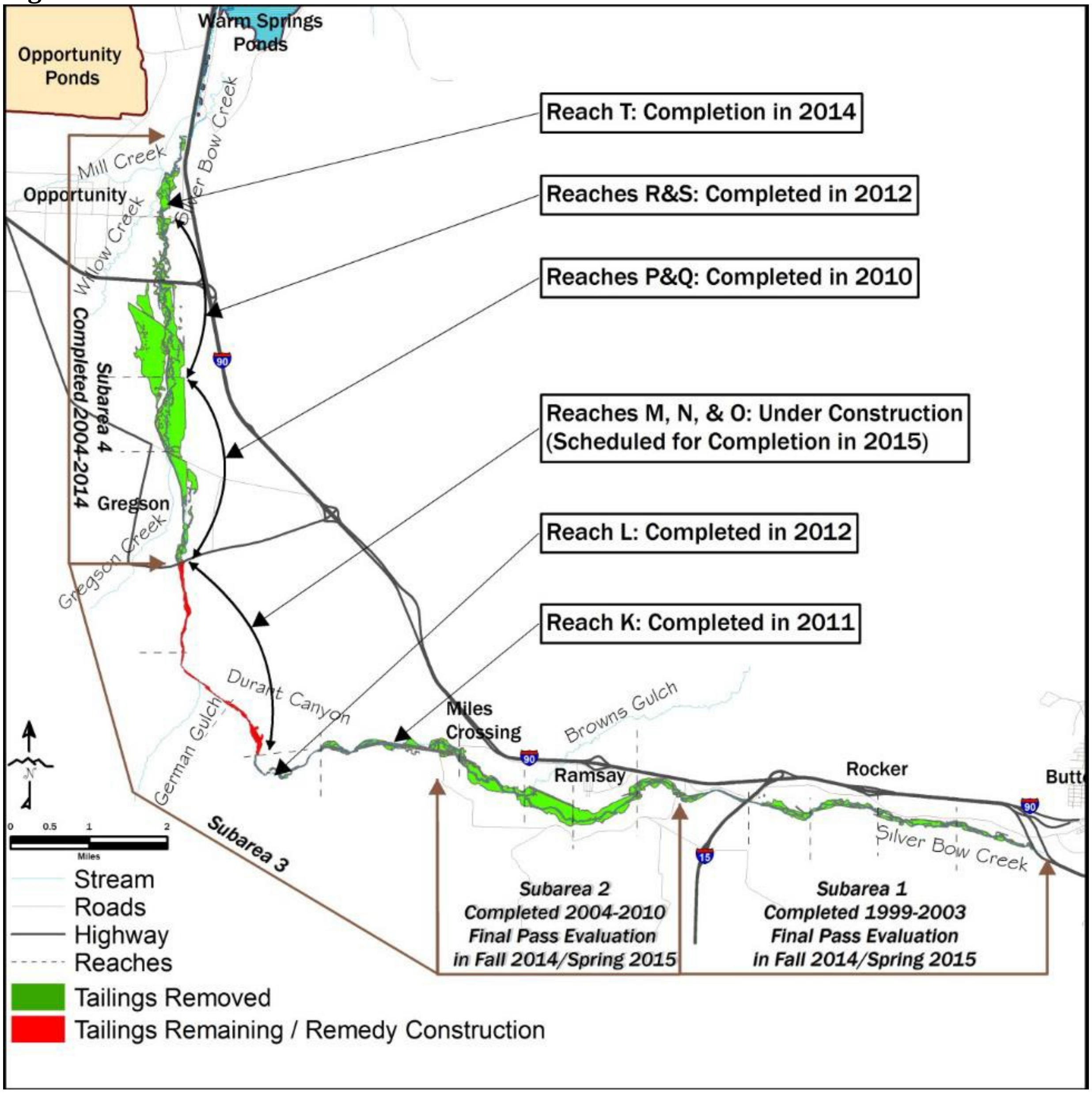
COC	Removal Goal milligrams per kilogram (mg/kg)
Arsenic	200
Cadmium	20
Copper	1,000
Mercury	10
Lead	1,000
Zinc	1,000

Remedy Implementation

The State of Montana, with approval from EPA, assumed the lead for implementation of remedial design and remedial action. Remedial construction has generally proceeded from upstream to downstream (Subarea 1 through Subarea 4) across the 26-mile OU (Figure 3). SSTOU is divided into four subareas based upon geologic and topographic features that control soil, hydrogeologic, geomorphic, surface water, ecologic, demographic and land use characteristics of the SSTOU. Each remedial subarea is further divided into remedial reaches, each approximately one mile in length.

The remedy includes excavation to a predetermined depth, established during design through test pitting and sampling, and off-site disposal of the material. Verification sampling to confirm acceptable removal of contaminated material took place within each reach before application of replacement soil, top soil and revegetation. The remedial action goal guiding the excavations was to remove 90 percent of the floodplain tailings and impacted soils with 95 percent confidence.

Figure 3. SSTOU Subareas



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site. Source: MDEQ 2014.

Subarea 1

Construction in Subarea 1 began in 1999 and finished in 2003.

Subarea 2

Construction in Subarea 2 began in 2004 and finished in 2010.

For Subarea 1 and Subarea 2, MDEQ will implement a "final pass" remedy to address very small deposits of remnant tailings-impacted soils. The goal is to improve and enhance the remediation as a whole before transitioning into O&M status. Wetlands enhancement work will be implemented in key areas. Characterization efforts for the “final pass” finished in 2014. Additional excavations to address “failure areas” (the small deposits of remnant tailings) will start in 2015.

Subarea 3

During the previous five years, remedial action projects within Subarea 3, Reach K and Reach L have been completed. The volume of the tailings deposited in Subarea 3 is less than in the other subareas. However, the narrow canyon combined with the constraints of two active railroads make tailings removal complicated and time consuming. In 2012, 2013, 2014 and 2015, remedial action efforts included four large-scale stream diversions where MDEQ diverted Silver Bow Creek into a large pipe to provide safe access to work areas in the narrowest part of the canyon. Work along railroad embankments included tailings removal followed by installation of railroad embankment treatments such as gabion mattresses to protect the completed remedy.

At the time of the field visit, remedial construction was underway in Reaches M, N and O of Subarea 3. Work was nearly complete to the confluence of German Gulch Creek and Silver Bow Creek. This construction was completed by the end of August 2015. This design segment includes a large-scale fish barrier that will isolate native cutthroat trout in German Gulch Creek from other species in the greater Clark Fork River drainage basin. Subarea 3 also includes a large box-culvert system. It reroutes the stream through a portion of the historical floodplain, lengthening the channel by 0.3 miles, providing access to an additional 19 acres of floodplain, simplifying stream diversion for cleanup, and providing a future trail underpass through one of the active railroads.

Subarea 4

During the previous five years, remedial action projects for Reaches R&S and Reach T in Subarea 4 have been completed. Remedial action began in 2004 and was substantially completed in 2014. Tailings removal and new stream channel construction have been completed from Fairmont Road north to the Warm Springs Ponds OUs. Tailings excavation and new stream channel construction in the area from Highway 1 north to Stewart Street finished in the fall of 2012. The remedial action for the area from Stewart Street north to the Warm Springs Ponds finished in spring 2014. This area incorporates many remedy and restoration plan features, including a series of ponds (approximately 22 acres) and wetlands next to the newly constructed Silver Bow Creek channel. In 2013 and 2014, MDEQ also removed areas of isolated remnant tailings in Subarea 4 extending from Fairmont Road north to Stewart Street. These areas were seeded and planted in 2014 and transitioned into care and maintenance status.

5.3 Operation and Maintenance

The 1995 ROD describes SSTOU O&M activities, including a long-term plan to monitor, manage and maintain reclaimed areas and on-site repositories. MDEQ conducts regular inspections for erosion and monitors surface water, sediments, groundwater, macroinvertebrates, periphyton and fish. The monitoring, management and maintenance program addresses vegetative performance on treatment areas, on-site repositories, remediated streambanks, streambank stability and channel meander. It also addresses in-stream sediment sampling for both contaminant concentrations and macroinvertebrate abundance and diversity. Repairs to areas damaged or eroded over time are completed as needed. Vadose zone, saturated zone and overland flow monitoring will promote documentation of metals immobilization in all remediated areas of the SSTOU.

5.4 Progress Since the Previous FYR

The protectiveness statement from the Site's 2011 FYR stated:

The remedy at OU 01 is not protective. Source areas within the OU that can recontaminate the remedy must be identified, evaluated, and mitigated if appropriate. These include salt patches appearing on remediated areas that impede vegetation, and inadequately vegetated stream banks, as well as tributary sources. An [institutional control (IC)] plan must be developed and approved. Enforceable elements should be added to the IC program to ensure interim protectiveness, and the formal IC program should be approved by [MDEQ] and EPA in coordination with appropriate County and local agencies and organizations. The existing monitoring plan also needs to be revised into a comprehensive groundwater, surface water, sediment, vadose zone, revegetation, macroinvertebrates, and fish monitoring plan to adequately demonstrate protectiveness. The plan also does not provide for maintenance of the remedy.

In-stream cleanup standards have not been met, although substantial progress towards these standards has been made and will likely continue. Environmental exposures continue.
To be protective, the remedy must be more completely implemented, data gaps must be filled, enforceable ICs put in place, and the monitoring and maintenance plan updated and implemented.

The 2011 FYR included six issues and recommendations. This report summarizes each recommendation and its current status below. The outstanding issues and recommendations identified in that document will be monitored, and are expected to be addressed as the remedy is completed and final operation and maintenance plans are developed. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.

Table 8: Progress on SSTOU Recommendations from the 2011 FYR

Section	Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
5.4.1	All spots within the remediated areas with little or no vegetation should be inventoried and remediated.	MDEQ	12/31/2013	Ongoing	NA
5.4.2	An inventory and evaluation of major tributary gulches with historical mining activity should be performed. Inventory should be field verified and noted for regulatory action, restoration work or West Side Soils OU evaluation and remediation. Remedial progress by the U.S. Forest Service on the Beal Mountain Heap Leach Pad project should be monitored until complete.	MDEQ	12/31/2012	Ongoing	NA
5.4.3	A formal institutional control Plan needs to be prepared and approved.	MDEQ	12/31/2012	Ongoing	NA
5.4.4	Ongoing evaluation and implementation efforts to control upstream stormwater should continue, as is currently required.	MDEQ and EPA	12/31/2013	Ongoing	NA

Section	Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
5.4.5	Align existing, and design new monitoring station locations, to comprehensively monitor remediated media within each subarea. The monitoring network should be designed to accurately assess the performance of the remedy in surface water and groundwater, as well as vegetation, macroinvertebrates and fish, and help identify areas not responding as intended so they can be quickly addressed.	MDEQ	12/31/2013	Ongoing	NA
5.5.6	Stormwater best management practices should be applied to disturbed areas along reconstructed streambanks during and after final construction activities to prevent erosion and transport of sediment (possibly with residual metals) into Silver Bow Creek. Effective management practices should be maintained and monitored until streambanks are stabilized by deep rooted vegetation, and robust vegetative cover can be established in the reconstructed floodplain.	MDEQ	12/31/2013	Ongoing	NA

5.4.1 Bare Areas

Most of the bare soil and failure areas are located in Subareas 1 and 2 in areas where in-field screening was not used to direct additional removals. All work completed from 2010 through 2015 has used the field screening technology. The number and size of failure areas in Subarea 4 and the completed areas of Subareas 3 are greatly reduced.

MDEQ has completed a sampling and surveying effort to map and characterize the remaining failure areas throughout the SSTOU. In spring 2014, MDEQ completed removal of additional areas identified in Subarea 4. MDEQ completed mapping of Subareas 1 and 2 in the summer of 2014 and will complete removal of those remnant tailings areas between 2015 and 2017.

MDEQ will continue to monitor the Site to locate and address additional areas if needed.

5.4.2 Tributary Inventory

MDEQ is in the process of completing an initial assessment of compliance with performance standards for the Site. As part of the assessment, MDEQ is evaluating surface water quality at several locations throughout the SSTOU, including samples upstream and downstream from tributaries. At the current time – before the remedy is complete – water quality in Silver Bow Creek is approaching compliance with performance standards. The sampling data collected to date show that concentrations generally decrease downstream of each potential tributary area, except for below the West Side Soils OU. MDEQ is completing additional monitoring to determine if tributaries are contributing contaminant loads that would prevent the SSTOU from meeting applicable performance standards.

At the current time it is not clear if metals loads to Silver Bow Creek are from the remnant tailings in previously excavated areas (failure areas) in Subareas 1 and 2 or from unremediated areas in the upstream off-site sources. MDEQ plans to address the failure areas first (beginning in late fall of 2015) and then complete additional monitoring to determine if additional measures are needed to address potential sources from upstream areas.

5.4.3 Institutional Controls

MDEQ is in the process of completing an initial assessment of compliance with performance standards for the Site. As part of the assessment, MDEQ is evaluating the need for institutional controls as contemplated in the 1995 ROD. The work completed at the SSTOU included removal of additional tailings in coordination with the Natural Resource Damage Program and other changes that may reduce the overall need for institutional controls at the Site. Once the major cleanup operations are complete, MDEQ will re-evaluate the institutional controls described in the 1995 ROD and develop a suite of institutional controls for the Site.

As a part of the assessment, MDEQ has prepared a site-wide monitoring, inspection and maintenance plan that identifies key components of the remedy and known areas of waste left in place.

5.4.4 Upstream Stormwater

MDEQ is in the process of completing an initial assessment of compliance with performance standards for the Site. As part of the assessment, MDEQ is evaluating surface water quality at several locations throughout the SSTOU, including water entering upstream of the Site. At the current time, water from upstream exceeds SSTOU performance standards for several COCs during wet weather. MDEQ expects that the PRP will implement appropriate actions upstream to be protective of the SSTOU remedy, but MDEQ will track the process and participate as needed to ensure protection of the SSTOU remedy.

5.4.5 Monitoring

MDEQ is in the process of completing an initial assessment of compliance with performance standards for the Site. As needed, MDEQ will add or modify surface and groundwater monitoring stations to better define the potential sources in areas of insufficient data to make a firm determination whether the areas contain a significant source of COCs.

Habitat monitoring is also ongoing in cooperation with the Natural Resource Damage Program. MDEQ and the Natural Resource Damage Program will update and modify the monitoring plan as needed.

5.4.6 Stormwater Management

Designs implemented by MDEQ have included enhanced use of designed overbank flow control areas, flood control berms, flood control swales, fabric protected meander tabs, additional stabilization fabrics, coir logs, clear water diversions and other measures to minimize erosion during construction and the early vegetation-recovery period. Post-event inspections and monitoring indicate that these measures have been successful in minimizing erosion during vegetation establishment.

MDEQ has implemented robust railroad embankment treatments in Subarea 3 to provide both short- and long-term erosion and protection to prevent transport of contaminated sediments from the railroad embankments.

5.5 Document Review

ARARs Review

Site-wide ARARs are reviewed in Section 4.4. Certain Montana surface water and groundwater standards are now more stringent. Revisions to the cleanup goals will be considered by MDEQ as it assesses performance standard compliance. A decision document addressing ARAR updates may be needed.

Institutional Controls Review

MDEQ is in the process of completing an initial assessment of compliance with performance standards for the Site. As part of the assessment, MDEQ is evaluating the need for institutional controls as contemplated in the ROD. The work completed at the SSTOU included removal of additional tailings in coordination with the Natural Resource Damage Program and other changes that may reduce the overall need for institutional controls at the Site. Once the major cleanup operations are complete, MDEQ will re-evaluate the institutional controls described in the 1995 ROD and develop a suite of institutional controls for the Site.

As a part of the assessment, MDEQ has prepared a site-wide monitoring, inspection and maintenance plan that identifies key components of the remedy and known areas of waste left in place.

5.6 Data Review

Post-Removal Soil Sampling
Table 9 summarizes verification sampling results for Subarea 3, Reach K and L. Verification samples came from the final excavation surface at 147 locations. Of the initial samples collected, 60 (41 percent) passed, 29 (20 percent) were uncertain and 57 (39 percent) failed. All areas generating samples that "failed" the action levels established in the quality assurance standards were excavated to additional depth to effectively remove the tailings. After the excavation to additional depth (additional removal), these areas were sampled again to ensure that sample results passed quality assurance standards and the removal criteria were achieved.

Twenty-nine of the "uncertain" XRF samples were submitted to a laboratory for analysis. Twenty-two of the 29 laboratory samples "passed" (were below) the criteria. Seven samples exceeded the action levels for at least three of the six metals or failed at least one ceiling level. Based on laboratory results, it is assumed that the majority of the area (as much as 76 percent, or 22 of 29 samples) represented by the "uncertain" samples would in fact pass.

For Reaches K and L, when combining the areas represented by the 60 initially passing samples, the 57 samples that led to additional removals until the criteria were met, and the 22 uncertain field samples that passed laboratory analysis, 95.2 percent of the areas (139 out of 146 sampled areas) may be considered to pass confirmation sampling. In this area, however, even areas showing "uncertain" field screening results were subject to substantial additional removals, so the actual percentage of removal would have been higher. Remaining areas may be contaminated with residual arsenic, copper, lead or zinc.

Table 9: Reach K, L, R, S and T Verification Sample Summary

	Total Samples	Pass		Uncertain		Fail	
		Number	Percent	Number	Percent	Number	Percent
Reach K and L							
Prior to additional removal	146	60	41	29	20	57	39
After additional removal	146	117	80	29	20	0	0

After additional removal, assume 76 percent of uncertain samples pass	146	139	95.2	0	0	7	4.8
Reach R and S							
		Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Prior to additional removal	300	191	63.7	79	26.3	30	10
After additional removal	300	205	68.3	78	26	17	5.7
After additional removal and lab results	300	251	83.7	28	9.3	21	7
After additional removal and lab results, assume 94 percent of uncertain samples pass	300	277	92.3	0	0	23	7.7
Reach T							
		Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Prior to additional removal	326	247	75.8	43	13.2	36	11
After additional removal	326	265	81.3	47	14.4	14	4.3
After additional removal and lab results	326	284	87.1	27	8.3	15	4.6
After additional removal and lab results, assume 94 percent of uncertain samples pass	326	310	95.1	0	0	16	4.9

Verification samples came from the final excavation surface at 300 Reach R and S locations. Of the initial samples collected, 191 (64 percent) passed, 79 (26 percent) were uncertain and 30 (10 percent) failed. Additional removal took place in most areas represented by the "failed" samples; most of these areas are considered "passing" after the additional removal. Fifty of the uncertain XRF samples were submitted to Energy Laboratories in Helena, Montana, for confirmation analysis. Analytical results for 47 of the 50 laboratory samples (94 percent) are below the criteria and can be considered as passing. Three samples exceeded the action levels for at least three of the six metals; thus, the samples failed. In this case, all three samples failed for arsenic, copper and zinc. Based on these data, it is probable that the majority of the areas represented by the uncertain samples would in fact pass, based on laboratory confirmation samples, and as much as 92.3 percent of the areas may be considered to pass confirmation sampling. Remaining areas may be contaminated with residual arsenic, cadmium, copper, lead, mercury or zinc. Table 9 summarizes verification samplingresults**.**

Verification samples came from the final excavation surface at 326 Reach T locations. Of the initial samples collected, 247 (76 percent) passed, 43 (13 percent) were uncertain and 36 (11 percent) failed. Additional removal took place in most areas represented by the failing samples; most of these areas can be considered as "passing" after the additional removal.

Twenty of the "uncertain" XRF samples were submitted to a laboratory confirmation analysis. Analytical results for 19 of the 20 laboratory samples (95 percent) were below the criteria and can be considered as "passing." Based on these data, it is probable that the majority of the areas represented by the "uncertain" samples would in fact pass based on results from laboratory confirmation samples. These results indicate as much as 95.1 percent of the areas may be considered to pass confirmation sampling. Remaining areas may be contaminated with residual arsenic, cadmium, copper, lead, mercury or zinc. Table 9 summarizes verification sampling results.

Environmental media monitored includes surface water, instream sediment, groundwater, vadose zone water, terrestrial vegetation, soils, birds, small mammals, macroinvertebrates, periphyton and fish.

Surface Water Monitoring

Water quality in Silver Bow Creek is approaching performance standards. Surface water monitoring results indicate improved water quality in the SSTOU at all sites where remediation has been completed. Metal COC concentrations at un-remediated sites are generally substantially higher (often by an order of magnitude or more) than concentrations at sites where remediation is complete. However, metal COC concentrations at all SSTOU sample locations still frequently exceed performance goals. Of the metal COCs, copper most commonly exceeded performance goals in 2013. In 2013, total recoverable copper concentrations exceeded the performance goal in 81 percent (39 of 48) of the SSTOU samples. Exceedances for other total recoverable metal COC concentrations in the SSTOU were mercury (21 percent), cadmium (15 percent), lead (15 percent), zinc (2 percent) and arsenic (2 percent). At the two background sites upstream from the SSTOU, total recoverable copper and lead concentrations exceeded performance goals in 25 percent (two of 12) of the samples. However, no other metal COCs exceeded performance goals in the background sites. No metal COCs exceeded performance goals at either of the reference sites.

In-Stream Sediments

Sediment samples were analyzed for wet-weight COC concentrations in three size fractions and for the weighted-mean concentration among those size fractions. Weighted-mean sediment COC concentrations in the SSTOU commonly exceeded performance goals in 2013. However, at background sites located in previously contaminated and remediated areas upstream from the SSTOU, the proportion of samples exceeding performance goals was higher than for those samples within the SSTOU.

Groundwater Monitoring

Groundwater is monitored at 30 wells in nine well clusters: 21 monitoring wells and nine reference wells. Well clusters were located in remedial Subareas 1, 2 and 4 of the SSTOU. Eight well clusters were located in the Silver Bow Creek floodplain and one cluster was located near the Mine Waste Relocation Repository. Wells in the Mine Waste Relocation Repository area were monitored during June and October of 2013, while the rest of the sites were monitored during October only.

Concentrations of arsenic, cadmium, copper, lead and zinc continue to exceed state and federal standards in various locations within the SSTOU. Zinc is the metal COC that has consistently had the highest groundwater concentrations relative to the MDEQ standards. In the upstream Subareas 1 and 2, where remediation has been complete since 2008, arsenic, cadmium, copper and zinc concentrations have exceeded the performance standards at various monitoring wells. Zinc and cadmium concentrations in Subareas 1 and 2 at some monitoring wells exceed the standards by as much as five times. Copper concentrations only have exceeded the standard at one well in the monitoring network, which is located in Subarea 2 in the Miles Crossing cluster. Although groundwater monitoring only began in Subarea 4 in 2013, results thus far suggest that the remedy has been effective at reducing groundwater concentrations in Subarea 4. No metal COCs exceeded standards at well clusters where remediation had been completed. At the Stuart well cluster, where remediation was in progress in 2013, only cadmium and zinc exceeded standards and the magnitude of those exceedances was relatively low compared to the exceedances for those COCs at some wells in Subareas 1 and 2.

Biological Monitoring

The remedy does not require biological monitoring of SSTOU. However, MDEQ, Montana Fish, Wildlife and Parks, and the Montana Natural Resource Damage Program initiated biological sampling because of the potential for improved water quality associated with remediation and restoration activities. The continued impairment of the water quality entering the SSTOU remains a limiting factor in the recovery of the biological community in remediated stream reaches. Macroinvertebrate, periphyton and fish monitoring occurred in 2013. Overall, most sampling failed to meet the performance goals. None of the sites upstream of the SSTOU met this goal, indicating poor water quality from the upper watershed may limit the ability of the remediated sites to attain performance goals.

Fish sampling began in 2002 to monitor and document fish response to ongoing remediation activities. Fish population sampling suggest increasing trout abundance. Sensitive trout species (brook trout, westslope cutthroat trout and rainbow trout) were present at all sites in 2013 and indigenous westslope cutthroat trout (or hybridized cutthroat trout) were present at five of those sites. Since 2007, brook trout have been documented in at least one or more sampling years at all of the current sampling sections. While the continued presence or appearance of trout in all of the current monitoring sections in Silver Bow Creek is an improvement over past years when no fish could be detected, the rarity of these species still suggests water quality remains a concern downstream of Butte.

5.7 SSTOU Site Inspection

On October 1, 2014, EPA, MDEQ and Skeo Solutions met at the Montana Resources site entrance. The group toured the entire length of SSTOU, including subareas 1, 2, 3 and 4. The various stages of remedial work were observed, including completed vegetated areas in Subarea 2, recently graded and seeded areas in Subarea 3, and active removal and stream bank restoration in Subarea 4. The Site was well maintained overall. No issues were noted. The complete site inspection checklist is available in Appendix D. Photographs from the site inspection are available in Appendix E.

5.8 Technical Assessment

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

Yes. The remedy is expected to function as intended by the 1995 SSTOU ROD and the 1998 SSTOU ESD once complete. In the meantime, no complete exposure pathways are present due to soil removals and the fact that there is no domestic consumption of contaminated water. The removal of tailings-impacted soils and the remedial activities for sources upstream or off site under other OUs' cleanup actions are expected to reduce contaminant levels in groundwater and surface water. MDEQ completed removal of additional areas identified in Subarea 4 in 2014 and in Subarea 3 in 2015. MDEQ will continue to monitor the Site to locate and address additional areas if needed.

Water quality in Silver Bow Creek is approaching performance standards. At the time of this FYR, MDEQ is in the process of evaluating the SSTOU remedial action, including assessment of compliance with removal standards, upstream and downstream surface water sampling, identification of potential upstream source areas, and the need for institutional controls. Currently, it is not clear how groundwater and surface water interact in the SSTOU. Better understanding of the relationship between groundwater flow and surface water flow would provide a more detailed assessment of how metal COC concentrations in groundwater influence metal COC concentrations in surface water.

MDEQ intends to develop an institutional control plan after the remedial actions are considered complete. SSTOU includes a mix of public and private lands, which will require various institutional controls. Currently, access to SSTOU is limited by on-site contractor presence and interim fencing.

Following the identification of failure areas in Subareas 1 and 2, MDEQ inventoried and mapped areas requiring additional removals in 2014. For Subareas 1 and 2, MDEQ will implement a “final pass” remedy to address very small deposits of remnant tailings-impacted soils. The goal is to improve and enhance the remediation as a whole before transitioning into care and maintenance status. Wetlands enhancement work will be implemented in key areas. Remedial action work to address the small deposits of remnant tailings will start in 2015. MDEQ intends to continue to locate and address additional areas as needed.

Contaminant concentrations measured in groundwater samples collected since 2005 exceed the MCL at some sample locations. However, groundwater is not used for potable consumption within the SSTOU. Institutional controls to prohibit groundwater use will be implemented, as necessary.

MDEQ recently submitted an SST Site Inspection Monitoring and Maintenance Plan (January 2015) to EPA. MDEQ’s intent is for this plan to function as the Operation and Maintenance Plan for the SSTOU. EPA is currently reviewing MDEQ’s submittal in accordance with the terms of the SST Site Superfund Memorandum of Agreement, and will work with MDEQ to finalize an SSTOU Operation and Maintenance Plan.

Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

No. The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy are generally still valid; however, remedial actions have enhanced instream conditions and upland/riparian habitat at areas previously devoid of vegetation. The remedy selection assumed that wildlife exposures would be limited as they were not expected to frequent the SSTOU. Cleanup and restoration activities have increased the likelihood that wildlife and recreationists will use the SSTOU area. Additional assessment of risk to environmental receptors may be needed.

Current and anticipated future land and water uses at, or near, the SSTOU have not changed since the ROD. Groundwater is not used for potable consumption within the SSTOU.

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

No. No other information has come to call into the question the protectiveness of the remedy. Late in the five-year review process, EPA did receive information regarding waste materials removed under remedy implementation and placed on Parcel 26 near the Solvay plant near Butte. MDEQ has ensured that the temporary repository for this waste on Parcel 26 is adequately fenced and protected. Permanent disposal for this waste is an issue that will need resolution in the future.

Technical Assessment Summary
The remedy is expected to function as intended once complete. The removal of tailings-impacted soils and the remedial activities for sources upstream or off site under other OUs' cleanup actions are expected to reduce contaminant levels in groundwater and surface water. At the time of this FYR, most targeted removals have been completed. Water quality in Silver Bow Creek is approaching performance standards. MDEQ intends to develop an institutional control plan after the remedial actions are considered complete. The original ecological risk assessment and remedy assumed that wildlife exposures would be limited as they were not expected to frequent the SSTOU. Cleanup and restoration activities have increased the likelihood that wildlife and recreationists will use the SSTOU area. Additional assessment of risk to environmental receptors may be needed. MDEQ has developed a plan to function as an operation and maintenance plan, and this plan was recently provided to EPA for review and approval under the SST Site Superfund Memorandum of Agreement.

5.9 Issues and Recommendations

Table 10 provides recommendations to address the current site issues.

Table 10: Recommendations to Address Current Site Issues

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
An O&M plan has been submitted but not yet approved.	Finalize and approve the O&M plan.	MDEQ	EPA	09/30/2017	No	Yes
Institutional controls are not yet implemented.	Develop and implement an institutional controls plan.	MDEQ	EPA	09/30/2017	No	Yes
Areas of vegetation failure remain.	Identify and remove all remaining hot spots.	MDEQ	EPA	09/30/2017	No	Yes
The interaction between groundwater and surface water is not fully characterized.	Conduct a more detailed assessment of how metal COC concentrations in groundwater influence metal COC concentrations in surface water.	MDEQ	EPA	09/30/2017	No	Yes
The ecological risk assessment did not consider the current fauna now present at remediated areas.	Evaluate risk to ecological receptors.	MDEQ	EPA	09/30/2017	No	Yes

5.10 Protectiveness Statement for SSTOU (OU 1)

The remedy at SSTOU (OU 1) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.

6.0 OU 3: BMFOU

6.1 Description

BMFOU is located in the Butte mining district and lies beneath Butte and Walkerville as well as Montana Resources' permitted active mine area. Its boundaries are the Continental Divide to the east, Silver Bow Creek to the south, Missoula Gulch to the west, and the Yankee Doodle Tailings Pond and upper Silver Bow Creek to the north (Figure 4).

The BMFOU 1994 ROD and 2002 Consent Decree described BMFOU as:

- The waters in the Berkeley Pit.
- Underground mine workings hydraulically connected to the Berkeley Pit.
- The alluvial aquifer near the Berkeley Pit that drains into it.
- The bedrock aquifers, including the bedrock aquifer water in and near the Continental Pit.
- Other contributing sources of inflow to the Berkeley Pit/East Camp system, including surface runoff, leach pad, stormwater that enters the Berkeley Pit from BPSOU, tailings slurry circuit overflows, and Horseshoe Bend surface water flows.
- The Travona/West Camp groundwater system, except if that groundwater discharge becomes part of BPSOU response actions (upon EPA approval, in consultation with the State).
- The surface area designated for the potential development of a sludge repository.

The West Camp System is located in the southwest corner of the BMFOU. It includes the Travona, Emma and Ophir mines and associated underground workings. The East Camp and West Camp systems are separated by bulkheads, installed in the late 1950s, to reduce the amount of pumping necessary to dewater the mines. The West Camp is considered a separate hydrologic system. Remediation and maintenance of the West Camp groundwater (through the Butte Treatment Lagoon System) was transferred to the BPSOU in the 2006 BPSOU ROD.

The Berkeley Pit is BMFOU's major feature. It is 1,780 feet deep and encompasses 675 acres. BMFOU also encompasses thousands of miles of underground mine workings. Groundwater in the East Camp system has been rising since 1982 when mine dewatering pumping ceased. Active mining – primarily for copper and molybdenum – continues in the Continental Pit nearby, in Montana Resources' permitted area. The mining operations use Silver Lake water and treated site water (i.e., water from Horseshoe Bend drainage that has been treated in the BMFOU treatment plant), which reduces the amount of water entering the Berkeley Pit in the BMFOU.[10]

The upper reach of Silver Bow Creek above the Yankee Doodle Tailings Pond is the main stream drainage in the BMFOU. Discharge from the localized area surrounding the Berkeley Pit does not reach Silver Bow Creek below Blacktail Creek and will not until treated to meet surface water quality standards. Mining and other activities in the area have greatly changed the original channel alignment. Surface water in the active mining area is controlled by a series of ditches and ponds that convey runoff and mine process water to various locations, including the

[10] An active hardrock mining permit issued by MDEQ addresses reclamation of the active mining operations.

Berkeley Pit and concentrator area. From the Montana Resources Concentrator to the confluence with Blacktail Creek, the historical Silver Bow Creek channel has been reconfigured over decades of mining and waste disposal. At the confluence with Blacktail Creek, Silver Bow Creek flows west and then north, terminating at the Warm Springs Ponds.

The two main aquifers in the area are the bedrock, which is a large part of the BMFOU, and the alluvium, which was deposited over the bedrock in valleys and drainages. Groundwater in the bedrock occurs in fractures, joints and mine workings. Groundwater levels in the surrounding bedrock aquifer are currently higher than the water level in the Berkeley Pit, resulting in radial flow of groundwater from the bedrock toward the pit.

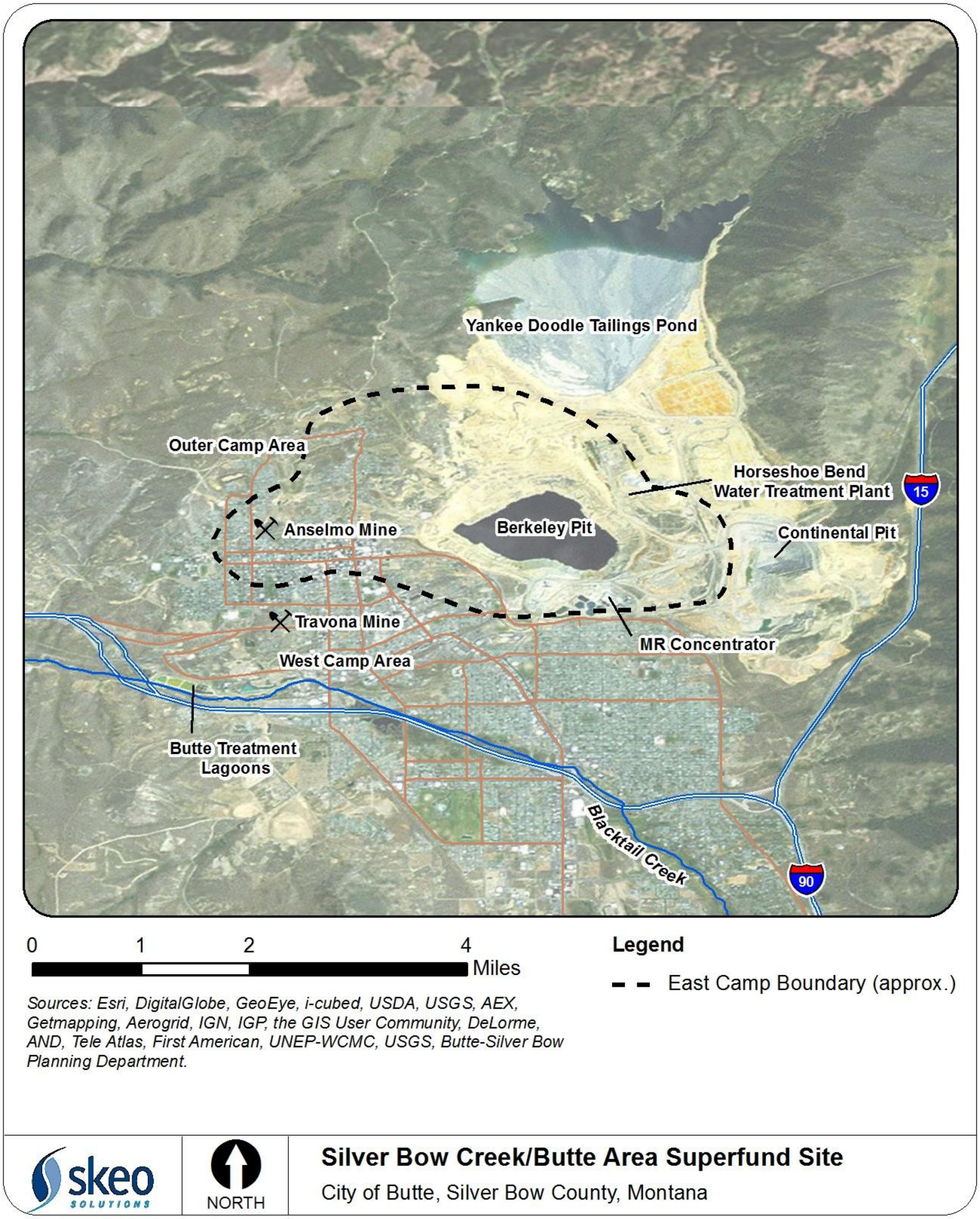
Groundwater in the alluvium flows south from the leach pads area and then west toward the Berkeley Pit. There is an alluvial groundwater divide approximately one mile south of the Berkeley Pit (in the vicinity of Continental Drive). North of this divide, groundwater flows toward the Berkeley Pit; south of the divide, groundwater flows to the BPSOU subdrain (which runs approximately underneath the Silver Bow Creek above Blacktail Creek), where it is captured and sent to the Butte Treatment Lagoons system for treatment (BPSOU).

Early EPA technical evaluations of the Berkeley Pit and West Camp workings indicated that it would be necessary to control the rate of Berkeley Pit filling to prevent future impacts to the alluvial aquifer and Silver Bow Creek. The evaluations further demonstrated the need to treat the Berkeley Pit water prior to discharge to Silver Bow Creek.

A 1989 removal action in the West Camp Area prevented flooding of basements and discharge of contaminated groundwater to Silver Bow Creek as a result of rising mine waters. Water was pumped from the Travona shaft to the Butte Metro Sewage Treatment Plant for treatment and discharge into the Silver Bow Creek. This action helped established the critical water level within the West Camp System below 5,435 feet.

BMFOU’s RI/FS was conducted from July 1990 through January 1994.

Figure 4: BMFOU Features



6.2 Remedial Actions

Remedy Selection

The remedy selected in the Site's 1994 BMFOU ROD, and revised by the 2002 BMFOU ESD, addresses contaminated water in the Berkeley Pit, contaminated water in associated underground mine workings and other contaminated inflow to Berkeley Pit and BMFOU. Its primary objective is to protect human health and the environment from risks posed by contaminated water in the bedrock aquifer and the rising contaminated waters within the OU.

The RAO established for the OU in the 1994 BMFOU ROD is to prevent human and aquatic exposure to contaminated groundwater and surface water.

The remedy selected in the 1994 BMFOU ROD, as amended by the 2002 BMFOU ESD, included the following components:

- Control of inflow from Horseshoe Bend, with exceptions for short-term flows to the Berkeley Pit.
- Routing of stormwater runoff from upper areas of BPSOU to the Berkeley Pit.
- Treatment of surface water and groundwater from the Horseshoe Bend and Continental Pit water through treatment at the Horseshoe Bend water treatment plant and the potential use of water in the mining process or discharge to Silver Bow Creek.
- Placement of Horseshoe Bend water treatment plant sludges in the Berkeley Pit.
- Treatment of West Camp water in the Butte Treatment Lagoons in 2002.[11]
- If water is discharged to Silver Bow Creek after treatment at the Horseshoe Bend water treatment plant (instead of being used in active mining operations), it must meet all applicable surface water discharge standards identified in the ROD and ESD.
- Thorough evaluation of the ability of the Horseshoe Bend water treatment plant to treat additional water from the Berkeley Pit four years prior to the East Camp System reaching the critical water level (5,410 feet above mean sea level); and pumping or other efforts to divert water from the Berkeley Pit to the Horseshoe Bend treatment plant when the critical water level is approached.
- Design and implementation of a long-term, comprehensive monitoring program.
- Waiver of groundwater ARARs for the bedrock aquifer and implementation of an institutional control program to restrict use of contaminated groundwater using land and water use restrictions, along with access controls.
- A public education program on the BMFOU remedial action.

A technical impracticability waiver for the bedrock aquifer ARAR standards was established for the BMFOU in the 1994 ROD. The focus of the BMFOU selected remedy is on containment of the contaminated water; there are no water quality standards to be met in the affected BMFOU aquifer.

The Berkeley Pit is filling with water originating from surrounding bedrock and alluvial aquifers and also from surface inflows. Water accumulating in the pit and in the bedrock aquifer is acidic

[11] This change in remedy was documented in the 2002 BMFOU ESD and the 2006 BPSOU ROD.

from the formation of acid mine drainage and contains high concentrations of metals. Because the water level in the Berkeley Pit is the lowest groundwater elevation in the bedrock system, all bedrock groundwater in the area flows toward the Berkeley Pit. Therefore, the selected remedy ensures contaminated mine water is contained and prevented from migrating off site. However, if water levels were to continue to rise in an uncontrolled manner, the hydraulic gradient could change and contaminated water could begin to flow out of the East and West Camps into surrounding alluvial groundwater and eventually to Silver Bow Creek. To prevent this, the selected remedy determined critical water level elevations for the East Camp (5,410 feet above mean sea level) and the West Camp (5,435 feet above mean sea level).

Remedy Implementation

Site PRPs instituted the inflow control program in 1996, capturing and integrating the Horseshoe Bend discharge into the mining process at the active Montana Resources mining operations. However, a stop in mining activities from July 2000 until September 2003 required construction of the Horseshoe Bend water treatment plant. Currently, all surface water from the Horseshoe Bend area is intercepted and treated using a high-density lime precipitation treatment system. This treated water is then recycled back into Montana Resources' mining operations. Section 6.6 provides additional discussion of available data and its relation to future remedy implementation.

The 2002 BMFOU Consent Decree between EPA, MDEQ, ARCO (now Atlantic Richfield), Dennis Washington, Montana Resources and Montana Resources Inc. contains a statement of work that describes the necessary steps to implement the ROD as modified by the ESD. These steps include remedial design, remedial action and O&M for the BMFOU.

The implemented BMFOU monitoring plan tracks the elevations and quality of water inflows into the East Camp and West Camp systems and compares them to the critical water level, which was set in the original 1994 BMFOU ROD, for both the East Camp, including Berkeley Pit, and the West Camp. This information is updated annually and used in models of the Berkeley Pit and West Camp to provide EPA and MDEQ with a projected date by which critical water levels will be met. The BMFOU monitoring plan is discussed further in Section 6.6.

The Butte Alluvial and Bedrock Controlled Groundwater Area was established in 2008 as the required institutional controls for the BMFOU.[12] This action under state law prohibits the construction of new groundwater wells in the bedrock aquifer for domestic or other purposes. Existing wells in the bedrock aquifer are tested semi-annually, and are currently below MCL standards. For further discussion of institutional controls, see Section 6.5.

Remedy design and implementation continues. The PRPs have initiated the Horseshoe Bend water treatment plant remedial action adequacy review to evaluate and ensure the ability of the Horseshoe Bend water treatment plant to treat additional water from the Berkeley Pit or surrounding bedrock aquifer four years prior to the East Camp System reaching the critical water level.

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12 http://dnrc.mt.gov/divisions/water/water-rights/controlled-ground-water-areas/butte-alluvial-and-bedrock-site.

The public education program centers on the PitWatch.org website. It provides detailed and regularly updated information on BMFOU-related activities.

6.3 Operation and Maintenance

The Horseshoe Bend water treatment plant is BMFOU's primary remedy component with an ongoing O&M component. The Horseshoe Bend water treatment plant is a two-stage high-density sludge lime precipitation water treatment system consisting of two primary treatment units and five ancillary process systems. The treatment facility is fully automated with remote alarm indication. The major treatment components all have redundant systems to eliminate downtime due to equipment failure.

The water treatment plant is also equipped with an automated treated water control loop. If treated water exceeds the acceptable pH range, this system will automatically recycle water through the plant until it does.

Quarterly reporting on Horseshoe Bend water treatment plant system performance and O&M activities has continued since the previous FYR. Annual summaries of these reports resumed in 2014. Routine O&M activities have continued since the previous FYR. Upgrades and system enhancements have also occurred. The original lime unloading system installed during plant construction did not perform to design specifications. Modifications required to correct this issue were completed on May 21, 2014, increasing the lime unloading rate from about 640 to 960 pounds of dry lime per minute. During 2014, additional efforts were made to reduce scaling and gypsum formation to reduce the single stage operation time and associated increased unit lime addition and allow for improved sludge density control.

During 2014 annual cleanout and maintenance, the PRPs discovered a crack in the concrete floor of the Stage One Reactor. After investigation, a concrete specialty company identified the likely cause of the crack as a cold joint pour during construction in 2002. The crack was successfully repaired and ground penetrating radar scans and impulse response testing of the floors in both the Stage One Reactor and Clarifier were conducted and no indication of damage or deterioration was found in either vessel. Minor seepage into the Stage Two Reactor was observed along a construction joint in the floor of the vessel when it was empty. This joint has been repaired and the Horseshoe Bend Water Treatment Plant Groundwater Level Reduction Project will continue to improve control of groundwater in the local vicinity of the plant. Dewatering will become a part of the ongoing operation and maintenance for the Horseshoe Bend water treatment plant. Additional details on maintenance activities are available in the BMFOU Annual Report 2014.

Operating costs for the BMFOU were not available for review in this FYR. Data from the Horseshoe Bend water treatment plant is evaluated in Section 6.6.

6.4 Progress since the Previous FYR

The protectiveness statement from the Site's 2011 FYR stated:

The remedy at BMFOU is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could cause unacceptable risk are being controlled by water treatment, routing water for remaining use, land use access controls, and an IC preventing groundwater use. In order to be protective in the long term, water quality issues in the treated effluent will have to be resolved before discharge to Silver Bow Creek becomes necessary.

West Camp water treatment has been formally transferred to the BPSOU.

The 2011 FYR included seven issues and recommendations for the BMFOU. Some of the issues were considered and not implemented because none of the BMFOU contaminated ground and surface water is being released into Silver Bow Creek. The current adequacy review for Horseshoe Bend water treatment plant will address these issues. Remedy implementation and normal O&M activities are expected to resolve these issues as part of the ongoing remedy design and implementation. This report summarizes each recommendation and its current status below.

Table 11: Progress on BMFOU Recommendations from the 2011 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Conduct an additional performance test to investigate solutions to exceedance of the final pH standard prior to the next FYR.	Atlantic Richfield and Montana Resources	12/31/2014	Considered and not implemented. All treated water is currently being utilized in active mining operations. As remedy design and implementation continues, evaluation of the water treatment plant will include evaluation of solutions to meet the final pH standard prior to release of treated water to the Silver Bow Creek. As part of continuing remedy implementation, the PRPs completed the activity schedule for the Horseshoe Bend Water Treatment Plant remedial action adequacy review, which will address this issue.	09/11/2014

Recommendations	**Party Responsible**	**Milestone Date**	**Action Taken and Outcome**	**Date of Action**
Conduct an additional performance test to investigate solutions to gypsum supersaturation issues prior to the next FYR.	Atlantic Richfield and Montana Resources	12/31/2014	Considered and not implemented. All treated water is currently being utilized in active mining operations. As remedy implementation continues, evaluation of the water treatment plant will include evaluation of solutions to supersaturation issues. As part of continuing remedy implementation, the PRPs completed the activity schedule for the Horseshoe Bend water treatment plant remedial action adequacy review.	09/11/2014
Conduct an additional performance test to investigate solutions to ensure reliable cadmium compliance prior to the next FYR.	Atlantic Richfield and Montana Resources	12/31/2014	Considered and not implemented. All treated water is currently being utilized in active mining operations. As remedy implementation continues, evaluation of the water treatment plant will include evaluation of solutions to ensure reliable cadmium standard compliance prior to release of water to Silver Bow Creek. As part of continuing remedy design and implementation, the PRPs completed the activity schedule for the Horseshoe Bend water treatment plant remedial action adequacy review, which will address this issue.	09/11/2014

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Conduct an additional performance test to treat Berkeley Pit water prior to the next FYR.	Atlantic Richfield and Montana Resources	12/31/2014	Considered and not implemented. As part of continuing remedy design and implementation, the PRPs completed the activity schedule for the Horseshoe Bend water treatment plant remedial action adequacy review, which will address this issue.	09/11/2014
Conduct an additional performance test to investigate the effect of scale inhibitors on metals removal prior to the next FYR.	Atlantic Richfield and Montana Resources	12/31/2014	Considered and not implemented. As part of continuing remedy design and implementation, the PRPs completed the activity schedule for the Horseshoe Bend water treatment plant remedial action adequacy review, which will address this issue.	09/11/2014
Perform Whole Effluent Toxicity testing on representative effluent prior to the next FYR.	Atlantic Richfield and Montana Resources	12/31/2014	Considered and not implemented. As part of continuing remedy design and implementation, the PRPs completed the activity schedule for the Horseshoe Bend water treatment plant remedial action adequacy review, which will address this issue.	09/11/2014
Determine a more practical approach to analyzing radionuclides to determine compliance with the beta-photon emitter discharge criteria.	EPA, MDEQ, Atlantic Richfield and Montana Resources	12/31/2014	Considered and not implemented. As part of continuing remedy design and implementation, the PRPs completed the activity schedule for the Horseshoe Bend water treatment plant remedial action adequacy review, which will address this issue.	09/11/2014

6.5 Document Review

ARARs

Site-wide ARARs are reviewed in Section 4.4. There have been no changes to groundwater or surface water ARARs since the 2011 FYR. As discussed in the 2011 FYR, there have been ARAR changes in ARARs since the 1994 BMFOU ROD. The 2002 BMFOU ESD documents and adopts those changes as appropriate.

Institutional Controls Review

The 2010 Institutional Control Implementation Plan describes the types of institutional controls implemented and planned for both the BPSOU and the BMFOU. The already enacted well ban for the bedrock aquifer and the creation of the Water Quality District, which monitors the ban satisfies1994 BMFOU ROD as amended requirements and ensures the selected remedy is protective upon completion.

Controlled Groundwater Area: The Butte Alluvial and Bedrock Controlled Groundwater Area was established in 2008 as part of required institutional controls for the BMFOU.[13] (See map of area in Appendix E).

Since the controlled groundwater area regulation does not prevent the use of existing wells, the 2010 Institutional Control Implementation Plan calls for the Butte-Silver Bow Water Quality District to implement an education, testing and well abandonment program designed to: a) discourage inappropriate uses of groundwater from existing wells; and b) encourage owners to take existing wells out of service voluntarily. To date, testing of existing private wells has shown they meet water quality standards. The Technical Infeasibility Well Sampling Study identified several wells recommended for abandonment that are not being used for drinking or irrigation purposes. The water district has had funding issues that have prevented full implementation of the well abandonment program. Butte-Silver Bow County and the water district are in the process of obtaining additional funding to proceed with implementation of these institutional controls.

[13] http://dnrc.mt.gov/divisions/water/water-rights/controlled-ground-water-areas/butte-alluvial-and-bedrock-site.

Table 12: BMFOU Institutional Control (IC) Summary Table

Area of Interest – BMFOU						
Media	**ICs Needed**	**ICs Called for in the Decision Documents**	**Impacted Area**	**IC Objective**	**Instrument in Place**	**Notes**
Ground water	Yes	Yes	BPSOU and BMFOU	Restrict all new appropriation of groundwater. Ensure that existing wells are part of an education and abandonment program.	Butte Alluvial and Bedrock Controlled Groundwater Area	The testing, education and well abandonment program needs to be implemented for the BPSOU, but the IC is complete for the BMFOU.

6.6 Data Review

<u>Water</u>

Long-term monitoring of the Berkeley Pit and all ancillary mine shafts and monitoring wells is ongoing, as required in the BMFOU Consent Decree. The monitoring program consists of 63 monitoring wells, 11 mine shafts and four surface water sites, as well as the Berkeley Pit and the Continental Pit (Figures E-1 through E-6). The Montana Bureau of Mines and Geology (the Bureau) provides monthly and annual summary reports to site agencies. The reports share monitoring data and trends; data from some of the monitoring locations date back to 1983 when the Site was first listed on the NPL. Data through the end of 2014 are included in this FYR report.

The 1994 BMFOU ROD, as amended, established critical water levels for the East Camp and West Camp bedrock systems. In the West Camp bedrock system, the maximum water level cannot exceed an elevation of 5,435 feet above mean sea level at well BMF96-1D (near the Travona mine). In the East Camp bedrock system (which includes the Berkeley Pit and hydraulically connected mine workings), the maximum water level cannot exceed an elevation of 5,410 feet above mean sea level at any of the eight compliance points. In addition to these compliance points, the East Camp bedrock system must be maintained at a level lower than West Camp water levels.

Alluvial wells overlying the East Camp bedrock aquifer are also monitored. The East Camp alluvial system includes the alluvial aquifer within the active mine area and a portion of the alluvial aquifer outside of the active mine area to the south. The alluvial groundwater divide between the BMFOU and the BPSOU is included in this monitoring. Water levels and water quality vary throughout the alluvial system. Areas closer to mining operations exhibit elevated metal concentrations (e.g., leaching from waste dumps and historical tailings impoundments). Areas outside of mining operations more reflect regional water quality and hydrology.

The Bureau continually monitors and reviews water levels to ensure that future remedial components are completed on time and account for the current characterization of the system. During this review period, there was a rotational slump in the southeast corner of the Berkeley

Pit. This slope failure led to a rise in the pit water level. In addition, sampling of the water in the pit was cancelled due to safety concerns associated with pit wall stability. Based on the Bureau's 2014 Berkeley Pit model filling update, the estimated dates of reaching the critical water levels at both the East Camp (the Anselmo Mine is currently the compliance point in the East Camp with the highest water level) and the Berkeley Pit have moved later in time (Table 13). Based on this shift, remedy requirements for the completion of the review of the Horseshoe Bend water treatment plant adequacy now moves to July 2019 and the date by which any needed upgrades must be completed moves to July 2021. Overall, the data and model updates indicate that the remedy implementation is working as predicted to control groundwater inflow.

Water levels were temporarily suspended at the West Camp System in 2013 to allow for a study of the system's critical water level. This is described in more detail in the data analysis section for the BPSOU (Section 9.6), since this affected influent rates at the Butte Treatment Lagoons.

Table 13: Berkeley Pit Filling Model Updates

Model Year	Date East Camp Critical Water Level, Anselmo Mine	Change from Previous Year, Month[1]	Date Review Water Treatment Plant Adequacy	Date Complete Any Upgrades	Date Critical Water Level, Berkeley Pit
2014	July 2023	+1.7	July 2019	July 2021	August 2027
2013	May 2023	-1.3	May 2019	May 2021	June 2027
2012	July 2023	+3	July 2019	July 2021	August 2027
2011	April 2023	+2	April 2019	April 2021	May 2027
2010	February 2023	+2	February 2019	February 2021	February 2027

Notes:
[1] Minus sign signifies date moved sooner than previous projection; plus sign signifies date moved later in time.
Table extracted from Bureau 2014 Berkeley Pit filling model update.

Groundwater throughout the BMFOU is sampled for water quality and these data and trends are tracked and reported by the Bureau in their annual reports. A technical impracticability waiver was established for the BMFOU groundwater in 1994. The focus of the BMFOU selected remedy is on containment of the contaminated water; there are no water quality standards to be met in the affected BMFOU aquifers. The variability in water chemistry among different wells throughout the OU is most relevant for planning water treatment activities and for tracking the extent of contamination, and is the main purpose of the sampling.[14] Noteworthy water quality results from 2010 through 2013 include moderate increases in sulfate, copper and zinc in East Camp alluvial well LP-16. However, based on the selected remedy and the technical impracticability waiver, these findings have no bearing on the protectiveness of the remedy.

Berkeley Pit Slope Stability Evaluation

On August 22, 2012, a rotational-like slump occurred through alluvial sediments in the southeast portion of the Berkeley Pit. On November 4, 2012, another slope displacement occurred, expanding the slump zone slightly to the west. As a result, Montana Resources initiated a slope stability study in November 2012. On February 8, 2013, another slope failure occurred. EPA has reviewed and commented on the study and is awaiting final revisions.

[14] Water quality data from the BMFOU groundwater monitoring program are publicly available in the State of Montana's Groundwater Information Center.

The draft slope stability study report concludes rising pit water level is expected to have the greatest influence on potential slope instability in the extreme eastern part of the Berkeley Pit where the thickest sequence of in-situ alluvium and overlying fill occurs in the Southeast Corner, Pittsmont, Northeast Corner sectors and the Concentrator sector. The Neversweat sector (along the southwest pit wall) contains other potential instability areas of mine backfill, not influenced by pit water levels.[15]

As a result of the slope stability study, EPA and MDEQ will require that Atlantic Richfield and Montana Resources implement certain recommendations as a result of the report. Some of those tasks may include:

- Additional review of slope stability around the Berkeley Pit.
- Laboratory testing of subsurface samples and updated slope stability analysis for the Pittsmont sector.
- Oriented-core data analysis in the Concentrator sector.

<u>Horseshoe Bend Water Treatment Plant</u>
With a few exceptions (infrequent and short-duration bypass events to the Berkeley Pit), all Horseshoe Bend flows have been used within Montana Resources' current mining operations. Data tables from 2010 through 2014 were reviewed and are presented in Appendix E. The only noteworthy finding in the data was extremely high water usage levels in June and July 2012. The 10 million gallons of water purchased from Butte was mistakenly used for special projects at Montana Resources mining operations and was not associated with site remedial efforts. The data supports the effective and consistent operation of the Horseshoe Bend water treatment plant over the past five years. Improvements at the plant continued over the past five years (Section 6.3). A plant evaluation is currently underway to evaluate the ability of the Horseshoe Bend water treatment plant to treat additional water from the Berkeley Pit or surrounding wells to ensure full implementation of the selected remedy and to ensure that the critical water level is not reached. It is clear that the implementation of the BMFOU remedy will not allow for contaminated groundwater to reach the critical water level.

<u>Waterfowl Mitigation</u>
A Waterfowl Mitigation Plan was developed because of potential impacts to birds from exposure to Berkeley Pit water. Birds potentially land on the surface of the water during migration seasons and most fly off unharmed. The 2002 BMFOU Consent Decree recognized that birds exposed to Berkeley Pit water for less than four to six hours are not at substantial risk of suffering effects of water toxicity. Waterfowl mitigation efforts began in 1998 and include using rifles, shotguns and three Phoenix Wailers (high tech devices that emit predator and electronic sounds to scare birds off the surface of the water) to haze birds off the surface and keep them from landing on the surface of the Berkeley Pit water. Mitigation efforts have continued over the last five years in compliance with the Berkeley Pit Migratory Waterfowl Mitigation Plan, Observation and Hazing Program. Table E-6 in Appendix E includes a table with the number of birds observed and the number of bird fatalities recorded from 2010 through 2014. After the February 8, 2013 slope

[15] For additional details, see the draft Geotechnical Engineering Evaluation Berkeley Pit Southeast Corner Stability Report, dated August 13, 2014.

failure at the Berkeley Pit, the U.S. Fish and Wildlife Service granted a variance to the plan to ensure that workers involved in these efforts are not put in unsafe conditions. Therefore, the surface of the water in the pit has not been checked by boat for the number of bird fatalities since 2013.

6.7 Site Inspection

On October 2, 2014, EPA RPM Nikia Greene, staff from EPA contractor Skeo Solutions, PRP representatives, and MDEQ and Montana Bureau of Mines staff met at the Montana Resources site entrance. The group toured the Montana Resources property to observe the condition of remedial components, including the Horseshoe Bend water treatment plant, the Berkeley Pit, the bird mitigation lookout station and the monitoring well network. Atlantic Richfield and Montana Resources representatives discussed the interaction of the BMFOU with the BPSOU, current operations, difficulties relating to the February 8, 2013 pit slope failure and the effects on activities such as pit monitoring and waterfowl mitigation efforts.

The Site was well maintained overall. The remedy appeared to be in working order. The property is an active mining operation with secured access. The complete site inspection checklist is available in Appendix B. Photographs from the site inspection are available in Appendix C.

6.8 Technical Assessment

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

Yes. The remedy is expected to function as intended by the 1994 BMFOU ROD as modified by the 2002 BMFOU ESD. In the meantime, contaminated mine water is contained and prevented from migrating off site and institutional controls are in place to restrict all new appropriations of groundwater. The Berkeley Pit is filling with contaminated water originating from the surrounding bedrock and alluvial aquifers and also from surface inflows. As the Berkeley Pit is the lowest elevation in the bedrock system, contaminated mine water is contained and prevented from migrating off site. As noted, an institutional control in the form of a controlled groundwater district rule from DNRC (October 2009), which prevents use of the bedrock aquifer for domestic use has been enacted, and no domestic wells currently use the bedrock aquifer. The Montana Bureau of Mines and Geology, in cooperation with the Butte Silver Bow Health Department, collect annual water quality samples for wells associated with the Butte Alluvial and Bedrock Controlled Groundwater Area to ensure contaminants associated with historical mining operations are not present in harmful concentrations in groundwater supplies.

Based on the Bureau’s 2014 Berkeley Pit model filling update, the estimated dates of reaching the critical water level at both the East Camp System and the Berkeley Pit have moved later in time. This shifts the remedy review date requirements for evaluation of Horseshoe Bend water treatment plant adequacy to July 2019. Any upgrades must be completed by July 2021. The PRPs have initiated the Horseshoe Bend water treatment plant remedial action adequacy review. Overall, the data and model updates indicate that remedy implementation continues in a manner in line with current model estimates.

No water has been discharged to Silver Bow Creek from the BMFOU. With a few exceptions (infrequent and short-duration bypass events to the Berkeley Pit), all Horseshoe Bend flows have been used within Montana Resources' current mining operations. The data supports the effective and consistent operation of the Horseshoe Bend water treatment plant over the past five years.

PRPs conducted a pit stability study after slumps in 2012 and 2013. Areas of concern remaining are the Concentrator and Pittsmont sectors. Additional studies and analysis are needed in these areas. Safety concerns resulting from stability issues has resulted in ceasing of surface water sampling in the Berkeley Pit. Waterfowl mitigation efforts have continued since the 2011 FYR in compliance with the Berkeley Pit Migratory Waterfowl Mitigation Plan, Observation and Hazing Program and the variance issued by the U.S. Fish and Wildlife Service. To ensure future protectiveness, the slope stability study recommendations should be implemented, sampling of the Berkeley Pit water should be resumed and an evaluation of the remedy should be conducted to determine any needed changes to the Waterfowl Mitigation Plan.

Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of remedy selection are still valid.

Current State of Montana water quality standards (Circular MDEQ-7) are reflective of the surface water quality discharge standards identified in the 1994 BMFOU ROD and revised by the 2002 BMFOU ESD. No additional exposure pathways were identified during this review that should be addressed in order to evaluate remedy protectiveness.

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

No. There is no other information at this time that calls into question the protectiveness of the remedy. However, the community involvement process highlighted that there is a fair amount of misinformation around the community regarding remedy implementation at BMFOU. Additional community outreach may be needed to further explain the selected remedy and to reach community members with misunderstandings regarding the plan for remedy implementation as well as the interaction of the remedy at BMFOU and current mining operations.

Technical Assessment Summary

The remedy is functioning as intended by the 1994 BMFOU ROD and the 2002 BMFOU ESD. The data supports the effective and consistent operation of the Horseshoe Bend water treatment plant. Currently no water is being released from the BMFOU into the Silver Bow Creek. Remedy design and implementation is continuing with the adequacy review of the Horseshoe Bend water treatment plant which will ensure compliance with discharge standards and resolve the potential for gypsum release. The implementation of institutional controls for BMFOU has been completed. To ensure future protectiveness, the slope stability study recommendations should be implemented, sampling of the Berkeley Pit water should be resumed and an evaluation of the remedy should be conducted to determine any needed changes to the Waterfowl Mitigation Plan.

6.9 Issues and Recommendations

Table 14 provides recommendations to address the current site issues.

Table 14: Recommendations to Address Current Site Issues

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
Rotational slumps have occurred at the Berkeley Pit and analysis indicates there will continue to be future slumps.	Complete implementation of the recommendations required by EPA regarding the 2014 slope stability study.	Atlantic Richfield and Montana Resources	EPA/MDEQ	09/30/2017	No	Yes
Sampling of the water in the Berkeley Pit has been limited due to safety concerns of physically being on the surface of the water.	Implement current alternatives that are being developed.	Atlantic Richfield and Montana Resources	EPA/MDEQ	09/30/2017	No	Yes
A portion of the Waterfowl Mitigation Plan has been modified due to safety concerns related to slope stability at the Berkeley Pit.	After implementing recommendations required by EPA regarding the 2104 slope stability study, evaluate the remedy to determine any needed changes to the Waterfowl Mitigation Plan.	Atlantic Richfield and Montana Resources	EPA/MDEQ	09/30/2019	No	Yes

The following additional items, though not expected to affect protectiveness, warrant additional follow up:

- Additional community outreach may be needed to further explain the selected remedy and to reach community members with misunderstandings regarding the plan for remedy implementation as well as the interaction of the remedy at BMFOU and current mining operations.

6.10 Protectiveness Statement for BMFOU (OU 3)

The remedy at BMFOU (OU 3) is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled.

7.0 OUs 4 and 12: Warm Springs Ponds Active and Inactive OUs

7.1 Description

The WSPOUs are located in southwestern Montana, at the lower end of Silver Bow Creek, approximately 27 miles downstream of Butte. The OUs consist of a series of three sediment settling ponds (Figure 5). OU 4 consists of Ponds 2 and 3, also called the Active Area of WSP. OU 12 consists of Pond 1, also known as the Inactive Area. Pond 1 was never involved in the active treatment of water from Silver Bow Creek by the addition of lime and no longer plays a role in settling sediments. OU 12 is essentially isolated from the active treatment portion of the pond system.

The Warm Springs Ponds system is addressed by EPA due to large areas of sediment contamination located within the Ponds. Prior to response actions, large areas of contaminated material existed outside of the Ponds and in the Mill-Willow Bypass. The Ponds also present the possibility of a catastrophic release of contaminated material, if the berms surrounding the Ponds give way due to a flood or an earthquake.

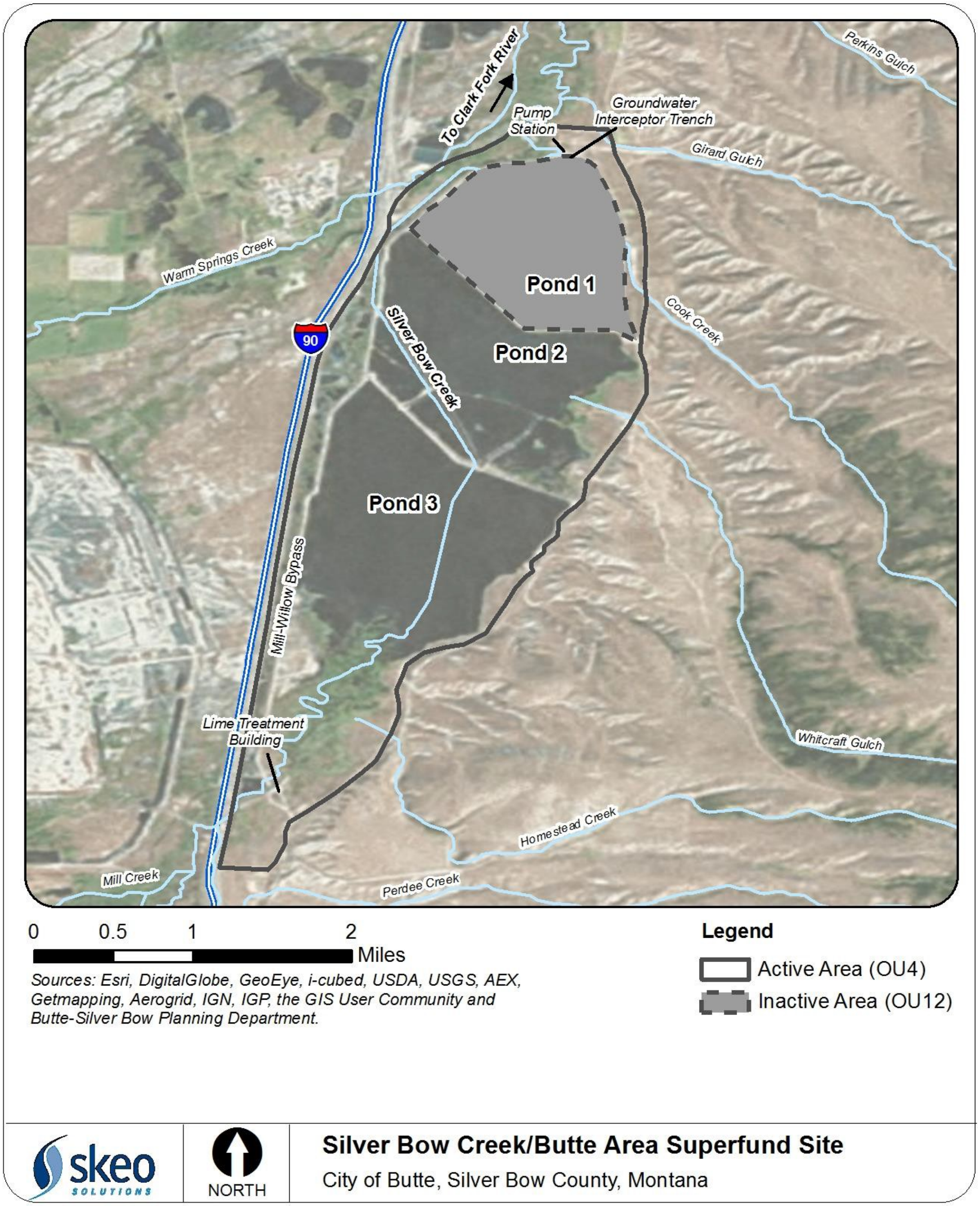
The Warm Springs Ponds complex covers approximately 2,600 acres. U.S. Interstate 90 and the Mill-Willow Bypass (stream diversion around the Warm Springs Pond) border the area to the west. The Clark Fork River borders the area to the north. Hills border the area to the east, and marsh lands and incoming streams border the area to the south.

Before remedial action, the Inactive Area OU contained an estimated 3.4 million cubic yards of contaminated sediments, tailings and soils. Approximately 2.9 million cubic yards of contaminated sediments, tailings and soils were contained within Pond 1. Approximately 475,000 cubic yards of these materials were within the area downstream of Pond 1. These source materials consisted of over-bank deposits that settled out along Silver Bow Creek before the construction of Pond 1.

Silver Bow Creek flows from the south and enters Pond 3 near the southern end of the OU. Tailings and other sediments and contaminants from Silver Bow Creek physically settle to the bottom as the velocity of the incoming water decreases. Water flowing out of Pond 3 goes primarily into Pond 2, with a smaller volume used to maintain several wildlife ponds between Ponds 2 and 3. The effluent from Pond 2 flows into the Mill-Willow Bypass as a regulated point-source discharge. It then flows down the bypass to the Clark Fork River.

No domestic wells are located within the WSPOUs. However, several wells are located within a mile east of the pond system. These wells are in bedrock aquifers that do not appear to be affected by the pond system. The Town of Warm Springs pumps its water from supply wells in unconsolidated tertiary deposits from depths of approximately 200 feet. These wells are supplied with water from groundwater resources west of and hydraulically isolated from the WSPOU.

Figure 5. WSPOU Site Plan



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

7.2 Remedial Actions

Following a removal action that addressed the Mill-Willow bypass and surrounding area contamination, EPA signed the WSPOU's interim ROD on September 28, 1990. In June 1991, EPA signed an ESD that identified the Inactive Area of Pond 1 and the area beneath Pond 1 as a separate action to be addressed under a separate ROD (OU 12). The 1990 WSPOU Active Area (OU 4) ROD addresses Pond 2 and Pond 3, the Mill-Willow Bypass and berms, inlet and outlet structures, treatment improvement features, and monitoring systems. The selected remedy is an interim cleanup measure that provides the highest degree of certainty that it will be successful and permanent. The final remedy will be selected following completion of upstream OU cleanups or as otherwise appropriate.

The overall RAOs established for the WSP Active OU are:

- Prevent releases of pond bottom sediments due to earthquakes or floods.
- Meet Montana Water Quality Act ambient chronic water quality standards for arsenic, cadmium, lead, mercury, copper, iron and zinc at a compliance point just above the defined starting point of the Clark Fork River, and comply with discharge standards for the Pond 2 discharge after implementation of the Warm Springs Ponds response actions and the upstream cleanup actions.
- Prevent ingestion of water above concentrations deemed safe by the Montana Public Water Supply Act for arsenic, cadmium, lead, mercury and silver and above established reference doses for copper, iron, lead, zinc and cadmium. Also, prevent ingestion of water containing arsenic concentrations that would cause risk greater than one chance in 10,000.
- Inhibit the migration of tailings from the Mill-Willow Bypass to the Clark Fork River to reduce the potential for future exceedances of ambient water quality standards in the Clark Fork River.
- Inhibit the migration of tailings from the upper reaches of Silver Bow, Mill and Willow Creeks to the Clark Fork River, to reduce the potential for re-contamination of the Mill-Willow Bypass and future exceedances of ambient water quality standards in the Clark Fork River.
- Reduce the potential for direct human contact, inhalation and ingestion of exposed tailings and contaminated soils and tailings posing excess cancer risks above one chance in 10,000.
- Reduce the levels of arsenic, cadmium and other contaminant concentrations in the groundwater of the Pond 1 Inactive Area to achieve compliance with groundwater performance standards at the designated point of compliance.

Major components of the selected interim remedy for the Warm Springs Ponds Active Area OU are:

- Allow the ponds to remain in place; Ponds 2 and 3 will continue to function as treatment ponds until upstream sources of contamination are cleaned up and standards can be met without treatment.

- Raise and strengthen all pond berms according to specified criteria to protect against dam failure in the event of major earthquakes or floods, and increase the storage capacity of Pond 3 to receive and treat flows up to the 100-year flood.
- Construct new inlet and hydraulic structures to prevent debris from plugging the Pond 3 inlet and to safely route flows in excess of the 100-year flood around the ponds.
- Comprehensively upgrade the treatment capability of Ponds 2 and 3 to fully treat all flows up to 3,300 cubic feet per second (cfs) (100-year peak discharge) and construct spillways for routing excess flood water into the bypass channel.
- Remove remaining tailings and contaminated soils from the Mill-Willow Bypass, consolidate them over existing dry tailings and contaminated soils within the Pond 1 and Pond 3 berms, and provide adequate cover material, which will be revegetated.
- Reconstruct the Mill-Willow Bypass channel and armor the north-south berms of all ponds to safely route flows up to 70,000 cfs (one-half of the previously estimated probably maximum flood).
- Flood (wet-close) all dry portions of Pond 2.
- Establish surface and groundwater quality monitoring systems and perform all activities necessary to ensure compliance with all ARARs.
- Implement institutional controls to prevent future residential development, swimming and consumption of fish by humans.
- Defer, for not more than one year after the effective date of the ROD, decisions concerning the remediation of contaminated soils, tailings and groundwater in the area below Pond 1, pending evaluation of various wet- and dry-closure alternatives and public review.

The Warm Springs Ponds Inactive Area OU interim remedy, selected in June 1992, may be summarized as follows.

- Remove all tailings and contaminated soils from the adjacent portion of the bypass channel and from the area below Pond 1 not planned for wet-closure. Consolidate the wastes over existing dry tailings within the western portion of Pond 1.
- Modify, or enlarge if necessary, the adjacent portion of the bypass channel to safely route flood flows up to 70,000 cfs, which is one-half the previously estimated probable maximum flood for the combined flows of Silver Bow Creek, Willow Creek and Mill Creek.
- Raise, strengthen and armor with soil cement the north-south aspect of the Pond 1 berm.
- Stabilize the east-west aspect and extend and armor the north-south aspect of the Pond 1 berm.
- Relocate the downstream portion of the bypass channel and convert the present channel into a groundwater interception trench.
- Deepen the converted groundwater interception trench and install pumps to allow for a pump-back system. Pump intercepted water that fails to meet specified standards back to the Active Area for treatment.
- Construct wet-closure berms to enclose the submerged and partially-submerged tailings and contaminated soils.

- Chemically fix (immobilize) the tailings and contaminated soils, now enclosed by smaller berms, by incorporating lime and lime slurry onto or into them.
- Implement long-term ecological monitoring.
- Implement institutional controls to prevent residential development, swimming, domestic well construction and disruption of dry-closure caps.

Atlantic Richfield conducted the interim remedial actions under UAOs and EPA enforcement and oversight from July 1990 through September 1995. Initial cleanup began with the Mill-Willow Bypass expedited response action in 1990 and 1991, and work continued through both the Active and Inactive Areas in 1992 through 1995. EPA has determined that Atlantic Richfield has met all interim remedial action construction requirements. A final remedy will be selected following completion of upstream OU cleanups or otherwise as appropriate. Discharge standards for Pond 2 discharge of treated water are included in Table 15.

Table 15. Pond 2 Discharge Standards

Constituent	Daily Maximum (mg/L)	Monthly Average (mg/L)
Total Recoverable Arsenic	0.02	0.02
Total Recoverable Cadmium	0.0062	0.0016
Total Recoverable Copper	0.026	0.017
Total Recoverable Iron	1.5	1.0
Total Recoverable Lead	0.137	0.0053
Total Mercury	0.0002	0.0002
Total Recoverable Selenium	0.26	0.035
Total Recoverable Silver	0.0082	0.00012
Total Recoverable Zinc	0.16	0.15
Total Suspended Solids	45.0	30.0
pH	6.5 to 9.5 standard units	----

7.3 Operation and Maintenance

Currently, the Warm Springs Ponds treatment system is operated by Atlantic Richfield. Pond 1 is not used in the treatment process at the Site, because the pond is largely filled with sediment. Lime is added to Silver Bow Creek upstream of Pond 3, primarily during the winter months, to raise the pH of the influent to facilitate metals precipitation.

7.4 Progress Since the Previous FYR

The protectiveness statement from the 2011 FYR for the Site stated:

The remedy at WSPOUs 04 and 12 is not protective because the arsenic standard is not met in the Pond discharge. In order to ensure protectiveness, full remedy implementation must progress at other OUs upstream. Further, it is unknown if additional human or wildlife exposures are occurring within these OUs.

The 2011 FYR included three issues and recommendations. This report summarizes each recommendation and its current status below. The outstanding issues and recommendations identified in that document will be monitored, and are expected to be addressed as the remedy is completed and final operation and maintenance plans are developed. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.

Table 16: Progress on Recommendations from the 2011 FYR

Section	Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
5.1	Complete arsenic treatment optimization studies, and then determine if meeting RAOs is feasible.	PRP	12/31/2014	In progress.	NA
5.2	Evaluate contaminant pathways. New exposure pathways for wildlife/aquatic life may now be present.	PRP	12/31/2014	Not yet completed.	NA
5.3	Begin forward planning for the final ROD (including data collection efforts, updated risk assessments and feasibility studies).	PRP	12/31/2014	Not completed. Will be completed after upstream OUs are completed or otherwise as appropriate.	NA

7.5 Document Review

<u>ARARs Review</u>

Site-wide ARARs are reviewed in Section 4.4. Montana surface water and groundwater standards are now more stringent. Revisions to the cleanup goals will be considered in the final remedy selection.

<u>Institutional Controls Review</u>

The ROD called for institutional controls to prevent future residential development, swimming and consumption of fish by humans. ARCO currently owns all property within the WSPOUs. The area is a designated wildlife management area administered by the Montana Department of Fish, Wildlife and Parks (MTFWP). Currently, MTFWP operates the wildlife management area under a 2005 lease with ARCO. The lease allows recreational use of the area, but restricts swimming and limits fishing to catch-and-release only. Signage is posted at entry points to the ponds describing the MTFWP fishing regulations.

It was originally envisioned that restrictions on future development would be accomplished through a conservation easement with restrictive covenants, but that approach proved difficult to implement. Instead, the implementation of land use restrictions has involved Atlantic Richfield working with Anaconda-Deer Lodge County to use other instruments that prevent the Warm Springs Ponds from being used for residential habitation or in other ways that could disturb the remedy.

Atlantic Richfield submitted a petition to DNRC for designation of the Warm Springs Ponds Active and Inactive Area OUs as a controlled groundwater area pursuant to Section 85-2-506(2)(f), Montana Code Annotated. The petition included a request that DNRC issue an order establishing a permanent water well ban for potable water supply within these OUs. DNRC approved the petition and established a controlled groundwater area at the WSP, effective May 25, 1995.

7.6 Data Review

During the April through June 2014 reporting period, Pond 2 discharge was in compliance with the Final Daily Maximum Standards for all constituents, with the exception of nine arsenic, two copper and five pH exceedances (Figures 6 and 7).

- The highest measured arsenic value was 0.0292 mg/L, which occurred in June 2014. This value exceeded the discharge standard of 0.0200 mg/L by 0.0092 mg/L.
- The highest measured copper value was 0.0423 mg/L, which occurred in April 2014. This value exceeded the final discharge standard of 0.0318 mg/L by 0.0105 mg/L.
- The highest measured pH value was 9.84, which occurred in June 2014.

Figure 6. WSPOU Daily Metals Monitoring

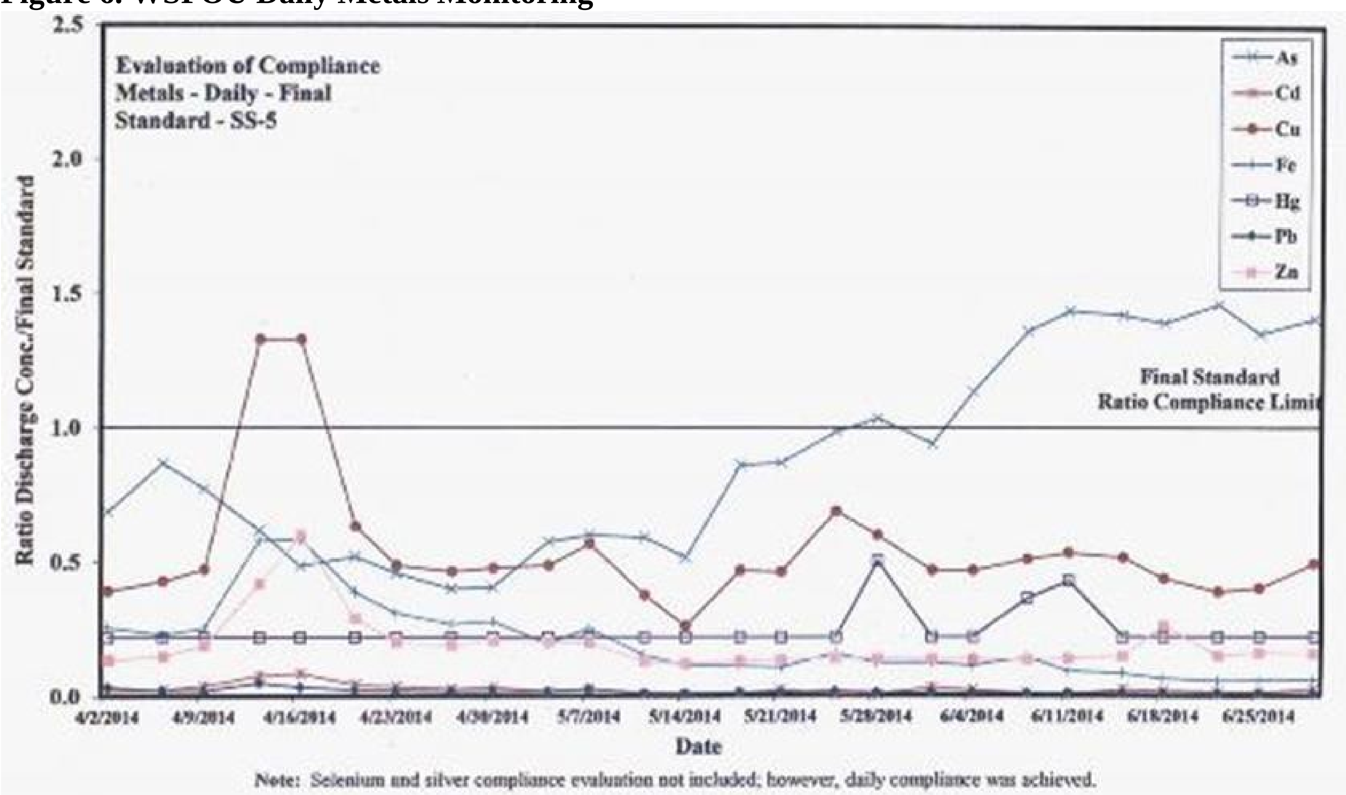
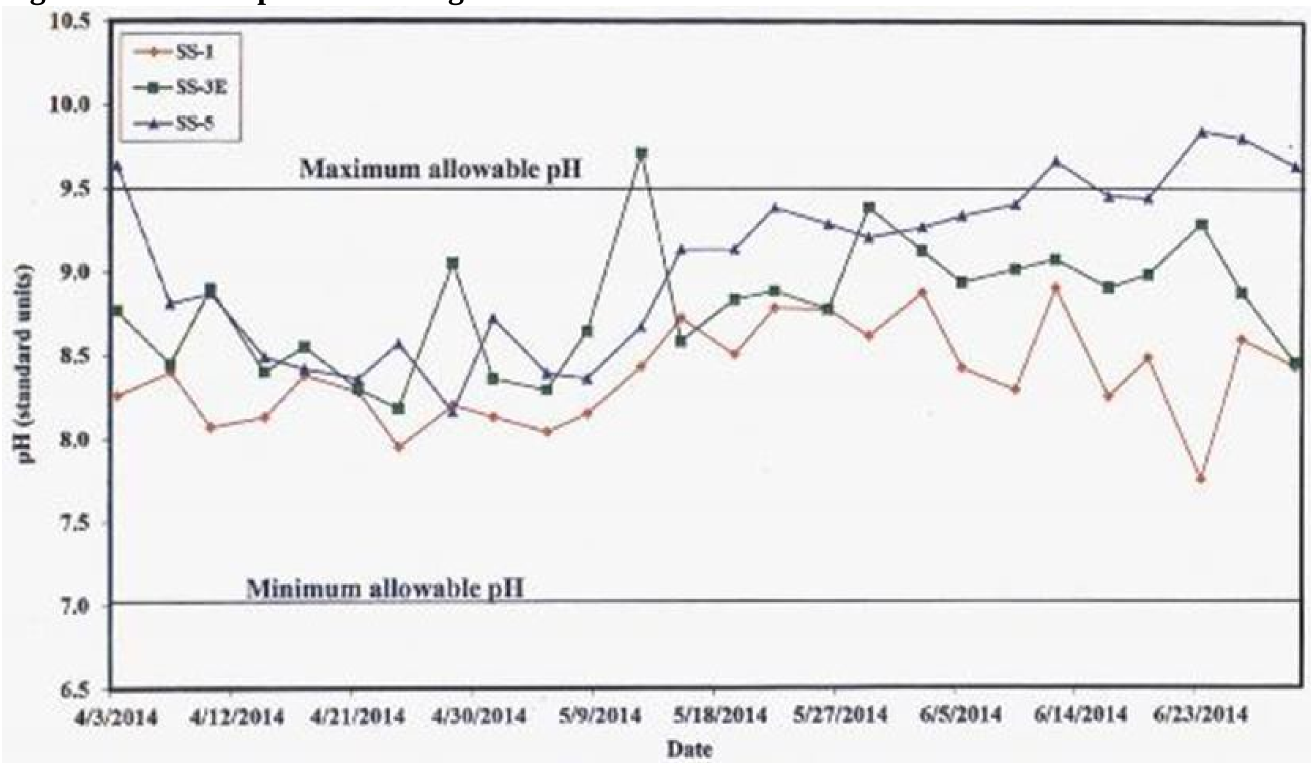


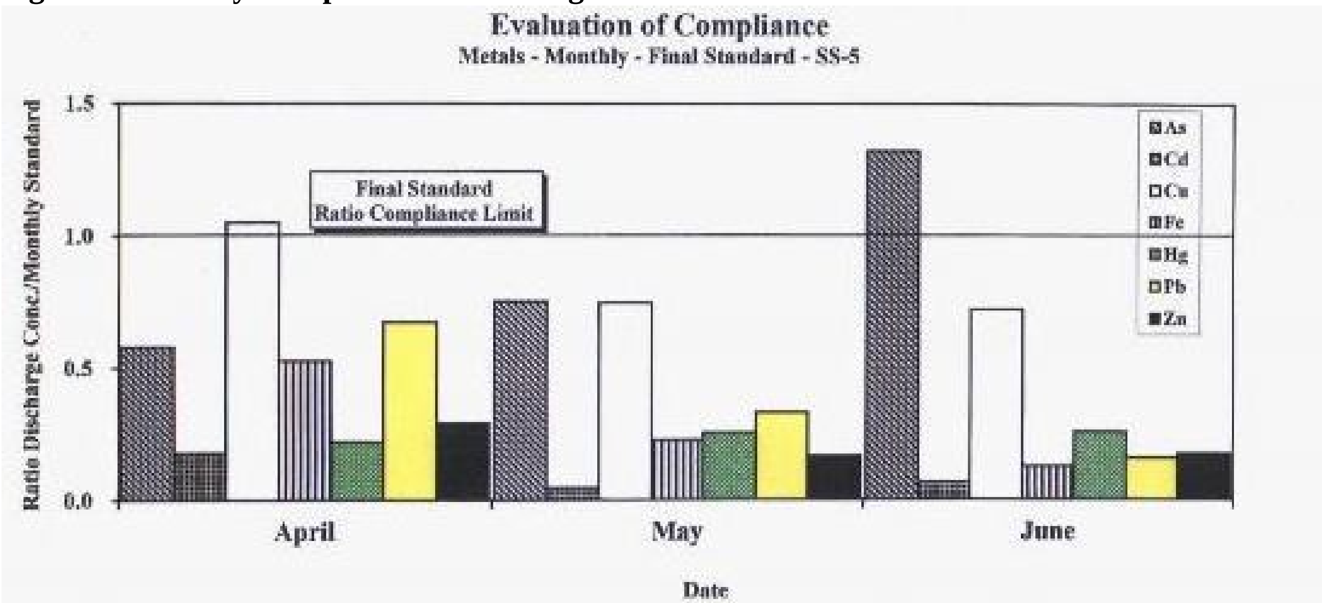
Figure 7. WSPOU pH Monitoring



The monthly averages for all constituents were in compliance with the Monthly Final Standard for the months of April, May and June, with the exception of copper and arsenic (Figure 8). The following supplemental observations were made:

- The pH at the Pond 2 discharge (SS-5) ranged from 8.2 to 9.8 during the reporting period.
- The pH within the system (SS-3E and SS-5) was maintained above 7.0 during the entire reporting period.

Figure 8. Monthly Compliance Monitoring



In general, constituent concentrations decreased through the Warm Springs Ponds system, in the order of inflow (SS-1) > Pond 3 discharge (SS-3E) > Pond 2 discharge (SS-5) for most constituents the majority of the time. Monthly sampling results applicable to the Mill-Willow Bypass are presented in Appendix F.

Semi-annual groundwater monitoring activities were conducted during the reporting period. Groundwater quality data from these activities are presented in Appendix F. Groundwater measured at the point of compliance does not exceed performance standards and is not used for drinking water. Pond 2 and Pond 3 dewatering elevations are included in Figures 9 and 10.

Figure 9. Pond 2 Operating Elevations

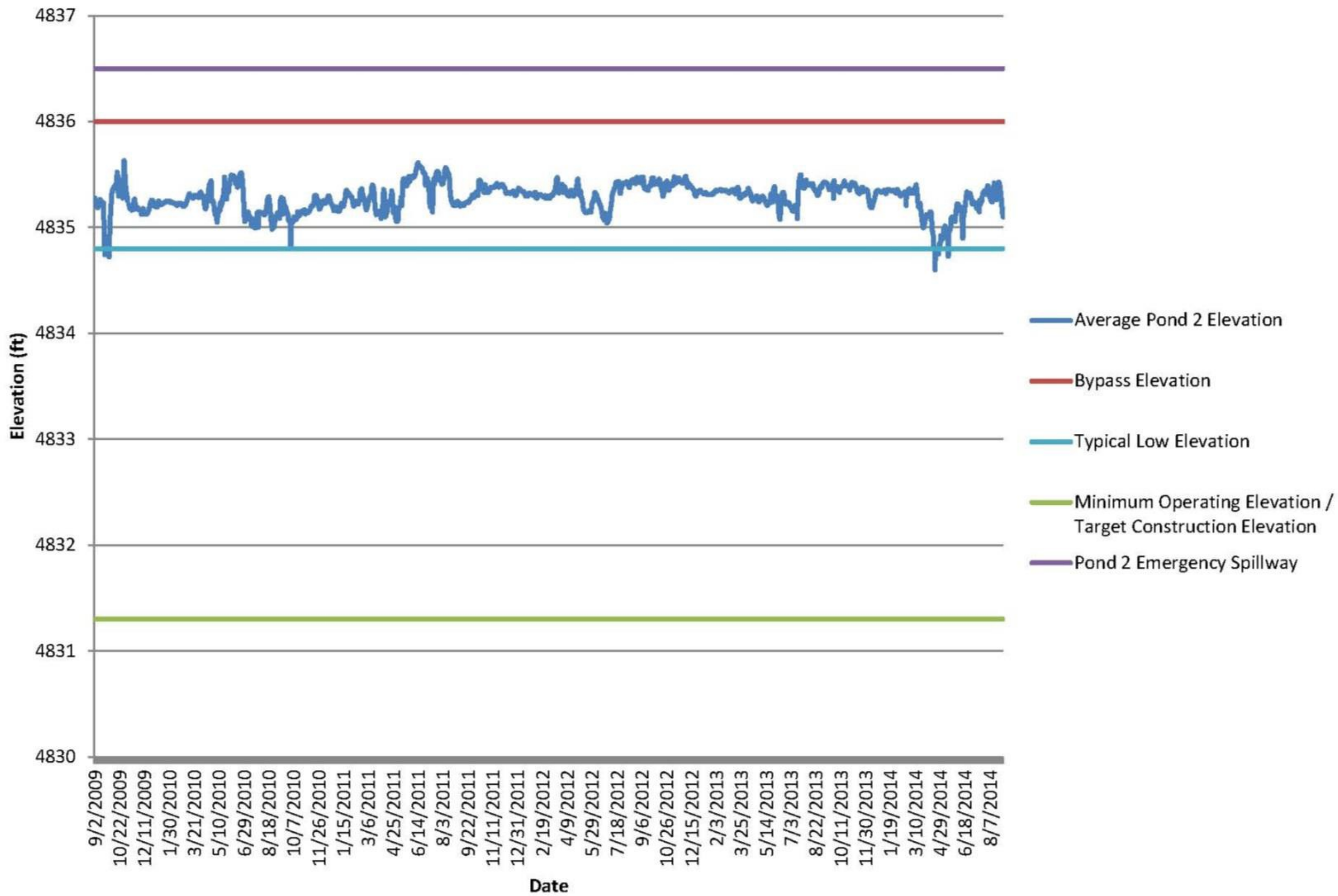
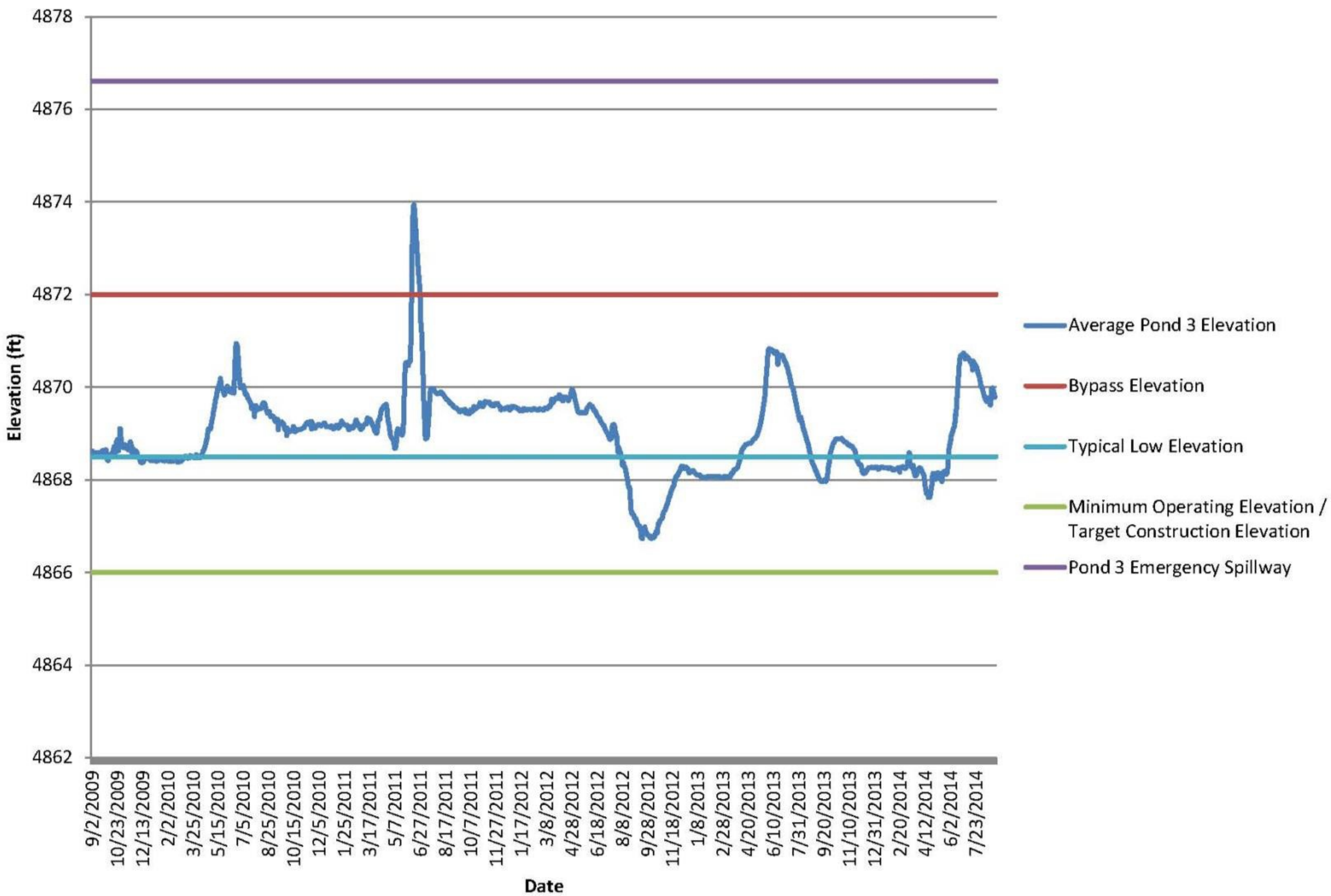


Figure 10. Pond 3 Operating Elevations



7.7 Site Inspection

On October 2, 2014, EPA RPM Kristine Edwards, staff from EPA contractor Skeo Solutions, PRP representatives, and MDEQ and Montana Bureau of Mines staff met at the WSPOU lime treatment building. The group toured the ponds to observe the condition of remedial components, including the treatment plant, pond, berms and spillways. Fencing and MTFWP signage were observed at all property entrances. The Site was well maintained overall. The remedy appeared to be in working order. The complete site inspection checklist is available in Appendix B. Photographs from the site inspection are available in Appendix C.

7.8 Technical Assessment

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

Yes, the interim remedy is functioning as intended. The selected remedy is an interim cleanup measure that provides the highest degree of certainty that it will be successful and permanent. The final actions at this OU will be determined following completion of upstream areas.

While the ambient water quality standards for cadmium, lead, mercury, copper, iron and zinc have been in compliance with discharge standards for the Pond 2 discharge, arsenic continues to exceed standards on a seasonal basis, mainly during the summer and fall months. Atlantic Richfield is continuing to study and better understand the arsenic cycling at the Site. It is possible that the Warm Springs Ponds are operating at their maximum potential given the inherent limitations of alkaline precipitation and settling technology and the physical limitation of the size of the ponds.

Revegetation efforts have proven to be successful at both the dry closures and along the Mill-Willow Bypass. The removal of tailings in combination with the reconstruction of the Mill-Willow Bypass has prevented erosion of tailings from the Mill-Willow Bypass into the Clark Fork River. In general, the revegetation effort prevents exposure of COCs associated with tailings to human and ecological receptors via direct contact, ingestion or inhalation.

The Inactive Area at the northern boundary of the Site continues to achieve RAOs, except the ambient water quality standard for arsenic. Off-site migration of groundwater exceeding performance standards is prevented. The wet closures remain inundated and biologically active. The wet closures are functioning as intended to prevent mobilization or direct exposure to COCs.

Dam safety inspections have confirmed that the Warm Springs Ponds facilities comply with the State of Montana Dam Safety Regulations.

DNRC's controlled groundwater area, and the fact that all land parcels within the boundary of the WSPOUs are owned and controlled by Atlantic Richfield or the MTFWP collectively and legal agreements contain prohibition on residential land use or fish consumption at the Site, continue to effectively prevent the use of contaminated groundwater, swimming in the ponds, or another use that could compromise the remedy.

Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

No, the cleanup levels are no longer valid. Montana surface water and groundwater standards are now more stringent. In addition, the ecological risk assessment called for in the 2011 FYR has not been completed. Revisions to the cleanup goals will be considered in the final remedy selection. Current land use restrictions are preventing any unacceptable exposures.

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

No other information has come to light that could call into question the protectiveness of the remedy.

Technical Assessment Summary

Yes, the interim remedy is functioning as intended. The selected remedy is an interim cleanup measure that provides the highest degree of certainty that it will be successful and permanent. The final actions at this OU will be determined following completion of upstream areas. Arsenic continues to exceed standards on a seasonal basis, mainly during the summer and fall months. Atlantic Richfield is continuing to study and better understand the arsenic cycling at the Site. Additionally, water quality coming into the ponds continues to improve which may result in consistent compliance with standards eventually. DNRC's controlled groundwater area, and the fact that all land parcels within the boundary of the WSPOUs are owned and controlled by Atlantic Richfield or the MTFWP collectively, continue to effectively prevent the use of contaminated groundwater, swimming in the ponds, or another use that could compromise the remedy. Current land use prevents any unacceptable exposures.

7.9 Issues and Recommendations

Table 17 provides recommendations to address the current site issues.

Table 17: Recommendations to Address Current Site Issues

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
Arsenic surface water standard seasonally exceeded in effluent.	Complete arsenic treatment optimization studies, and then determine if meeting RAOs is feasible.	PRP	EPA	09/30/2017	No	Yes
New exposure pathways for wildlife/aquatic life may now be present.	Evaluate contaminant pathways.	PRP	EPA	09/30/2017	No	Yes

7.10 Protectiveness Statement for Warm Springs Ponds Active and Inactive OUs (OU 4 and OU 12)

The remedy at Warm Springs Ponds Active OU (OU 4) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.

The remedy at Warm Springs Ponds Inactive OU (OU 12) is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.

8.0 OU 7: Rocker OU

8.1 Description

The Rocker OU 1995 ROD provides a comprehensive description of the OU's history, contamination, risks and remedy. This section summarizes that information.

The Rocker OU covers about 16 acres and includes the contaminated groundwater resulting from site operations under and near the land surface. It is located south of U.S. Interstate 15/90 near Rocker, Montana, about 3 miles west of Butte, in Silver Bow County (Figure 11). Silver Bow Creek borders the OU's surface area to the north. Railroad lines and sidings owned by the Butte, Anaconda, & Pacific Railway Company border the area to the south. The Butte, Anaconda, & Pacific Railway Company has two small storage sheds in the western end of the OU. A historic office building east of the repository also remains in place. The small community of Fredericksburg is located to the south. The community of Rocker is just north of Silver Bow Creek. The Rocker OU sits next to the SSTOU at its northern boundary.

The Rocker Timber Framing and Treating Plant was built in 1909 and operated until the plant's closure around 1957. The Anaconda Company, predecessor to Atlantic Richfield Company, owned and operated the plant. Initially, the facility treated mining timbers with a creosote solution. Later, it used arsenic trioxide solutions for treatment.

During plant operations, spilled process materials (arsenic trioxide powder), treated wood chip residues, and dripped or leaked process solutions (creosote and caustic heated arsenic brines) resulted in contaminated soils and significant groundwater contamination. Rocker Timber Framing and Treating Plant wood treating wastes intermixed with contaminated tailings when other mining waste washed downstream to Rocker from mining and smelting facilities in Butte.

Arsenic in soils and groundwater at the Rocker OU is the primary COC. Other metals contamination from mine waste was also present at various locations at the Rocker OU.

About 200 people live in Rocker. Most of Silver Bow County is forest and range land. The community of Rocker is zoned for residential, commercial and agricultural uses. Land uses in the Rocker OU are currently industrial and railroad uses with some recreational use on the Greenway Trail along Silver Bow Creek. There are many wells in the area that are not currently in use due to the potential for contaminant migration to private wells.

AR, Rarus Railroad, Butte-Silver Bow County, and various private and corporate entities own all property in and near the Rocker OU. The three parcels that make up the Rocker OU are owned by AR and Rarus Railroad. The property currently includes a repository of treated materials contoured to promote proper surface drainage, leaving a 15-foot-high knoll vegetated with drought-resistant grasses. The area of treated materials was fenced to limit access and trespassing. Riprap along a portion of the north side of the excavated area protects against erosion during flood events in Silver Bow Creek.

The Rocker OU properties are currently zoned for commercial and industrial purposes. Institutional controls exclude residential development. Recent changes in land uses in the vicinity include a new recreation trail next to Silver Bow Creek that passes by the Rocker OU.

The Rocker OU overlies three aquifers that are hydraulically connected to each other.

For surface soils, more than 95 percent of the cancer and non-cancer risk was due to the presence of arsenic. No other contaminant (including other metals, creosote and polycyclic aromatic hydrocarbons) was determined to pose unacceptable cancer or non-cancer risk in excess of EPA's acceptable risk range. For groundwater, arsenic contributed over 99 percent of the future potential cancer risk of consuming groundwater from the shallow, intermediate and deep alluvial groundwater systems. ARARs were not met for several other contaminants.

8.2 Remedial Actions

Remedy Selection

The remedy selected in the 1995 Rocker OU ROD, addresses surface soil, alluvium and groundwater contaminated by wood-treating compounds and mining waste in the Rocker OU.

RAOs for the Rocker OU are:

- Attain groundwater standards (ARARs) or other risk-based levels for inorganic (primarily arsenic) and organic COCs for groundwater underlying and adjacent to the OU, and protect human health during and after cleanup. Owing to the nature of the groundwater contamination, the aquifers of preferred use, and the quality/quantity of water available from water-producing zones within the Rocker OU, this RAO is primarily intended to prevent further contamination of the two lower aquifers. A secondary part of the RAO is to attain ARAR levels outside of waste unit boundaries in the upper aquifer.
- Prevent release of contaminated groundwater to Silver Bow Creek that would result in a violation of surface water ARARs or other risk-based contaminant levels.
- Prevent migration of contaminated groundwater from areas where levels exceed groundwater standards into regions where levels are within groundwater standards.

The remedy selected for the Rocker OU in the 1995 ROD and amended by the 2014 Rocker ESD included:

- *Groundwater Source Material Removal and Treatment of Shallow Groundwater:* Excavate contaminated soils in areas where groundwater arsenic concentrations exceed 10,000 μg/L. Treat excavated soils with iron sulfate and lime amendments, and dispose of treated soils in an on-site repository. Treat contaminated groundwater. Rely on natural attenuation to achieve cleanup standards outside of the waste unit boundary. The 2014 ESD changed the ARAR for arsenic in groundwater from 18 μg/L to 10 μg/L.
- *Contaminated Surface and Near-Surface Soils:* Excavate surface soils with arsenic concentrations in excess of 1,000 mg/kg to a depth of 18 inches. Treat excavated soils with iron sulfate and lime amendments, and dispose of treated soils in an on-site repository. Cover soils with arsenic concentrations ranging from 380 mg/kg to 1,000

mg/kg with 18 inches of clean soil and revegetate. Implement institutional controls to protect the remedy, prevent future residential use, and to prevent domestic groundwater use until cleanup is achieved.

- *Well Ban and Alternative Water Supply:* Implement a groundwater well ban for new wells within a quarter-mile radius of the OU in any of the three aquifer units. Construct an expanded capacity water supply system for the community of Rocker.
- *Groundwater Monitoring:* Monitor and demonstrate that the requirements of the ROD have been met. Return the groundwater resource to the community after cleanup levels are achieved and provide O&M of the repository and soil covers.

The Statistical Evaluation and Implementation Plan, which is part of the work plan attached to the Rocker OU Consent Decree, established a trigger action level for implementing a contingent groundwater remedy. That trigger action level is an arsenic concentration of 18 μg/L in groundwater in certain wells. The 2014 Rocker ESD further calls for evaluation of technologies to address the groundwater plume. After the evaluation of technologies, the contingent remedy trigger will be re-evaluated.

Remedy Implementation

The PRP began Rocker OU remedy construction in April 1997 and finished in October 1997. PRPs excavated 48,000 cubic yards of soils contaminated with arsenic above 1,000 μg/L to a depth of 5 feet below the seasonally low groundwater level. Excavated soil was then treated in a pug mill with iron sulfate and lime amendments. Soil sampling confirmed treated soils had leachable arsenic concentrations below 0.30 mg/L. Treated soils were disposed of in an on-site repository.

The PRP treated groundwater contaminated with arsenic above 1,000 μg/L in open excavation trenches using iron sulfate, lime and potassium permanganate amendments. During remedy implementation, additional areas of contamination were identified and treated. Groundwater contamination on the south side of the Site was treated with ferrous iron through a groundwater injection trench. Additional soils were excavated, treated and stored in the on-site repository. Monitored natural attenuation was expected to address remaining groundwater contamination. The Rocker OU reached construction complete status in October 1997.

The PRP covered other soils above 380 μg/L with clean cover soil and revegetated the entire area.

More than 40 monitoring wells were installed during the remedial investigations. During remedy implementation, seven wells were constructed within the remediation footprint as treated source materials were backfilled into excavated areas. Those wells were designated as interior “gravel wells” because their screened intervals were within the treated groundwater that was backfilled with clean gravel. In addition, exterior and contingency (point of compliance) wells in each of the three aquifer zones were installed.

As part of the remedy implementation, a new water main was constructed to connect the existing Butte-Silver Bow County water supply line to Rocker. A 300,000-gallon water supply reservoir was also constructed to supplement the increased water usage. Institutional controls were implemented and are discussed in Section 8.5. In 2011, the nearby Town Pump truck stop installed two adsorptive arsenic media treatment tanks on their well to ensure the water meets current drinking water standards.

Recent post-remedy monitoring information shows that arsenic concentrations in groundwater were increasing and that the groundwater plume appeared uncontained. In 2014, PRPs began to develop an updated conceptual site model to help understand these issues identified at the Site. After completion, EPA will re-evaluate technologies to address the issue that the concentrations are increasing in certain areas and groundwater plume is potentially not contained. The analysis will also determine whether the implemented remedy can meet the goals and requirements of the remedy selected in the 1995 Rocker OU ROD and revised by the 2014 Rocker OU ESD or whether further remedial action is required.

8.3 Operation and Maintenance

PRPs began quarterly O&M activities in 1998. The specific objectives of the quarterly Rocker OU groundwater monitoring program are as follows:

- Confirm treatment results and track groundwater quality trends.
- Document the long-term efficacy of the iron/lime/oxidant groundwater treatment process carried out in 1997.
- Document potential migration of the arsenic plume.
- Document that nearby public and domestic water supplies remain unaffected by the Rocker OU arsenic plume.
- Document changes in water table elevation and flow patterns following excavation and treatment of the shallow alluvial hydrostratigraphic unit.
- Monitor compliance with groundwater performance standards.

Quarterly sampling events include:

- Measuring the water level in all Rocker OU monitoring wells and staff gages in Silver Bow Creek. Sampling of three private wells and 31 monitoring wells.
- Measuring field parameters in Silver Bow Creek.

Initial surface water sampling was done in 2011 and again in 2014 at Silver Bow Creek.

An annual qualitative inspection of general site conditions evaluates the uniformity of vegetation cover, presence of bare areas, identification of noxious weed infestations, location of erosive areas, condition of ditches, damage due to trespassing, and other conditions. Recommendations are made based on the overall condition of individual components (e.g., vegetation, erosion, security, channels, etc.) of the reclaimed area.

O&M costs were not available for review during this FYR, as those costs are not shared by the PRP.

8.4 Progress Since the Previous FYR

The protectiveness statement from the 2011 FYR for the Rocker OU stated:

The remedy at OU7 is not protective because the Town Pump well exceeds the arsenic MCL of 10 μg/L and was being used for drinking water. Additionally, prolonged use of this well could enlarge the existing plume and otherwise adversely affect remediation of the site. Action to prevent domestic/public use of this well and to prevent extensive pumping is needed to ensure protectiveness. Further, it is unknown whether site contaminants are reaching Silver Bow Creek. Other aspects of the remedy currently protect human health and the environment because land use controls are in place to prevent residential development on the OU and a ban on well use within the Rocker OU is still in place. The DNRC instituted a [controlled groundwater area] for the Rocker area and the Rocker residents were provided with an alternate community water system. Existing wells within the [controlled groundwater area] can still be utilized, however well owners have been notified of the potential risks. RAOs were prioritized according to actual or potential use of these groundwater zones. Progress is taking place in lowering the arsenic concentrations in the high quality lower aquifers which are currently used (tertiary groundwater system) and that have the potential to be used (deep alluvium). A [technical impracticability] waiver is under consideration. Ongoing monitoring, continued implementation of institutional controls, controlling site access, and O&M activities are required to ensure long-term protectiveness.

The 2011 FYR included seven issues and recommendations. This report summarizes each recommendation and its current status below.

Table 18: Progress on Recommendations from the 2011 FYR

Issue	Recommendation	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
7.1, 7.2	Evaluate whether additional treatment or a technical impracticability waiver is needed. Review the technical impracticability waiver petition submitted in 2007.	Atlantic Richfield/EPA/MDEQ	09/30/2012	Implemented. The 2007 technical impracticability request was retracted at EPA's request while additional data is collected and alternatives are considered.	08/21/2013
7.3	Follow up to ensure Town Pump continues to use the community water supply and not groundwater.	EPA/MDEQ	12/31/2011	Complete. The recommendation was revised and Town Pump installed an arsenic treatment system on its well to address the issue.	12/28/2011

Issue	Recommendation	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
7.4	Evaluate the current or potential contribution, if any, of arsenic contamination to Silver Bow Creek from shallow groundwater.	Atlantic Richfield	09/30/2011	Ongoing. Atlantic Richfield revised the sampling plan to collect additional data, but EPA is still evaluating whether or not there are additional data gaps that need to be filled.	Ongoing
7.5	Evaluate the protectiveness and continuation of the quarter-mile-radius well ban.	EPA/MDEQ/ Butte-Silver Bow County	09/30/2011	Ongoing. Consideration of reducing the size of the groundwater control area must wait until the conceptual site model is complete.	Ongoing
7.6	Update the monitoring plan to optimize groundwater sampling.	EPA/MDEQ	09/30/2011	Ongoing. Once the conceptual site model is updated, the monitoring plan will be revisited.	Ongoing
7.7	Write a decision document to update the arsenic standard.	EPA/MDEQ	09/30/2012	Complete. An ESD was issued updating the arsenic standard.	9/30/2014

8.5 Document Review

ARARs

Site-wide ARARs are reviewed in Section 4.4. Site decision documents established federal MCLs and the Montana Water Quality Standards as ARARs for groundwater at the Site. Changes to the standards identified in the RODs are recorded in the 2014 ESD for the Rocker OU. There have been no regulatory changes to groundwater or surface water ARARs since the 2011 FYR. The 2014 ESD incorporated the prior change to the arsenic groundwater ARAR.

Institutional Control Review

Future development and use of groundwater resources in the area was restricted via a well ban, implemented under state law as a controlled groundwater area, which prohibits direct consumption of groundwater via wells in order to prevent migration of the contaminated groundwater into the deeper, high quality groundwater systems in the area. Land use restrictions in place prohibit interference with or adverse effects to the integrity or protectiveness of the remedial measures implemented pursuant to the Rocker Consent Decree. These restrictions exclude use of any portion of the OU for residential purposes and ban installation of any new groundwater wells. Table 19 describes the institutional controls in place at the Rocker OU.

Table 19: Rocker OU Institutional Controls (ICs)

Area of Interest – Rocker OU						
Media	**ICs Needed**	**ICs Called for in the Decision**	**Impacted Area**	**IC Objective**	**Instrument in Place**	**Notes**
Groundwater	Yes	Yes (1995 ROD)	A quarter-mile buffer around the Rocker OU and a small portion of the SSTOU.	Restrict all new appropriation of groundwater.	DNRC-controlled groundwater area	Institutional control established in 1997. It was expected to be temporary until groundwater in the area was effectively mitigated and the Butte-Silver Bow County Health Department re-petitioned DNRC to remove the designation. The controlled groundwater area remains in place. No petition has been submitted to remove it or reduce its size.
Soil	Yes	Yes (1995 ROD)	Rocker OU	Restrict residential development and protect soil repository.	Butte-Silver Bow County zoning restricts use to commercial/industrial. In addition, deed restricitons are in place restricting land use.	None

8.6 Data Review

Groundwater

Arsenic is the primary groundwater COC at the Rocker OU, so it is the only COC addressed in this data review. Since the 2011 FYR, 21 of the 24 wells that are part of the regular monitoring program, have had quarterly arsenic concentrations exceeding the new standard of 10 µg/L at some point since the first quarter of 2011 (Figure G-1 in Appendix G). Some wells are showing an increase in arsenic concentrations over time (refer to the 2013 Annual Monitoring Report for arsenic concentration plots). Three contingency (point of compliance) wells also have reported arsenic concentrations equal to or greater than the new standard during the FYR period. Table G-1 in Appendix G includes a summary of mean arsenic concentrations in select wells since 1998.

EPA noted in the 2014 ESD that the remedy has failed to meet the RAOs for the Rocker OU regarding groundwater and additional remedial technologies need to be considered. Maps should also be developed to depict the current extent of the arsenic plume based on the new 10 µg/L standard to ensure that the evaluated technologies consider the expanded plume boundaries.

The highest arsenic concentrations continue to occur in the shallow interior wells installed in the gravel zone created by remediation (e.g., RH-62) (which is within the waste unit boundary). Concentrations in some of these wells have declined since the post-remediation rebound event observed between 2002 and 2006 when concentrations exceeded 10,000 µg/L, but concentrations in many of the gravel zone wells are higher than concentrations detected immediately after remediation.

In November 2014, wells RH-32 (shallow alluvial) and RH-72 (tertiary) were sampled to investigate the upward trend in arsenic concentrations at RH-44. Arsenic was detected in RH-32 at 37 µg/L and at RH-72 at 230 µg/L, which both exceed the arsenic cleanup standard of 10 µg/L. The detection in RH-32 is consistent with the elevated detections observed historically – detections of 30.5 µg/L in November 1991, 387 µg/L in September 1992 and 148 µg/L in July 1993. The detected concentration in RH-72 was the highest arsenic concentration detected in a tertiary sediment well at the Rocker OU during the November 2014 sampling event. This detection suggests that arsenic has migrated beyond its known limits, and vertically into the tertiary sediments. The detection at shallow alluvial well RH-32 is much lower than historical levels but still above the new standard of 10 µg/L. Additional investigation of arsenic southwest of the Rocker OU boundary, near RH-72, and in the eastern portion of the Site, near RH-32, is warranted to delineate the extent of contamination in these areas and to monitor contaminant trends in these wells.

Arsenic contamination in the alluvium beneath the remediated area appears to be a continuing source of arsenic to the groundwater, as shown by the elevated concentrations in the gravel zone wells. Downward gradients in the northern and western portion of the remediated area are also a concern due to potential for vertical contaminant migration. The 2013 Annual Monitoring Report indicates that a forthcoming conceptual site model will address the potential for remaining arsenic contamination below and within the remediated area.

Arsenic concentrations also remain elevated above 1,000 µg/L in shallow exterior monitoring wells RH-05 and RH-41. Mean arsenic concentrations in RH-41 have steadily decreased over time, while arsenic concentrations in RH-05, which increased substantially from 1997 to 2006, have remained fairly constant between 2006 and the present. There appears to be a gap in the monitoring network southwest of RH-05. Additional investigation of this area is warranted to refine groundwater flow direction and to determine the extent of the plume in this area.

The 2014 ESD changed the arsenic cleanup standard from 18 µg/L to 10 µg/L. During this FYR period, three contingency wells (Ayers, RH-53 and Town Pump) have reported arsenic concentrations equal to or greater than the new standard. At EPA's request and working through the State of Montana drinking water program, the Town Pump well has had a treatment system installed to ensure the water meets the current standard. Recent water sampling by MDEQ at the Town Pump well confirmed the treated water meets the new 10 µg/L standard. Continued sampling and monitoring is required by the State drinking water authorities to ensure the Town Pump treatment system is functional. Continued sampling under the Superfund program is needed to determine if additional action is required to ensure the Ayers well, and all other domestic wells in the area, meet drinking water standards.

Although the arsenic cleanup standard was changed, the contingent remedy trigger value for action has not been changed from the 18 µg/L value specified in the Statistical Evaluation and Implementation Plan for the Contingent Remedy, which is part of the work plan attached to the Rocker OU Consent Decree. This trigger value may require additional evaluation in light of the new arsenic standard and based on the forthcoming conceptual site model update.

Surface Water

Because of increasing arsenic concentrations at shallow alluvial well RH-44, located about 100 feet east of Silver Bow Creek, the previous FYR recommended surface water sampling to determine if the plume is migrating and if the contaminated shallow groundwater is having (or has the potential to have) an impact on the creek. Surface water samples were collected in November 2011, February 2014 and February 2015 at one upstream location (RSG-1), one location within the Site (RSG-3) and one downstream location (RSG-4), and analyzed for total and dissolved arsenic. Radon analysis was also included to assist in assessing groundwater gains and losses.

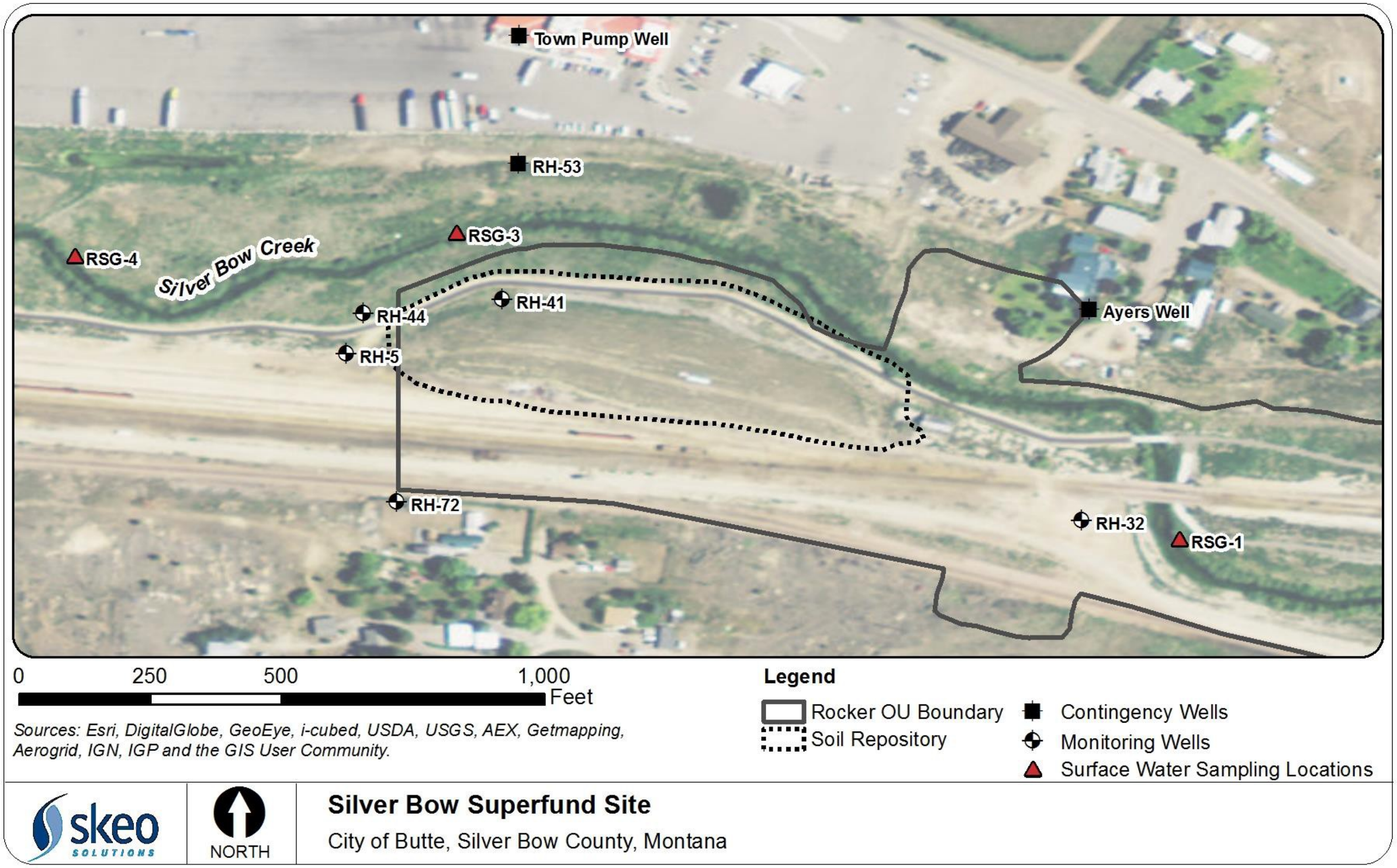
The dissolved arsenic in groundwater concentrations in well RH-44 during 2011, 2014 and 2015 exhibited a continued increase, with concentrations ranging from 430 µg/L in 2011 to 610 µg/L in 2015. The surface water data does not exhibit the same trend. The 2011 data show there was minimal change in the dissolved arsenic concentration between RSG-01 (upstream) and RSG-04 (downstream) (Table 20). The dissolved concentrations ranged from 3.1 µg/L (upstream) to 3.3 µg/L (downstream). The 2011 radon data collected at RSG-03 and RSG-04 are reported to demonstrate a limited gain to the stream in this reach and that flow measurements indicate that Silver Bow Creek continually gains water as it passes through the Rocker Site. The PRP reported a significant flow increase between RSG-03 and RSG-04 with a small arsenic load increase between the two sampling locations but this increase was reported to be within the calculated measurement error. Further, the surface water results support the small load increase since the surface water data collected in 2014 and 2015 show that the dissolved arsenic concentrations in the upstream sample (RSG-01) are nearly the same with concentrations observed in the downgradient sample (RSG-04) (Table 20).

Table 20: Comparison of Dissolved Arsenic in Well RH-44 Versus Surface Water

	Dissolved Arsenic Concentrations (µg/L)			
	Surface Water			Groundwater
Sample Date	RSG-1	RSG-3	RSG-4	RH-44
11/21/2011	3.1	3.1	3.3	430
2/21/2014	3	3.2	3	560
2/11/2015	3.7	3.5	3.8	610

The 2015 surface water data indicate a slight increase in dissolved arsenic concentrations from 2011 and 2014, but this increase was also observed in the upgradient sample. Concentrations in the upstream sample are similar to the downstream sample, so no appreciable contribution from the Rocker site is occurring based on current data. The dissolved arsenic surface water concentrations at the downstream location (RSG-4) also does not reflect the overall increasing trend in well RH-44. However, additional evaluation and characterization of the area is currently being conducted to further determine if the shallow groundwater has the potential to impact Silver Bow Creek.

Figure 11: Rocker Features



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

8.7 Site Inspection

On October 2, 2014, EPA RPM Nikia Greene, staff from EPA contractor Skeo Solutions, PRP representatives, staff from the O&M contractor, and MDEQ and Montana Bureau of Mines staff met at the Site. The group toured the Site to observe the condition of all remedial components, including site fencing, on- and off-site monitoring wells, and the capped landfill area. The Site was well maintained overall; the remedy appeared to be in working order. Chain-link fencing surrounds the Site. The O&M contractor regularly inspects the Site. The capped area of the landfill and non-capped area were well vegetated. One of the wells inside the fenced area of the Site had damage from frost heaves. The complete site inspection checklist is available in Appendix D. Photographs from the site inspection are available in Appendix E.

8.8 Technical Assessment

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

No. RAOs for the Rocker OU related to groundwater have not been fully met with the current selected remedy. It has not succeeded in attaining groundwater standards for groundwater underlying and adjacent to the OU. Surface water sampling should continue to assist in completing the updated site model. Additional data is needed to fully determine whether migration of contaminated site groundwater is occurring. EPA has requested that PRPs complete an updated conceptual site model.

The shallow groundwater system in the area of the Rocker OU is not currently used as a drinking water source. Institutional controls are in place to prevent new wells from being installed into the contaminated aquifers. DNRC instituted a controlled groundwater area in the Rocker area and Rocker residents were provided with an alternate community water system. Although there are existing wells within the controlled groundwater area, well owners have been notified of the potential risks and only one currently used domestic well has shown arsenic levels at or slightly above the drinking water standard. Some land use restrictions are in place preventing residential use of the Site and protecting the implemented remedy.

Two existing wells – Town Pump and Ayers – may be impacted by the revised drinking water standard selected in the 2014 Rocker ESD. The Town Pump well has two adsorptive arsenic media treatment tanks installed to ensure the water meets current drinking water standards. Recent water sampling by MDEQ at the Town Pump well confirmed the treated water meets the new 10 µg/L standard. The Ayers well has arsenic concentrations below the old 18 µg/L standard, but may have concentrations, at times, just above the 10 µg/L standard. Continued sampling and monitoring is required to ensure the Town Pump treatment system is functional and to determine if additional action is required to ensure the Ayers well and all other domestic wells in the area meet drinking water standards. Additional information is also needed to understand the potential impact of these wells on the groundwater plume.

The data analysis revealed that additional investigation of the Rocker OU is warranted to refine groundwater flow direction and to determine the current extent of the plume. Arsenic contamination in the alluvium beneath the remediated area, appears to be a continuing source of arsenic to the groundwater. Given that the contaminant plume is not currently contained, EPA has requested additional data and data characterization from the PRPs. The remedy needs to be re-evaluated to identify changes that will ensure it is protective over the long term and meets RAOs.

Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of remedy selection in the 1995 Rocker ROD, and revised by the 2014 Rocker ESD, are still valid (the 2014 Rocker ESD incorporated a revised arsenic ARAR).

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

No. There is no other information that could call into question the protectiveness of the remedy.

Technical Assessment Summary

RAOs for the Rocker OU have not been met with the current selected remedy. It has not succeeded in attaining groundwater standards for groundwater underlying and adjacent to the OU. Additional data and an updated conceptual site model are needed to fully determine whether migration of contaminated site groundwater is occurring.

Additional continued sampling and monitoring is required to ensure the Town Pump treatment system is functional and to determine if additional action is required to ensure the Ayers well and all other domestic wells in the area meet drinking water standards. Additional information is also needed to understand the potential impact of these wells on the groundwater plume.

Additional investigation of the Rocker OU is warranted to refine groundwater flow direction and to determine the extent of the plume. Given that the contaminant plume is not currently contained, EPA is currently requesting additional data and data characterization from the PRPs. The remedy needs to be re-evaluated to identify changes that will ensure it is protective over the long term and meets RAOs, or whether an ARARs waiver is appropriate.

8.9 Issues and Recommendations

Table 21 provides recommendations to address the current site issues.

Table 21: Recommendations to Address Current Site Issues

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
There appears to be a gap in the monitoring network southwest of RH-05. In addition, during the most recent sampling event, arsenic was detected in tertiary well RH-72 at 230 µg/L, significantly exceeding the arsenic cleanup standard of 10 µg/L.	Upon completion of the conceptual site model, update, develop and review the conceptual site model to determine what additional investigation and/or action for this area is warranted to refine groundwater flow direction and to determine the extent of the plume in the southwest direction.	Atlantic Richfield	EPA/ MDEQ	09/30/2016	No	Yes
Arsenic contamination in the alluvium beneath the remediated area appears to be a continuing source of arsenic to the groundwater.	Evaluate the situation and determine any needed updates to the selected remedy.	Atlantic Richfield	EPA/ MDEQ	09/30/2016	No	Yes
A local private well has arsenic concentrations, at times, above the 10 µg/L standard.	Determine whether or not this well and all other domestic wells in the area meet drinking water standards and are not having an effect on the groundwater plume.	Atlantic Richfield	EPA/ MDEQ	09/30/2016	Yes	Yes
There is not a complete understanding of how the shallow groundwater interacts with surface water in Silver Bow Creek.	Update, develop and review the conceptual site model to determine the potential impact on Silver Bow Creek.	Atlantic Richfield	EPA/ MDEQ	09/30/2016	No	Yes

8.10 Protectiveness Statement for Rocker OU (OU 7)

A protectiveness determination of the remedy at the Rocker OU (OU 7) cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions: completion of the updated conceptual site model and further investigation of private domestic area wells. It is expected that these actions will take approximately 18 months to complete, at which time a protectiveness determination will be made.

9.0 OU 8: BPSOU

9.1 Description

The BPSOU includes impacted soils, mine wastes and contaminated attic dust within portions of the City of Butte and the Town of Walkerville, along with mining-impacted alluvial groundwater and surface water associated with the historical and current Silver Bow Creek floodplain in Butte. Previously identified Silver Bow Creek/Butte Area Site OUs 2, 5, 6, 10 and 11 were incorporated into BPSOU.

The BPSOU is situated in a predominantly urban setting. It includes neighborhoods, schools and parks as well as commercial and industrial areas. The communities of Butte and Walkerville were established close to the silver and copper mining and milling centers and facilities as a matter of convenience. Operations of mines, mills, concentrators and smelters in this area generated tailings, related wastes and a variety of other materials that were deposited on-location, in the midst of residential areas. Land use within the BPSOU is subject to county government regulation through local ordinances. The population of Butte peaked in 1920 at 60,313. As of the 2010 U.S. Census, 33,525 people lived in Butte and 675 people lived in Walkerville.

The two primary streams in the valley are Blacktail Creek, which begins in the Highland Mountains to the south, and Silver Bow Creek. As mining production increased, mills and smelters were located along the creek. To accommodate mineral processing activities, Silver Bow Creek was rerouted as needed and used for waste disposal. Tailings impoundments were placed in the floodplain and wastes were discharged directly into the creek. With the advent of open pit mining, most of the original Silver Bow Creek channel and floodplain were fundamentally altered by the Berkeley Pit and Yankee Doodle Tailings Pond. Today, many of the waste deposits along historic Silver Bow Creek above Blacktail Creek remain in place. Most are capped.

Screening studies, remedial investigations and risk assessments have been conducted in Butte since the early 1990s to identify COCs and to quantify actual and potential human health and environmental risks from COCs in tailings, waste, soils, indoor dust, surface water and groundwater.

Possible exposure pathways for humans at the BPSOU include:

- Ingestion of surface soils.
- Ingestion of interior dust.
- Dermal exposure to surface water.
- Ingestion of surface water.

Assessments of ecological risks focused on aquatic habitat in Silver Bow Creek and identified the following potential exposure pathways:

- Fish and benthic macroinvertebrates may be exposed by breathing and touching the surface water and sediment and by ingesting prey or sediment.
- Waterfowl may be exposed by direct ingestion of surface water and sediments or by ingesting contaminated prey.

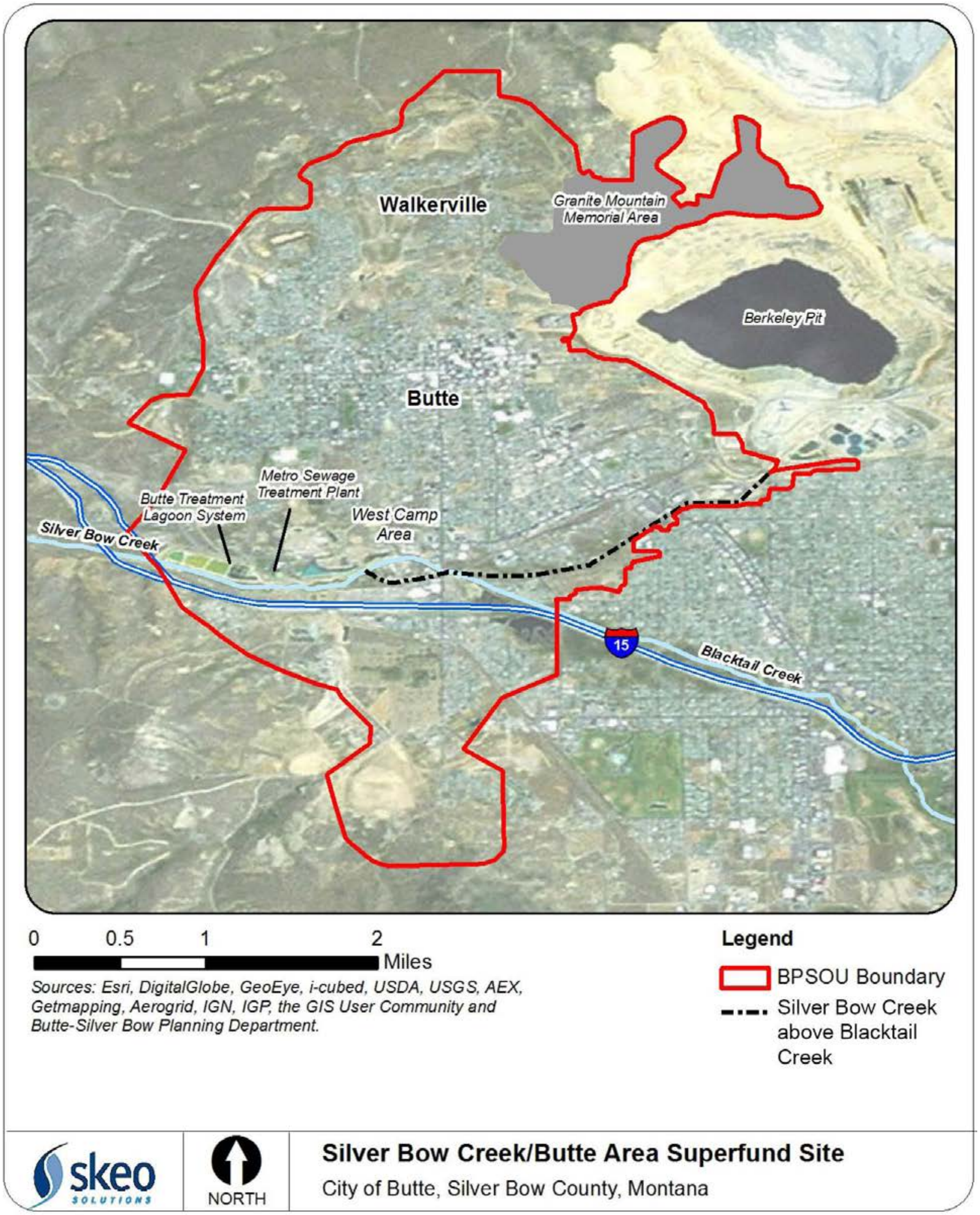
Previous response actions using Superfund removal authorities and the Butte-Silver Bow Lead Intervention and Abatement Program have significantly reduced some the human health risks. Metal-laden mine waste within the BPSOU has contaminated local groundwater and surface water resources. There were multiple removal actions within the BPSOU from the late 1980s through 2004.[16] The response actions were completed in a manner consistent with the final selected remedy.

The following is a list of previously implemented response actions conducted within the BPSOU.

- Walkerville Time-Critical Removal Action (1988)
- Timber Butte Time-Critical Removal Action (1989)
- Butte Priority Soils Time-Critical Removal Action (1990 and 1991)
- Colorado Smelter Time-Critical Removal Action (1992)
- Anselmo Mine Yard and Late Acquisition/Silver Hill Time-Critical Removal Action (1992)
- Walkerville II Time-Critical Removal Action (1994)
- Railroad Beds Time-Critical Removal Action (1999-2004)
- Storm Water Time-Critical Removal Action (1997-2006). This removal action was incorporated into the 2006 BPSOU ROD.
- Walkerville Time-Critical Removal Action (2000)
- Lower Area One Emergency Response Action (1992-2006). This removal action was incorporated into the 2006 BPSOU ROD.
- Butte Priority Soils OU Emergency Response Action Residential Soils/Source Areas (1994-2006). This removal action was incorporated into the 2006 BPSOU ROD.
- Lower Area One Manganese Removal (1992)
- Old Butte Landfill/ Clark Mill Tailings (1998)

[16] For a detailed summary, see the 2006 BPSOU ROD and the 2011 FYR.

Figure 12: BPSOU Features



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

9.2 Remedial Actions

Remedy Selection

The remedy selected in the 2006 BPSOU ROD and amended by the 2011 ESD includes components to address contaminated solid media (waste rock piles, smelter wastes, milling wastes, contaminated soil and contaminated dust), surface water base flow and stormwater runoff, and alluvial groundwater. A brief description of the RAOs and components of the remedy selected are presented below. For more information, see the 2006 ROD and 2011 ESD for BPSOU.

Solid Media

The RAOs established for BPSOU solid media are:

- Prevent the ingestion of, direct contact with, and the inhalation of, contaminated soils, indoor dust, waste rock and/or tailings or other process waste that would result in an unacceptable risk to human health assuming current or reasonably anticipated future land uses.
- Prevent releases of contaminated solid media to the extent that they will not result in an unacceptable risk to aquatic environmental receptors.
- Prevent releases of contaminated water from solid media that would result in exceedances of the Montana State Water Quality Standards for surface water.
- Prevent releases of contaminated water from solid media that would result in exceedances of the Montana State Water Quality Standards for groundwater, except where ARAR waivers are appropriate and other means to protect from associated risks are available.
- Remediate contaminated solid media to the extent that it will not result in an unacceptable risk to human health and/or aquatic environment receptors.
- Prevent release of contaminated water from solid media that would result in degradation of surface water, in accordance with the surface water remedial goals.

The action levels selected for COCs in soils, dust and vapor are presented in Table 22.

Table 22: Soil, Dust and Vapor Action Levels

COC	Exposure Scenario	Action Level (mg/kg)
Lead	Residential	1,200
	Non-residential	2,300
Arsenic	Residential	250
	Commercial	500
	Recreational	1,000
Mercury	Residential	147
	Residential (vapor)	0.43 micrograms per cubic meter ($\mu g/m^3$)

Residential Metals Abatement Program (RMAP) aims to reduce risk from exposure to high metals. The RMAP includes comprehensive procedures for sampling, remediation, medical monitoring, community outreach and overall property characterization and remedial status tracking. Contaminated solid media located in non-residential areas include waste rock piles, smelter wastes, milling wastes and contaminated soils. Major components of the selected remedy for BPSOU solid media are described below for both the residential contamination and the non-residential contamination.

- Continuation and expansion of the Butte-Silver Bow Lead Intervention and Abatement Program, in a way that requires sampling and assessment of all residential properties within and near the BPSOU and abatement if action levels are exceeded for arsenic, lead and/or mercury.
- Addressing contaminated solid media through a combination of source removal, capping and land reclamation.
- Reclaimed areas, including cover soil caps, must achieve the performance standards described by EPA in the Butte Reclamation Evaluation System (BRES). This system is a site-specific tool to evaluate the stability, integrity and degree of human and environmental protectiveness afforded by EPA-sanctioned response actions, or other past reclamation actions on lands impacted by mining within the BPSOU. The system also sets corrective action "triggers," based on the evaluation criteria, for corrective actions.
- Institutional controls are required to protect capped and waste-in-place areas, restrict removal and disposal of contaminated dirt, and determine land use requirements.

Groundwater

The RAOs established for BPSOU groundwater are:

- Prevent ingestion of, or direct contact with, contaminated groundwater that would result in unacceptable risk to human health.
- Prevent groundwater discharge that would lead to violations of surface water ARARs and remedial goals for the BPSOU.
- Prevent degradation of groundwater that does not exceed current standards.

The BPSOU groundwater remedy is summarized as follows:

- The groundwater component requires the continued use of the Hydraulic Control Channel and the BPSOU Subdrain capture and interception system to capture and pump contaminated groundwater (and some surface water) into the Butte Treatment Lagoon facility for treatment prior to discharge.
- Additional groundwater control measures such as infiltration barriers, groundwater diversion or other measures may also be needed and are to be evaluated.
- The groundwater aquifer must be further evaluated and characterized to ensure the effectiveness of the interception and pumping systems.
- Groundwater monitoring and data reporting is required.
- The wetlands demonstration area near Kaw Avenue and George Street will be used for the construction of an emergency overflow pond.
- A five-year shakedown period for operation of the BPSOU Subdrain interception and pumping facility and the Butte Treatment Lagoons is required.
- Treated water discharged to Silver Bow Creek from the Butte Treatment Lagoon facility shall meet all discharge requirements set forth in the ARARs.

- Institutional controls are required to prevent the domestic use of contaminated groundwater.

The 2006 BPSOU ROD contained a waiver of ARAR standards for the alluvial groundwater within the defined technical impracticability Waiver Area described in the 2006 BPSOU ROD. The selected remedy will not, and is not intended to, clean up groundwater to meet groundwater performance standards within the boundary of the waived standards. Therefore, there are no performance standards for groundwater in the area of the BPSOU alluvial aquifer covered by the technical impracticability waiver boundary (Figure H-4 in Appendix H).

Since the selected remedy requires the prevention of contaminated plumes from migrating outside the established technical impracticability zone, the boundary for the technical impracticability zone represents the point of compliance boundary for groundwater. Groundwater performance standards must be met at these points of compliance (Table 23).

Table 23: BPSOU Groundwater MCLs outside Technical Impracticability Zone

COC	MCL (µg/L)
Arsenic	10
Cadmium	5
Copper	1,300
Lead	15
Mercury	2
Zinc	2,000

Surface Water and Stormwater

The RAOs established for BPSOU surface water are:

- Prevent ingestion or direct contact with contaminated surface water that would result in an unacceptable risk to human health.
- Return surface water to a quality that supports its beneficial uses.
- Prevent source areas from releasing contaminants to surface water that would cause the receiving water to violate surface water ARARs and remedial goals for the BPSOU and prevent degradation of downstream surface water sources, including during storm events.
- Ensure that point source discharge from any BPSOU Superfund water treatment facility meet ARARs.
- Prevent further degradation of surface water.
- Meet the more restrictive of chronic aquatic life or human health standards for surface water identified in Circular MDEQ-7 through the application of B-1 class standards.
- Institutional controls are required for stormwater controls.

The BPSOU surface water remedy included the removal of in-stream sediments and near-stream contamination in the reach of Silver Bow Creek and certain areas of Blacktail Creek not addressed in the prior Lower Area One non-time-critical removal action. It also required that discharge from the Butte Treatment Lagoons facility meet performance standards for discharges in a permanent manner. For more details, see the 2006 BPSOU ROD and the 2011 BPSOU ESD.

The evaluation and implementation of wet weather control best management practices (BMPs) on a yearly basis to control wet-weather runoff under a variety of scenarios and flows such that surface water performance standards are met is required. If BMPs do not meet surface water performance standards within a 15-year period, the selected remedy provides for contingency measures such as the construction of a collection and treatment plant system for stormwater and/or flow augmentation in Silver Bow Creek.

The selected remedy requires an EPA-approved, comprehensive, long-term surface water monitoring program. It will include collection of compliance and diagnostic flow and chemistry data for normal flow and wet weather conditions in receiving surface waters and within intermittent stormwater conveyances at the BPSOU.

Remedy Implementation

BPSOU remedy design and implementation began in 2007 using existing order authority. EPA issued a UAO for remedy implementation in 2011. Response actions started are summarized below. For a detailed history of the response actions, see the 2011 FYR, Volume 6: Butte Priority Soils Operable Unit. Design and implementation of many remedial components are still ongoing.

Solid Media Residential

As noted above, substantial cleanup of solid media in residential areas occurred prior to the ROD using Superfund removal authority. After extensive remedial design efforts, EPA and MDEQ approved the Butte-Silver Bow RMAP in 2010. The RMAP requires a multi-pathway approach to address arsenic, lead and mercury above action levels in yard soil, indoor dust (living space and direct exposure to non-living space dust), interior and/or exterior lead paint, and lead solder in household drinking water pipes. Major components include:

- Homes adjacent to the BPSOU that have lead, arsenic or mercury in attic dust will also be addressed in the same manner as homes within the BPSOU (the RMAP defines the area for which attics with elevated levels will be addressed in Appendix A of the RMAP. The area is known as the Residential Metals Expanded Area).
- Properties whose owners refuse access, properties without current exposure pathways and vacant properties will be flagged and tracked in the RMAP database for future action.
- The RMAP requires developing and implementing community awareness and educational programs in conjunction with a medical monitoring program.
- The RMAP has completed 838 abatement projects and has sampled 2,487 residential parcels as of December 31, 2014.

Completed residential contamination remediation activities include:

- Final Multi-Pathway RMAP Plan
- Anaconda Sampling Worksite 137
- PA012 Dump Site 113
- 33 West Missoula

Ongoing residential contamination remediation activities include:

- RMAP assessments
- RMAP cleanups, including attic dust
- Community outreach and education
- Health studies and medical monitoring
- Long-term tracking methods (database)

Non-Residential Contamination

After many years of work under pre-ROD removal actions, and extensive post-ROD remedial design work under orders from EPA, these contaminated areas in BPSOU have now been addressed and have either been removed or have working caps and revegetation. The integrity of the caps is now being evaluated and maintained, which includes corrective actions. These areas are addressed using the BRES evaluation and corrective action tool. The BRES system is being implemented to evaluate and correct where necessary the condition of source area caps. Sites at which non-residential contamination remedial activities occurred include:

- Goldsmith Dump Site 161
- Arctic Site 1530
- Wake Up Jim Site 161 – moved to Granite Mountain Area and will not be reclaimed
- Small waste areas surrounding Clark Mill Tailings repository
- Caledonia Street
- Moose Dump Site 12
- Back Fill 007 Site 65
- New and Mahoney Street
- 413 Boardman Street
- Jenny Dell Site 33
- Kelly Mine Yard Entrance
- North Wyoming Street
- 800 North Main
- North Corner of Granite and Arizona
- Green Mountain Shaft
- Streambanks and over bank deposits from the Blacktail Creek/Silver Bow Creek confluence area to Lower Area One
- 424 North Washington Street
- 131 West Copper Street
- 20 additional sites identified in 2010
- Sites within the Granite Mountain Memorial Area
- Syndicate Pit
- Butte Mine Waste Repository
- Colorado Smelter
- Lower Railroad Yard Site 1

Groundwater

Above the confluence of Silver Bow Creek and Blacktail Creek, groundwater is currently being captured by a subdrain (French drain) installed under the Silver Bow Creek channel. The captured groundwater is transported to the Butte Treatment Lagoons for treatment. The performance of the subdrain is being evaluated and will be improved as needed. Improvements made to date include Lower Area One contaminated alluvial groundwater, along with Missoula Gulch base flow, and the West Camp groundwater is being routed to the hydraulic control channel and the Butte Treatment Lagoon System for treatment. The Butte Treatment Lagoon System at Lower Area One was substantially upgraded in accordance with ROD requirements and those upgrades were completed in 2013. It is now a fully functional and modern treatment facility. In addition, activities including the Butte Reduction Works East End Grading and Silver Bow Creek above Blacktail Creek/ Butte Reduction Works Upgrades work plans, culvert removals in Silver Bow Creek, wetland demonstration area and the localized groundwater study are complete.

The comprehensive groundwater monitoring program throughout the alluvial aquifer is being developed as part of ongoing remedial design efforts. It is intended to ensure proper functioning of the groundwater control and capture system. A draft interim groundwater monitoring plan is in place, giving the agencies access to substantial data to assess groundwater components of the remedy. Ongoing remedial activities include:

- Irrigation controls and monitoring at the Parrott Tailings.
- Groundwater flow monitoring at Silver Bow Creek above Blacktail Creek.
- Butte Reduction Works groundwater and surface water monitoring.
- Conduction of an abandoned aqueduct study and implementation of resulting recommendations.
- Preparation of the BPSOU Subdrain Groundwater Management Report.
- Implementation of selected BPSOU subdrain improvement actions.
- Implementation of the revised groundwater monitoring program.

Surface water and stormwater

As noted above, substantial surface water cleanup work and wet weather control cleanup work was done under Superfund removal authorities pre-ROD. This work included the removal of substantial portions of the Colorado Tailings and Butte Reduction Work tailings in the Lower Area One removal action, and the construction of catch basins in the Missoula Gulch area, as well as controls on railroad facility run-off. Surface water monitoring is occurring under a draft interim surface water monitoring plan. Since 2009, the responsible parties have implemented two cycles of upfront stormwater control BMPs to mitigate contaminated stormwater run-off. These actions included the reclamation and revegetation of areas identified as contamination contributors to stormwater runoff, initiation of stormwater system sediment cleanout activities on a periodic basis, the expansion and improvement of existing catch basins and the initiation of a curb and gutter program.

BMPs completed under the third cycle include:

- Clean out of the Butte-Silver Bow stormwater system.
- Disconnection of illicit connections.
- Continuation of full implementation of the curb and gutter program in Butte.
- Installation of hydrodynamic devices.
- Development and implementation of a Butte-Silver Bow street maintenance and snow management plan.

Ongoing BMP implementation includes the construction of stormwater catch basins at the base of Buffalo Gulch. Additional stormwater data has also been collected and evaluated as part of the current remedial design and implementation process. The full Surface Water Management Program has not been finalized but will be as the remedial design is completed. Surface water data is available to show current water quality and trends in Silver Bow Creek. See Section 9.6 for discussion of the results.

Institutional Controls
Some of the institutional controls have been implemented. They are discussed in Section 9.5.

9.3 Operation and Maintenance

The BPSOU is still in the remedy implementation phase, and with routine O&M on certain components ongoing. Although some of the existing remedial components (Butte Treatment Lagoon System, existing stormwater projects and non-residential soil remedial projects) have O&M components, they are currently part of the continuing remedial design and remedial action phase.

9.4 Progress Since the Previous FYR

The protectiveness statement for the BPSOU (OU 8) from the 2011 FYR stated:

The remedy at OU8 is not protective because aquatic life standards are not met in the stream. Environmental exposures continue. Short-term protectiveness is provided for all other potential exposures by the recently enacted [controlled groundwater area], information/educational ICs, and engineering and access controls of source areas. To ensure protectiveness, remedy implementation must be completed, and municipal storm water contributions to Silver Bow Creek must be abated.

Releases of arsenic and heavy metal contaminants in alluvial groundwater to Silver Bow Creek have been reduced through a comprehensive groundwater control, capture, and treatment system, such that water quality standards are being met much of the time during base flow conditions. The design of a more effective capture system is very important for completion of the surface water component of the remedy. Storm water continues to be a significant source of contaminant loading to Silver Bow Creek during runoff events, and additional remedial actions are necessary.

The RMAP program will continue to obtain access to residential properties within the BPSOU that have not previously been sampled to complete indoor and outdoor assessments (i.e., residential yard soil, indoor and outdoor dust, attic dust, lead-based paint, drinking water, and mercury vapor) and perform clean up actions where necessary. The program anticipates completing these goals by about 2020.

For non-residential areas, engineering and institutional controls effectively isolate identified waste materials, thus preventing human and environmental exposures. Protection of human *health is expected to be strengthened as the BRES evaluation and cover maintenance programs are improved and mature, and as the IC Plan is fully implemented, tested, and enforced. It is important that follow-up on BRES findings be tracked and implemented.*

The 2011 FYR included six issues and recommendations. This report summarizes each recommendation and its current status below. The outstanding issues and recommendations identified in that report will be monitored, and are expected to be addressed as the remedy is completed and final operation and maintenance plans are developed. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.

Table 24: Progress on BPSOU Recommendations from the 2011 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Issue a decision document to acknowledge changes in sampling and removal depths for residential properties.	EPA/MDEQ	12/31/2011	Complete. EPA issued ESD modifying soil sampling and removal depths.	07/18/2011
Develop a program to follow up on Butte Reclamation Evaluation System related recommended corrective actions and other O&M for reclaimed areas. Include corrective action tracking, annual work plans, updates to the source area database and an annual audit of the schedule and accomplishments.	Butte-Silver Bow County	12/31/2011	In progress. Butte-Silver Bow County is working on updating the BRES system.	Ongoing
Construct new BMPs on Butte Hill to control runoff. Continue water quality monitoring during storm events to measure progress and long-term trends in stormwater quality. Include careful monitoring and coordination with Butte-Silver Bow County with the stormwater conveyance system in this process.	Atlantic Richfield / Butte-Silver Bow County	12/31/2014	In progress. New BMPs, such as the installation of hydrodynamic devices at stormwater outflows, were installed. EPA, MDEQ, Atlantic Richfield and Butte-Silver Bow County are working together to develop BMPs to control runoff. This is part of ongoing remedial actions.	Ongoing
Evaluate and optimize municipal stormwater collection system in concert with upgrades to the Superfund collection and treatment system.	Atlantic Richfield / Butte-Silver Bow County	12/31/2014	In progress. Butte Silver Bow County continues to upgrade its municipal system. A surface water characterization report that is expected to be complete by the end of 2016.	Ongoing

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Implement an enforceable Institutional Control Plan.	Atlantic Richfield /Butte-Silver Bow County	12/31/2014	In progress. The 2010 draft Institutional Control Implementation Plan has been completed. It is being implemented as part of ongoing remedial actions. A final plan will be produced.	Ongoing
Update the monitoring plan to include ecological monitoring.	Atlantic Richfield	12/31/2014	Complete. Ecological monitoring of Silver Bow Creek occurs as part of the SSTOU. Data collections and analysis addressing BPSOU will continue under SSTOU.	09/30/2015

9.5 Document Review

ARARs

Site-wide ARARs are reviewed in Section 4.4. There have been no changes to groundwater or surface water ARARs since the 2011 FYR.

Institutional Controls Review

The 2010 draft Institutional Control Implementation Plans include details on the types of institutional controls planned and implemented. These institutional control plans are subject to revision and final approval as remedial design continues to meet the requirements of the 2006 BPSOU ROD and ensure the selected remedy is protective upon completion.

Controlled Groundwater Areas. Two controlled groundwater areas established by DNRC serve areas of the BPSOU (Appendix H).

Hook-Up Ordinance/Education and Well Abandonment Program. Butte-Silver Bow County has adopted a "hook-up" ordinance that requires all prospective potable water users to hook into the Butte-Silver Bow County water system where municipal service is available. This institutional control enhances the effectiveness of the controlled groundwater areas and private covenants already in place.

Since the controlled groundwater area does not prevent the use of existing wells, the 2010 draft Institutional Control Implementation Plan calls for the Butte-Silver Bow Water Quality District to implement an education, testing and well abandonment program designed to: a) discourage inappropriate uses of groundwater from existing wells; and b) encourage owners to take existing wells out of service voluntarily. To date, testing of existing domestic private wells have shown they meet water quality standards. The 2014 draft Data Summary Report of Groundwater Quality of Private, Industrial, and Irrigation Wells in the Technical Impracticability Waiver Zone Well Sampling Study identified several wells recommended for abandonment that are not being used for drinking or irrigation purposes. The water district has had funding issues that have prevented implementation of the well abandonment program. Butte-Silver Bow County is in the process of obtaining additional funding to proceed with implementation of these institutional controls.

Excavation and Dirt-Moving Protocols Ordinance and Enforcement. In 2013, Butte-Silver Bow County passed an ordinance (number 13-6, 9-7-2013) that outlines the procedures for the enforcement of the 2009 Excavation and Dirt-Moving Protocols for all dirt-work to be performed in and near the Butte-area Superfund Sites. It is located in Chapter 8.28 – Excavations and Dirt Moving – of the Butte-Silver Bow County Municipal Codes.[17]

Stormwater Management Ordinance and Enforcement. In 2011, Butte-Silver Bow County passed an ordinance (number 10-13, 4-20-2011) that outlines the procedures, protocols and requirements for implementing and enforcing effective stormwater management within the Site. It is located in Chapter 32 – Stormwater Management – of the Butte-Silver Bow County Municipal Codes.[18]

GIS (and other) Database Description and Management. Butte-Silver Bow County operates and maintains a GIS system that stores information and runs applications pertinent to ensuring institutional controls are implemented and maintained.

Deed Notices on Properties where Waste Was Left in Place or where Engineering Controls Were Constructed. All source area property on which Superfund stormwater structures are located, or on which land use restrictions are required, will have Developable Property or Dedicated Use Property Covenants. For sample language for the covenants, see the 2010 draft Institutional Control Implementation Plans. These restrictions have been put in place on some properties. Implementation is ongoing. With such a large and complex area requiring individual restrictive covenants on multiple properties, a centralized database of these records should be made publicly available via a public website. In addition, annual reporting, as required by the 2010 draft Institutional Control Implementation Plans, needs to be implemented and completed.

In addition, engineering controls and access controls are used throughout the BPSOU to ensure the integrity of remedy components, ensure public safety, and prevent unauthorized use and access to source area properties or stormwater control basins.

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[17] https://www.municode.com/library/mt/butte-silver_bow_county/codes/code_of_ordinances?nodeId=TIT8HESA_CH8.28EXDIMO, accessed on April 17, 2015.
[18] https://www.municode.com/library/mt/butte-silver_bow_county/codes/code_of_ordinances?nodeId=TIT13PUUT_CH32STMA, accessed on April 17, 2015.

Table 25: BPSOU Institutional Control (IC) Summary Table

Area of Interest – BPSOU						
Media	**ICs Needed**	**ICs Called for in the Decision Documents**	**Impacted Area**	**IC Objective**	**Instrument in Place**	**Notes**
Solid media	Yes	Yes (2006 ROD)	BPSOU	Protect remedy components associated with areas where waste was left in place. Educate residents regarding the RMAP program and risks associated with residential contamination.	Butte-Silver Bow earth-moving ordinance, restrictive covenants, zoning ordinances, community awareness and education, Butte-Silver Bow County database/GIS tracking system.	A centralized database of all areas with restrictions or needing restrictions will ensure that, upon completion of remedy implementation, a complete review is possible and that annual reporting can occur, as required by the 2010 Institutional Control Implementation Plan.
Ground water	Yes	Yes (2006 ROD)	BPSOU and BMFOU	Restrict all new appropriation of groundwater. Ensure that existing wells are part of an education and abandonment program.	Butte Alluvial/ Bedrock controlled groundwater areas were enacted. Butte Silver Bow County also enacted a "hook-up" ordinance.	The well abandonment program needs to be implemented.
Surface and storm water	Yes	Yes (2006 ROD)	BPSOU	Ensure protocols and requirements are implemented and enforced to ensure effective stormwater management. Ensure Butte-Silver Bow County has perpetual access to inspect and maintain water conveyance structures and enact penalties for anyone damaging these structures.	Stormwater management ordinance was enacted.	None

9.6 Data Review

There are a variety of data sources for the BPSOU. Data is collected primarily by three entities: Butte-Silver Bow County, Atlantic Richfield, and the BNSF and Union Pacific railroad companies. This data collection covers the RMAP program, a variety of solid media remedial projects ongoing throughout the OU, surface water drainage and collection, and water treatment at the Butte Treatment Lagoons in Lower Area One.

Residential Metals Abatement Program (RMAP)
According to the 2006 BPSOU ROD and 2011 BPSOU ESD, soil abatements of residential yards in the BPSOU take place when soil lead concentrations exceed 1,200 mg/kg or arsenic concentrations exceed 250 mg/kg. A multi-pathway program is also implemented to abate other hazards (attic dust, interior dust and paint) associated with lead, arsenic and mercury. The program also provides biological testing, education and community outreach. This program requires an assessment of all residential properties within the BPSOU within 10 years and remediation of all contaminated residential properties within the BPSOU within 20 years.

Yard and attic cleanup actions are done annually and summarized in annual Construction Completion Reports prepared by the Butte-Silver Bow Health Department on the behalf of the PRPs. Environmental assessments are also done annually to develop a list of potential abatement projects for the following year. If the contamination is only surficial (less than 12 inches in depth), then institutional controls are typically not necessary for a property after cleanup. If contamination is at depth and not removed, institutional controls may be needed, depending on the use of the property. The text below summarizes the results of annual Construction Completion Reports from 2010 to 2014.

Table 26 shows that all abatement projects were conducted due to the detection of lead above 1,200 mg/kg or arsenic above 250 mg/kg. In 2011, seven additional residences that had received environmental assessments and qualified for soil abatement activities, opted to not allow the Residential Metals Program to perform abatement activities for various reasons. In cases where remediation needs are identified but property owners are unwilling to allow work to be completed, Butte-Silver Bow County is providing education and continuing attempts to convince property owners to comply. Where this fails, Butte-Silver Bow County is tracking these properties to ensure that work is eventually completed as needed, sometimes as part of a property transfer.

From 1990 through December 2014, a total of 2,723 yards within the BPSOU have been sampled (out of 4,000 total properties estimated in Section 5.2.1 of the 2006 ROD). In addition, during this same period, a total of 520 yards within the BPSOU were determined to have exceeded action levels and have been abated. At each removal location, prior to backfilling, a layer of lightweight geotextile fabric is placed over the exposed surface as a marker of the extent of soil removal/replacement and as a visual indicator that the underlying soil may contain arsenic, lead or mercury concentrations above action levels. Backfill material may include replacement soil for yard and garden areas, pit-run gravel base for driveways, sod or seeding.

Table 26: Summary of Residential Abatement Projects Completed from 2010 to 2014

Year	Abatement Projects Completed				Total Abatement Projects Completed	Residences Opting Out of Abatement Activities	Number of Environmental Assessments Completed
	Yards	Attics[b]	Interior Living Space	Other			
2010	24	38	3	NA	65	0	251
2011	28	41	5	NA	74	7	244
2012	32	50	1	2 stormwater projects	85	0	251
2013	33	76	4	1 stormwater project	114	0	208
2014	26	89	1	2 basements[c]	118	0	305
FYR Totals	143	294	14	5	456	7	1259
Since 1990	520	386	43	10	959	7	2,723

Notes:
a. NA – not applicable.
b. Attic insulation is removed in conjunction with any contaminated attic dust.
c. Soils from earthen basements that exceed actions levels are encapsulated with a surfactant, as appropriate for the space.

In addition to the abatement activities, a clinical and educational intervention program is completed each year. Blood lead screening is available to all Butte-Silver Bow residents. Butte's Women, Infant, and Children Program conducts the testing. In addition to blood testing, families are educated about potential lead exposures in and around their homes. Since the start of the program, 8,568 total blood lead tests have been conducted. Prior to 2013, the Centers for Disease Control and Prevention recommended 10 µg/dL as a blood lead "level of concern." The Butte-Silver Bow Health Department used this level of concern as a risk management tool to identify children who might have elevated lead exposures so that actions could be taken to reduce such exposures.

Children with confirmed venous blood lead results exceeding 9.9 µg/dL were referred for case management, including home visits when appropriate, intensive education for the family, environmental investigation and follow-up blood lead testing. Figure 13 provides a summary of the number of blood lead tests conducted by year with the corresponding number of blood level test results greater than 9.9 µg/dL. As shown, the number of blood lead test greater than 9.9 µg/dL decreased significantly from 1990 to 2012. Starting in 2013, the Butte-Silver Bow Health Department starting using the new blood lead reference level – 5 ug/dL – issued by the Centers for Disease Control and Prevention. Based on the new reference level, the number of children exceeding this level has increased from 0.1 percent in 2010 to 1 percent in 2014 (Figure 14).

The Butte-Silver Bow Health Department completed a Phase 1 health study in July 2014. It evaluated Butte blood lead records for nearly 3,000 children from 2003 to 2010 along with additional records collected in 2011 and supplemental information about RMAP assessments and abatements. The Butte-Silver Bow Health Department concluded that blood lead levels in Butte children have declined dramatically since 2003. Average values for 2010 were less than half of the values for 2003, with geometric means having declined from 3.5 µg/dL in 2003 to 1.6 µg/dL in 2010. The geometric means over these time periods are below the new Centers for Disease Control and Prevention reference level of 5.0 µg/dL The percent of blood lead levels above 10.0 µg/dL declined by a similar magnitude, while the percent of blood lead levels above 5.0 µg/dL declined by an even greater margin, decreasing from 33.6 percent in 2003, to 9.5 percent in 2010.

Figure 13: Summary of Blood Tests Resulting in Exceedance of Lead Reference Levels

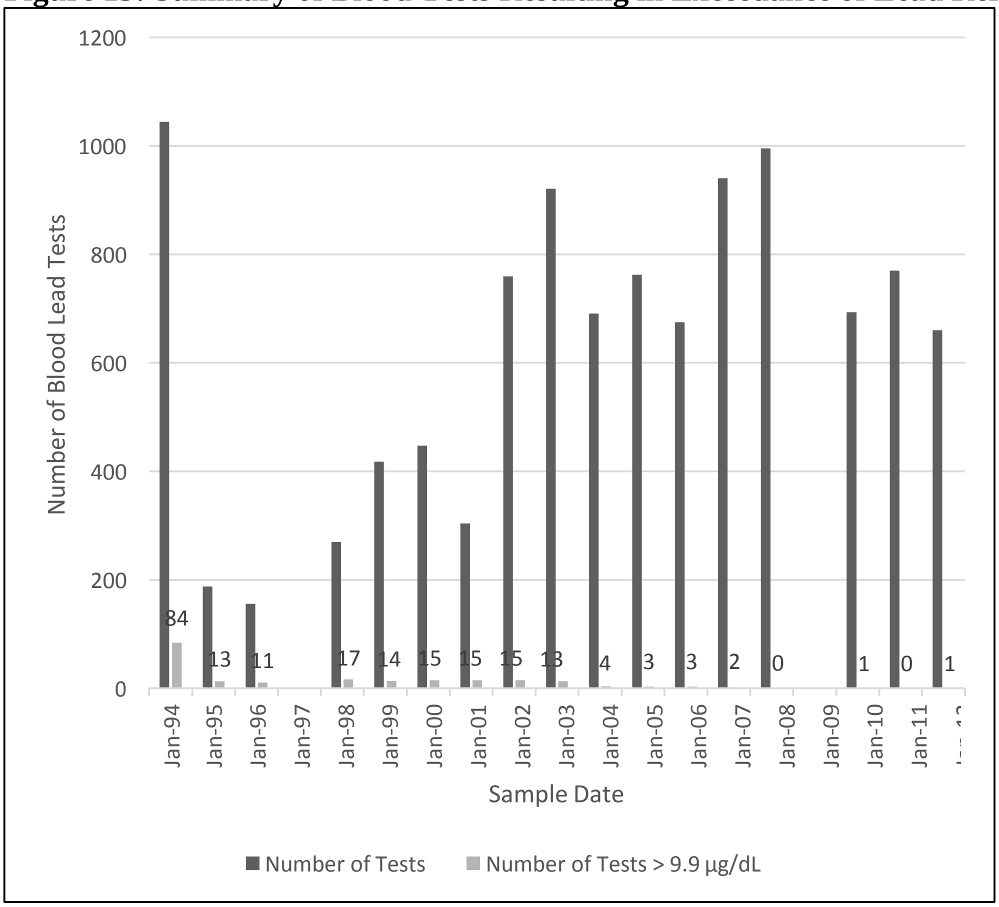
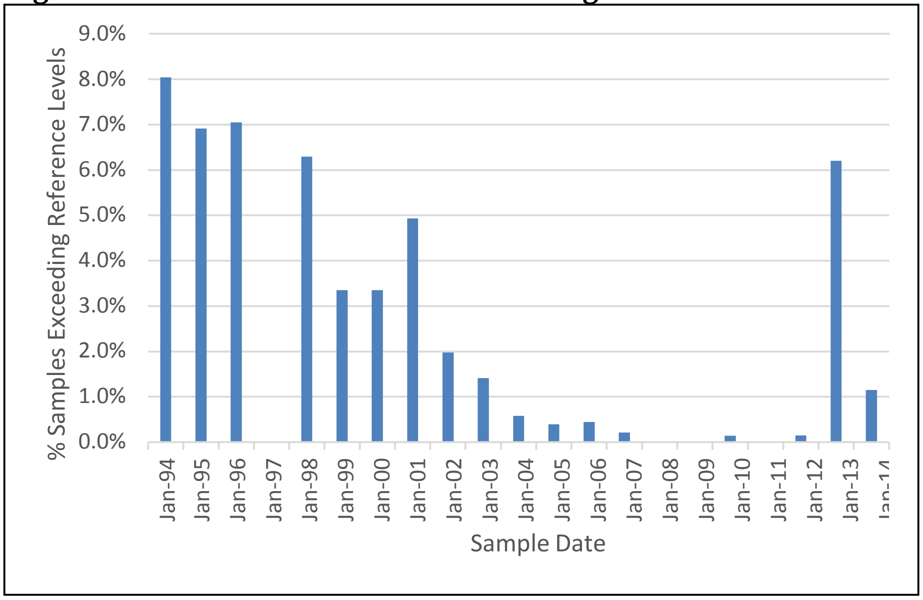


Figure 14: Percent of Blood Tests Resulting in Exceedance of Lead Reference Levels



The 2014 Butte-Silver Bow Health Department's Butte Priority Soils Operable Unit Public Health Study Phase 1 also examined the effectiveness of the RMAP for the BPSOU. The Butte-Silver Bow County Health Department found that "the RMAP has been an important community-wide mechanism for identifying and reducing lead exposures from a variety of sources" and their primary recommendation was that the RMAP should be continued.

Stormwater

While the remedy in the BPSOU 2006 ROD is still being implemented, EPA is currently working on a Surface Water Characterization Report that will fully evaluate data from 2008 to 2013. This FYR provides a preliminary summary of the stormwater data that will be more fully presented in that report.

Using all available stormwater data from 2001 to 2014, there has been an overall decrease in total recoverable copper and zinc concentrations at station SS-06G (located inside the western boundary of the BPSOU). From 2005 to 2013, there has been a 96 percent decrease in copper and a 97 percent decrease in zinc total recoverable concentrations. Exceedances of acute standards for copper and zinc continue to occur despite this reduction.

There are clear improvements since 2002. Although Silver Bow Creek has had large improvements in water quality during storm events, stormwater still presents a challenge. Since 2007, the decreases in copper and zinc have been variable. There was a downward trend from 2007 to 2011. The years 2012 and 2013 showed increases and 2014 was lower again. The upstream station, SS-01 (located outside the eastern boundary of the BPSOU), also showed increases in 2012 and 2013. The difference between SS-01 and SS-06G reflects contributions from the BPSOU.

Butte Reclamation Evaluation System (BRES)
Annual reports for 2012 and 2013 were available for review during this FYR. Reports include BRES Field Evaluations and recommended Corrective Action Plans. Annual reports do not include summaries or analysis of the activities at BRES sites within the BPSOU. As remedy implementation continues, EPA is working with Butte-Silver Bow County to ensure future annual reports are more comprehensive and provide a better overview and analysis of BPSOU activities, institutional control status and operation and maintenance activities. In addition, EPA is working with Butte-Silver Bow County and the railroads to centralize all project information and data into a data base.

Butte Treatment Lagoon System
Atlantic Richfield provides quarterly and annual reports on the Butte Treatment Lagoon System. This FYR reviewed the annual reports from 2010 to 2013 and the 2014 quarterly reports. The Butte Treatment Lagoon System went from a full-scale pilot system (required under the Lower Area One removal action) to an upgraded, fully functional, modern treatment facility in November 2013 (required under the BPSOU ROD). The remedy captures, controls and treats groundwater in sufficient quantities to meet performance standards. The Hydraulic Control Channel captures and transports contaminated groundwater to cell-D4 of the Butte Treatment Lagoons for treatment and discharge into Silver Bow Creek. The lagoon system also addresses BPSOU alluvial groundwater as well as West Camp groundwater. As required by the ROD, the effectiveness of current alluvial groundwater capture system at the BPSOU subdrain continues to be evaluated by EPA through the installation of additional groundwater monitoring wells, tracer studies, pumping tests and other evaluations in the BPSOU subdrain, and a dense network of surface water monitoring locations in Blacktail and Silver Bow Creeks. EPA is also evaluating percolation barriers in this area as required by the ROD. Thus, the focus of the data review is to evaluate the effectiveness of groundwater capture through a review of surface water chemistry.

At the Butte Treatment Lagoon System, groundwater is treated with lime and then flows through a series of three settling ponds for the settling of sludge. The review evaluated results from influent location CT-IN04, effluent sample location CT-EFS7 and field grab samples at station MSD-HCC. COCs analyzed during 2010 include aluminum, arsenic, cadmium, copper, iron, mercury, lead, silver and zinc. Only those COCs exceeding the MDEQ-7 total recoverable chronic standards (MDEQ chronic criteria) are summarized below.

During 2010, exceedances of the MDEQ copper chronic standard (0.0305 mg/L) in the Butte Treatment Lagoon System effluent occurred five times for copper (maximum of 0.051 mg/L) from April through May. The PRP made temporary changes in routing within the system due to low channel pH and an increase in influent metals concentration related to BPSOU subdrain pumping. Though a direct correlation cannot be made, copper exceedances fall within the period that additional water was handled at the Butte Treatment Lagoons from Butte-Silver Bow County sewage treatment plant dewatering and when brief lime shutdowns occurred for general maintenance. Operators worked to minimize the impact of events. Outside of these instances, the Butte Treatment Lagoon System performed effectively throughout 2010.

During 2011, a slight exceedance of the MDEQ copper chronic standard (0.0305 mg/L) in the Butte Treatment Lagoon effluent occurred once for copper (0.033 mg/L) in November. No correlation could be made between site events and the copper exceedance. Operators worked to optimize treatment. Outside of this instance, the Butte Treatment Lagoon System performed effectively throughout 2011.

During 2012, a slight exceedance of the MDEQ iron chronic standard (1.0 mg/L) in the Butte Treatment Lagoon effluent occurred once for iron (1.1 mg/L) in March. No correlation could be made between site events and the iron exceedance. Operators worked to optimize treatment. Outside of this instance, the Butte Treatment Lagoon System performed effectively throughout 2012.

During 2013, exceedance of MDEQ chronic standards in the Butte Treatment Lagoon System effluent occurred for arsenic, cadmium and copper. Exceedences of the human health standard of 1.1 mg/L for arsenic occurred 22 times from May through October (maximum of 0.021 mg/L). Three exceedances of the MDEQ chronic criterion of 0.00076 mg/L occurred for cadmium once each in January, May and June (maximum of 0.00097 mg/L). Exceedance of the MDEQ chronic criterion for copper of 0.0305 mg/L, also occurred four times during 2013 in January, and three times in September (maximum of 0.039 mg/L). Copper exceedances followed increased influent concentrations and flows. The 2013 annual report concluded that the overall increases in analytic concentration are likely due to construction activities and resulting reduced lagoon capacities. Operations personnel adjusted the temporary systems to maintain adequate water treatment through construction and continued to optimize treatment after upgrades. Outside of the instances described, the Butte Treatment Lagoon System performed effectively throughout 2013.

Since construction upgrades finished in November 2013, no exceedances of MDEQ water quality criteria were observed in the Butte Treatment Lagoon System effluent samples during all four quarters of 2014. The Butte Treatment Lagoon System performed effectively throughout the year and operators continued to optimize treatment.

Groundwater Capture Systems

In June 2015, EPA completed a groundwater data analysis report evaluating data collected from 2011 to 2013 in support of evaluating the effectiveness of the two groundwater capture systems (the BPSOU subdrain capture system and the Lower Area One capture system) and one treatment system (Butte Treatment Lagoons). EPA evaluates the effectiveness of the capture systems by reviewing surface water data near and downstream of the capture systems where impacts to surface water due to groundwater inflow would be expected to be seen as increases in dissolved metals concentrations.

Silver Bow Creek above Blacktail Creek – Direct impacts to Silver Bow Creek near the BPSOU subdrain pump vault were evaluated by EPA by noting any increases in metals concentrations in surface water between stations SS-04 and SS-05. Overall, slight differences were observed between dissolved copper and zinc concentrations between the two stations, but neither station is reported to be consistently higher or lower. Overall, EPA concludes that surface water monitoring data under base flow and normal high flow conditions do not indicate above-standard impacts by metals in the reach where contamination could potentially escape the capture system in the vicinity of the subdrain. Groundwater elevations data are reported to demonstrate that the water in the Technical Impracticability Zone, east of the pump vault, is being captured by the BPSOU subdrain. Monitoring wells near the pumping vault allow evaluation of changes in groundwater quality and help evaluate whether contaminated water collected in the subdrain is being released back into the groundwater. Based on the results of the water quality data, the lack of surface water impacts and the hydraulic indications of capture, EPA concludes that the BPSOU subdrain capture system appears to be adequately preventing contaminated groundwater within the Technical Impracticability Zone in the BPSOU subdrain area from significantly impacting surface water at this time.

Lower Area One – Due to construction activities related to upgrades of the Butte Treatment Lagoons system and upgrades to the nearby municipal sewage treatment plant, dewatering has occurred in the Lower Area One area for the period of 2011 to 2013. Therefore, hydraulic capture could only be evaluated based on water quality results. According to the 2010 Groundwater Data Analysis Report, EPA reported groundwater quality at the west end of Lower Area One has historically been poor and the monitoring with wells BPS07-18A and BPS07-18B reported to be likely representative of groundwater quality not captured. Except for zinc and cadmium, groundwater quality at these wells met groundwater remedial goals in 2010. Except for unusually high zinc concentrations in October 2011, EPA reported that the concentrations of cadmium, copper and zinc in these wells were stable to slightly declining from 2011 to 2013 while arsenic appeared to be increasing at BPS07-18A. EPA reported that arsenic significantly exceeded the ROD groundwater remedial goal in wells BPS07-18A and BPS07-18B in 2013; the only other exceedance was zinc in well BPS07-18B. EPA reported that the west end of Lower Area One experienced significant disturbances to the local groundwater system due to construction dewatering for the sewage treatment plant upgrades and Butte Treatment Lagoon upgrades. Following completion of construction activities, EPA expects the groundwater to adjust to post-construction conditions and monitoring data will be evaluated to determine if these wells are suitable for points of compliance or if additional actions or replacement wells are needed.

Technical Impracticability Zone Perimeter Monitoring – The Alluvial Aquifer Technical Impracticability Zone was established in the BPSOU ROD. Since 2007, additional wells have been drilled to better define the perimeter boundary. In late 2011 and early 2012, wells BPS11-11A1, BPS11-11A2, BPS11-11B, BPS11-11C, BPS11-12, BPS11-15, BPS11-16, BPS11-19A2 and BPS11-19B were installed to the south of the existing Technical Impracticability Zone boundary. Results for wells near the Technical Impracticability Zone boundary from 2007 through 2012 for the six COCs with exceedances of the ROD groundwater performance standards are summarized as follows:

- **BT-98-02:** Consistent exceedances of ROD groundwater standards for cadmium and zinc are noted in this well (Table 27). The metals concentrations appear to have increased from 2008 to 2012 and cadmium and zinc concentrations declined in 2012 and 2013.
- **AMW-13:** A single exceedance of the arsenic standard occurred in 2013.Water levels and metals concentrations in this well are influenced by a local source of water and tailings.
- **BPS07-05A**: A single exceedance of the arsenic standard occurred in 2013. A boundary adjustment may be needed to place this well inside the Technical Impracticability Zone.

- **BPS11-04:** All arsenic results have been slightly above the standard in this new well. Since it is inside the Technical Impracticability Zone, EPA determined that it supports the location of the ROD boundary.

EPA reports that the data from the perimeter wells indicate that the Technical Impracticability Zone needs some slight adjustment, to accurately reflect where groundwater performance standards are being met and where they are not. Point of compliance wells can then be clearly determined and installed where necessary.

Table 27: Summary of Technical Impracticability Zone Perimeter Well BT-98-02 Results Since 2007 (µg/L)

Sample Date	Arsenic	Cadmium	Copper	Mercury	Lead	Zinc
12/21/2007	0.888	4.66	7.73	0.03	0.047	1,750
0**9**/0**3/2008**	1	**5.3**	5	<0.1	<0.05	**2,200**
10/0**8/2009**	1.2	**7**	5.8	<0.1	<0.05	**2,550**
10/20/2010	0.963	**7.28**	7.05	0.014	<0.055	**2,580**
10/10/2011	1.27	**10.4**	6.97	<0.02	<0.06	**2,590**
0**4/20/2012**	0.814	**11.9**	8.28	0.025	<0.06	**2,940**
0**9/24/2012**	1.05	**9.59**	6.92	0.089	<0.06	**2,760**
0**4/15/2013**	1.03	**10.9**	8.04	<0.02	<0.02	**2,670**
Remedial Goals	*10*	*5*	*1,300*	*2*	*15*	*2,000*

Notes:
Well BT-98-02 is outside the ROD Technical Impracticability Zone.
Concentrations in **Bold** indicate concentrations that exceed the ROD cleanup goal.

9.7 Site Inspection

EPA RPMs Sara Sparks and Nikia Green, staff from EPA contractor Skeo Solutions and stakeholder representatives conducted a site inspection of key features at the BPSOU on October 2, 2014. RPM Sara Sparks and staff from Skeo Solutions met at the Granite Mountain memorial area and traveled to various components of the BPSOU remedy on Butte Hill. The inspection then continued with remaining site visit participants with of an overview of the Lower Area One groundwater collection and treatment system and a tour of representative reclaimed source areas on Butte Hill. Reclaimed areas were well vegetated. The site inspection checklist and site photos can be found in Appendices B and C. At the Lower Area One, the inspection consisted of a tour of the new water treatment system and the ponds used for settling and polishing the treated water. Sludge is currently removed using a floating dredge and then allowed to settle and dry in a nearby location.

9.8 Technical Assessment

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

Yes. The remedy is expected to function as intended by the 2006 BPSOU ROD and the 2011 BPSOU ESD once complete. In the interim, the RMAP program, currently implemented institutional controls, the Butte Treatment Lagoon System and ongoing remedial activities are ensuring that unacceptable risks are being controlled.

The upgrades at the Butte Treatment Lagoon System have improved effluent conditions for treated water released into Silver Bow Creek.

Stormwater BMPs and other remedial construction projects need to be completed and implemented to make sure there are no completed environmental exposure pathways.

The 2010 draft Institutional Control Implementation Plans includes details on the types of institutional controls planned. These institutional control plans are subject to revision and final approval as remedial design continues to meet the requirements of the 2006 BPSOU ROD and ensure the selected remedy is protective upon completion. With such a large and complex area requiring individual restrictive covenants on multiple properties, a centralized database should be made publicly available via a public website. In addition, annual reporting, as required by the 2010 Institutional Control Implementation Plan, needs to be implemented and completed.

RMAP implementation continues to remove contaminated soil, dust and other material from residential properties throughout Butte and remains on schedule for timely completion. The number of blood lead test results greater than 9.9 μg/dL decreased significantly from 1990 to 2012. Starting in 2013, the Butte-Silver Bow Health Department started using the Centers for Disease Control and Prevention's revised blood lead reference level of 5.0 μg/dL in their analysis of the RMAP. The 2014 Butte-Silver Bow Health Study concluded that blood lead levels in Butte children have declined dramatically from 2003 to 2010.

Limited documentation is available that identifies progress toward implementing BRES recommendations. PRPs are working toward including all projects in the BRES database. Annual reporting has begun as part of BRES but needs to be improved. As remedy implementation continues, adequate tracking must be established to maintain records showing that corrective actions have been taken to maintain the caps, perform required O&M and meet the program schedule. Community members raised concerns about trespassing and vandalism (all-terrain vehicle riding) on capped areas that were potentially affecting the protectiveness of the remedy.

Concerns raised during community interviews and review of the BRES field forms (see Appendix J) highlighted the link between the BRES system and the surface water management program. At specific source areas, cap erosion was occurring due to stormwater run-on and runoff issues originating outside of the immediate site boundaries. If a source area experiences erosion problems due to stormwater routing, an engineering evaluation is required. Appendix A of the BRES document indicates that the BRES system and the Surface Water Management

Program are interactive. Therefore, the engineering evaluation will need to coordinate with any municipal stormwater construction to address such issues.

Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of remedy selection are still valid.

The findings of the ARARs review found that neither state nor federal aquatic and human health standards have changed since the 2006 BPSOU ROD. Current State of Montana water quality standards (Circular MDEQ-7, published in 2008) are reflective of the surface water quality standards identified in the 2006 BPSOU ROD. No additional exposure pathways were identified during this review that should be addressed in order to evaluate remedy protectiveness. A review of exposure assumptions used in the BPSOU site risk assessments compared to current guidance indicates that previous exposure assumptions remain conservative and reasonable in evaluating risk and developing risk-based cleanup levels.

EPA evaluates lead exposure by using blood-lead modeling for evaluating child and adult exposures since chronic health effects associated with lead exposure have been related to elevated blood lead levels. EPA established a national health criterion that specifies that no more than 5 percent of the population exceed a blood lead level of 10 ug/dL. The blood lead level of 10 µg/dl continues to be used by the EPA as a basis for risk management decisions at Superfund sites. There have not been any changes in the IEUBK model since the 2011 FYR that call into question the exposure assumptions or cleanup levels established at the time of remedy selection.

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

No, the community involvement process highlighted that there is a fair amount of concern in the community regarding remedy implementation and maintenance at BPSOU. Additional community outreach may be needed to further explain the selected remedy, as well as to reach and inform all community members about the RMAP program. In addition, providing regular ways for community members to report issues with capped areas or stormwater conveyance systems may improve remedy performance. Providing a written response to issues raised by community members concerning the alluvial aquifer groundwater rate of flow, the stability of the contaminated plume in the alluvial aquifer, and the functioning of the subdrain capture system would help to address community concerns surrounding these issues.

Technical Assessment Summary

Once completed, the remedy is expected to function as intended by the 2006 BPSOU ROD and the 2011 BPSOU ESD. In the meantime, the RMAP program, currently implemented institutional controls, the Butte Treatment Lagoon System and ongoing remedial activities are ensuring that there are no completed human exposure pathways. The upgrades at the Butte

Treatment Lagoon System have improved effluent conditions for treated water released into Silver Bow Creek.

Stormwater BMPs and other remedial construction projects need to be completed and implemented to make sure there are no completed environmental exposure pathways.

The BRES system and the surface water management program continue to be the focus of remedy design and implementation efforts. BRES annual reports need to be completed in a timely manner and adequate tracking must be established to ensure caps are maintained, required O&M is conducted and the program schedule is met.

The outstanding issues and recommendations identified in this FYR report will be monitored, and are expected to be addressed as the remedy is completed and final operation and maintenance plans are developed. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks.

9.9 Issues and Recommendations

Table 28 provides recommendations to address the current site issues.

Table 28: Recommendations to Address Current Site Issues

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
Annual reports on the Butte Reclamation Evaluation System were limited in their analysis and summary.	Provide a Butte Reclamation Evaluation System annual report that is timely, has adequate tracking to maintain the caps, performs required O&M and meets the program schedule.	Butte-Silver Bow County	EPA/MDEQ	12/31/2016	No	Yes
Community members have information about site areas where damage from trespassing and stormwater occur without a centralized way to report this information.	Establish a means for community members to report illegal trespassing, significant stormwater damage and stormwater issues related to Superfund.	Atlantic Richfield, Butte-Silver Bow County, BNSF and Union Pacific railroads	EPA/MDEQ	09/30/2018	No	Yes
The community involvement process highlighted that there is a fair amount of concern in the community regarding remedy implementation and maintenance at the BPSOU.	Provide a written response to issues raised by community members concerning the alluvial aquifer groundwater rate of flow, the stability of the contaminated plume in the alluvial aquifer, and the functioning of the subdrain capture system.	Atlantic Richfield	EPA/MDEQ	09/30/2017	No	Yes

The following additional items, though not expected to affect protectiveness, warrant additional follow up:

- Conduct additional community outreach to further explain the selected remedy, as well as to reach and inform all community members about the RMAP program.

9.10 Protectiveness Statement for BPSOU (OU 8)

The remedy at BPSOU (OU 8) is expected to be protective of human health and the environment upon completion. In the interim, exposure pathways that could result in unacceptable risks are being controlled.

10.0 Next Review

The next FYR will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

2010 Construction Completion Report, Butte-Silver Bow Residential Metals Program. Butte-Silver Bow Health Department, Environmental Health Division.

2010 Groundwater Data Analysis Report, Butte Priority Soils Operable Unit, Silver Bow Creek/Butte Area National Priorities List Site. CDM Federal Programs Corporation. January 2012.

2011 Construction Completion Report, Butte-Silver Bow Residential Metals Program. Butte-Silver Bow Health Department, Environmental Health Division.

2011 Warm Springs Ponds Five-Year Dam Safety Inspection Report. Atlantic Richfield Company. April 3, 2012.

2012 Annual Report, Mann-Kendall Revisions.

2013 Butte Reclamation Evaluation System Technical Recommendation Report, BNSF Railway Company and Union Pacific Railroad Company, Butte Priority Soils Operable Unit. Prepared by Kennedy/Jenks Consultants. May 29, 2014.

2012 Construction Completion Report, Butte-Silver Bow Residential Metals Program. Butte-Silver Bow Health Department, Environmental Health Division.

2013 Construction Completion Report, Butte-Silver Bow Residential Metals Program. Butte-Silver Bow Health Department, Environmental Health Division.

2014 Butte Reclamation Evaluation System Technical Recommendation Report, BNSF Railway Company and Union Pacific Railroad Company, Butte Priority Soils Operable Unit. Prepared by Kennedy/Jenks Consultants. March 20, 2015.

2014 Construction Completion Report, Butte-Silver Bow Residential Metals Program. Butte-Silver Bow Health Department, Environmental Health Division. February 2015.

2014 EPA Five-Year Review Questions and Responses. MDEQ. November 2014.

Administrative Order for Partial Remedial Design/Remedial Action Implementation and Certain Operation and Maintenance at the Butte Priority Soils Operable Unit/Butte Site. U.S. EPA. July 21, 2011.

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Arsenic Sample Results. Alpine Analytical, Inc. December 20, 2013.

Berkeley Pit Migratory Waterfowl Mitigation Monthly Report. Montana Resources, LLP. November 2014.

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BNSF and UPRR Institutional Controls Plan, Group 2 Draft. March 18, 2010.

BPSOU Press Release. U.S. EPA. September 18, 2015.

BPSOU Surface Water Monitoring Stations Map. Atlantic Richfield Company. 2012.

BPSOU & BMFOU Water Collection & Treatment System Flow Diagram. Pioneer Technical Services. January 5, 2011.

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Butte Mine Flooding Operable Unit, Water-Level Monitoring and Water-Quality Sampling 2009 Consent Decree Update, Butte, Montana 1982-2009. Montana Bureau of Mines and Geology. February 2011.

Butte Mine Flooding Operable Unit, Water-Level Monitoring and Water-Quality Sampling 2010 Consent Decree Update, Butte, Montana 1982-2010. Montana Bureau of Mines and Geology. October 2011.

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Butte Mine Flooding Operable Unit, Water-Level Monitoring and Water-Quality Sampling 2012 Consent Decree Update, Butte, Montana 1982-2012. Montana Bureau of Mines and Geology. September 2013.

Butte Mine Flooding Operable Unit, Water-Level Monitoring and Water-Quality Sampling 2013 Consent Decree Update, Butte, Montana 1982-2013. Montana Bureau of Mines and Geology. October 2014.

Butte Priority Soils Operable Unit, Public Health Study, Phase 1. ENVIRON International Corporation. July 2014.

Butte Priority Soils Operable Unit, Remediation, Bulletin #19. U.S. EPA. July 11, 2013.

Comments on the Draft Butte Mine Flooding Operable Unit Berkeley Pit Slope Stability Evaluation, STRATA Report. U.S. EPA. August 15, 2014.

Community Involvement Plan, Butte Priority Soils Operable Unit, Silver Bow Creek/Butte Area Superfund Site, Butte, Montana. U.S. EPA. February 2013.

Consent Decree for the Butte Mine Flooding Site. U.S. EPA. March 2002.

Data Summary Report of Groundwater Quality of Private, Industrial, and Irrigation Wells in the Technical Impracticability (TI) Waiver Zone, Butte, Silver-Bow County, Montana. MSE Technology Applications, Inc. December 2014.

Draft Final Design Report, Third Cycle Best Management Practices, Butte Priority Soils Operable Unit. Prepared by Kennedy/Jenks Consultants. September 27, 2013.

Draft Geotechnical Engineering Evaluation, Berkeley Pit Southeast Corner Stability, Montana Resources, LLP, Butte, Montana. STRATA Services. August 13, 2014.

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Final Order in the Matter of Butte Alluvial and Bedrock Petition for Controlled Groundwater Area No. 76G-30043832. Department of Natural Resources and Conservation, Water Resources Division. October 30, 2009.

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Appendix B: Site Inspection Checklists

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Silver Bow Creek/Butte Area: Streamside Tailings Operable Unit (SSTOU)	**Date of Inspection: 10/1/2014**
Location and Region: Butte, MT Region 8	**EPA ID: MTD980502777**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: Upper 40's, partly cloudy.**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Ground water pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: ______
- ☐ Monitored natural attenuation
- ☐ Ground water containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

☒ Report attached: See section 4.3 and Appendix J

III. ON-SITE DOCUMENTS AND 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: ______	☐ 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.	**Ground Water 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 ☐ Contractor for state

☐ PRP in-house ☐ Contractor for PRP

☐ Federal facility in-house ☐ Contractor for Federal facility

☒ SSTOU is not yet construction complete. therefore, it has not yet entered the O&M phase.

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate:______ ☐ Breakdown attached

Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	______	☐ Breakdown attached
From: mm/dd/yyyy	To: mm/dd/yyyy	______	☐ Breakdown attached
From: mm/dd/yyyy	To: mm/dd/yyyy	______	☐ Breakdown attached
From: mm/dd/yyyy	To: mm/dd/yyyy	______	☐ Breakdown attached
From: mm/dd/yyyy	To: mm/dd/yyyy	______	☐ Breakdown attached

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: Those areas under construction were fenced off from the public.
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** 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): ______ Frequency: ______ Responsible party/agency: State Contact ______ (Name) ______ (Title) mm/dd/yyyy (Date) ______ (Phone no.) 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
2.	**Adequacy** ☐ ICs are adequate ☒ ICs are inadequate ☐ N/A Remarks: ICs are not yet in place to prohibit activities that would disturb capped areas. The majority of capped areas are on properties owned by the state.
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: ______

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☐ Settlement not evident
   Arial extent:______ Depth: ______________________
   Remarks: ______

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths:______ Widths:______ Depths: ______
   Remarks: ______

3. **Erosion** ☐ Location shown on site map ☐ Erosion not
   evident Arial extent:__________ Depth: ___
   Remarks: ______

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Arial extent:______ Depth: ______
   Remarks: ______

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/shrubs (indicate size and locations on a diagram)
   Remarks: ______

6. **Alternative Cover** (e.g., armored rock, concrete) ☐ N/A
   Remarks: ______

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Arial extent: ______ Height: _____
   Remarks: ______

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Arial extent: ______
   ☐ Ponding ☐ Location shown on site map Arial extent: ______
   ☐ Seeps ☐ Location shown on site map Arial extent: ______
   ☐ Soft subgrade ☐ Location shown on site map Arial extent: ______
   Remarks: ______

9. **Slope Instability** ☐ Slides ☐ Location shown on site map

☐ No evidence of slope instability

Arial 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** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement

Arial extent: ______ Depth: ______

Remarks: ______

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation

Material type:______ Arial extent: ______

Remarks: ______

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion

Arial extent: ______ Depth: ______

Remarks: ______

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting

Arial extent: ______ Depth: ______

Remarks: ______

5. **Obstructions** Type: ______ ☐ No obstructions

☐ Location shown on site map Arial 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 Arial 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. **Extraction Wells Leachate**

☐ 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**	Area extent:______	Depth:______	☐ N/A
☐ Siltation not evident			
Remarks: ______			
2. **Erosion**	Area 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	
Area extent:______	Depth: ______		
Remarks: ______			
2. **Vegetative Growth**	☐ Location shown on site map	☐ N/A	
☐ Vegetation does not impede flow			
Area extent:______	Type: ______		
Remarks: ______			
3. **Erosion**	☐ Location shown on site map	☐ Erosion not evident	
Area 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	
	Area extent:______		Depth: ______	
	Remarks: ______			
2.	**Performance Monitoring**	Type of monitoring: ______		
	☐ Performance not monitored			
	Frequency:______		☐ Evidence of breaching	
	Head differential: ______			
	Remarks: ______			
IX. GROUND WATER/SURFACE WATER REMEDIES		☒ Applicable	☐ N/A	
A. Ground Water 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 provided condition	☐ Requires upgrade	☐ Needs to be
	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 provided condition	☐ Requires upgrade	☐ Needs to be
	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 ground water treated annually: ______ ☐ Quantity of surface water treated annually: ______ Remarks: ______
2. **Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good ☐ Needs maintenance condition Remarks: ______
3. **Tanks, Vaults, Storage Vessels** ☐ N/A ☐ Good ☐ Proper secondary containment ☐ Needs maintenance condition Remarks: ______
4. **Discharge Structure and Appurtenances** ☐ N/A ☐ Good ☐ Needs maintenance condition 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:** ☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining
E. 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 and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). <u>The majority of the SSTOU has been completed and the remaining areas are expected to be completed in the next year. The stream appears well contoured and the covered areas are well vegetated.</u>
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>The SSTOU is not yet construction complete. therefore, it has not yet entered the O&M phase.</u>
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. <u>None noted.</u>
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>None noted.</u>

<u>Site Inspection Participants</u>

Kristine Edwards, EPA
Joel Chavez, MDEQ
Treat Suomi, Skeo Solutions

Ryan Burdge, Skeo Solutions
Emily Chi, Skeo Solutions

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Silver Bow Creek/Butte Area: Berkeley Pit/ Mine Flooding Operable Unit (BMFOU) OU3	**Date of Inspection: 10/2/2014**
Location and Region: Butte, MT Region 8	**EPA ID: MTD980502777**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: Upper 40's to low 50's, party cloudy.**

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☒ Access controls
☒ Institutional controls
☒ Ground water pump and treatment
☒ Surface water collection and treatment
☐ Other:
☐ Monitored natural attenuation
☐ Ground water containment
☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

☒ Report attached: See section 4.3 and Appendix J

III. ON-SITE DOCUMENTS AND 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:______	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: Current mining operations are authorized by the State of Montana, outside the scope of the Superfund Site.			
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.	**Ground Water 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: No water was discharged to Silver Bow Creek during the past five years.			
10.	**Daily Access/Security Logs**	☒ Readily available	☒ Up to date	☐ N/A
	Remarks: ______			

IV. O&M COSTS

1.	**O&M Organization**	
	☐ State in-house	☐ Contractor for state
	☐ PRP in-house	☒ Contractor for PRP
	☐ Federal facility in-house	☐ Contractor for Federal facility
	☐ _____	
2.	**O&M Cost Records**	
	☐ Readily available	☐ Up to date
	☒ Funding mechanism/agreement in place	☒ Unavailable

Original O&M cost estimate:______ ☐ Breakdown attached

Total annual cost by year for review period if available

From: mm/dd/yyyy	To: mm/dd/yyyy	______	☐ Breakdown attached
Date	Date	Total cost	

Remarks: O&M costs were not available for review duringthis FYR.

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: BMFOU is part of a highly secure active mining operation. Access is restricted and security is high.

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Appropriate signs are posted at mine area access points.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

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): Check of deed records during the FYR process.

Frequency: Every five years

Responsible party/agency: EPA

Contact	______	______	mm/dd/yyyy	______
	Name	Title	Date	Phone no.

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

Remarks: See section 6.5 of the current FYR for further discusion of ICs.

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

Remarks: See section 6.5 of the current FYR for further discusion of ICs.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: ______

2. **Land Use Changes On Site** ☒N/A

Remarks: The BMFOU includes the Berkely Pit, Horsehoe Bend water treatment plant and active areas of the MR mine.

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: ______			
VII. LANDFILL COVERS ☐ Applicable ☒N/A			
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒N/A			
IX. GROUND WATER/SURFACE WATER REMEDIES ☒Applicable ☐ N/A			
A. Ground Water 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: The Horsehoe Bend Water Treatment Plant is currently operating at less than capacity. The WTP is currently undergoing an optimization plan. The reactors have formed cracks and are currently being repaired. Blowers were taken out of operation.			
2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**			
☒Good condition	☐ Needs maintenance		
Remarks: ______			
3. **Spare Parts and Equipment**			
☒Readily available	☐ Good provided condition	☐ Requires upgrade	☐ Needs to be
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 provided condition	☐ Requires upgrade	☐ Needs to be
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 ground water treated annually: Between 1.5 and 2 billion gallons ☐ Quantity of surface water treated annually: ______
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:** ☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining
E. 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 and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).
The Berkeley Pit is filling with contaminated water originating from the surrounding bedrock and alluvial aquifers and also from surface inflows. As the Berkley Pit is the lowest elevation in the bedrock system, contaminated mine water is contained.

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.
Not Applicable

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.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
None Noted.

Site Inspection Participants

Nikia Greene, EPA
Treat Suomi, Skeo Solutions

Ryan Burdge, Skeo Solutions
Emily Chi, Skeo Solutions
Daryl Reed, MDEQ
Tim Hilmo, Atlantic Richfield Company
Steve Walsh, Montana Resources, LLP
Mary Anne Antonioli, Montana Resources, LLP
Tom Kloker, Montana Resources, LLP
Ted Duaime, Montana Bureau of Mines
Gary Icopini, Montana Bureau of Mines

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Silver Bow Creek/Butte Area: Warm Springs Ponds Active and Inactive Operable Units (WSPOU)	**Date of Inspection: 10/1/2014**
Location and Region: Butte, MT Region 8	**EPA ID: MTD980502777**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: Upper 40's, partly cloudy.**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Ground water pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: ______
- ☐ Monitored natural attenuation
- ☐ Ground water containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

☒ Report attached: See section 4.3 and Appendix J

III. ON-SITE DOCUMENTS AND 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**

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: ______	☐ 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.	**Ground Water 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	☐ Contractor for state
	☐ PRP in-house	☐ Contractor for PRP
	☐ Federal facility in-house	☐ Contractor for Federal facility
	☒ WSPTOU is not yet construction complete. therefore, it has not yet entered the O&M phase.	

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate:______ ☐ Breakdown attached

Total annual cost by year for review period if available

From: mm/dd/yyyy Date	To: mm/dd/yyyy Date	______ Total cost	☐ Breakdown attached
From: mm/dd/yyyy Date	To: mm/dd/yyyy Date	______ Total cost	☐ Breakdown attached
From: mm/dd/yyyy Date	To: mm/dd/yyyy Date	______ Total cost	☐ Breakdown attached
From: mm/dd/yyyy Date	To: mm/dd/yyyy Date	______ Total cost	☐ Breakdown attached
From: mm/dd/yyyy Date	To: mm/dd/yyyy Date	______ Total cost	☐ Breakdown attached

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: Access to sensitive areas limit vehicle and public access.

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**

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): ______
Frequency: ______
Responsible party/agency: State

Contact			
______	______	mm/dd/yyyy	______
Name	Title	Date	Phone no.

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

2. **Adequacy** ☐ ICs are adequate ☒ ICs are inadequate ☐ N/A
Remarks: The property is leased and managed by the state.

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: ______

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Area extent:______ Depth: ______
Remarks: ______

2.	**Performance Monitoring** Type of monitoring: ______ ☐ Performance not monitored Frequency:______ ☐ Evidence of breaching Head differential: ______ Remarks: ______
IX. GROUND WATER/SURFACE WATER REMEDIES ☒Applicable ☐ N/A	
A. Ground Water 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 provided condition ☐ Requires upgrade ☐ Needs to be 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 provided condition ☐ Requires upgrade ☐ Needs to be 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 ground water 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:** ☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining
E. 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 and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). <u>The overall property and the remedial features appear in good condition.</u>
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>The WSPOU is not yet construction complete. therefore, it has not yet entered the O&M phase.</u>
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. <u>None noted.</u>
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>None noted.</u>

Site inspection participants

Kristine Edwards, EPA
Sara Spark, EPA
Daryl Reed, MDEQ
Treat Suomi, Skeo Solutions

Ryan Burdge, Skeo Solutions
Emily Chi, Skeo Solutions
Chris Hagan, JCI
Tim Hilmo, Atlantic Richfield Company
S. Donald, Atlantic Richfield Company
Jean Harris, Atlantic Richfield Company

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Silver Bow Creek/Butte Area: Rocker Timber Treating and Framing (Rocker) OU7	**Date of Inspection: 10/2/2014**
Location and Region: Butte, MT Region 8	**EPA ID: MTD980502777**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: Upper 40's to low 50's, party cloudy.**

Remedy Includes: (Check all that apply)

☒ Landfill cover/containment
☒ Access controls
☒ Institutional controls
☐ Ground water pump and treatment
☐ Surface water collection and treatment
☐ Other: ______
☒ Monitored natural attenuation
☒ Ground water containment
☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

☒ Report attached: See section 4.3 and Appendix J

III. ON-SITE DOCUMENTS AND 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: ______	☐ 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.	**Ground Water 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	☐ Contractor for state
	☐ PRP in-house	☒ Contractor for PRP
	☐ Federal facility in-house	☐ Contractor for Federal facility
	☐ _____	
2.	**O&M Cost Records**	
	☐ Readily available	☒ Up to date
	☐ Funding mechanism/agreement in place	☐ Unavailable

Original O&M cost estimate:______ ☐ Breakdown attached

Total annual cost by year for review period if available

From: mm/dd/yyyy	To: mm/dd/yyyy	______	☐ Breakdown attached
Date	Date	Total cost	

Remarks: O&M costs were not available for review.

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** 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): Check of deed records during the FYR process. Frequency: Every five years Responsible party/agency: EPA Contact ______ (Name) ______ (Title) mm/dd/yyyy (Date) ______ (Phone no.) 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 Remarks: ______	
2. **Adequacy** ☐ ICs are adequate ☒ ICs are inadequate ☐ N/A Remarks: See section 8.5 of the current FYR for further discusion of ICs.	
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** Remarks: ______	☐ Location shown on site map	☐ Roads adequate	☒N/A
B. Other Site Conditions			
Remarks: ______			
VII. LANDFILL COVERS ☒Applicable ☐ N/A			
A. Landfill Surface			
1. **Settlement** (low spots) Arial extent:______ Remarks: ______	☐ Location shown on site map	☒Settlement not evident Depth: ______	
2. **Cracks** not evident Lengths:________ Remarks: ______	☐ Location shown on site map Widths:___	☒ Cracking Depths: ______	
3. **Erosion** Arial extent:______ Remarks: ______	☐ Location shown on site map	☒Erosion not evident Depth: ______	
4. **Holes** Arial extent:______ Remarks: ______	☐ Location shown on site map	☒Holes not evident Depth: ______	
5. **Vegetative Cover** ☐ No signs of stress Remarks: ______	☐ Grass ☐ Trees/shrubs (indicate size and locations on a diagram)	☒Cover properly established	
6. **Alternative Cover** (e.g., armored rock, concrete) Remarks: ______		☒N/A	
7. **Bulges** Arial extent: ______ Remarks: ______	☐ Location shown on site map	☒Bulges not evident Height: _____	

8. **Wet Areas/Water Damage**		☒Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: ______
	☐ Ponding	☐ Location shown on site map	Arial extent: ______
	☐ Seeps	☐ Location shown on site map	Arial extent: ______
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: ______
	Remarks: ______		
9. **Slope Instability**		☐ Slides	☐ Location shown on site map
	☒No evidence of slope instability		
	Arial 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.)

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.)

D. Cover Penetrations ☐ Applicable ☒N/A

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

F. Cover Drainage Layer ☐ Applicable ☒N/A

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

H. Retaining Walls ☐ Applicable ☒N/A

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

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒N/A

IX. GROUND WATER/SURFACE WATER REMEDIES ☒Applicable ☐ N/A

A. Ground Water Extraction Wells, Pumps and Pipelines ☐ Applicable ☒N/A

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

C. Treatment System ☐ Applicable ☒N/A

D. Monitoring Data

1. **Monitoring Data**

☒Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining

Remarks: Additional data is needed to fully determine whether migration of contaminated site groundwater is occurring.	
E. 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: One well on site was damaged due to frost heave.
X. OTHER REMEDIES	
If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). RAOs for the Rocker OU have not been met. The implemented remedy has not succeeded in attaining groundwater standards. Surface water sampling data is needed to determine if there is a continued release to Silver Bow Creek.
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. The data analysis revealed that additional investigation of the Rocker OU is warranted to refine groundwater flow direction and to determine the extent of the plume.
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. RAOs for the Rocker OU have not been met. The implemented remedy has not succeeded in attaining groundwater standards. Surface water sampling data is needed to determine if there is a continued release to Silver Bow Creek.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None Noted.

Site Inspection Participants

Nikia Greene, EPA
Treat Suomi, Skeo Solutions
Ryan Burdge, Skeo Solutions
Emily Chi, Skeo Solutions
Daryl Reed, MDEQ
Tim Hilmo, Atlantic Richfield Company
Ted Duaime, Montana Bureau of Mines
Gary Icopini, Montana Bureau of Mines
Chapin Storrar, CDM Smith
Jenni Harris, Pioneer

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Silver Bow Creek/Butte Area: Butte Priority Soils Operable Unit (BPSOU) OU8	**Date of Inspection: 10/2/2014**
Location and Region: Butte, MT Region 8	**EPA ID: MTD980502777**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: Upper 40's to low 50's, party cloudy.**

Remedy Includes: (Check all that apply)

☒Landfill cover/containment ☐ Monitored natural attenuation
☒Access controls ☐ Ground water containment
☒Institutional controls ☐ Vertical barrier walls
☒Ground water pump and treatment
☒Surface water collection and treatment
☒Other: Residential Metals Abatement Program (RMAP)

Attachments: ☒Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

☒Report attached: See section 4.3 and Appendix J

III. ON-SITE DOCUMENTS AND 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: ______	☐ 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.	**Ground Water 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 ☐ Contractor for state
☐ PRP in-house ☒ Contractor for PRP
☐ Federal facility in-house ☐ Contractor for Federal facility
☐ ______

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☒ Funding mechanism/agreement in place ☒ Unavailable
Original O&M cost estimate:______ ☐ Breakdown attached

Total annual cost by year for review period if available

From: mm/dd/yyyy (Date) To: mm/dd/yyyy (Date) ______ (Total cost) ☐ Breakdown attached

Remarks: O&M costs werer not available for review during this FYR.

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: Fencing around the water treatment plant at Lower area one was secure and in excelent condition.

B. Other Access Restrictions	
1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A Remarks: Appropriate signs are posted at restricted areas such as the Lower Area One treatment plant.	
C. Institutional Controls (ICs)	
1. **Implementation and Enforcement** 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): ______ Frequency: ______ Responsible party/agency: ______ Contact ______ (Name) ______ (Title) mm/dd/yyyy (Date) ______ (Phone no.) 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 Remarks: See section 9.5 of the current FYR.	
2. **Adequacy** ☐ ICs are adequate ☒ ICs are inadequate ☐ N/A Remarks: See section 9.5 of the current FYR.	
D. General	
1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks: ______	
2. **Land Use Changes On Site** ☐ N/A Remarks: The BPSOU includes active areas of Walkerville and Butte. No land use changes have been noted or are expected, although there is continual contstruction and developemnt at areas included in the Site.	
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: ______	

	VII. LANDFILL COVERS	☒Applicable	☐ N/A
A. Landfill Surface			
1.	**Settlement** (low spots)	☐ Location shown on site map	☒Settlement not evident
	Arial extent:______		Depth: ______
	Remarks: ______		
2.	**Cracks**	☐ Location shown on site map	☒Cracking not evident
	Lengths:______	Widths:______	Depths:______
	Remarks: ______		
3.	**Erosion**	☐ Location shown on site map	☒Erosion not evident
	Arial extent:______		Depth: ______
	Remarks: ______		
4.	**Holes**	☐ Location shown on site map	☒Holes not evident
	Arial extent:______		Depth: ______
	Remarks: ______		
5.	**Vegetative Cover**	☐ Grass	☒Cover properly established
	☐ No signs of stress	☐ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: ______		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☒N/A
	Remarks: ______		
7.	**Bulges**	☐ Location shown on site map	☒Bulges not evident
	Arial extent: ______		Height: ______
	Remarks: ______		
8. **Damage**	**Wet Areas/Water**	☒Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: ______
	☐ Ponding	☐ Location shown on site map	Arial extent: ______
	☐ Seeps	☐ Location shown on site map	Arial extent: ______
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: ______
	Remarks: ______		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒No evidence of slope instability		
	Arial 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.)		
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.)		
D. Cover Penetrations ☐ Applicable ☒N/A		
E. Gas Collection and Treatment ☐ Applicable ☒N/A		
F. Cover Drainage Layer ☐ Applicable ☒N/A		
G. Detention/Sedimentation Ponds ☐ Applicable ☒N/A		
H. Retaining Walls ☐ Applicable ☒N/A		
I. Perimeter Ditches/Off-Site Discharge ☒Applicable ☐ N/A		
1. **Siltation**	☐ Location shown on site map	☒Siltation not evident
Area extent:______		Depth: ______
Remarks: ______		
2. **Vegetative Growth**	☐ Location shown on site map	☐ N/A
☒Vegetation does not impede flow		
Area extent:______		Type: ______
Remarks: ______		
3. **Erosion**	☐ Location shown on site map	☒Erosion not evident
Area extent:______		Depth: ______
Remarks: ______		
4. **Discharge Structure**	☒Functioning	☐ N/A
Remarks: ______		
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒N/A		
IX. GROUND WATER/SURFACE WATER REMEDIES ☒Applicable ☐ N/A		
A. Ground Water 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: The water treatment plant at Lower Area One has had a full upgrade since the last FYR. All componenets are functioning properly.		
2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**		
☒Good condition ☐ Needs maintenance		
Remarks: ______		

3. **Spare Parts and Equipment**

☒Readily available ☐ Good ☐ Requires upgrade ☐ Needs to be
provided condition

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 ☐ Requires upgrade ☐ Needs to be
provided condition

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

Remarks:

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☒Good ☐ Needs
maintenance condition

Remarks: ______

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☒Good ☒Proper secondary containment ☐ Needs
maintenance condition

Remarks: ______

4. **Discharge Structure and Appurtenances**

☐ N/A ☒ Good maintenance condition ☐ Needs

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:**

☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining

E. 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 and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The remedy is expected to function as intended by the 2006 BPSOU ROD and the 2011 BPSOU ESD once complete. In the interim, ongoing remedial activities continue.

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.

remedy design and implementation are continuing.

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. Full implementation and accessibility of the BRES system are necesary to ensure future remedial success.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None Noted.

Site Inspection Participants

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Nikia Greene, EPA
Treat Suomi, Skeo Solutions
Ryan Burdge, Skeo Solutions
Emily Chi, Skeo Solutions
Tim Hilmo, Atlantic Richfield Company
Thomas Hicky, Pioneer
Dave Griffis, Pioneer
DJ Renz, Pioneer
Brad Hollamon, Pioneer

Appendix C: Photographs from Site Inspection Visit

SSTOU: Subarea 2, looking south

SSTOU: Staging area for construction


SSTOU: Beginning of Reach M, looking upstream


SSTOU: Reach M, recently seeded area

SSTOU: Subarea 3, truck with contaminated soil

SSTOU: Subarea 3, looking downstream

SSTOU: View of sediment pond construction (subarea 3) from bridge. Formerly full of tailings

BMFOU: Berkeley Pit from the Berkeley Pit viewing station

BMFOU: Montana Resources South Gate


BMFOU: Continental Ditch roadside project

BMFOU: Montana Resources entrance

BMFOU: Active mining area

BMFOU: Active mining area

BMFOU: Horseshoe Bend Water Treatment Plant

BMFOU: Treatment Plant Control Room

BMFOU: Lime receiving room

BMFOU: Blowers-reinstalled. They run one at a time.


BMFOU: Crack in reactor

BMFOU: Well #2 – Interceptor

BMFOU: Clarifier – Recently emptied to clean


BMFOU: Horseshoe Bend


BMFOU: Horseshoe Bend- where the flow comes down to go to the equalizer

BMFOU: Waterfowl Mitigation station above Berkeley Pit


BMFOU: Berkeley Pit

BMFOU: Berkeley Pit

BMFOU: Horseshoe Bend from across Berkeley Pit


BMFOU: Berkeley Pit Viewing Stand


BMFOU: Berkeley Pit

BMFOU: Truck and chutes active at Montana Resources mining operation

BMFOU: At the water surface of Berkeley Pit – two pumps had gotten disconnected

BMFOU: Pipes that were disconnected from the pump

BMFOU: Pipes that were disconnected from the pump

BMFOU: Boat used on Berkeley Pit that was taken out due to slope instability


BMFOU: Outfall of Tailing system – 24 million gallons/day recycled back to concentrator

BMFOU: Yankee Doodle Tailings

BMFOU: Terramac RT9 and the Argo (smaller-more of a reconnaissance vehicle)


Warm Springs Ponds: Lime treatment silos


Warm Springs Ponds: Level sensor with an alarm

Warm Springs Ponds: Pond 3 with waterfowl

Warm Springs Ponds: Where the bypass spillway exits

Warm Springs Ponds: Hog Hole and Pond 2

Warm Springs Ponds: Discharge from Pond 2

Warm Springs Ponds: Pump station

Warm Springs Ponds: Water level pumps

Rocker: Unlocked Rocker well (in closed-off space behind Town Pump)

Rocker: Town Pump well (everything in Town Pump has built-in arsenic filter. McDonalds and the Casino are on Rocker municipal water).

Rocker: View of Rocker OU from Town Pump back parking lot

Rocker OU Well RH-25

Rocker OU Sign on gate

Rocker OU walking into fenced area

Looking toward Town Pump from Rocker fenced area

Rocker well with frost heave

Locked gate at Rocker OU

BPSPOU: Landscape renewal sign

Diamond head frame

Granite Mountain Mine Memorial


BPSOU: Mine waste repository with cap


BPSOU: Mining head frame


BPSOU: fenced-in repository


BPSOU: 11th and Excelsior beginning of a curb and gutter project

BPSOU: looking downhill from 11th and Excelsior

BPSOU: WTP at Butte Treatment Lagoons

BPSOU: Butte Treatment Lagoons Chemical Addition Building – everything is new except stairs and platform

BPSOU: distribution tank


BPSOU: Butte Treatment Lagoons B Series


BPSOU: Butte Treatment Lagoons A Series


BPSOU: Butte Treatment Lagoons dredging equipment in B series


BPSOU: Butte Treatment Lagoons HCC (hydraulic control channel)


BPSOU: Butte Treatment Lagoons HCC (hydraulic control channel)


BPSOU: discharge point to creek


BPSOU: D4- lowest point in valley (5410 water level – surface)


BPSOU: backup power generator next to D4


BPSOU: hoist at D4


BPSOU: two pumps for D-4

BPSOU: some test revegetation

BPSOU: discharge point with view of highway (Butte Silver Bow Wastewater Treatment Plant discharge point is under the highway)


BPSOU: discharge end of MSD pipe (groundwater collection system); also the upper end of HCC


BPSOU: telemetry station at MSD discharge


BPSOU: drying bed – bigger cell


BPSOU: BRW 01 west


BPSOU: discharge out of drying bed


BPSOU: drying bed

BPSOU: West Camp pump station

BPSOU: locked gate



BPSOU: view of Butte Hill


BPSOU: recently completed trail

BPSOU: Silver Bow Creek above the confluence with Blacktail Creek[1]

[1] EPA has called the surface area from Texas Avenue to the confluence with Blacktail Creek the "Metro Storm Drain" in prior Superfund removal and remedial documents and publications, including the 2006 Butte Priority Soils Operable Unit Record of Decision (2006 BPSOU ROD) and 2011 BPSOU Explanation of Significant Differences. The Montana Department of Environmental Quality has requested that this document refer to this same area as Silver Bow Creek in light of the Montana Second Judicial District Court's order in Silver Bow Creek Headwaters Coalition v. State of Montana, DV-10-431 (August 17, 2015) regarding the appropriate name to be applied by the State for this area under State law. See Appendix J at page J-3. Reference to the area as "Silver Bow Creek" should not be construed as an EPA admission or determination on any procedural or substantive issue. The United States retains and reserves all its rights and authorities.

BPSOU: Wardell Bridge on Silver Bow Creek

BPSOU: "Golden Triangle" -revegetated

Appendix D: ARARs

Table D-1. Previous and Current ARARs for Groundwater COCs

	2015 Standards		2011 FYR		2005 FYR	
Compound	State (µg/L)[1]	Federal (µg/L)[2]	State (µg/L)[1]	Federal (µg/L)[2]	State (µg/L)[1]	Federal (µg/L)[2]
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	10	10	10	10	20	10
Cadmium	5	5	5	5	5	5
Chromium	100	100	100	100	100	100
Copper	1,300	1,300	1,300	1,300	1,300	1,300
Iron	N/A	N/A	N/A	N/A	N/A	N/A
Lead	15	15	15	15	15	15
Manganese	N/A	N/A	50a	N/A	50a	N/A
Mercury	2	2	2	2	2	2
Selenium	50	50	50	50	50	50
Silver	100	N/A	100	N/A	100	N/A
Zinc	2,000	N/A	2,000	N/A	2,000	N/A

1. Montana Numeric Water Quality Standards - Circular DEQ-7. February 2012.
2. Safe Drinking Water Act contaminants and federal MCLs.

Table D-2. Previous and Current ARARs for Surface Water COCs

	Current Surface Water Standards					2011 FYR					2005 FYR				
	State(1)			Federal(2)		State(1)			Federal(2)		State(1)			Federal(2)	
	Aquatic Life		Human Health	CMC (Acute) (3)	CCC (Chronic) (4)	Aquatic Life		Human Health	CMC (Acute) (3)	CCC (Chronic) (4)	Aquatic Life		Human Health	CMC (Acute) (3)	CCC (Chronic) (4)
Compound	Acute (µg/L)	Chronic (µg/L)	Standard (µg/L)	(µg/L)	(µg/L)	Acute (µg/L)	Chronic (µg/L)	Standard (µg/L)	(µg/L)	(µg/L)	Acute (µg/L)	Chronic (µg/L)	Standard (µg/L)	(µg/L)	(µg/L)
Aluminum	750	87	N/A	750	87	750	87	N/A	750	87	750	87	N/A	N/A	N/A
Arsenic	340	150	10	340	150	340	150	10	340	150	340	150	18	340	150
Cadmium	0.52*	0.097*	5	2***	0.25***	0.52*	0.097*	5	2***	0.25***	1.05**	0.16**	5	3****	0.33****
Chromium	16 (Cr-VI) 579 (Cr-III)*	11 (Cr-VI) 27.7 (Cr-III)*	100	570	74	N/A	N/A	100	N/A	N/A	N/A	N/A	100	N/A	N/A
Copper	3.79*	2.85*	1,300	Freshwater criteria calculated using the biotic ligand model	Freshwater criteria calculated using the biotic ligand model	3.79*	2.85*	1,300	2.337#	1.45#	7.3**	5.2**	1,300	19.7****	12.7****
Iron	N/A	1,000	N/A	N/A	N/A	N/A	1000	300[a]	N/A	N/A	N/A	1000	300[a]	N/A	N/A

Lead	13.98*	0.545*	15	65***	2.5***	13.98*	0.545*	15	65***	2.5***	82***	3.2***	15	100.1****	3.9****
Manganese	N/A	N/A	N/A	N/A	N/A	N/A	N/A	50[a]	N/A	N/A	N/A	N/A	50[a]	N/A	N/A
Mercury	1.7	0.91	0.05	1.4***	0.77***	1.7	0.91	0.05	1.4***	0.77***	1.7	0.91	0.05	N/A	N/A
Selenium	20	5	50	N/A	5	20	5	50	N/A	5	20	5	50	N/A	N/A
Silver	0.374*	N/A	100	3.2	N/A	0.374*	N/A	100	3.2	N/A	4.1***	N/A	100	N/A	N/A
Zinc	37*	37*	2,000	120***	120***	37*	37*	2,000	120***	120***	67**	67**	2000	N/A	N/A

µg/L - micrograms per liter
* - Value indicated is for a hardness of 25 mg/L as CaCO3.
** - Value indicated is for a hardness of 50 mg/L as CaCO3.
*** - Value indicated is for a hardness of 100 mg/L as CaCO3.
**** - Value indicated is for a hardness of 150 mg/L as CaCO3.
# - Standards are hardness-dependent. Value indicated is for a hardness of 84.6 mg/L as CaCO3. Source: http://www.epa.gov/waterscience/criteria/copper/2007/criteria-full.pdf.
a - Indicates value is a secondary maximum contaminant level (MCL) based on aesthetics (taste, odor, staining).

1. Montana Numeric Water Quality Standards - Circular DEQ-7. February 2012.
2. Current National Recommended Water Quality Criteria, U.S. EPA, http://www.epa.gov/waterscience/criteria/wqctable/#mm.
3. CMC – Criteria Maximum Concentration is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect.
4. CCC - Criterion Continuous Concentration is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.

Appendix E: BMFOU Maps and Data Tables

Table E-1: Horseshoe Bend Water Treatment Plant 2010 Flow Totals

MONTH	INFLUENT GALLONS	FIRST STAGE WASTING GALLONS	SECOND STAGE WASTING GALLONS	RETURN WATER GALLONS	LIME GRIT FLUSH WATER	HSB PLANT WATER GALLONS	BUTTE WATER	POWER KW-HRS	NAT GAS CU. FT.	LIME DELIVERE D	LIME #/TON	GALLONS PER DAY	LIME MG/L
JANAURY	161,169,072	2,135,252	3,335,374	11,665,020	1,401,579	161,992,064	63,510	337,162	9,513.7	1,191.02	3.55	5,199,002	1,772
FEBRUARY	142,678,720	2,396,866	2,281,329	10,629,990	702,321	146,336,144	380	307,604	7,680.2	1,109.19	3.73	5,095,669	1,864
MARCH	161,687,488	2,532,467	5,917,323	12,468,010	23,188	161,162,256	3,670	324,004	7,001.3	1,280.92	3.80	5,215,725	1,899
APRIL	156,308,480	2,074,856	7,035,819	12,316,990	1,185,827	150,825,984	1,120	301,134	2,945.4	1,198.17	3.68	5,210,283	1,838
MAY	158,086,688	2,515,535	4,303,672	12,713,000	769,333	160,642,432	8,740	327,304	2,044.3	1,281.15	3.89	5,099,571	1,943
JUNE	154,696,672	2,468,786	4,106,634	12,395,005	745,194	157,844,928	445	317,068	678.3	1,368.07	4.24	5,156,556	2,120
JULY	152,116,048	2,846,712	4,779,113	13,092,995	789,458	155,309,760	1,515	311,508	87.1	1,369.70	4.32	4,906,969	2,159
AUGUST	155,132,272	3,309,578	4,795,726	11,492,020	789,826	156,025,232	950	304,408	186.2	1,398.06	4.32	5,004,267	2,161
SEPTEMBER	149,055,504	3,460,337	4,234,045	12,376,590	817,794	151,199,520	630	303,774	952.4	1,565.58	5.04	4,968,517	2,518
OCTOBER	149,341,680	1,944,480	10,254,522	13,318,290	1,146,159	153,209,120	115,810	295,916	2,806.9	1,876.59	6.03	4,817,474	3,013
NOVEMBER	144,153,184	1,795,271	8,173,446	12,774,600	613,555	150,461,472	739	294,836	6,445.7	1,657.96	5.52	4,805,106	2,758
DECEMBER	152,144,768	2,825,276	3,680,873	12,470,490	764,713	158,127,248	360	316,332	7,687.2	1,348.02	4.25	4,907,896	2,124
TOTALS	1,836,570,576	30,305,416	62,897,876	147,713,000	9,748,947	1,863,136,160	197,869	3,741,050	48,028.7	16,644.43	4.35	5,031,700	2,173

Table E-2: Horseshoe Bend Water Treatment Plant 2011 Flow Totals

MONTH	INFLUENT GALLONS	FIRST STAGE GALLONS	SECOND STAGE GALLONS	RETURN WATER GALLONS	LIME GRIT FLUSH WATER	HSB PLANT WATER GALLONS	BUTTE WATER	POWER KW-HRS	NAT GAS CU. FT.	LIME DELIVERE D	LIME #/TON	GALLONS PER DAY	LIME MG/L
JANAURY	163,699,808	5,403,343	4,971,747	12,889,010	716,329	160,243,600	625	303,038	8,182.0	1,695.81	4.97	5,280,639	2,484
FEBRUARY	143,280,976	2,722,346	4,572,212	11,517,990	568,794	141,809,904	415	270,444	10,300.3	1,218.33	4.08	5,117,178	2,039
MARCH	155,398,688	3,153,725	3,997,181	12,836,300	640,137	155,300,432	325	296,800	8,114.9	1,421.57	4.39	5,012,861	2,193
APRIL	143,871,760	3,170,881	4,355,706	11,877,730	614,362	136,757,488	845	264,488	5,997.6	1,230.34	4.10	4,795,725	2,050
MAY	154,818,512	5,428,604	9,945,679	12,782,950	533,412	151,814,944	420	271,558	3,497.3	1,548.02	4.80	4,994,146	2,397
JUNE	151,167,840	129,876	22,042,580	10,400,910	293,514	145,362,192	1,695	230,204	2,271.3	1,699.40	5.39	5,038,928	2,695
JULY	161,733,845	11,169,374	7,401,758	11,813,020	268,221	147,324,499	940	281,906	216.9	2,057.42	6.10	5,217,221	3,050
AUGUST	162,752,240	16,863,280	898,500	10,124,990	163,541	149,395,200	2,560	297,428	80.7	2,276.00	6.71	5,250,072	3,353
SEPTEMBER	162,359,088	16,077,156	260,795	10,247,960	268,221	148,231,824	1,210	276,288	708.8	2,076.01	6.13	5,411,970	3,066
OCTOBER	172,049,232	15,091,591	4,059	10,394,940	311,135	164,251,232	39,691	288,248	5,874.8	1,984.46	5.53	5,549,975	2,765
NOVEMBER	167,355,008	4,714,817	4,729,821	11,071,320	639,020	162,923,920	16,929	343,586	7,931.2	1,586.04	4.55	5,578,500	2,272
DECEMBER	170,393,264	3,808,097	5,173,073	12,842,700	627,713	169,091,456	620	335,350	9,767.5	1,705.48	4.80	5,496,557	2,400
TOTALS	1,908,880,261	87,733,090	68,353,111	138,799,820	5,644,399	1,832,506,691	66,275	3,459,338	62,943.3	20,498.88	5.15	5,229,809	2,575

Table E-3: Horseshoe Bend Water Treatment Plant 2012 Flow Totals

MONTH	INFLUENT GALLONS	FIRST STAGE GALLONS	SECOND STAGE GALLONS	RETURN WATER GALLONS	LIME GRIT FLUSH WATER	HSB PLANT WATER GALLONS	BUTTE WATER	POWER KW-HRS	NAT GAS CU. FT.	LIME DELIVERED	LIME #/TON	GALLONS PER DAY	LIME MG/L
JANAURY	174,516,720	3,407,875	7,423,728	12,815,000	590,485	170,943,440	600	351,384	8,431.2	1,557.21	4.28	5,629,572	2,139
FEBRUARY	162,879,088	3,376,336	8,308,840	12,247,050	631,113	159,682,192	400	334,428	8,435.1	1,319.98	3.89	5,817,110	1,943
MARCH	177,924,080	1,967,728	15,080,651	11,690,920	345,709	167,802,944	620	308,284	5,783.3	1,823.96	4.92	5,739,486	2,458
APRIL	163,063,112	0	11,682,950	10,112,000	410,589	157,943,440	1,460	277,516	4,483.3	1,465.19	4.31	5,435,437	2,154
MAY	189,253,600	625,610	18,575,966	12,436,320	572,663	171,003,360	670	371,094	3,804.5	2,486.09	6.30	6,104,955	3,150
JUNE	181,466,032	3,581,876	21,066,136	7,220,900	341,477	161,474,784	3,921,740	324,394	2,430.5	2,033.89	5.38	6,048,868	2,687
JULY	175,678,912	3,272,307	18,184,114	5,458,775	514,001	153,501,120	5,987,750	307,954	185.6	1,903.63	5.20	5,667,062	2,598
AUGUST	167,773,424	7,627,750	301,905	10,213,125	687,451	154,467,424	3,070		128.3	1,902.55	5.44	5,412,046	2,719
SEPTEMBER	101,811,464	5,575,419	1,867,941	8,899,100	573,111	92,277,992	72,640	216,924	437.8	1,061.54	5.00	3,393,715	2,500
OCTOBER	80,428,112	5,070,192	2,656,321	8,924,875	591,650	75,543,024	885	258,058	2,243.5	789.18	4.71	2,594,455	2,353
NOVEMBER	113,560,296	11,956,216	4,247,476	12,412,125	892,208	101,914,856	1,065	289,264	5,753.4	2,227.77	9.41	3,785,343	4,703
DECEMBER	139,945,104	12,353,625	3,355,337	1,554,400	2,114,672	128,020,480	980		9,275.2	1,872.71	6.42	4,514,358	3,208
TOTALS	1,828,299,944	58,814,934	112,751,365	113,984,590	8,265,129	1,694,575,056	9,991,880	3,039,300	51,391.7	20,443.70	5.36	5,009,041	2,681

Table E-4: Horseshoe Bend Water Treatment Plant 2013 Flow Totals

MONTH	INFLUENT GALLONS	FIRST STAGE GALLONS	SECOND STAGE GALLONS	RETURN WATER GALLONS	LIME GRIT FLUSH WATER	HSB PLANT WATER GALLONS	BUTTE WATER	POWER KW-HRS	NAT GAS CU. FT.	LIME DELIVERED	LIME #/TON	GALLONS PER DAY	LIME MG/L
JANUARY	154,259,392	8,308,258	5,744,007	13,235,850	848,607	141,132,048	3,685	328,037	10,121.1	1,623.21	5.05	4,976,109	2,523
FEBRUARY	121,920,568	9,473,091	4,171,599	11,471,975	633,810	109,803,560	825	260,081	8,258.6	1,656.15	6.52	4,354,306	3,257
MARCH	125,073,800	4,031,172	4,251,868	12,576,985	672,414	119,060,064	910	302,742	6,831.7	1,316.40	5.05	4,034,639	2,523
APRIL	120,733,416	2,847,490	10,435,228	11,713,090	707,808	106,725,008	1,185	307,048	4,556.8	1,199.31	4.77	4,024,447	2,382
MAY	131,449,968	3,972,097	19,451,536	13,003,910	527,608	117,866,768	1,075	276,712	3,635.1	1,966.57	7.18	4,240,322	3,587
JUNE	120,014,880	1,053,934	13,058,299	9,962,910	449,090	110,542,384	850	238,902	1,500.2	1,309.47	5.23	4,000,496	2,616
JULY	132,187,528	10,706,314	2,128,315	7,079,880	2,212,211	119,080,528	1,040		163.2	1,727.22	6.27	4,264,114	3,133
AUGUST	138,581,392	7,097,660	3,613,095	0	592,290	128,892,912	100,360	325,603	287.1	1,690.97	5.85	4,470,367	2,926
SEPTEMBER	122,972,136	4,560,721	2,695,561	10,080,156	828,984	118,465,888	670	295,435	871.8	1,314.98	5.13	4,099,071	2,564
OCTOBER	128,973,552	3,888,730	3,179,443	11,786,010	755,255	123,655,128	965	308,318	3,632.5	1,365.50	5.08	4,160,437	2,538
NOVEMBER	128,341,064	5,421,061	2,561,082	11,532,980	734,750	120,150,144	785	355,305	6,214.8	1,374.14	5.14	4,278,035	2,567
DECEMBER	128,676,240	4,259,265	4,562,553	11,240,990	783,486	119,911,712	1,410	414,429	9,907.5	1,356.07	5.06	4,150,846	2,527
TOTALS	1,553,183,936	65,619,793	75,852,586	123,684,736	9,746,313	1,435,286,144	113,760	3,412,612	55,980.4	17,899.99	5.53	4,255,298	2,763

Table E-5: Horseshoe Bend Water Treatment Plant 2014 Flow Totals

MONTH	INFLUENT GALLONS	FIRST STAGE GALLONS	SECOND STAGE GALLONS	RETURN WATER GALLONS	LIME GRIT FLUSH WATER	HSB PLANT WATER GALLONS	BUTTE WATER	POWER KW-HRS	NAT GAS CU. FT.	LIME DELIVERED	LIME #/TON	GALLONS PER DAY	LIME MG/L
JANUARY	139,362,976	4,022,062	7,211,427	12,527,030	778,144	126,513,928	830	418,023	7,259.2	1,621.83	5.58	4,495,580	2,790
FEBRUARY	116,962,840	3,537,114	4,597,618	12,537,000	697,959	112,357,400	710	363,447	9,571.2	1,267.96	5.20	4,177,244	2,599
MARCH	139,353,424	9,415,570	6,394,367	13,370,040	704,186	136,346,176	730	322,537	7,797.3	1,823.33	6.28	4,495,272	3,137
APRIL	140,402,832	6,646,256	5,475,065	16,599,125	733,036	144,673,760	830	321,558	6,099.6	1,567.91	5.36	4,680,094	2,677
MAY	141,402,416	6,828,967	13,507,322	16,000,525	730,183	141,110,960	1,700	302,672	2,730.5	1,885.39	6.40	4,561,368	3,197
JUNE	121,606,352	67,837	15,788,021	11,122,310	253,984	118,439,784	2,895	232,968	2,448.9	1,569.38	6.19	4,053,545	3,094
JULY	140,079,136	117,894	21,861,446	11,230,980	252,545	135,262,320	1,055	250,869	203.8	1,963.15	6.72	4,518,682	3,360
AUGUST	148,823,360	121,307	23,252,722	11,206,985	178,966	134,724,704	21,290	264,738	516.4	1,766.58	5.70	4,800,754	2,846
SEPTEMBER	141,249,056	1,677	24,112,596	10,127,015	120,098	132,888,736	6,220	259,398	1,449.8	1,944.23	6.60	4,708,302	3,300
OCTOBER	165,761,632	24,715	31,262,218	12,943,085	84,112	150,174,112	700	298,411	2,203.6	2,323.40	6.72	5,347,149	3,361
NOVEMBER	143,877,872	1,899,524	20,732,756	10,449,965	217,244	129,364,200	107,650	256,868	7,742.0	1,721.22	5.74	4,795,929	2,868
DECEMBER	151,712,400	12,716,291	13,699,133	12,913,950	102,760	151,712,400	1,705	409,360	10,550.9	2,386.23	7.55	4,893,948	3,771
TOTALS	1,690,594,296	45,399,214	187,894,691	151,028,010	4,853,217	1,613,568,480	146,315	3,700,849	58,573.2	21,840.61	6.20	4,631,765	3,097

Table E-6: Birds observed and Bird Fatalities Recorded at the Berkeley Pit (2010-2014)

	2010		2011		2012		2013		2014	
Month	**Number of Birds Observed**	**Number of Fatalities**	**Number of Birds Observed**	**Number of Fatalities**	**Number of Birds Observed**	**Number of Fatalities**	**Number of Birds Observed**	**Number of Fatalities**	**Number of Birds Observed**	**Number of Fatalities**
January	Frozen[1]	0	Frozen	0	0	0	0	0	0	NA
February	0	0	Frozen	0	76	0	0	0	0	NA
March	559	0	Frozen	0	628	0	1218	NA	868	NA
April	938	0	710	0	1378	1	1380	NA	2168	NA
May	337	0	1600	3	464	0	1642	NA	768	NA
June	20	0	3	0	5	0	0	NA	10	NA
July	8	0	0	0	2	0	0	NA	11	NA
August	1	0	33	0	245	0	14	NA	55	NA
September	16	0	23	1	253	0	85	NA	266	NA
October	10	0	67	0	47	0	18	NA	25	NA
November	337	0	165	0	353	0	528	9	404	NA
December	Frozen	0	0	0	100	0	0	NA	27	NA
Totals	2,226	0	2,601	4	3,551	1	4,885	9	4,602	NA

NA – Due to safety concerns following the February 2013 slope failure, number of fatalities is not available.

1. When the surface of Berkeley Pit is frozen, observation decreases substantially per the waterfowl mitigation plan. There is no exposure to the contaminated water when completely frozen and the observation program is designed to address the times and seasons when waterfowl may be exposed to Berkeley Pit water.

Figure E-1: BMFOU Three Camp System

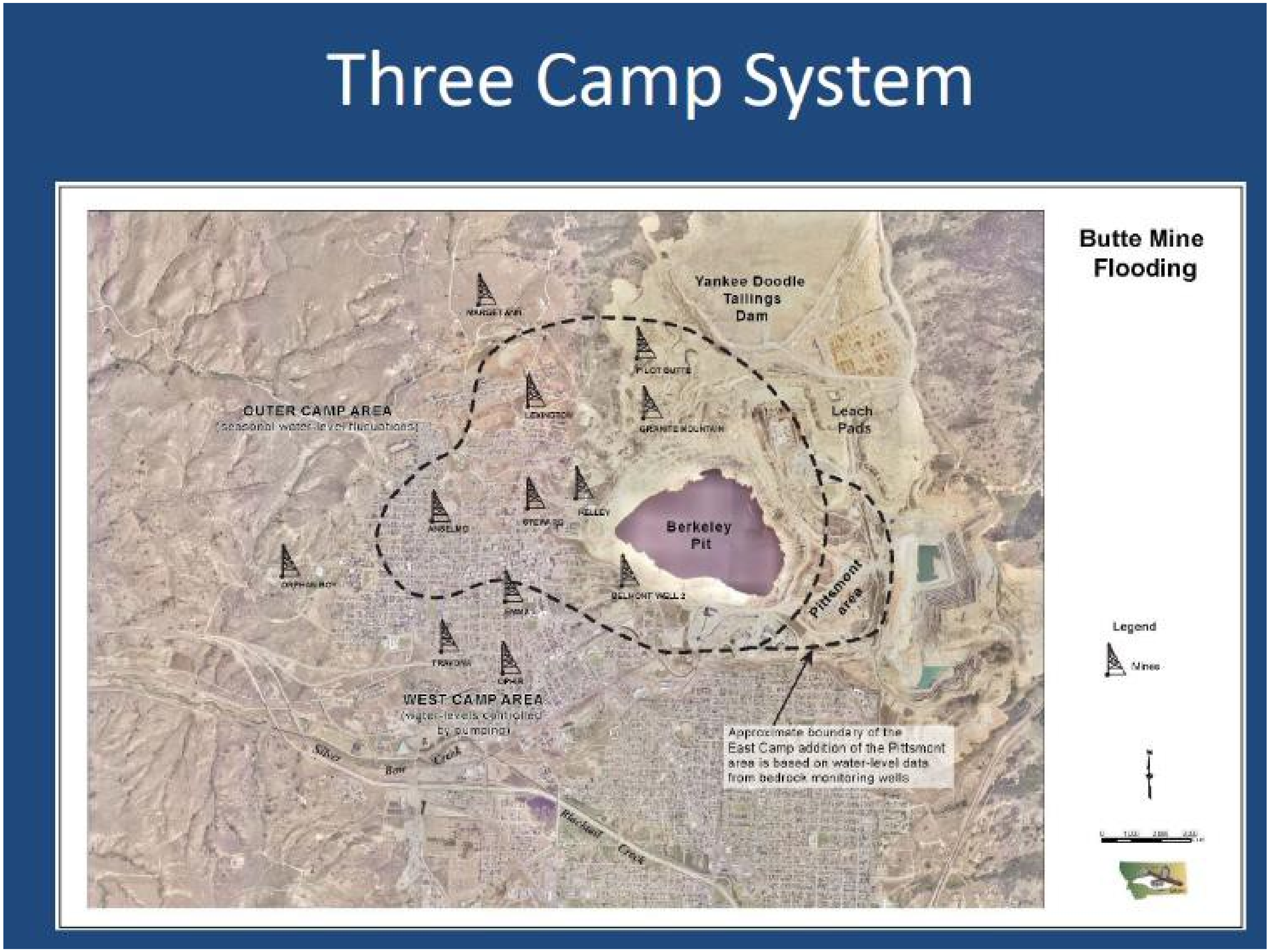


Figure E-2: Potentiometric Map for the East Camp Bedrock Aquifer

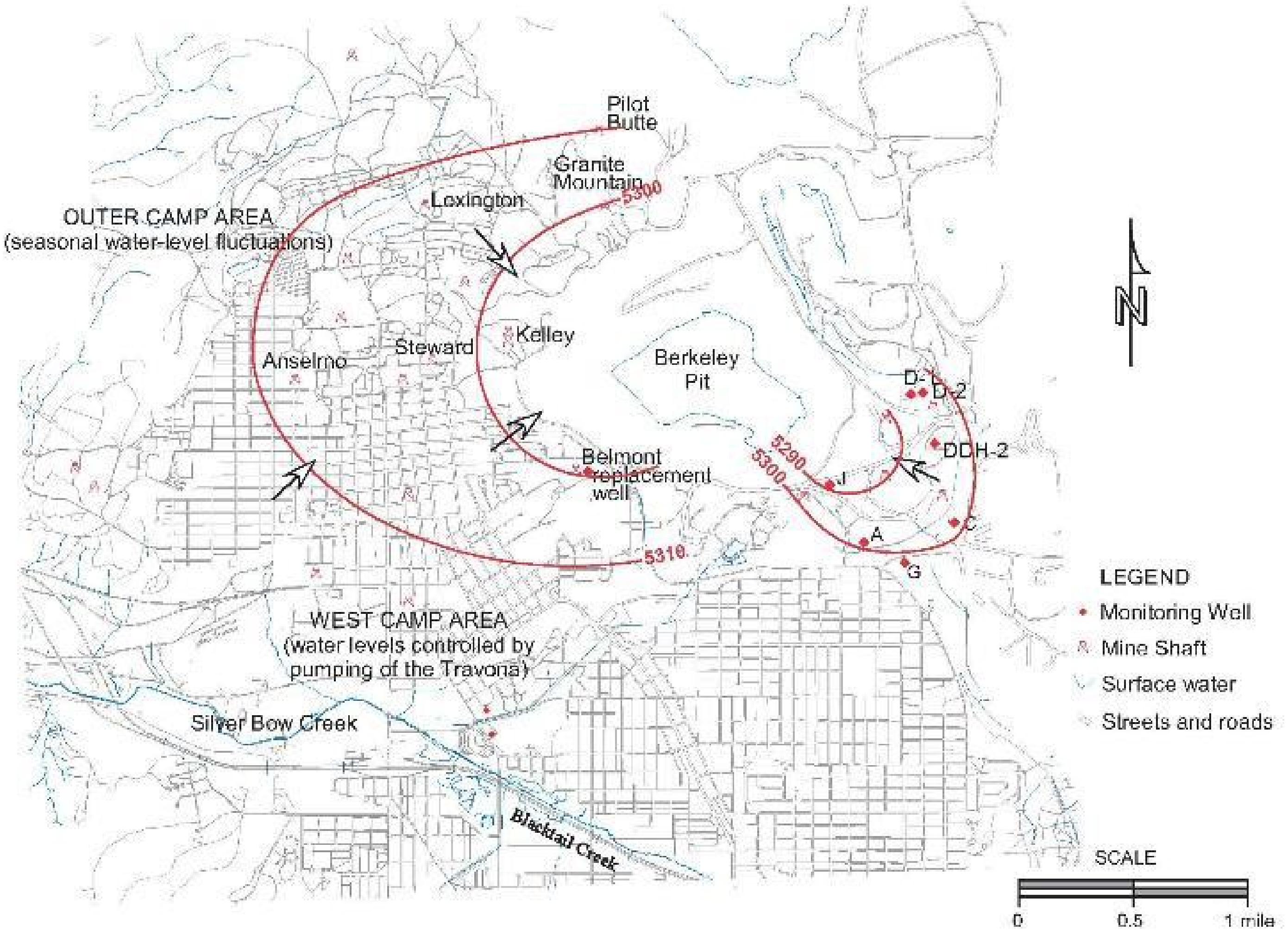


Figure 3-3. Potentiometric map for the East Camp bedrock aquifer, December of 2009; arrows indicate direction of ground-water flow (contour interval is 10 feet).

Figure E-3: BMFOU Monitoring Well Locations West Camp and Outer Camp

Figure E-4: BMFOU Monitoring Well Locations East Camp Bedrock

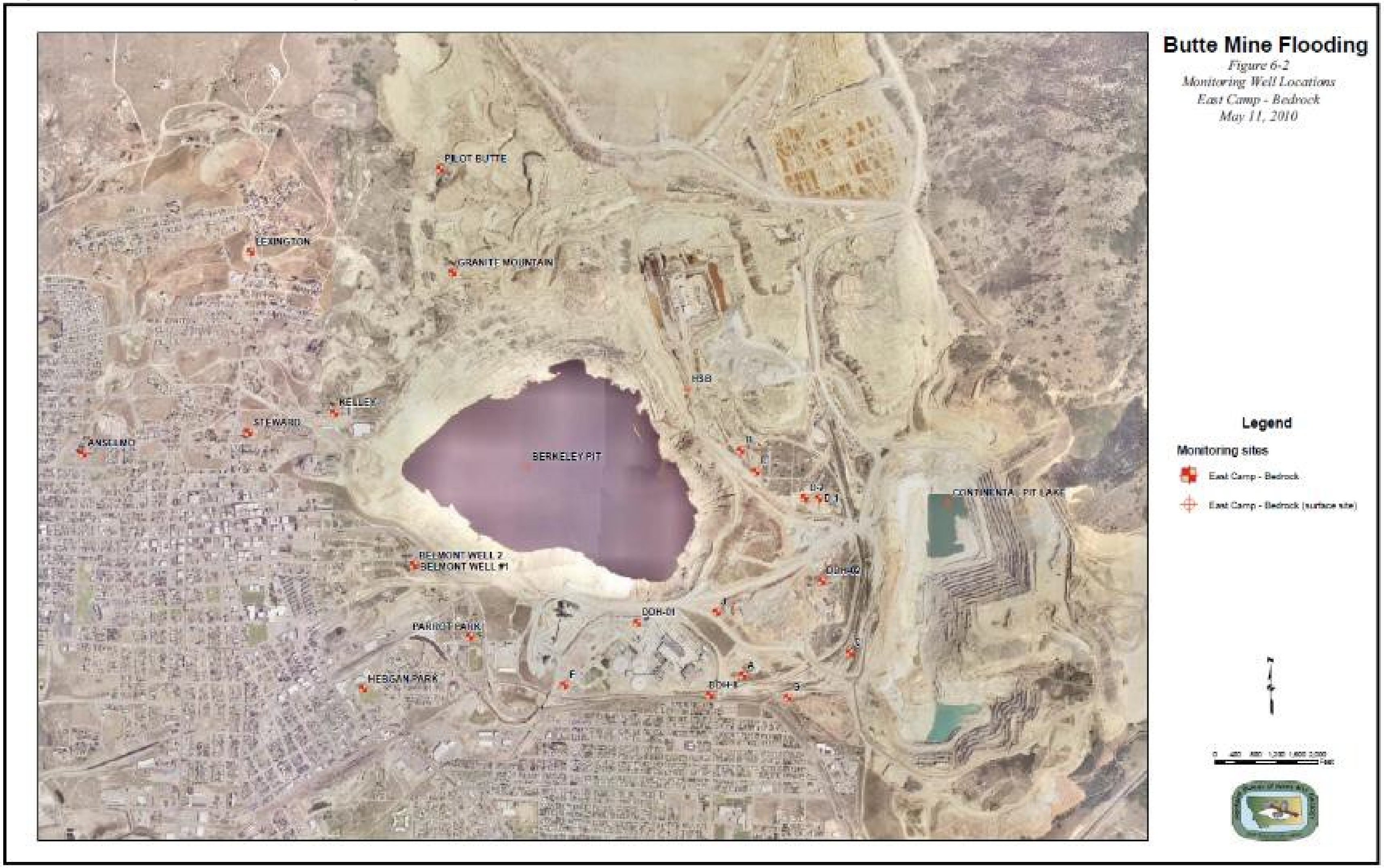


Figure E-5: BMFOU Monitoring Well Locations East Camp Alluvial

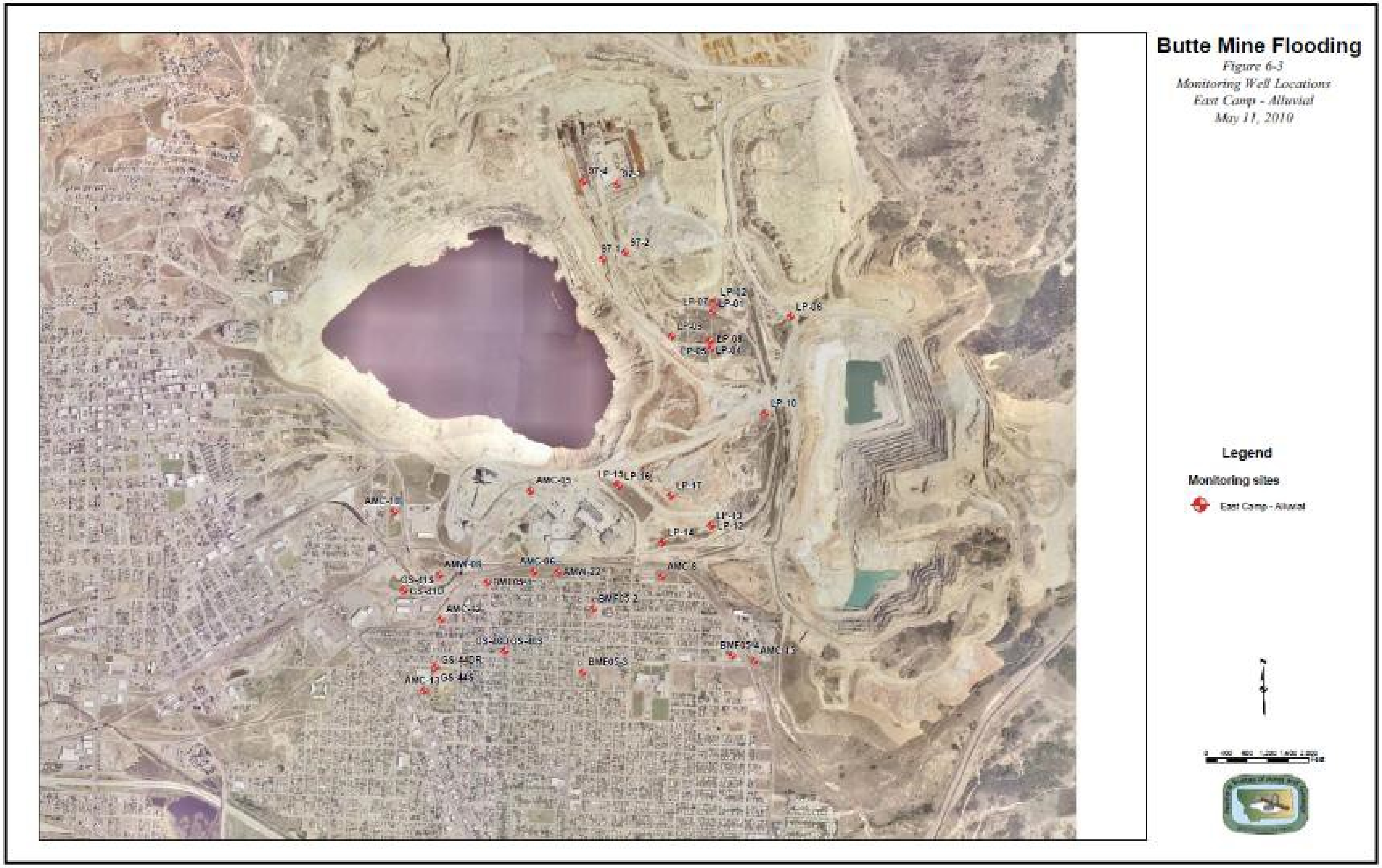
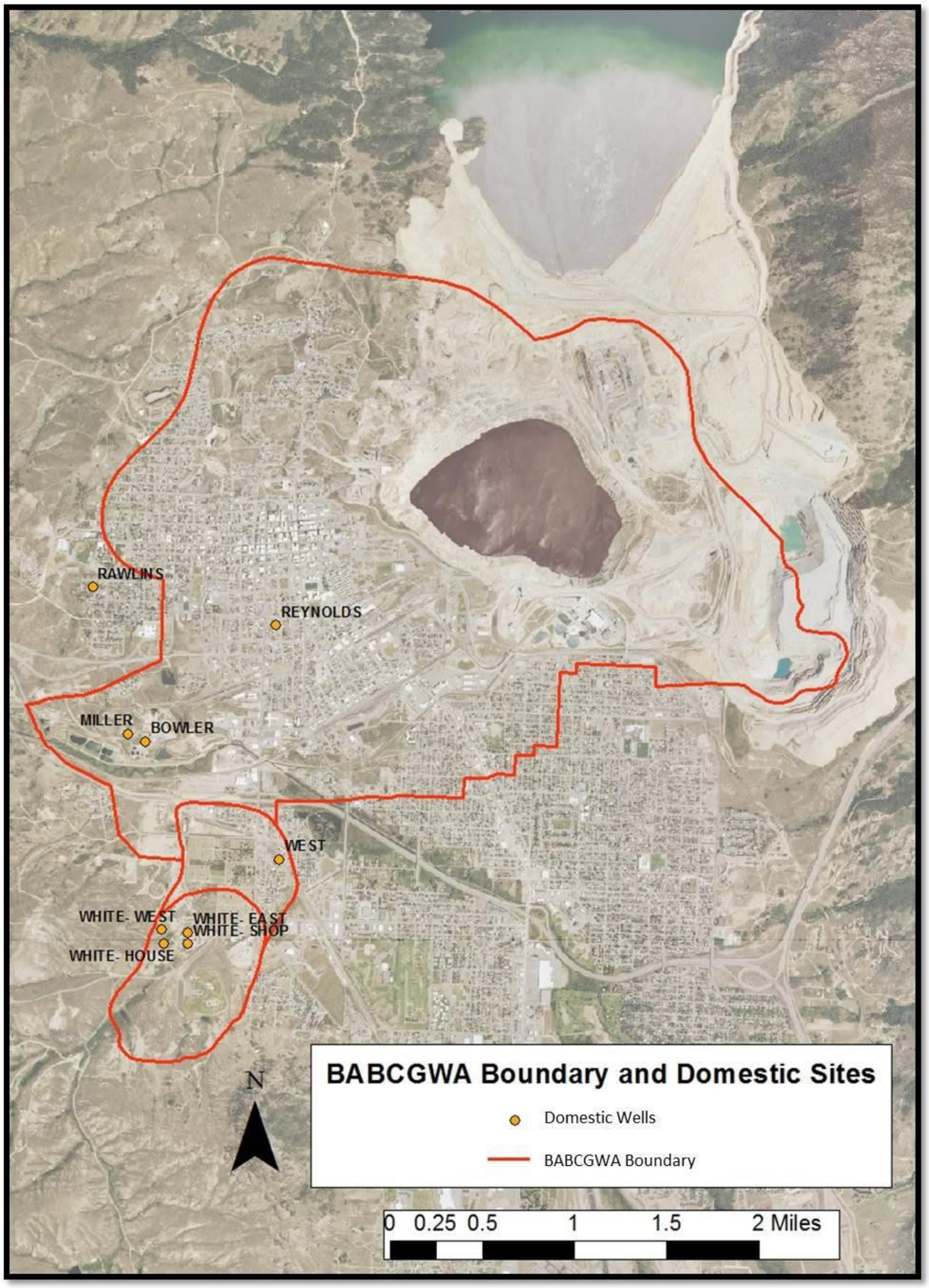


Figure E-6: Butte Alluvial and Bedrock Controlled Groundwater Area



Site map for domestic well sampling locations; Butte Alluvial and Bedrock Controlled Groundwater Area (BABCGWA) boundary is shown in red.

Appendix F: Warm Springs Ponds Monitoring

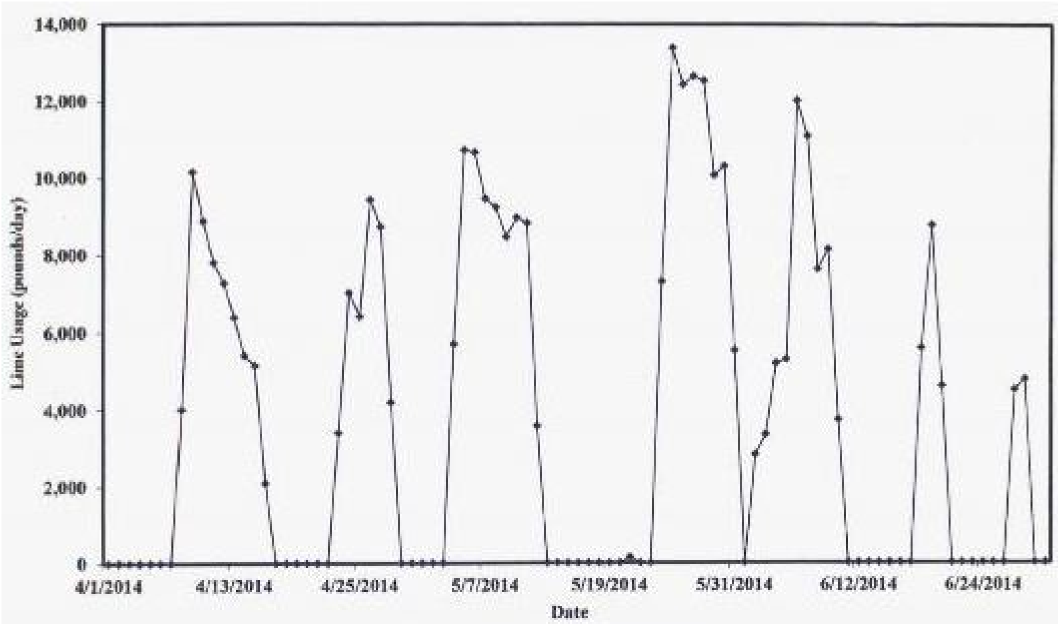


Figure 2-1. Daily Lime Usage Summary

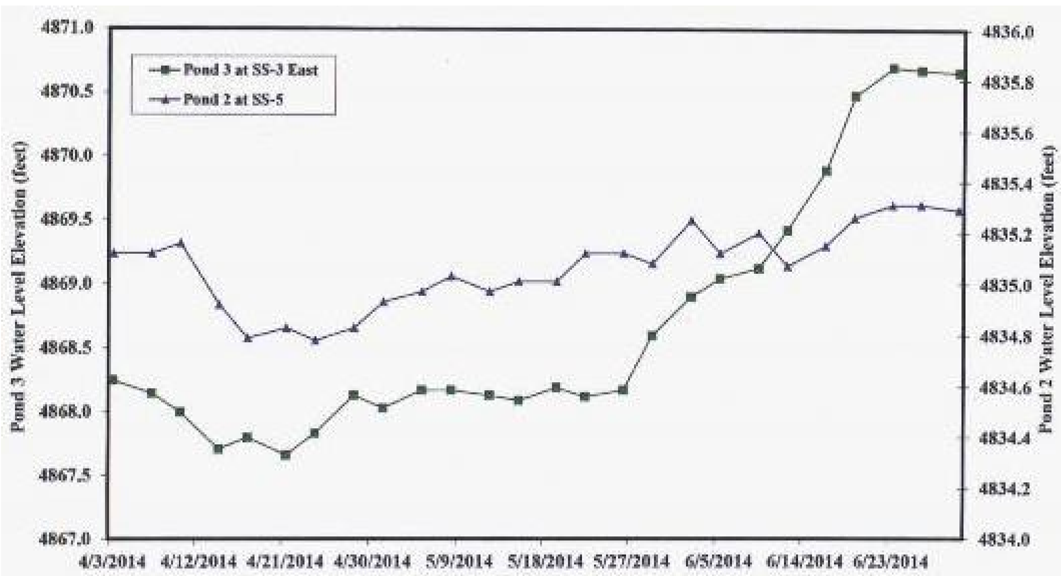
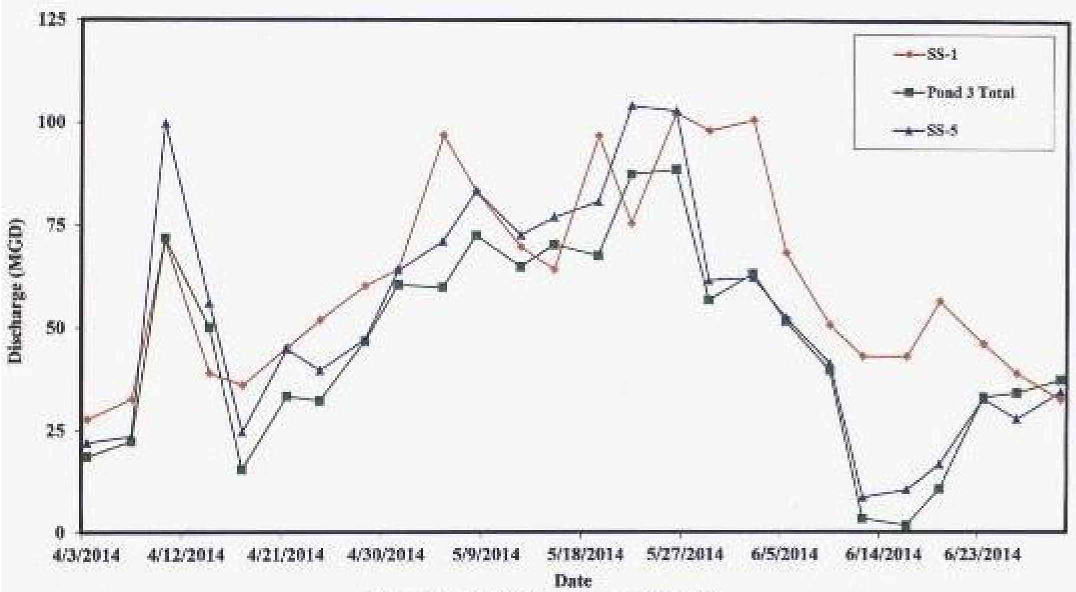
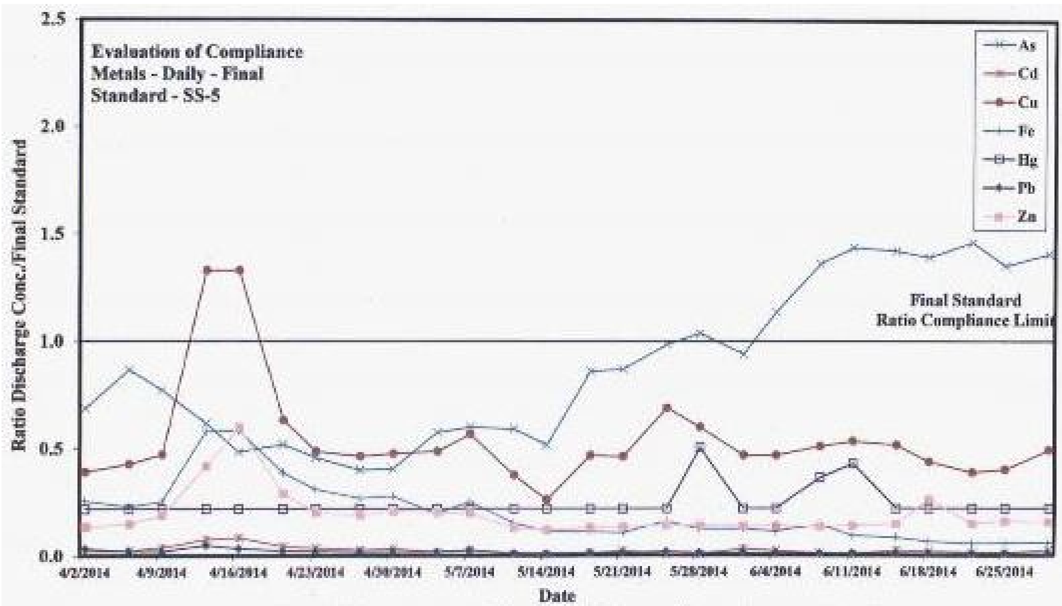


Figure 2-2. Pond Surface Elevation Summary



Notes: Pond 3 Total is an average daily flow.

Figure 2-3. Flow Summary



Note: Selenium and silver compliance evaluation not included; however, daily compliance was achieved.

Figure 2-4. Daily Evaluation of Compliance for Metals

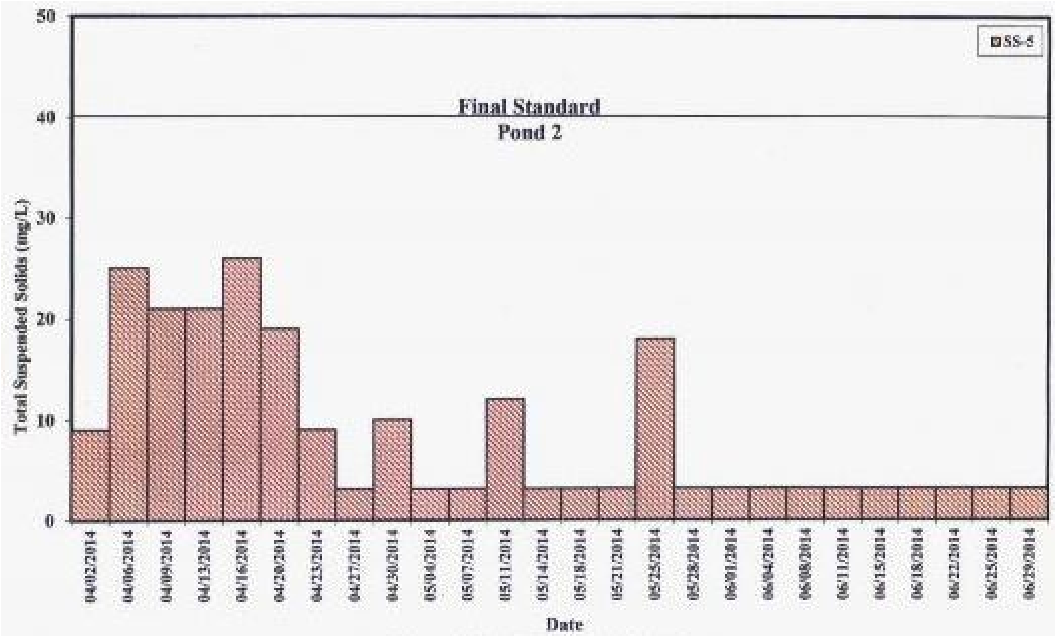


Figure 2-5. Total Suspended Solids Summary

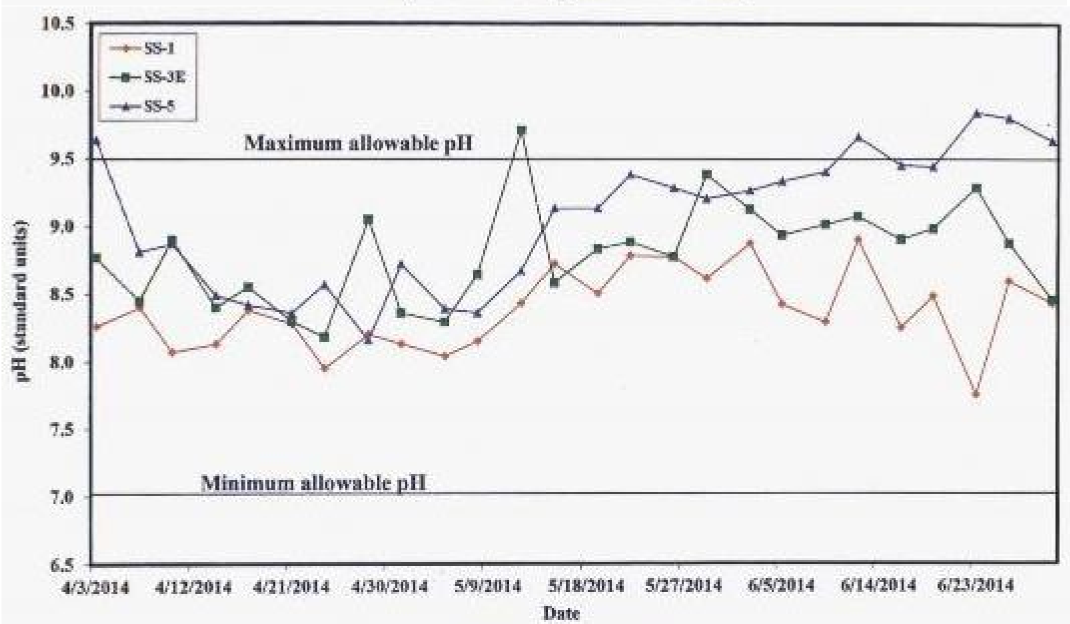


Figure 2-6. pH Summary

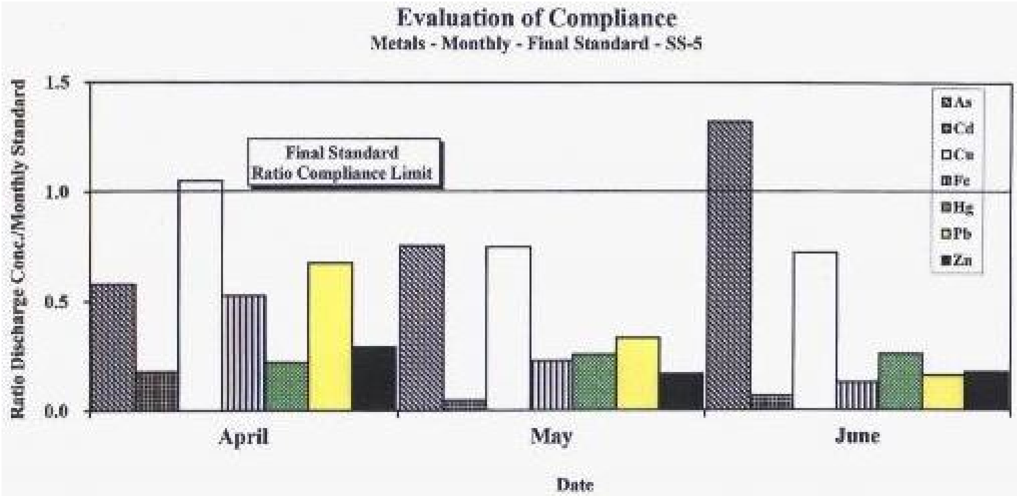


Figure 2-7. Monthly Evaluation of Compliance for Metals

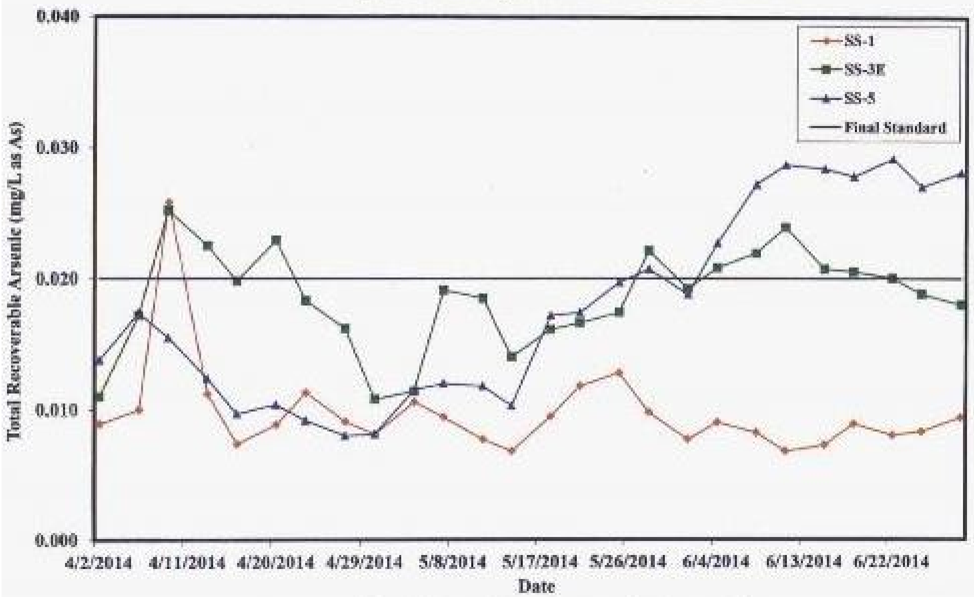
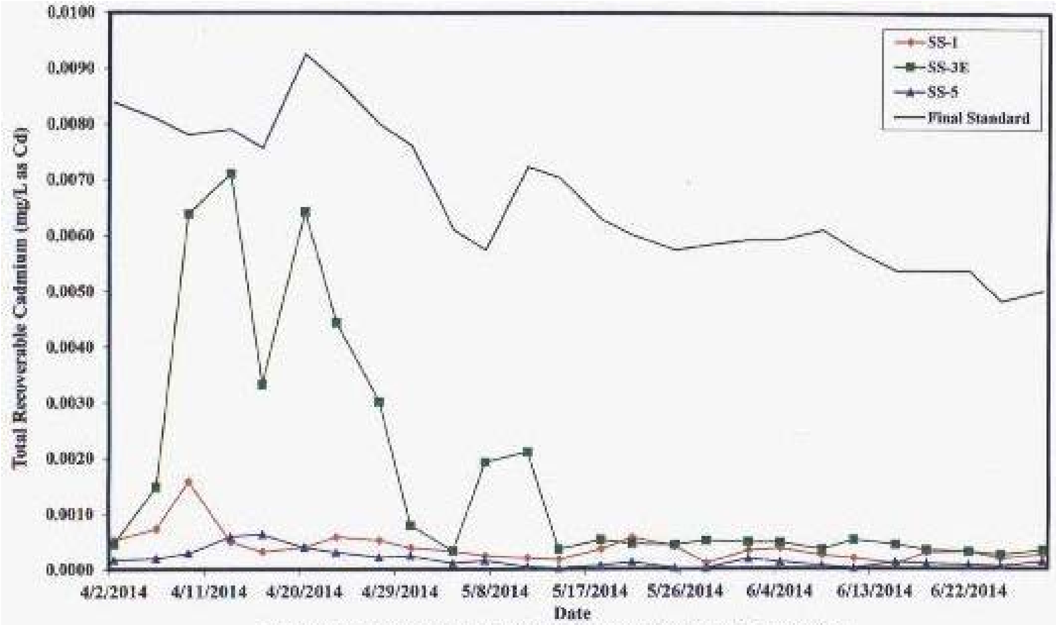


Figure 2-8. Total Recoverable Arsenic Concentration



Note: A value of 1/2 the dectection limit is used for concentrations below the detection limit.

Figure 2-9. Total Recoverable Cadmium Concentrations

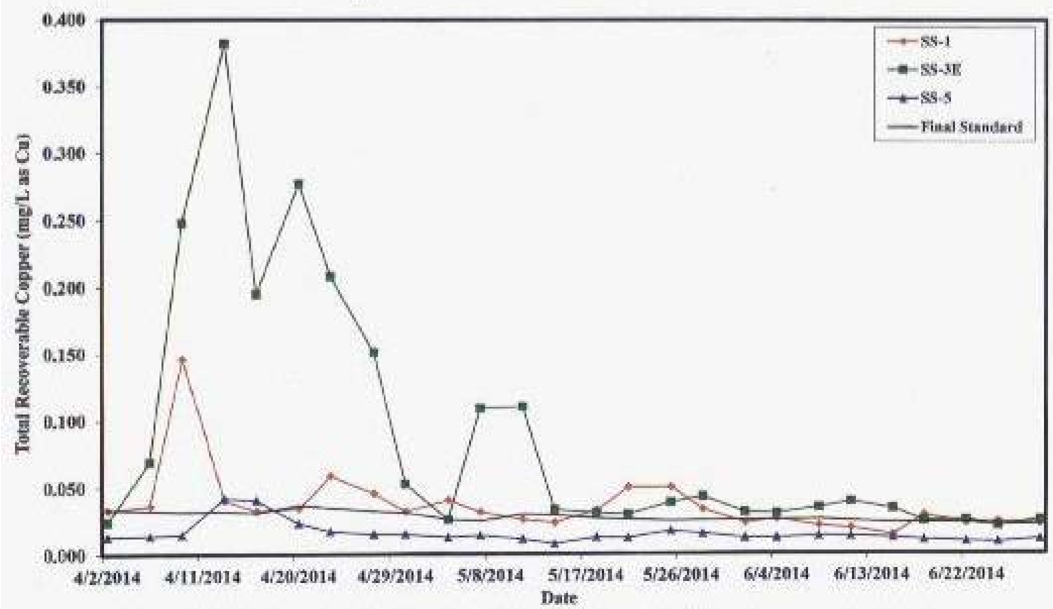


Figure 2-10. Total Recoverable Copper Concentrations

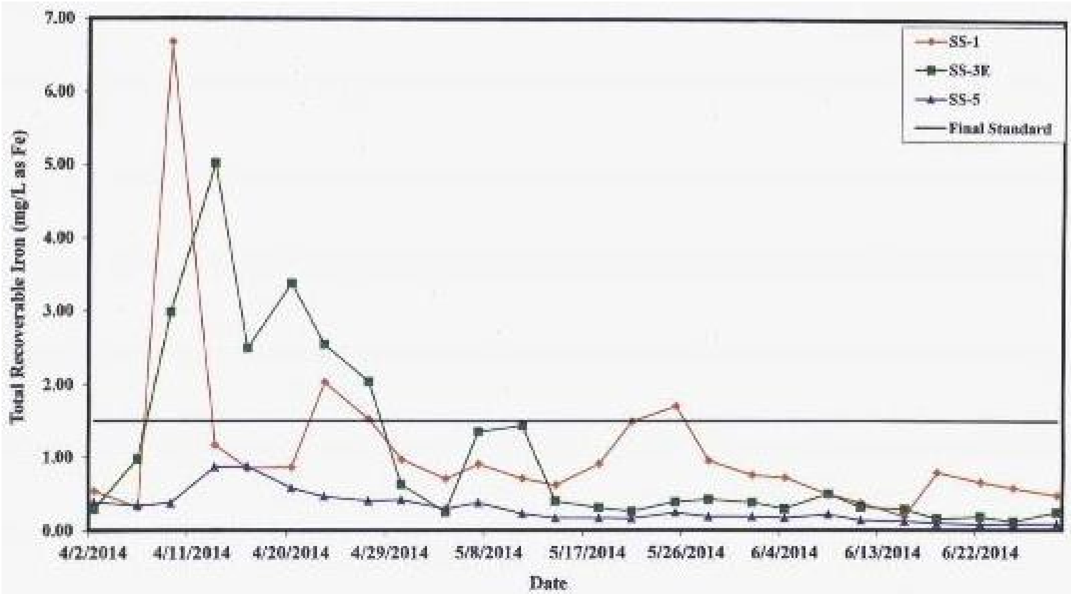


Figure 2-11. Total Recoverable Iron Concentrations

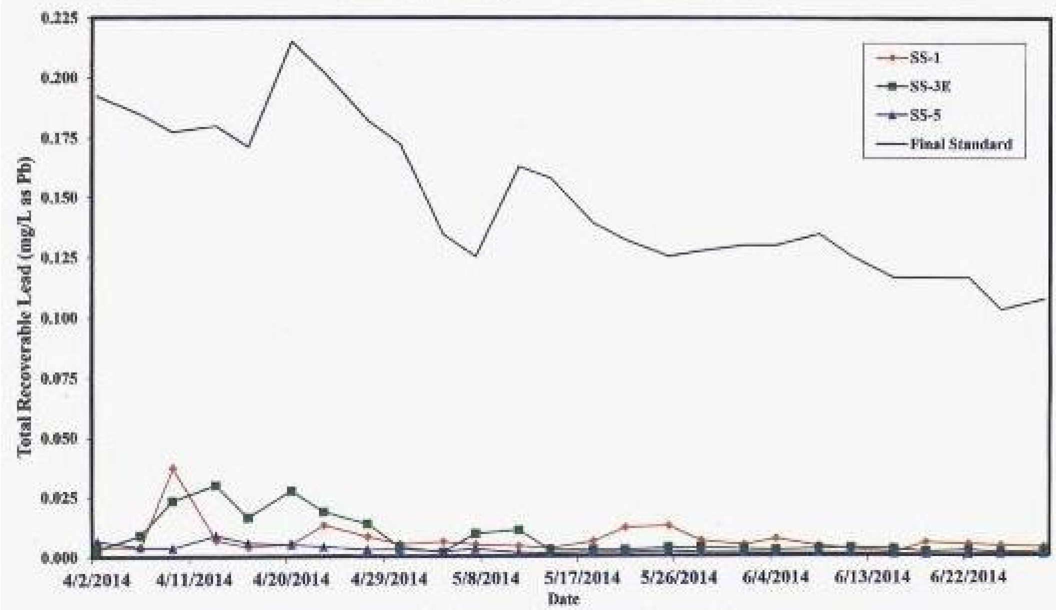
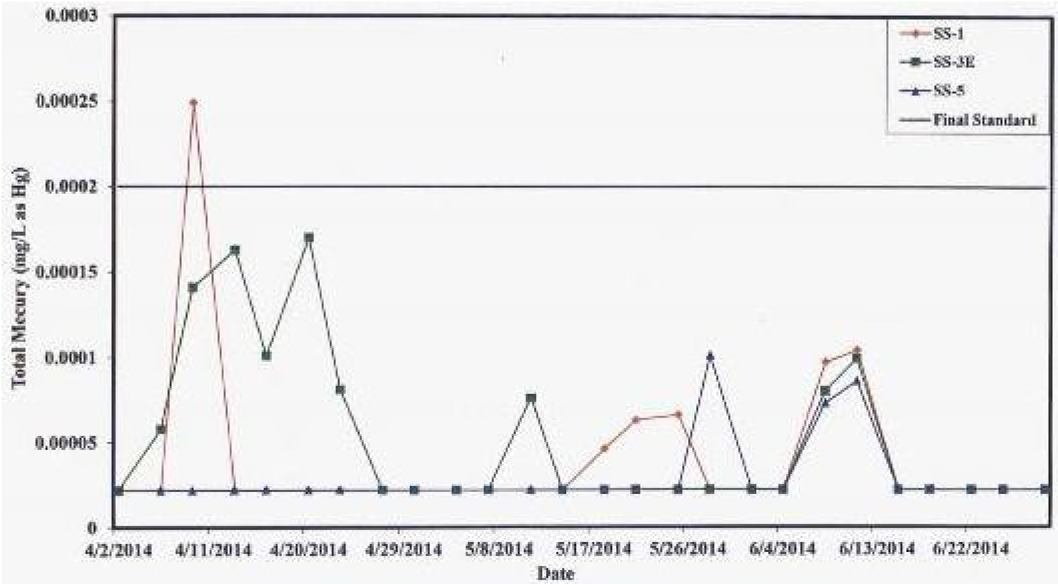
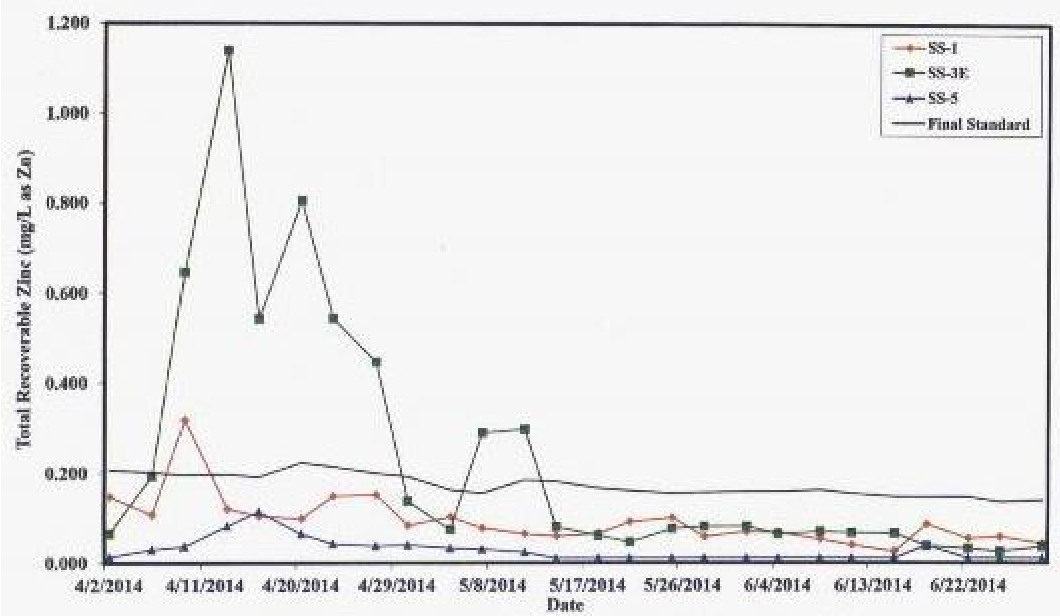


Figure 2-12. Total Recoverable Lead Concentrations



Note: A value of 1/2 the dectection limit is used for concentrations below the detection limit.

Figure 2-13. Total Mercury Concentrations



Note: A value of 1/2 the dectection limit is used for concentrations below the detection limit.

Figure 2-14. Total Recoverable Zinc Concentrations

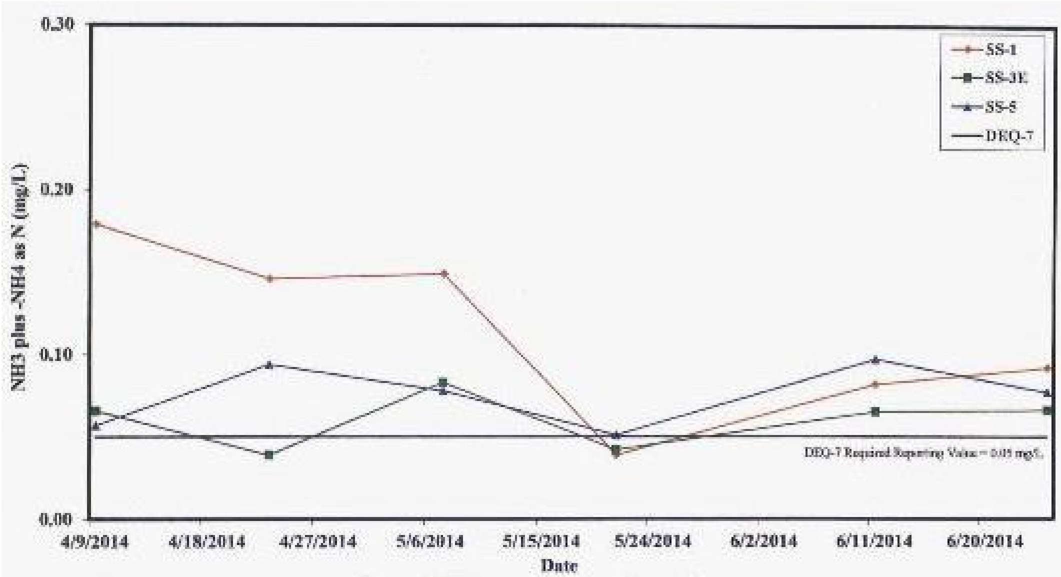
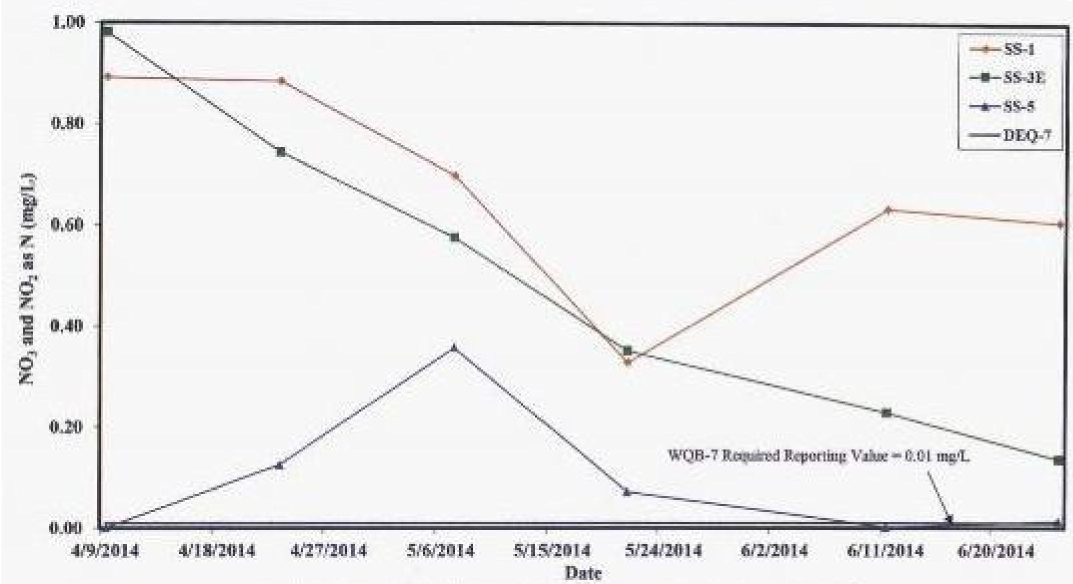


Figure 2-15. Ammonia Concentrations as Nitrogen



Note: A value of 1/2 the dectection limit is used for concentrations below the detection limit.

Figure 2-16. Nitrate - Nitrite Concentration as Nitrogen

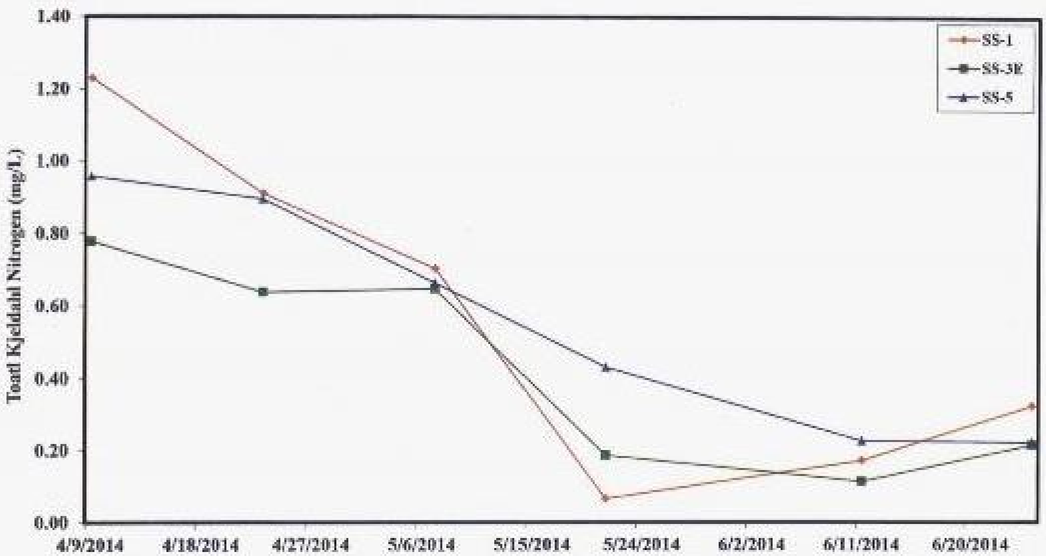


Figure 2-17. Total Kjeldahl Nitrogen Concentrations

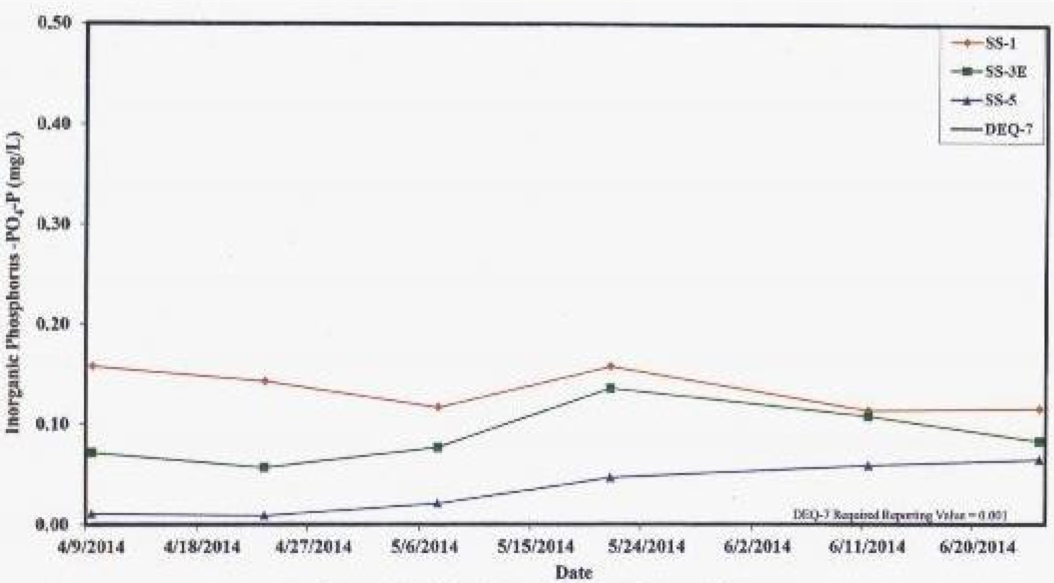


Figure 2-18. Ortho-Phosphate Concentrations as Phosphorus

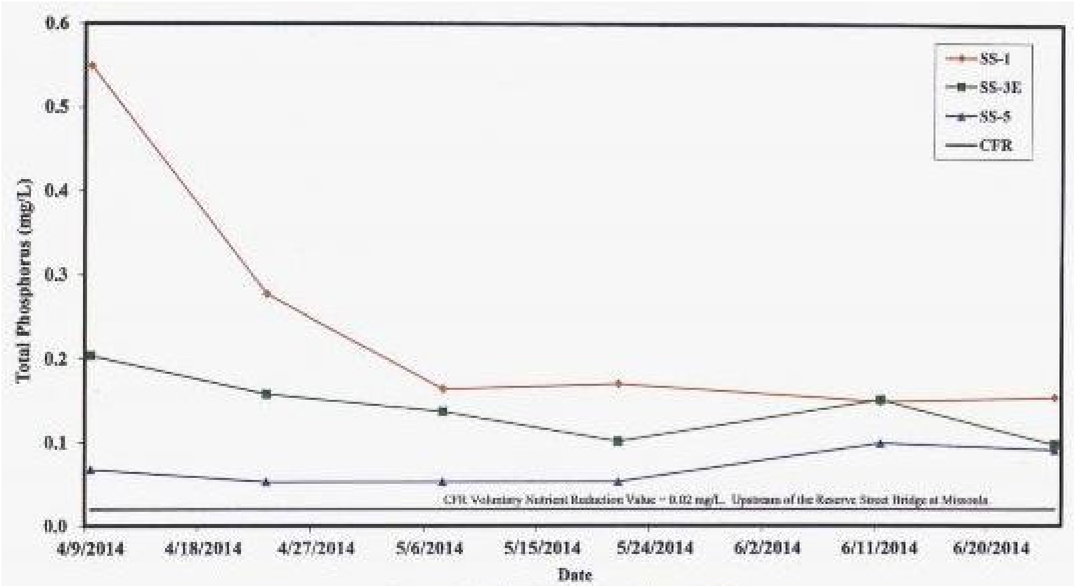


Figure 2-19. Total Phosphorus Concentrations

Appendix G: Rocker OU Data and IC information

Table G-1: Mean Arsenic Concentrations by Year (Select Wells)

		Mean Arsenic Concentration by Year (µg/L)															
Hydro-stratigraphic Unit	**Well**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Shallow Alluvial	RH-60[1]	110	155	313	277	315	245	252	299	1141	537	516	520	553	380	480	390
	RH-62[1]	4,280	6,991	9,900	9,390	11,685	9,735	10,845	11,283	10,951	7,655	7,460	7,250	6,150	6,400	6,600	5,200
	RH-17	76	119	151	94	38	39	29	32	36	53	53	55	57	45	49	43
	RH-44	553	403	395	258	244	175	196	163	135	213	254	328	348	365	410	540
	RH-52R[2]	7	6	7	3	3	3	3	4	4	4	3	3	2	2	2	2
Deep Alluvial	RH-12R[2]	10	9	9	8	8	7	7	8	7	7	7	7	7	7	7	7
	RH-14R	1,225	1,700	1,910	1,807	2,014	1,768	1,660	1,658	1,338	1,195	1,067	1,023	895	873	880	780
	RH-18	11	12	12	11	11	11	11	11	11	11	10	10	10	10	10	10
	RH-51[2]	7	8	7	6	7	6	6	6	6	6	5	5	5	5	5	5
	RH-55	--	--	--	10	10	12	13	15	14	13	13	13	11	12	12	12
	RH-76[2]	--	--	--	5	5	4	4	4	4	4	4	4	4	4	4	4
Tertiary Sediment	Ayers[2]	13	12	11	11	11	11	11	12	11	10	10	10	10	9	9	9
	Palmer[2]	4	4	4	4	4	4	3	3	5	4	3	3	3	3	3	3
	RH-06	1,024	745	584	338	207	99	92	148	141	126	116	97	110	150	200	150
	RH-36R[2]	12	11	12	9	10	10	10	9	10	9	9	10	9	9	9	9
	RH-43	13	12	11	9	8	9	9	9	10	9	8	9	8	8	9	9
	RH-46[2]	11	10	10	9	7	9	9	9	9	9	8	8	8	8	8	8
	RH-48	141	151	93	54	27	24	22	20	15	15	13	12	11	11	14	14
	RH-53[2]	11	13	11	12	14	11	12	13	13	12	11	12	11	11	11	11
	Town Pump[2]	11	11	11	11	12	11	12	12	12	11	11	11	10	10	10	10

Notes:
1 – Designates a “gravel well.”
2 - Designates a contingency well.
2014 mean concentration data for all wells were not yet available for review; 2014 mean concentrations for select key wells were calculated for this FYR and are discussed in the text.

Figure G-1: Wells with Arsenic Concentrations Greater than 10 µg/L since First Quarter 2011 (source: 2014 ESD)

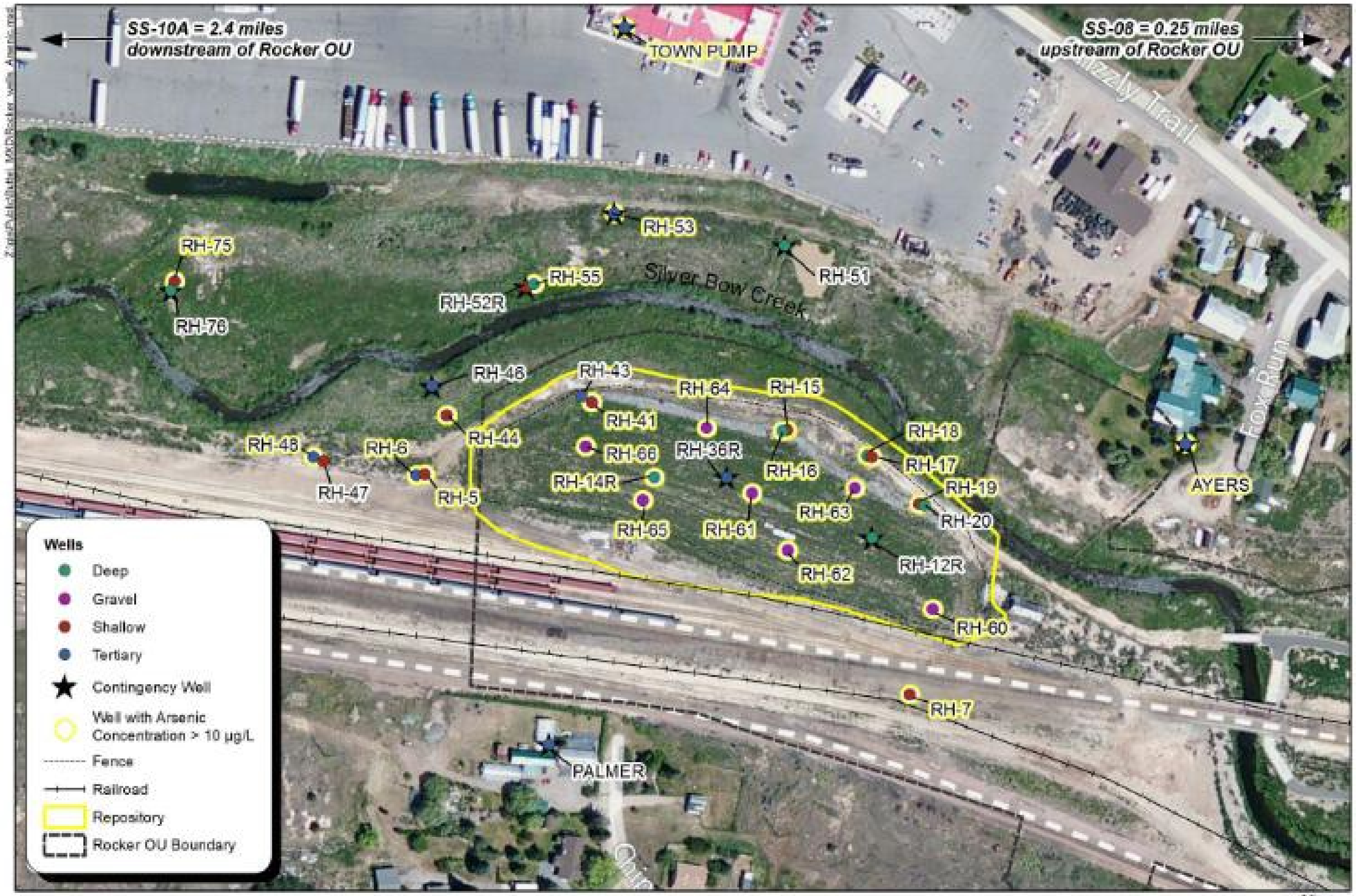


Figure 3-1. Wells with Arsenic Concentrations Greater than 10 µg/L since First Quarter 2011
Rocker OU
Silver Bow Creek/Butte Area

Figure G-2: Rocker OU Controlled Groundwater Area

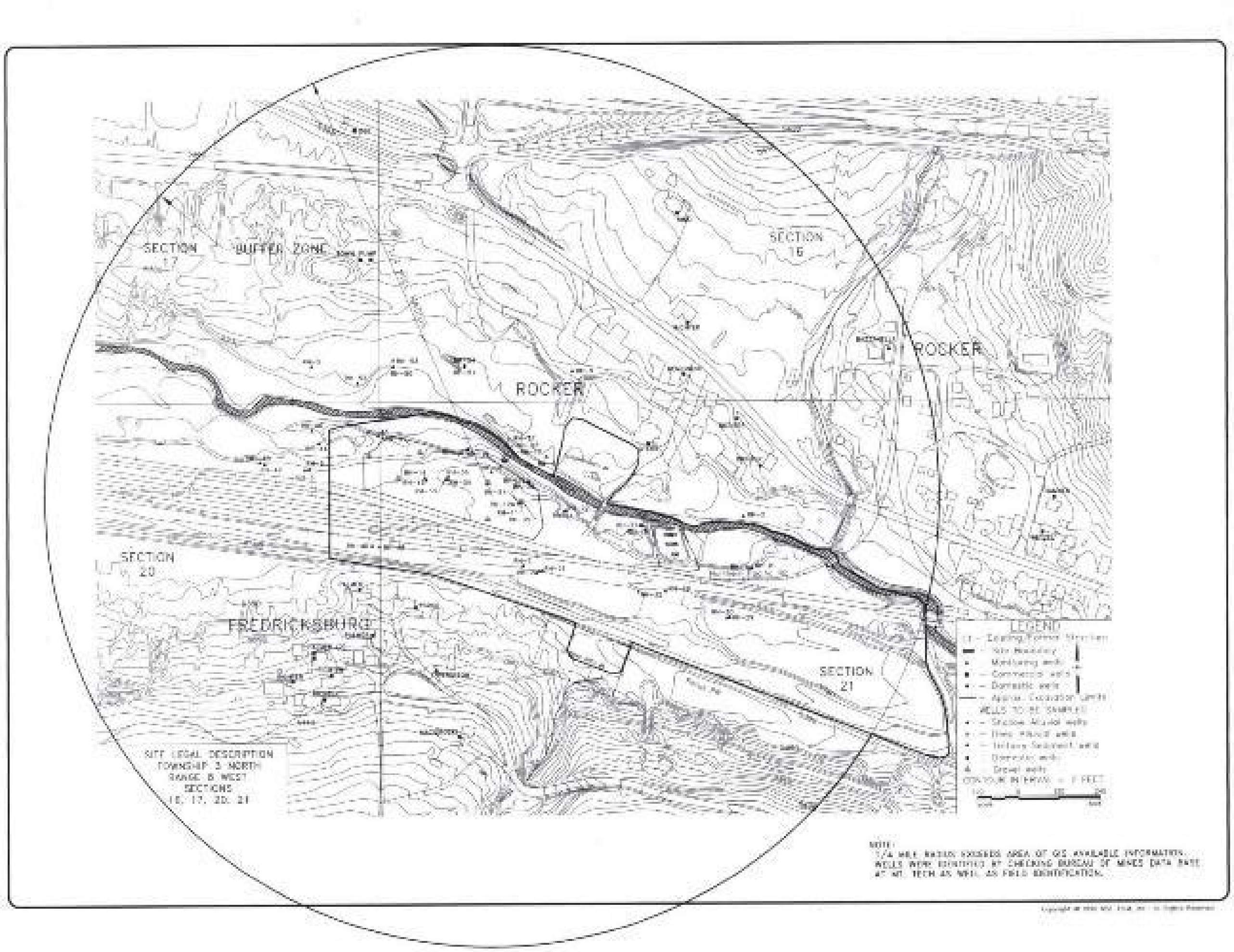


Figure G-3: Rocker OU Groundwater Closure Area

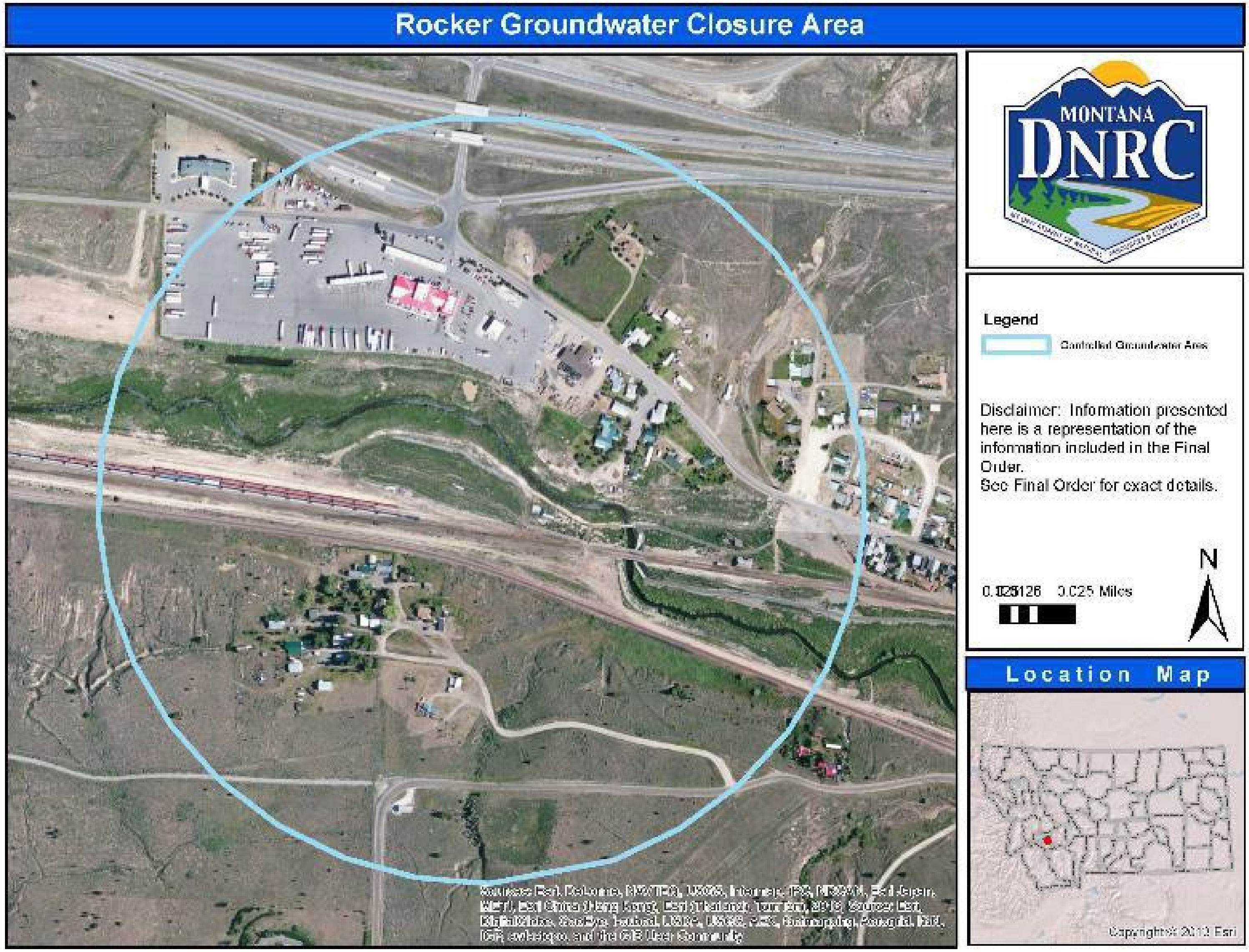


Figure G-4: Rocker OU Water Table Contour Map – Deep Alluvial Unit

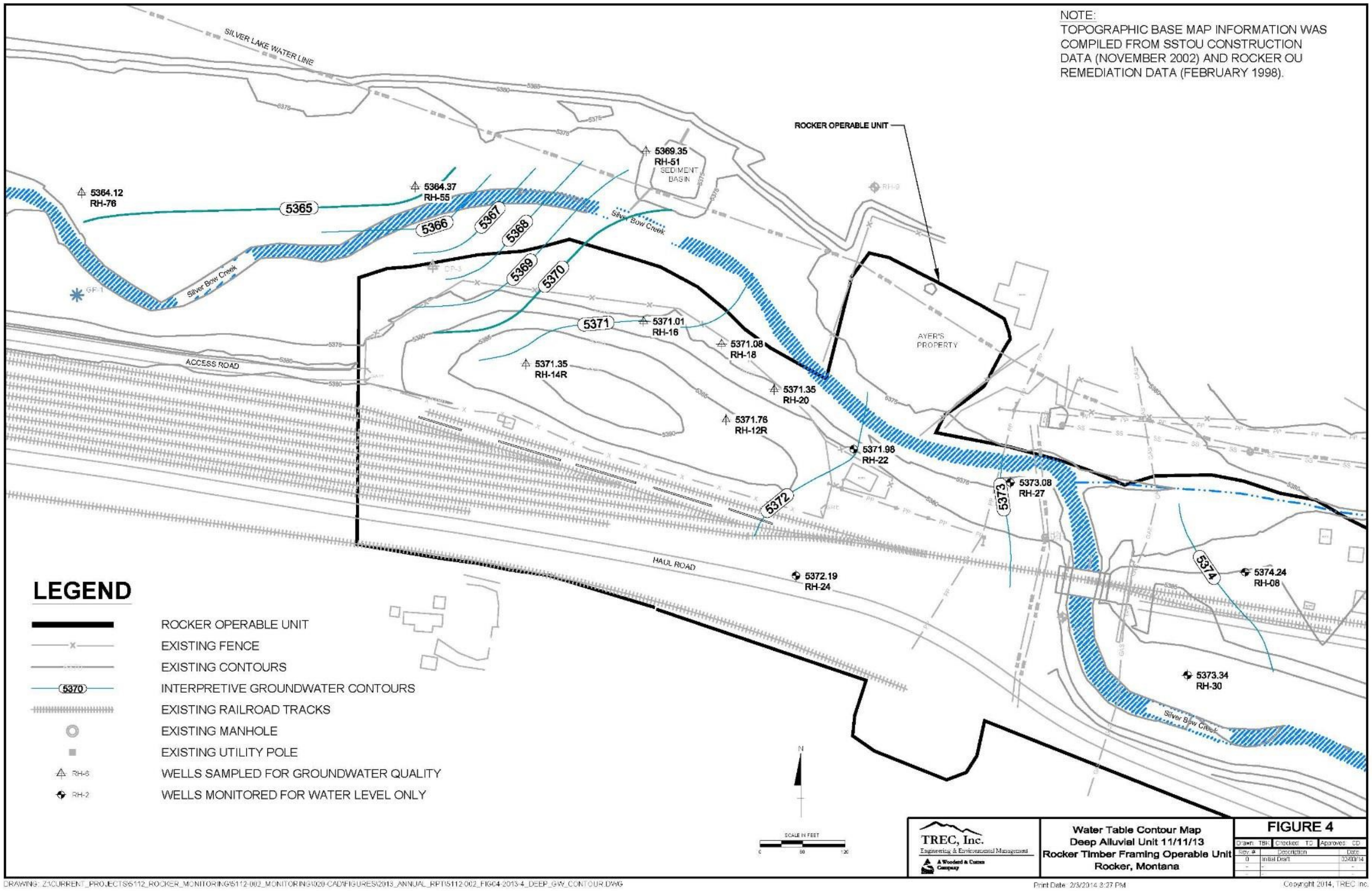
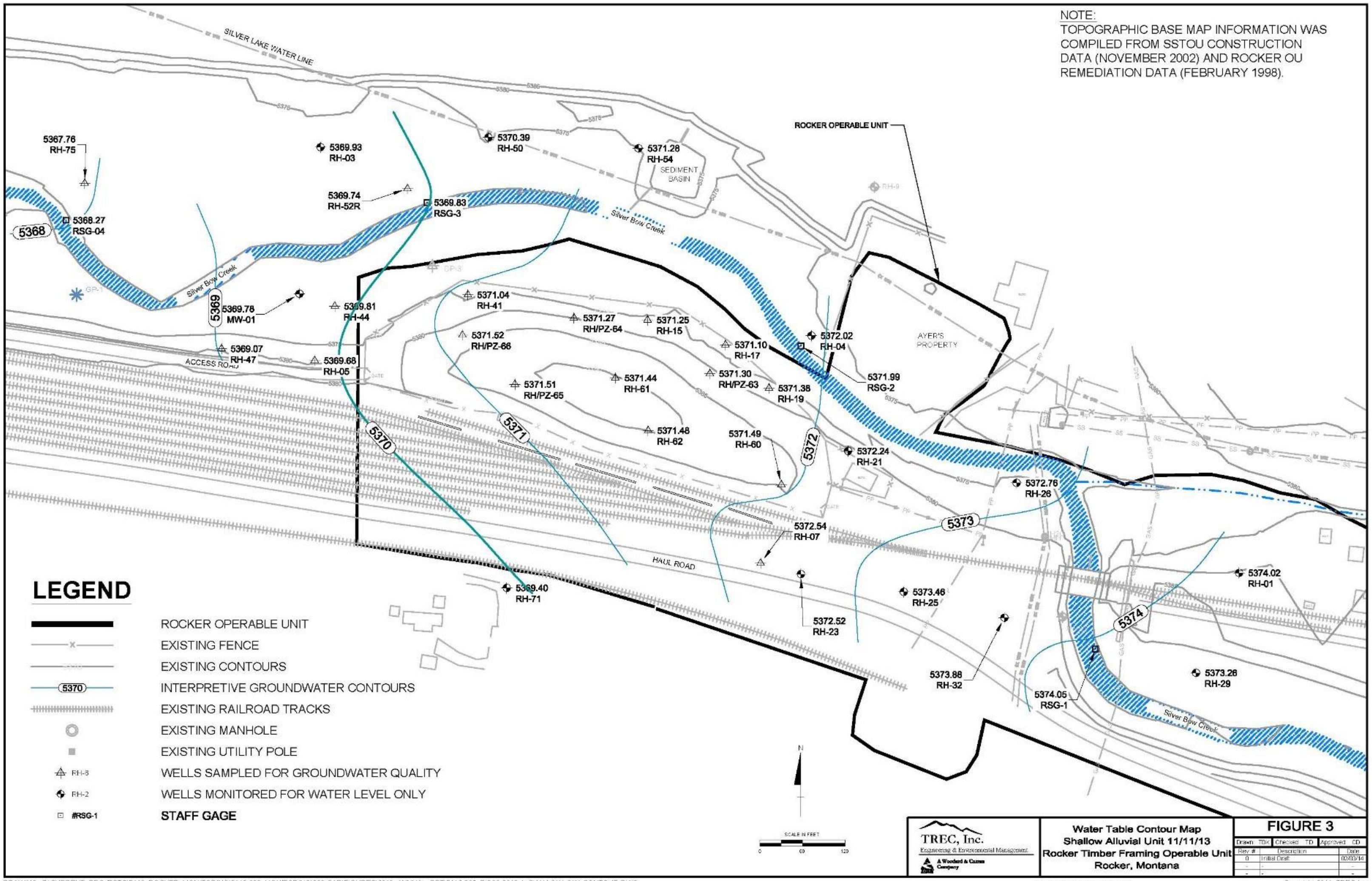


Figure G-5: Rocker OU Water Table Contour Map – Shallow Alluvial Unit



Appendix H: BPSOU Maps and Supplemental Information

Butte Treatment Lagoons System Description
The following description is from the Quarterly Operations and Maintenance Report Butte Treatment Lagoon System – Fourth Quarter 2014.

The BTL receives impacted water from the West Camp Pump System (WCP-1), Missoula Gulch baseflow, MSD sub-drain, Butte Reduction Works (BRW) groundwater capture, groundwater capture by the HCC, and BTL system D-cells. These waters are conveyed to the BTL collection cell, D4. Collected waters are then pumped from D4 to the Chemical Addition System (CAS) building, where pre-treatment water quality is monitored at station CT-IN04.

The impacted water is mixed with lime slurry in order to reach a target pH, which allows metals to precipitate out via gravity as water flows through a series of lagoon cells in the remainder of the BTL system. The lime slurry is created by adding dry calcium hydroxide to a portion of the influent water split off into mixing tanks in the CAS building. The calcium hydroxide addition is delivered by an accurate measurement system, and is measured by milligrams of lime (calcium hydroxide) per liter (mg/L) of influent water. The slurry is then added back to the remainder of the influent, and pH-adjusted influent flow is then directed to three parallel lagoon cell systems – A, B and C – where the A system is oriented to the north and C oriented to the south.

A fourth series of smaller, non-treatment cells, the D cells, is located south of lagoons A2 and A3. The D cells act as hydraulic barriers between the treatment cells and Silver Bow Creek. The A cells are separated by solid berms with manually adjustable stoplog weir overflow structures (identified as OS-1, OS-5 and OS-7), while the cells within the B and C systems are separated by cobble berms. Control structures are installed in positions to allow diversion of flows from cells B3 (OS-2) and C3 (OS-3) to the A cells, the effluent pipeline, or to the D cells, which allows for recirculation of the treated water. Typically, a third of the influent flow is directed into each A, B and C lagoon system. Waters exiting at B3 and C3 are combined, routed to the effluent pipeline to combine with treated water coming out of A3, or to cell A2 for additional treatment, and then discharged to Silver Bow Creek at CT-EFS7.

Figure H-1: Butte Treatment Lagoon Sampling Locations

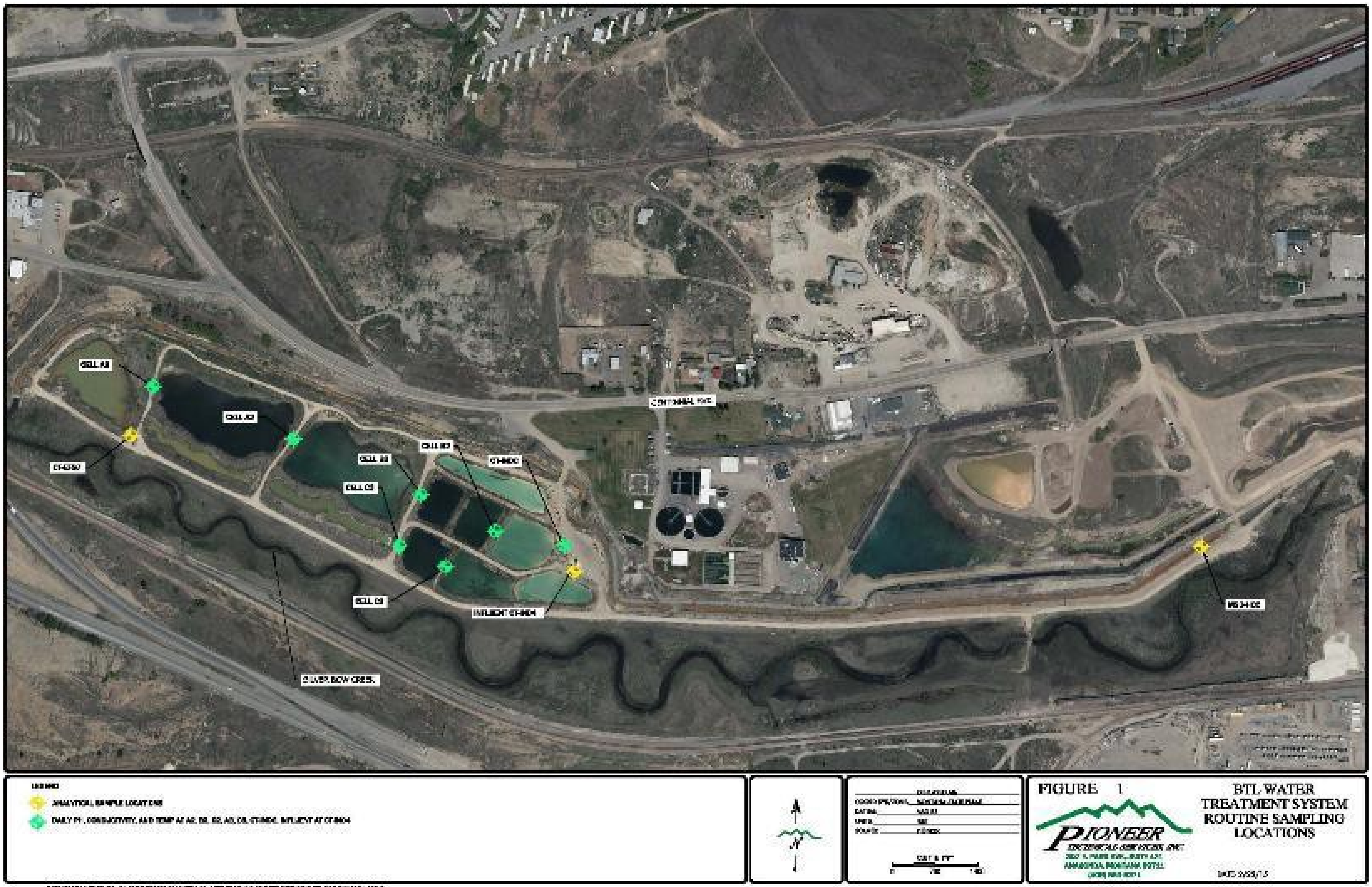


Figure H-2: BPSOU and BMFOU Water Collection Treatment System Flow Diagram

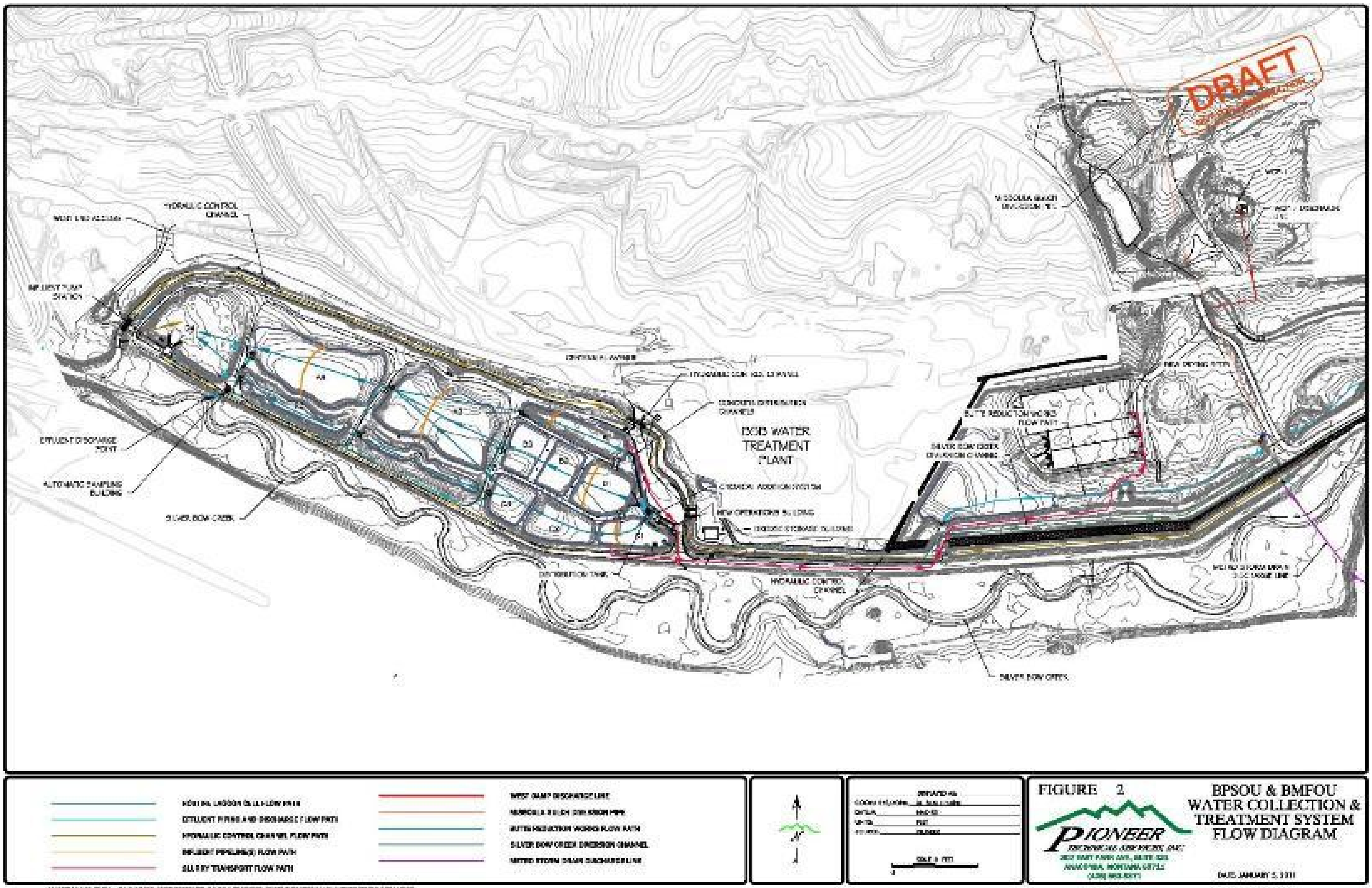


Figure H-3: Butte Alluvial and Bedrock Controlled Groundwater Area

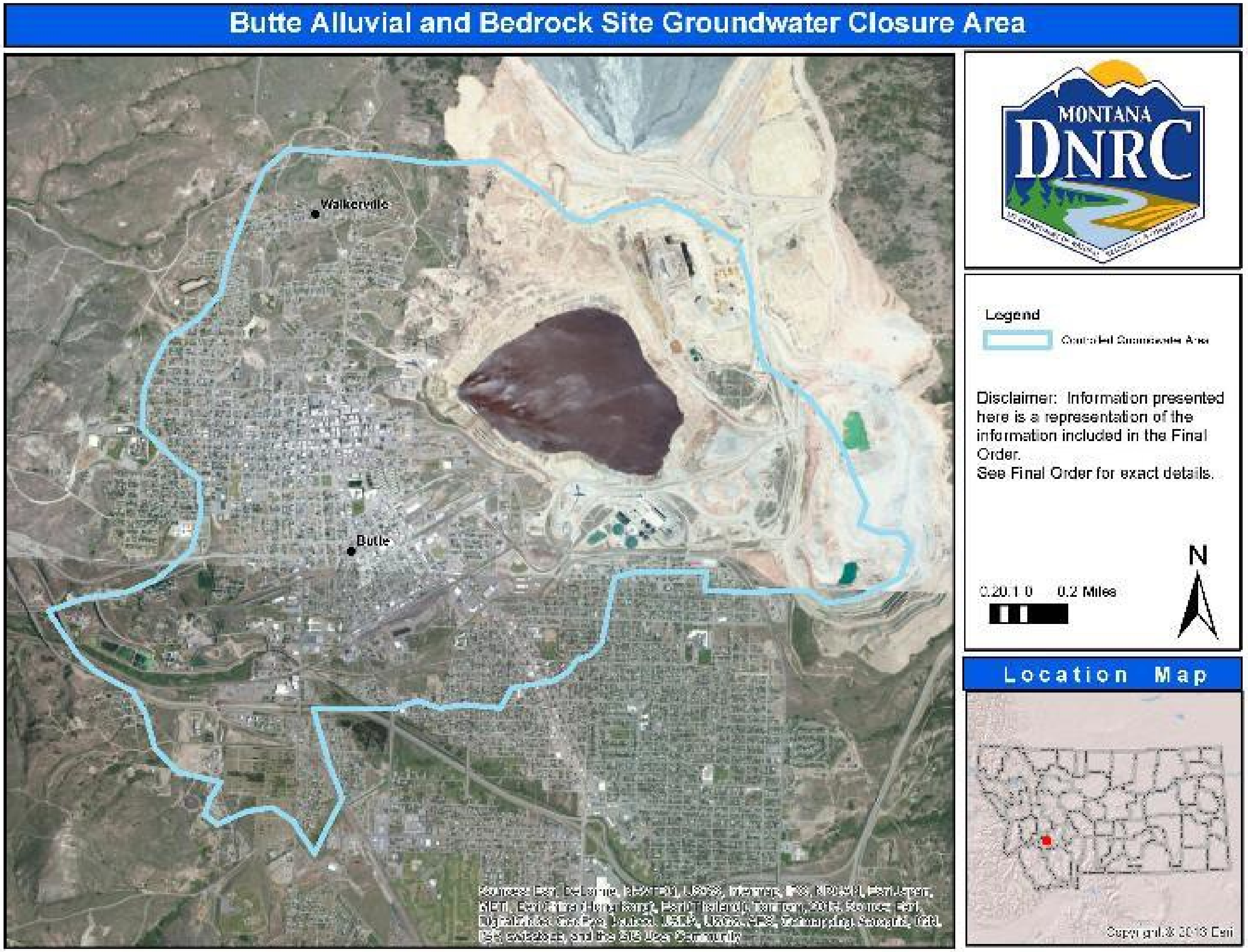
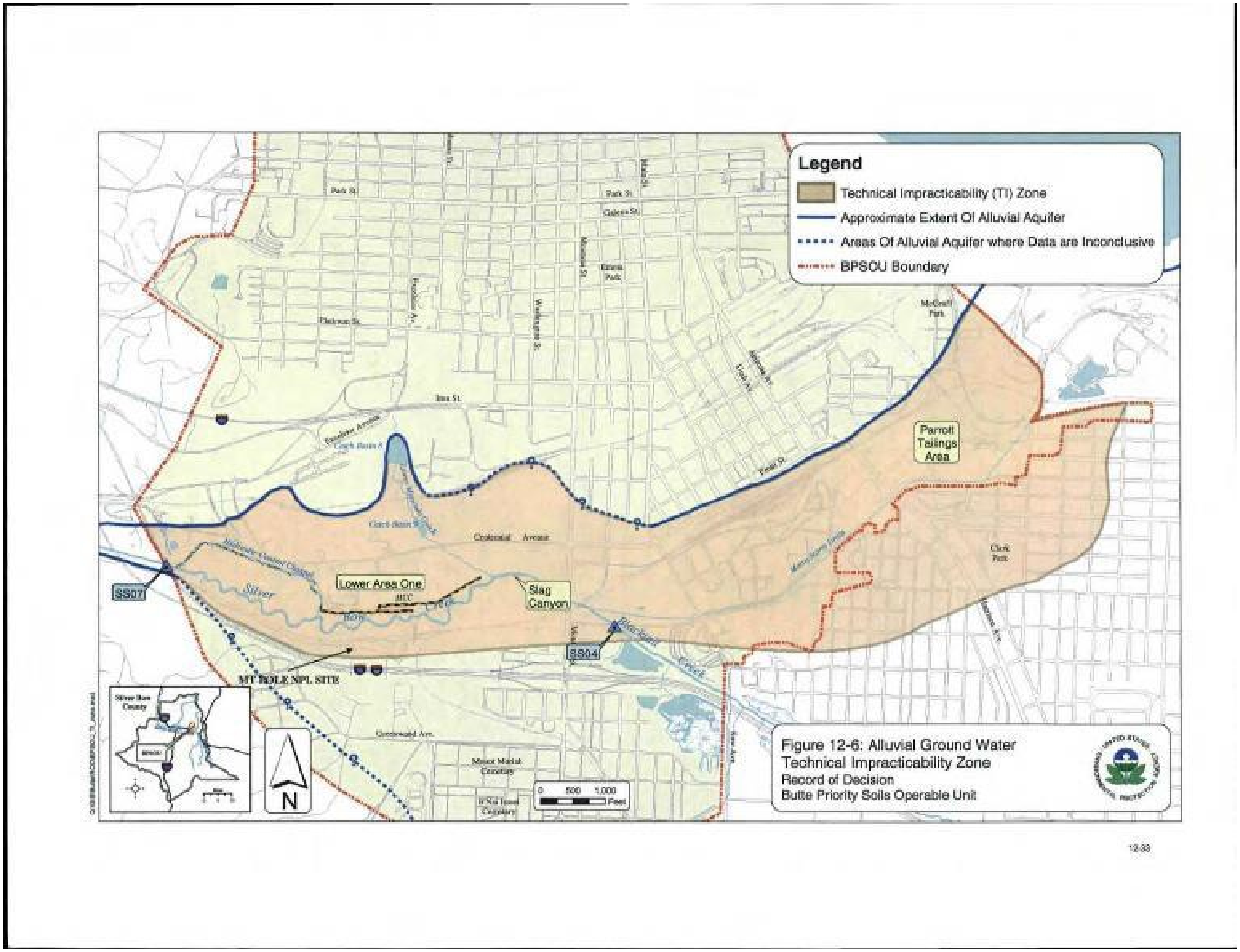


Figure H-4: Clark Tailings Controlled Groundwater Area

Figure H-5: BPSOU Groundwater Technical Impracticability Zone



Appendix I: Press Notice

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EPA Five-Year Review Planned for the Silver Bow Creek/Butte Area Superfund Site

The U.S. Environmental Protection Agency (EPA) is conducting the fourth Five-Year Review of remedial actions performed under the Superfund program at the Silver Bow Creek/Butte Area Superfund site in Butte, Montana. The purpose of the Five-Year Review is to make sure the selected cleanup actions remain protective of human health and the environment. The Five-Year Review is scheduled for completion by September 2015.

The boundary of the site begins above Butte, near the Continental Divide, includes Berkeley Pit and the interconnected mine workings and the Warm Springs Ponds (a treatment area), and extends westward along Silver Bow Creek. The site covers about 26 miles of stream and streamside habitat. The Silver Bow Creek/Butte Area site is one of four contamination areas, jointly known as the Clark Fork Basin Sites.

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Montana Office
10 West 15th Street, Suite 3200
Helena, MT 59626
(406) 457-5046
(866) 457-2690 (toll free)

http://www2.epa.gov/region8/silver-bow-creek-butte-area

EPA invites community participation in the Five-Year Review process: Community members are encouraged to contact EPA staff with any information that may help the Agency make its determination regarding the protectiveness and effectiveness of the remedies at the site.

EPA Region 8

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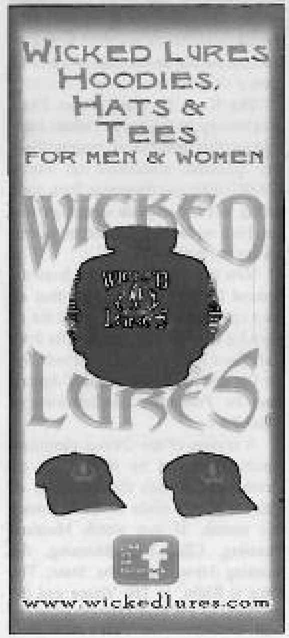

The Montana Standard

Today	Tonight	Thursday	Friday	Saturday	Sunday
61	34	62 26	55 31	58 29	60 32

ALMANAC

Temperature

Precipitation

Moon Phases

Yesterday State Extremes:

AROUND THE NATION

TODAY'S FORECAST MAP

AROUND MONTANA

RIVER LEVELS

WEATHER ON THE GO

SIGN UP FOR WEATHER ALERTS

Text mtsweather to 21321

Building ...

Continued from Page 1A

Trazzolino's

PARTY PASTIES

For Lunch or An After School Snack!

EPA Five-Year Review Planned for the Silver Bow Creek/Butte Area Superfund Site

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CTEC

CITIZENS TECHNICAL ENVIRONMENTAL COMMITTEE

PUBLIC OPEN HOUSE MEETING
ON THE
EPA FIVE-YEAR REVIEW

The US Environmental Protection Agency is conducting a 5-Year Review of the Superfund cleanup in and around Butte. A vital part of that effort is comments from the public on that effort.

COME TO THE MEETING AND MAKE AN IMPACT:

May 7, 2015 at the Butte Public Library, 226 W. Broadway Street, 6-8 PM

- Become Well Informed
- Understand and Participate in Decisions about the Environment we all share
- Learn about the Process and Voice your Opinions

The public must be involved for a successful effort. CTEC is committed to helping ensure the public has the information and the opportunities to participate.

CTEC is a group of volunteer citizens who work with the Environmental Protection Agency, the state of Montana, responsible parties, and others to make the Superfund process and cleanup decisions in the Butte area understandable to everyone.

Office: 27 West Park – Butte
Monday - Thursday 10:00 – 3:00 pm
Phone: 723-6247
E-Mail: ButteCTEC@hotmail.com
Website: ButteCTEC.org
Facebook: CTECbutte

On the Books

CASINO FIGHT

A 26-year-old woman says a 36-year-old woman challenged her to a fight, slapping her head and threatening her, late Wednesday at the Magic Diamond Casino in Rocker. Police say the incident was over a 27-year-old male who accompanied the younger woman to the casino. They were unable to locate the older woman at her residence.

SPEEDING MAN

Jay Ashton, 23, of Butte was cited for speeding, no liability insurance in effect and driving with a suspended or revoked license, all misdemeanors. Police say he was going 46 mph in a 25-mph zone in the 500 block of South Montana on Wednesday morning.

WRONG PLACE, TIME

Police responded to the area of Maryland and Iron, where they found Cassie Lynn Haskett, 31, of Butte, and an unknown male standing by a loading dock early Thursday. She was wanted on a warrant issued in Gallatin County and cited for possession of drug paraphernalia and possession of marijuana, both misdemeanors.

TWO ARRESTS IN A DAY

Tylor Cebulski, 19, of Butte was arrested for disorderly conduct and possession of alcohol or an intoxicant early Thursday in the 1400 block of South Warren Avenue. Shortly after his release from the county jail, he was cited for disorderly conduct for throwing objects and cursing at police at his mother's home in the 3400 block of Ottawa Street.

SHOPLIFTING

Tauteana Matt, 20, of Butte was caught by an employee early Thursday with shoplifting DVDs and grocery items, valued at $146, from the Safeway, at 2500 Massachusetts Avenue. Matt, who was wanted on a warrant issued in Butte city court, was cited with misdemeanor theft.

FAMILY ASSAULTED

Dane Avery Peters, 27, of Butte was arrested on two warrants for misdemeanor partner or family member assault after police recognized him riding a bike on Harrison Avenue late Wednesday.

Police say an argument between Peters and his 23-year-old sister led to a physical altercation. The woman told police he struck her in the face resulting in bruising around her right eye.

The siblings' mother, 50, intervened and Peters allegedly grabbed her arm and threw an aerosol spray can, striking her face. Police say she suffered bruising.

MAN ARRESTED

Edward Cocking, 23, of Butte told police he and his 24-year-old girlfriend argued when they responded late Thursday to the 1700 block of Elm Street for a disturbance. He said the blood spots found on the floor were from his cut foot, which police said was false. Police say the woman emerged from the bathroom with fresh cuts on her arm and chest, a cut on her lip and a swollen lower lip. She was reluctant to speak with police.

Man sentenced to 10 years for moving body

Matthew Brown
Associated Press

AP photo

Garrett Sidney Henderson Wadda admitted to dumping the body of a 21-year-old woman murdered on the Northern Cheyenne Indian Reservation.

BILLINGS — A man described by authorities as a transient was sentenced Thursday to 10 years in prison for dumping the body of a woman who was murdered on Montana's Northern Cheyenne Indian Reservation, after prosecutors indicated that the badly decomposed state of the victim prevented them from pursuing further charges.

U.S. District Judge Susan Watters sentenced Garrett Sidney Henderson Wadda, 36, originally of Fort Washakie, Wyoming, during an emotional hearing in Billings. Family members of the victim, 21-year-old Hanna Harris, told Watters that he was getting away with murder.

Wadda had previously pleaded guilty to being an accessory after the fact for dumping Harris' partially clothed body at the Lame Deer rodeo grounds in July 2013.

The judge expressed frustration that many details of Harris' killing remained unknown because of Wadda's efforts to conceal the crime and protect his common-law wife, Eugenia Ann Rowland. Rowland was sentenced in February to 22 years in prison on a charge of second-degree murder.

"Due to your actions, we don't know what happened and never will," Watters said.

Wadda, who was raised in Lame Deer, pretended to help in the search for Harris after her disappearance. Her maggot-ridden body was not discovered until four days later, and a cause of death could not be determined.

Watters cited Wadda's false help in the search and the state of Harris' body when it was found for imposing a prison term longer than called for in federal sentencing guidelines, which is about six to more than seven years.

Hanna Harris had a 10-month-old son when she was killed.

"People say if you want to get away with murder, go to the reservation. I think it's true," said the victim's mother, Malinda Harris Limberhand. Directly addressing the defendant, she added: "You may not yourself have killed her but you were responsible."

Limberhand and other family members had previously criticized the plea deal with prosecutors, but thanked them for their efforts in the case after Thursday's hearing.

Assistant U.S. Attorney Lori Suek had requested 15 years in prison for Wadda.

Defense attorney Vernon Woodward asked for 6 1/2 years, calling it a senseless crime rooted in the fact that both defendants and the victim were heavily intoxicated on the night of the murder.

Wadda told the judge that he was remorseful. He did not apologize, which he said was out of respect for Harris' family.

Rowland told her sister-in-law in January that she had blacked out from drinking on the night of Harris' disappearance and was awakened by Harris screaming that Wadda was raping her, according to documents filed by prosecutors.

Rowland said she tried to help Harris, but that Harris hit her, which made her angry and then both she and Wadda beat Harris. Rowland told her sister-in-law that they wrapped Harris' body in a sheet and dragged it outside, according to court filings.

Those accusations were not repeated Thursday and Wadda's sentence was based solely on what he did to Harris' body after her death.

Wadda admitted to moving the body, but has denied harming Harris.

Before the defendants were arrested — almost nine months after Harris' death — frustration with the pace of the investigation drew hundreds of people to a rally on the southeastern Montana reservation, where they demanded justice for Native American victims of unsolved murders across the U.S.

Crow Agency man sentenced to 27 years in prison for rape

BILLINGS (AP) — A Crow Agency man was sentenced Wednesday to 27½ years in prison for raping and assaulting a woman who had picked him up while he was hitchhiking near Billings last year.

U.S. District Judge Susan Watters followed the prosecution's recommendation in sentencing Garrett Dean Door Sr., saying the public needs to be protected from him. Door's attorney had asked for a shorter prison sentence of up to almost 20 years.

The Billings Gazette reports Door, 58, has 100 previous criminal convictions including three for sexual offenses.

In December, a jury convicted Door of aggravated sexual abuse and assault with intent to commit aggravated sexual abuse in connection with the May 6, 2014 hitchhiking incident.

On that day, a woman said she picked up Door after seeing him hitchhiking and limping in a rain storm outside Billings on U.S. Highway 212, according to court records. After driving him to a post office and other locations, he gave directions to a home he claimed was his on a remote dirt road.

At some point the woman became concerned and asked Door to get out of the car. She was punched in the face and an altercation followed in which Door choked and sexually assaulted the woman, court records said. She eventually escaped and called authorities.

Prosecutors said Door needed punishment and not rehabilitation because he had been to seven treatment programs without success.

Watters said Door has not been a contributing member of any community. She also called Door's criminal record "horrendous" and "probably record-setting" with assault, theft, burglary and drunken driving convictions, among others.

"I guess I'm sorry for everything," Door said at the sentencing.

NW grizzlies lag as other bear populations grow

KALISPELL (AP) — The remote population of grizzly bears in the Cabinet-Yaak Mountains of Northwest Montana has been out of the "negative territory" for the first time in decades.

Now, wildlife officials say human-caused mortalities continue to plague the tenuous population, which is estimated to number around 50, with a projected growth of 1.4 percent annually.

In contrast, the robust grizzly populations of the much-larger Northern Continental Divide Ecosystem and the Greater Yellowstone Ecosystem each have more than 1,000 bears, and are growing at an annual rate of roughly 3 percent.

Wayne Kasworm, the U.S. Fish and Wildlife Service recovery coordinator in Libby, said augmenting the sparse population with transplanted bears—an effort begun in 1990—has finally started to take hold. But every lost bear is a blow to the Cabinet-Yaak contingent, and the discovery of another dead grizzly in the Yaak last week highlights the need to curb human-caused mortalities, many of which are caused by hunters who mistake the threatened grizzly for a black bear, whose population numbers are dense in this corner of the state.

Although the recent grizzly's death remains under investigation by officials with Montana Fish, Wildlife and Parks, Kasworm said the trend of grizzly deaths have fallen into three main categories—malicious kills, cases of mistaken identity and instances of legitimate self-defense.

"Historically, we have had a lot of human-caused mortality that pushed the population into decline," Kasworm said. "In recent years though things have turned around and trend monitoring now indicates that we are growing."

Kasworm continued, "But, when we lose a bear or two out of a population of 50 bears, it's a much bigger deal than when we lose a bear or two out of a population of 1,000 bears over in the Northern Continental Divide Ecosystem. It really adds up fast."

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EPA is overseeing this cleanup for most areas of the site, in consultation with the Montana Department of Environmental Quality (DEQ) and site stakeholders. DEQ is the lead implementing agency for the Streamside Tailings area (main portion of Silver Bow Creek). Remedial actions thus far have included a combination of: removal of mining waste, treatment of arsenic contaminated soils, amendment and capping of mine waste, residential yard cleanups, storm water controls such as catch basins and hydrodynamic devices, groundwater controls and groundwater capture and treatment, surface water controls (such as ponds, treatment plants and treatment systems), excavation of mine waste along the banks of Silver Bow Creek, and the reconstruction of Silver Bow Creek. The large source areas within the site that have posed the greatest threats to human health and environment have been mitigated.

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For more information or questions, please contact
Nikia Greene, EPA Remedial Project Manager – 406 457-5019
Kris Edwards, EPA Remedial Project Manager – 406 457-5021

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Dave's Depot

By: Dave Jordan

San Francisco is like a big brother city to Butte. In the late 1800's they shared the same reputation as where to go for a good time. There were lots of jobs, a free-wheeling attitude and short of actually shooting somebody you could get away with just about anything. When, I first went to San Francisco in 1966 there was a bar named Lefty's O'Doul's on Geary and Powell Street that had the Montana Standard every day and of course you'd meet Butte people there all the time back when I was 19 and could go there in uniform. I am at home in the SF to the point where tourists constantly ask me for directions.

Even though San Francisco and Butte have grown into far different cities we still have the same spirit. I was lucky enough to be stationed at Treasure Island or home ported in Alameda for more than seven years spread out during my time in the Navy. I know the City very well which is why when I heard the traffic in San Francisco magically sorts itself somehow and uptown Butte will learn to live with all the changes coming our way, I was amused. I don't mind stretching the truth to make a point but it will be amusing to watch uptown traffic sort itself out for the next couple years.

The good news is that I get sharrows and a bike lane on my street. The other good news is that the traffic light on my corner is safe for awhile. The snap-shot of traffic on Main St. taken last month is being used to justify removing lights and it is a graphic example of manipulation of data. Everyone knows Main Street does not always need four lanes and the traffic may not always justify stop lights. There are peak periods when they are welcome for controlling traffic and winter on Main Street is going to be a real treat with no way to pass spun-out cars. The traffic light outside the Mother Lode Theater may only be needed when there's a show; then it is essential for the handicapped. We applaud the BSB Commissioners who forced the higher-ups to modify the Omnibus Traffic Plan to address traffic lights at a later date and to ease some of the dangers to bicyclists originally proposed. In the final vote on the Bicycle Route plan Commissioners Henderson, Fisher and Purdue-Dolan, although favoring Bikable Butte questioned the safety issues that others chose to ignore. I find myself a pariah to the biking community for speaking against something I feel strongly about.

I believe the biking community sacrificed their legal right to be treated like every other vehicle for a three foot wide strip that funnels them into conflict with turning cars. I was called a liar on this point by a crony of city hall who didn't have the courtesy say "In my opinion..." I actually researched my point and resent that people think I do not value safety. One of my other hats is Alpine Ski Instructor; I too understand safety. I ski with hundreds of kids every year and stress safety second! Comfort actually comes first because you can't learn or be safe unless you are comfortable (re. PSIA Pyramid of Self-Actualization). This is counter-intuitive but much about safety is and it is why experts study these things.

I honestly hope that I am wrong. I'll use the bike-lanes with extreme caution and we'll support the decision by publishing the new rules. The liability for this action will probably fall to BSB's insurance, somebody should check our coverage.

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For more information or questions, please contact Nikia Greene, EPA Remedial Project Manager 406 457-5019 or Kris Edwards, EPA Remedial Project Manager – 406 457-5021

For The Record

Births
May 26–A boy to Robin and Mark Johnson
May 28–A girl to Kylah and Bryan Fitzpatrick
May 29–A girl to Katie Robinson and Ryan Dobb
A boy to Candace Dorscher and Jacob Lehde
May 31–A boy to Levi Jakorac and Amanda Stirner
June 1–A girl to Trent and Scarlet Doyle
A girl to Sierra Hjorth and Cody Grantham, Deer Lodge
A boy to Cassandra Reuss
June 2–A girl to Regina Sorum and Codie Camba, Anaconda
June 3–A boy to Jim and Laura Wommack
A girl to Rick Hoffman and Kristin Grote

Deaths
May 27–Richard Anthony "Ricki" Simon, 71
Donald Leonard Bailey, 62
May 29–Lester 'Les' M. Crowe, 65
May 30–Jean L. Webster, 53
Deisie Stella Honey, 87, Longview, TX
May 31–Edith Davenport, 92
Leonard Keith Eagle, 37
June 2–Burr Leonard Lively, 88, Dillon

Sudoku answers

5	8	7	4	2	6	1	3	9
6	9	4	8	3	1	2	5	7
2	3	1	9	7	5	6	8	4
7	2	9	5	1	8	3	4	6
8	6	5	3	4	7	9	1	2
4	1	3	6	9	2	5	7	8
9	7	8	1	6	3	4	2	5
3	5	6	2	8	4	7	9	1
1	4	2	7	5	9	8	6	3

Crossword Answers

P	U	L	E		A	L	P	H	A		M	U	S	T
I	N	O	N		D	I	L	E	T	T	A	N	T	E
K	E	G	S		E	N	U	M	E	R	A	T	O	R
E	A	R			P	E	R			A	M	I	R	S
S	T	O	W		T	R	A	D	E	D		E	Y	E
T	A	L	E				L	O	P	E	R			
A	B	L	E		D	I	S	O	R	I	E	N	T	S
F	L	E	D	G	E	S		R	O	N	D	U	R	E
F	E	D	E	R	A	L	I	S	M		E	T	A	L
			R	E	L	E	T				E	R	N	E
C	A	T		A	T	T	A	C	H		M	I	S	C
A	R	I	A	S			L	E	U			T	I	T
N	U	R	S	E	M	A	I	D	S		T	I	T	O
O	B	E	I	S	A	N	C	E	S		H	O	E	R
N	A	S	A		S	A	S	S	Y		E	N	D	S

Edward **Jones**

MAKING SENSE OF INVESTING


John G. Kreis

Celebrate Father's Day by Investing in Your Children's Future

Father's Day is almost here. If you're a father, especially one with young children, get ready to add to your collection of homemade cards, ties, golf tees or other such gifts designed to please you. Your greatest gift, of course, is your children – and you would doubtlessly get great satisfaction from knowing that you've provided them with financial resources that can benefit their lives in many ways. So, why not use this Father's Day as a starting point for investing in your children's futures?

Here are a few methods for doing just that:

UGMA/UTMA – If you would like to buy and sell securities for the benefit of a child, you may consider opening a custodial account known as either an UTMA (Uniform Transfers to Minors) or UGMA (Uniform Gifts to Minors) account. You would serve as the custodian for this account, giving you control of it until your child turns either 18 or 21 (depending on your state of residence), at which point he or she would take over ownership. Investment income from an UGMA/UTMA account can receive favorable tax treatment. As long as the child is under age 19 (or under age 24 and a full-time student) and does not have earned income providing more than half of his or her support, the first $1,050 of investment income is tax-free, and the next $1,050 will be taxed at the child's tax rate, which is typically 10%. Investment income above $2,100 will be taxed at the parent's tax rate.

Roth IRA – Even young children can contribute to a Roth IRA, as long as they have some type of earned income from babysitting, mowing lawns or any other type of employment. Your children can fund a Roth IRA and choose from several different types of investments – stocks, bonds, government securities, and so on – and withdrawals of contributions are tax-free. Roth IRA earnings are also tax-free, providing the investor is at least 59½ and has had the account for at least five years. A Roth IRA can be used to help provide retirement income for your children, but it also offers penalty-free withdrawals of earnings when the money is used for a first-time purchase of a home.

529 Plans – If you would like to give your child the gift of education, earnings in a 529 college savings plan accumulate and are distributed tax free, provided they are used for qualified higher education expenses. (529 plan distributions not used for qualified expenses may be subject to federal and state income tax and a 10% IRS penalty on the earnings.) Another benefit to 529 plan contributions is that they may be deductible from your state taxes. However, 529 plans vary, so be sure to check with your tax advisor regarding deductibility. A 529 plan offers other benefits, too. For one thing, the lifetime contribution limits are generous; while these limits vary by state, some plans allow contributions well in excess of $200,000. And a 529 plan is flexible: If your child decides against college or vocational school, you can transfer the unused funds to another family member tax and penalty free.

Living and Testamentary Trusts – If you would like to leave a financial legacy for your children, and even their children, but still maintain some control over when they receive the money and how they can use it, you might consider speaking with an estate-planning attorney about establishing a trust. Some individuals create a trust to offer long-term support to heirs or charities after death, whether for several decades or several generations. Before you decide on any of these plans, consult with your tax and financial professionals to make sure the arrangement you've selected is suitable for your needs.

But however you choose to help your children, your generosity will make all the Father's Days to come even more meaningful for you – so consider taking action soon.

Edward Jones, its employees and financial advisors are not estate planners and cannot provide tax or legal advice. You should consult your estate-planning attorney or qualified tax advisor regarding your situation.

This article was written by Edward Jones for use by your local Edward Jones Financial Advisor.

Appendix J: Interview Forms and Community Correspondence

Table J-1: Summary of Community Correspondence Sent to EPA

Correspondence	Date
Letter from citizen	1/12/15
Letter from citizen	5/6/15
Letter from Citizens Technical Environmental Committee (CTEC)	5/13/15
Letter from citizen	5/22/15
Letter from citizen	5/22/15
Letter from citizen	5/25/15
Petition from The Citizens for Labor and Environmental Justice (CLEJ)- 218 signatures	5/29/15
Letter from CLEJ	5/29/15
Letter from George Grant Chapter of Trout Unlimited	6/2/15
Letter from citizen	6/22/15
Coalition letter representing 5 community organizations with 8 signatures	6/24/15
Letter from Project Green	6/26/15
Letter from citizen	6/29/15
Letter from citizen	6/29/15
Letter from citizen	6/29/15
Letter from citizen	6/29/15
Letter from citizen	6/29/15
Letter from Indian People's Action	6/29/15
Letter from citizen	6/29/15
Letter from citizen	6/29/15
Letter from citizen	6/29/15
Letter from citizen	6/29/15
Letter from citizen	6/29/15
Letter from citizen	6/30/15
Letter from citizen	6/30/15
Letter from citizen	6/30/15
Letter from CLEJ	6/30/15
Petition from CLEJ- 64 signatures	6/30/15
Letter from citizen	7/1/15

Residential Interview Form

Site:	*Silver Bow Creek/Butte Area*	**EPA ID No:**	*MTD980502777*
Interviewer:		**Affiliation:**	
Subject:		**Affiliation:**	*Resident*
Subject Contact Information:		**Phone:**	
Time:		**Date:**	
Location:			
Interview Format:	*In Person*	*Phone*	*email* *Mail*
Interview Category:	*Resident*		

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

3. What have been the effects of the Site on the surrounding community, if any?

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

5. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?

6. Do you own a private well in addition to or instead of accessing city/municipal water supplies? If so, for what purpose(s) is your private well used?

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

Site Name:	**Butte Priority Soils OU**	**EPA ID No.:**	**MTD980502777**
	Butte Mine Flooding OU		**MTD980502777**
Interviewer Name:	________________	**Affiliation:**	________________
Subject Name:	**Daryl Reed**	**Affiliation:**	**DEQ**
Subject Contact Information:	dreed@mt.gov 406-444-6433		
Time:	________________	**Date:**	________________
Interview Location:	________________		

Interview Format (circle one): **In Person** **Phone** **Mail** **Other: email**

Interview Category: **State Agency**

Addendum to responses submitted by the State of Montana to United States Environmental Protection Agency (EPA) on May 15, 2015.

After the State responded to the Five Year Review Questionnaire that it received in connection with this Five Year Review, it received an order of the Montana Second Judicial District Court in the litigation known as *Silver Bow Creek Headwaters Coalition v. State of Montana, DV-10-431* (August 17, 2015). This litigation was brought by the Coalition seeking a declaratory judgment regarding the appropriate name to be applied to the area from Texas Avenue to the confluence with Blacktail Creek. As a result of that order and the judgment of the Court, the State of Montana requests that the EPA revise any references to "Metro Storm Drain," or "MSD" to "Silver Bow Creek above the confluence with Blacktail Creek." Similarly, the State requests that the name for the subdrain be revised to "Butte Priority Soils Operable Unit (BPSOU) subdrain."

Site:	*Silver Bow Creek/Butte Area*	**EPA ID No:**	*MTD980502777*
Interviewer:		**Affiliation:**	
Subject:	*Matt Vincent*	**Affiliation:**	*Chief Executive, Butte-Silver Bow*
Subject Contact Information:		**Phone:**	
Time:	*10:00 AM*	**Date:**	*September 30, 2014*
Location:	*Butte-Silver Bow County Courthouse*		
Interview Format:	☒*In Person* *Phone*		*email* *Mail*
Interview Category:	*Local Government*		

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Yes. I have worked around Silver Bow Creek since 1995 in different capacities.

2. Do you feel well informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Yes. I have been getting information from the state agencies, who are the lead for Silver Bow Creek. I wish the same level of success and activity at Silver Bow Creek applied to the rest of the OUs. We're making progress. When I was interviewed for the last FYR, I was in a different position. Now as the Chief Executive, I'm in a position to try to get the other OUs to the status of Silver Bow Creek.

   EPA has been very responsive to my and local governments' concerns about getting to the end game like Silver Bow Creek has gone. In particular, BPSOU. MDEQ has been responsive to a lesser extent.

   We still have a ways to go. We need to figure out a final plan for the eastern area of the Site. If you had to put your finger on an issue about what the public is concerned about, it's the Berkeley Pit. We need to talk about what's going on at the Berkeley Pit. Anytime there is something that is unmanageable and needs to be cleaned up in perpetuity, there needs to be discussion. Even I don't know the end game for the pit. All I know is that there is a critical water level that will be reached in 10 years or so, but I don't know anything beyond that. We need to do better.

3. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   Not as it relates to the remedy. We've had vandalism in the parks, park structures.

4. Are you aware of any changes to state laws or local regulations that might affect the protectiveness of the Site's remedy?

   No. I think the state's in the process of redefining the TNDLs for Silver Bow Creek so we're paying attention to that. We have to balance that with our ability to meet those standards. We have a naturally mineralized area that's unlike any other place. We want to maintain and improve the health of the creek first and foremost and want to make sure those limits are reasonable. We have background levels of zinc and copper in the creek and we can't be expected to go below those background levels. I know that's part of the Consent Decree – looking at alternative standards

5. Are you aware of any changes in projected land use(s) at the Site?

   No. we are wide open to do what we have to do in a land management perspective to do what's best for the creek. What are we going to do in the historic SBC channel – I don't think we have any commercial zoning in that corridor. We're here to cooperate.

6. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?

   I think PitWatch – that's something our local government is in charge of – we need to start being more aggressive to use that as a way to disseminate information. That's an educational tool that was put together with funding from Atlantic Richfield. The educational tool was put together by the public advisory committee. The shortcomings and criticisms about not knowing about the BMFOU is probably more a function of the fact that we don't have a seat at the table with the BMFOU the way we do with BPSOU (where we are a PRP because our stormwater system was tagged as a conduit). When we're not at the table, we're left out. We've proven our value and cooperative nature in our discussion with the BPSOU, so we should be more involved in some of the discussions and decisions that are made about mine flooding. It stands out as one of the biggest disappointments in my professional career with EPA – when we as local government submitted 90 pages of comments for the Consent Decree for Berkeley Pit and not one thing was changed. We can do better there.

7. Do you have any comments, suggestions or recommendations regarding the project?

   It's not just taking the model from Silver Bow Creek and applying the remedy, we need restoration and collaboration. We've been doing work on BPSOU since 1988. But we should still try to do what's possible to incorporate restoration. We need better progress on the west side soils OU.

   My two young boys are probably the first generation of people here where when you ask them where's your favorite place to fish, they would say Silver Bow Creek. This wasn't possible in the past.

   95 percent of the project has been successful. It's getting to the point now where all the things that we do as local government and the agencies that are in charge of the unfinished

Superfund business in Butte. It's all done for the protection of Silver Bow Creek. Since I started working on Silver Bow, I never thought that in my lifetime we could catch a trout in Silver Bow Creek. Remarkable. That's the only word I can think of.

As a result we're doing a lot with stormwater here as a municipality. Things are underway with a 31 million dollar upgrade to our sanitary sewer treatment system.

There was a time where the mine waste contamination in Silver Bow Creek and nutrient contamination from sewer overall dampened the toxicity. Right now our nutrients are the limiting factor for the stream.

I understand some people have had issues with EPA. It is not an issue now with my new role. I feel positive about the relationship I'm forming with EPA.

Would like to see the same level of progress and effectiveness I've seen on Silver Bow Creek and the Middletown dam at other parts of the Site. We have to integrate the restoration that the state oversees with the remediation that EPA oversees. That hasn't been the case for the BPSOU. In fact, it pushed away from the bargaining table on the paired tailings and some of the things that have remained at the priority soils. It's been 4 years since the consent decrees were comprehensive. Butte-Silver Bow County is finally able to get back to the table with DEQ, NRD, ARCO, Butte-Silver Bow County. Last spring, we've reconvened those discussions. There's renewed commitment and understanding of where we need to be.

We really need more information and more progress related to understanding of the Berkeley pit. In the absence of good understanding on our part and where we are in the process, you get these alarmists, let's call them, who are saying that the Pit is overflowing, the sky is falling. I know it's not true but there's no information to the contrary. We need to be more proactive. People are sick of hearing about the critical water level, and that we have all the time in the world. That's no longer true. The time delta is now within the timeline of everyone's existence. We need to understand whatever adjustments or improvements that need to happen with the treatment plant. We need to know what's going to happen to the water. We need to keep options open and look to new technologies.

One of the complaints I've heard from some people is that there have been technologies brought to light that could have worked but because of the PRP's access they weren't allowed to try it.

The Rocker OU has an effect on the Rocker residents. The small area has resulted in the closure of wells in the area. Why can't we combine remedy with restoration for Rocker?

Site:	*Silver Bow Creek/Butte Area*		**EPA ID No:**	*MTD980502777*	
Interviewer:			**Affiliation:**		
Subject:	*Julia Crain*		**Affiliation:**	*Butte-Silver Bow County Special Project Manager*	
Subject Contact Information:			**Phone:**		
Time:			**Date:**		
Location:					
Interview Format:	☒*In Person*	☐*Phone*		☐*email*	☐*Mail*
Interview Category:	*Local Government*				

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Yes.

2. Do you feel well informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   I do, as an employee of the government, working in a job where it's my job to know what's going on. My job is a special projects planner for Butte-Silver Bow. I support the Superfund Coordinator, John Sesso, and Tom Malloy and I administer some of the tasks for Butte-Silver Bow.

   We receive a lot of questions via the PitWatch website – receiving requests from schools around the region for information – including from Idaho. That resource is really helpful. We redesigned it last year and it has been a successful redesign.

3. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   There was trespassing in the Mountain Con building (the hoist) in 2013 – but the trespasser was quickly captured by law enforcement.

   People aren't destructive of the infrastructure. They are aware of the history and protect those things.

4. Are you aware of any changes to state laws or local regulations that might affect the protectiveness of the Site's remedy?

   No.

5. Are you aware of any changes in projected land use(s) at the Site?

   No.

6. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?

   Yes. EPA has done a good job. I know that the RPM has a lot of one-on-one conversations with residents.

7. Do you have any comments, suggestions or recommendations regarding the project?

   No.

Site:	*Rocker OU*		**EPA ID No:**	*MTD980502777*	
Interviewer:	*Treat Suomi*		**Affiliation:**	*Skeo Solutions*	
Subject:	*Albert Molignoni*		**Affiliation:**	*Chairman of the Board for the County Water and Sewer District of Rocker*	
Subject Contact Information:	*1108 Grizzly Trail Butte, MT 59701*		**Phone:**	*(406) 723-9365*	
Time:	*09:56 AM*		**Date:**	*November 3, 2014*	
Location:					
Interview Format:	☐ *In Person*	☐ *Phone*	☐ *email*	☐ *Mail*	
Interview Category:	*Local Government*				

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Yes. EPA and ARCO haven't had success with the work that they have completed. The injections they did have not worked properly. We are still under the restriction of the five-year control area. It was only supposed to take five years for us to regain access to our groundwater, and that hasn't happened. It was over 12 years ago when that work started, so we should have had our groundwater back in the control area again. We are disappointed as a community because we were promised that this would do the job and it didn't. The only option now is to do it again or remove the source material and the Rocker OU.

2. Do you feel well informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   No. An official (EPA, MDEQ and ARCO) should come in and explain to the Board why things haven't happened the way they were supposed to. Now we are buying water from Butte-Silver Bow and this is very expensive and inconvenient. The Board is the best vehicle for disseminating information to the local community.

3. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   Not that I know of. The property is pretty barren.

4. Are you aware of any changes to state laws or local regulations that might affect the protectiveness of the Site's remedy?

   The new guidelines for arsenic are the only ones I am familiar with.

5. Are you aware of any changes in projected land use(s) at the Site?

   No.

6. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?

No, they haven't. There are only a few wells they are testing and there are some hand-dug wells that are not being tested. These hand-dug wells are older wells that have been around for a long time. The Board has not received information on why some wells are sampled and other wells are not.

Meeting with the Board is the best way to communicate information to the community. The Board meets every third Tuesday of the month at 7 p.m. at the Rocker Community Fire Hall. A phone call to the Chairman of the Board would allow scheduling time with the Board.

7. Do you have any comments, suggestions or recommendations regarding the project?

   I am not a scientist but I know the project didn't work as planned. One of our prior board members who had a Ph.D. explained that sometimes these things that work in the lab do not work in the field. That's what happened here. Things didn't work out in the field the way they expected.

Site:	*Silver Bow Creek/Butte Area*	**EPA ID No:**	*MTD980502777*	
Interviewer:	*Self-Completion*	**Affiliation:**		
Subject:	*Tim Hilmo & Steve Walsh*	**Affiliation:**	*Atlantic Richfield & Montana Resources*	
Subject Contact Information:		**Phone:**		
Time:		**Date:**	*December 2, 2014*	
Location:				
Interview Format:	☐ *In Person*	☐ *Phone*	☒ *email*	☐ *Mail*
Interview Category:	*Potentially Responsible Parties (PRPs)*			

1. What is your overall impression of the remedial activities at the Site?

   The PRPs believe the remedial action is effective. Response actions have contained contaminated water in the East Camp and West Camp systems and prevented the release of contaminated water to the alluvial aquifer and Silver Bow Creek. The requirements of the Consent Decree Scope of Work for pre Critical Water level (CWL) water treatment are being met and valuable experience in operating the treatment plant has been acquired.

2. What have been the effects of the Site on the surrounding community, if any?

   The remedy is protective of human health and the environment. Remedial activities in place prevent exposure to contaminated bedrock groundwater and surface water by humans and aquatic life.

3. What is your assessment of the current performance of the remedy in place at the Site?

   The remedy consists of many facets:
   - *A. Monitoring of groundwater levels and quality has been very effective. This monitoring provides a basis to reliably estimate the timing for evaluation of effectiveness and need for modification/upgrades of the water treatment facilities and to demonstrate that hydraulic gradients are maintained so that discharges to the alluvial aquifer and Silver Bow Creek do not occur.*
   - *B. Operation of the water treatment plant and integration of 100 percent of the treatment plant effluent into Montana Resources' mine process has effectively limited surface inflows to the Berkeley Pit and prevented discharges to Silver Bow Creek. Treatment plant maintenance activities have been effective.*
   - *C. Waterfowl mitigation efforts have been effective.*
   - *D. Institutional controls are protective and through the Pit Watch program and others, provide valuable information to the general public.*
   - *E. The schedule for future remedy requirements and the remedy adequacy review has been prepared and approved by EPA, and is being followed.*

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

Yes. Some in the Butte community question EPA's remedy strategy at public meetings, in correspondence with the agencies or in letters submitted to the local newspaper expressing their opinion. In general, the issues raised by these citizens – timing of treatment of Berkeley Pit water (draining of the Berkeley Pit) and the CRITICAL WATER LEVEL – are similar to the issues raised by the public in 1994 and considered by the agencies (and documented in the ROD responsiveness summary) at the time the final remedy was selected. Recently, there has been renewed public interest in the slope stability of the walls of the Berkeley Pit. This year, at EPA's direction, the PRPs have conducted investigations that provide additional information concerning the structural stability of the walls of the Berkeley Pit.

5. Do you feel well informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Yes. The PRPs communicate frequently with EPA and MDEQ project managers.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   Not at this time.

Site:	*Silver Bow Creek/Butte Area*		**EPA ID No:**	*MTD980502777*	
Interviewer:	*Jenni Harris*		**Affiliation:**	*Atlantic Richfield*	
Subject:	*Tina Donovan*		**Affiliation:**	*TREC, Inc.*	
Subject Contact Information:	*tdonovan@treccorp.com*		**Phone:**	*(406) 490-5764*	
Time:	*01:30 PM*		**Date:**	*December 17, 2014*	
Location:					
Interview Format:	☐ *In Person*	☐ *Phone*	☒ *email*		☐ *Mail*
Interview Category:	*O&M or Remedial Contractor*				

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

    The project is well run. Schedules are adhered to, and the site is well maintained. The vegetative cap at the site is in excellent condition and vegetation is robust and relatively free of noxious weeds. We found no evidence of erosion at the site. Site security is maintained with a fence, which is in excellent condition. Recently, tanks that had been on site for over 10 years were removed. Although the site is fenced from public use, the tank removal enhanced the area's visual appeal. Groundwater conditions are monitored regularly. Although on-site groundwater is still above water quality standards in some wells, we found no evidence of groundwater degradation.

2. What is your assessment of the current performance of the remedy in place at the Site?

    The remedy is simply to monitor conditions. This is being carried out as scheduled. The groundwater monitoring schedule is excessive, if anything.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels documented over time at the Site?

    The monitoring data indicate that, in general, groundwater arsenic concentrations have decreased since just after site remediation. Arsenic concentrations appear to be leveling off, although samples from one well indicates an increasing trend. Nearby domestic wells show no change in arsenic concentrations over time.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

    There is not a continuous on-site O&M presence. Personnel are on site quarterly for four to five days at a time, to perform groundwater monitoring. Quarterly monitoring occurs in February, May, August and November of each year. This monitoring consists of water level measurements in 50 wells and at four surface water sites. Thirty-four wells (31 monitoring wells, two domestic wells and one public water supply well) are sampled for water quality. Although the point of quarterly groundwater monitoring is not to inspect the site, personnel do make note of any site problems, and steps are taken to remedy any problems.

In addition to groundwater monitoring, there is an annual site inspection, typically in July or August of each year. The site is inspected for the condition of the vegetative cover, presence of noxious weeks, site security and site drainage. A form is completed and submitted to the Project Coordinator and Operations Project Manager. Any needed maintenance is noted and taken care of.

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

    There have been no changes in O&M requirements or maintenance schedules in the last five years, or since the O&M Plan was put in place. In the last three years, there have been deviations from the sampling routine. In an attempt to assess potential groundwater arsenic loading to surface water, surface water monitoring occurred in November 2011 and February 2014. Surface water monitoring consisted of collecting water quality samples and flow measurements at three surface water sites. Results of the surface water monitoring indicated that site groundwater does not load arsenic to surface water at a measurable level.

    In the past year, several additional wells were sampled for water quality, and the analytical list was expanded at several wells. The additional sampling was performed to assist in completing a Site Conceptual Model. Expanded sampling occurred in May and November of 2014. Data collected in May 2014 was inconclusive. Data collected in November 2014 has not yet been fully interpreted.

    None of the additional monitoring affects the protectiveness of the remedy.

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

    New fencing was installed in 2011, at the request of the agencies. Tanks tha had remained on site from an in-situ treatment prior to development of the O&M Plan were removed in 2014.

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

    Several shallow alluvial wells are prone to heaving of the internal casings. When this occurs, it is necessary to trim the internal casing in order to put a locking well cap in place. Initially, the contractor hired a driller to complete this task. Rather than hire a driller each time a casing needs to be trimmed, the contractor purchased an internal casing cutter. This allows the contractor to trim the internal casing themselves, eliminating the need to subcontract with a driller.

The agencies have suggested conducting surface water monitoring on an annual basis moving forward. Surface water monitoring took place in November 2011 and February 2014 and will be done again in 2015. At first glance, it appeared that February would be the best month to perform surface water monitoring; this is the quarter when surface water was most likely to be gaining groundwater. However, past experience has demonstrated that climatic conditions make February a difficult month to attain day-long steady state surface water conditions. When trying to assess interactions between surface water and groundwater, steady state conditions are imperative. Therefore, it was decided that any future surface water monitoring will occur in February if conditions allow, or alternatively, in the final quarter of the year. This will eliminate the chance of repeated attempts to sample under steady-state conditions.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

    Groundwater monitoring since 1998 indicates minimal seasonal variation in groundwater arsenic concentrations. The monitoring schedule could be reduced from a quarterly schedule to a semi-annual schedule. Additionally, historical water quality results show that few metals are present in groundwater at concentrations that are a concern to human health or the environment, and groundwater metals concentrations show minimal variation over time. Thus, the analytical list could be reduced.

Site:	*Rocker Operable Unit*		**EPA ID No:**	*MTD980502777*	
Interviewer:	*Self-Completed*		**Affiliation:**		
Subject:	*Tim Hilmo*		**Affiliation:**	*Atlantic Richfield*	
Subject Contact Information:			**Phone:**	*(406) 490-4375*	
Time:			**Date:**		
Location:					
Interview Format:	☐ *In Person*	☐ *Phone*		☒ *email*	☐ *Mail*
Interview Category:	*Potentially Responsible Parties (PRPs)*				

1. What is your overall impression of the remedial activities at the Site?

   Remedial activities at the site have been completed and the site is in the Operations and Maintenance (O&M) stage. The site is managed in accordance with the site approved O&M Plan. The specific objectives of the Rocker OU O&M program are as follows:
   - *Confirm treatment results and track groundwater quality trends;*
   - *Document the long-term efficacy of the iron/limerock/oxidant groundwater treatment process carried out in 1997;*
   - *Document potential migration of the plume, if any;*
   - *Document that nearby public or domestic water supplies remain unaffected by the Rocker site; and*
   - *Document changes in water table elevation and flow patterns following excavation and treatment of the shallow alluvial hydrostratigraphic unit.*

   Currently, additional data has been collected (2014) and is being evaluated to develop an updated Conceptual Site Model in Q1 2015.

2. What have been the effects of this Site on the surrounding community, if any?

   A Controlled Groundwater Well Area was established and a ban on additional wells is in place and an Alternate Water Supply is in effect for the Rocker community. However, the community (County Water and Sewer District of Rocker) has previously voiced concern regarding increased water rates to their current supply. They have also asked when their groundwater supply may be usable again.

3. What is your assessment of the current performance of the remedy in place at the Site?

   The remedy appears to be protective in that none of the contingency wells have been triggered to implement a contingency remedy. However an increasing arsenic trend has been observed in some wells internal to the site that has led to the additional sampling and development of the Conceptual Site Model mentioned above.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

The County Water and Sewer District of Rocker have previously inquired about their water supply. They were concerned with Butte Silver Bow tax rate increases and a timeframe that their groundwater would be available again.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Yes

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   Possible reduction in analytes/monitoring frequency as the current groundwater monitoring program is quarterly and not semi-annual.

Site:	*Warm Spring Ponds Operable Unit*	**EPA ID No:**	*MTD980502777*
Interviewer:		**Affiliation:**	
Subject:	*Brian Wilkins*	**Affiliation:**	*Operation Contractor, Pioneer Technical Services*
Subject Contact Information:	*Pioneer Technical Services, Anaconda, MT*	**Phone:**	
Time:		**Date:**	
Location:			
Interview Format:	☐ *In Person* ☐ *Phone* ☒ *email* ☐ *Mail*		
Interview Category:	*O&M or Remedial Contractor*		

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The Warm Springs Ponds is a unique site; it is a treatment facility but also a public use area. The ponds have transformed from a desolate area 20 years ago to a thriving biological system. The public is encouraged to visit the area to learn about the cleanup and result. Most people that visit do not realize it is an active treatment facility.

2. What is your assessment of the current performance of the remedy in place at the Site?

   The remedy in place works as intended. The treatment system is efficient in precipitating heavy metals.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time?

   The data fluctuates throughout the year. There are elevated arsenic levels during the summer months along with pH. The influent water from Silver Bow Creek has been changing over the course of the last five years, which could potentially affect the current treatment within the ponds system.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

   There is a seven-days-a-week, 365-day-a-year O&M presence. The main reason for this presence is dam safety. The main tasks for the operators of the facility are to inspect the embankments and structures and ensure the treatment system is operating as described in the O&M manual. Due to the size of the system, there is a need for presence on a regular basis.

5. Have there been any significant changes in O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

Atlantic Richfield has incorporated routine inspection procedures for protective safety devices and critical equipment. A new maintenance management system has been implemented in the last year to assist operators in completing and tracking maintenance tasks and inspections. Sampling has remaining consistent throughout the life of the project.

6. Have there been unexpected O&M difficulties or costs since start-up or in the last five years? If so, please provide details.

   There has not been any unexpected O&M difficulties or costs within the last five years.

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

   Due to the age of the equipment, most has met the design life. Atlantic Richfield has been in the process of updating treatment process equipment to continue to meet the requirements set forth in the UAO. New equipment is spec'd to help improve O&M efficiency as much as possible.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

   No.

Site:	*Warm Springs Pond Operable Unit*	**EPA ID No:**	*MTD980502777*
Interviewer:	*Self-Completed*	**Affiliation:**	
Subject:	*Tim Hilmo*	**Affiliation:**	*Atlantic Richfield Company*
Subject Contact Information:		**Phone:**	*(406) 490-4375*
Time:		**Date:**	
Location:			
Interview Format:	☐ *In Person* ☐ *Phone*	☒ *email*	☐ *Mail*
Interview Category:	*Potentially Responsible Parties (PRPs)*		

1. What is your overall impression of the remedial activities at the Site?

   Remedial activities have been very successful and are in the O&M stage. There is an approved O&M Plan that is followed that fulfills the requirements of the two UAOs (Inactive and Active). Specifically, these tasks include:
   i. *Routine O&M activities (e.g., site inspections, managing lime addition).*
   ii. *Routine surface water monitoring, sampling and analysis.*
   iii. *Routine groundwater monitoring, sampling and analysis.*
   iv. *Routine data management and reporting.*
   v. *Routine site management activities.*
   vi. *Dam stability inspections.*
   vii. *Other site ownership O&M as required.*

Optimization studies are ongoing to mitigate the seasonal exceedances of pH and arsenic (as mentioned below) that include installation of Solar Bees and lime reduction evaluation.

2. What have been the effects of the Site on the surrounding community, if any?

   The Warm Springs Ponds have become a very popular recreation area for the community. Atlantic Richfield manages the area as a Wildlife Management Area, with goals to maximize waterfowl use, fisheries, and preservation of existing flora and fauna. The area is open to the public and provides recreational and educational opportunities such as hunting, fishing, birdwatching and hiking. Local school groups take tours of the area several times each year.

3. What is your assessment of the current performance of the remedy in place at the Site?

   The Warm Springs Ponds capture the majority of constituents entering the system and the remedy is functioning as intended. Seasonal exceedances of pH and arsenic still exist, however. Optimization studies such as use of Solar Bees are ongoing and being evaluated to reduce these exceedances and increase the effectiveness of the remedy. The remedy is supporting a healthy, diverse and abundant aquatic, terrestrial and avian wildlife population as documented in the Site's Wildlife Management Plan. Annual and five-year dam inspections confirm that the dikes continue to function as designed.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   The majority of the community sees the Warm Springs Ponds as a local recreational asset. However, as in all communities, there are a few vocal individuals who provide critical comments at public meetings or in local newspaper opinion pieces.

5. Do you feel well informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Yes.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   No.

Silver Bow Creek/Butte Area NPL Superfund Site 5-year Review Interview Form

Site:	*Butte Priority Soils Operable Unit*		**EPA ID No:**	*MTD980502777*	
Interviewer:	*Loren Burmeister*		**Affiliation:**	*Atlantic Richfield Company*	
Subject:	*Josh Bryson*		**Affiliation:**	*Pioneer Technical Services, Inc.*	
Subject Contact Information:	*jbryson@pioneer-technical.com*		**Phone:**	*(406) 565-7164*	
Time:	*10:15 AM*		**Date:**	*April 17, 2015*	
Location:	*Pioneer Technical Services, 1101 South Montana Street, Butte, MT*				
Interview Format:	☐ *In Person*	☐ *Phone*	☒ *email*	☐ *Mail*	
Interview Category:	*O&M or Remedial Contractor*				

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The project has evolved over time where the BPSOU site had focused on active construction of the soils, surface water, and groundwater remedy to its current state that is more focused on finalization of site work to ensure the remedies success and active monitoring and maintenance to evaluate the effectiveness of the remedy.

   Based on surface water monitoring results, reclamation driven cleanup has been successful. We are now to a point that we are attempting to identify small remaining contributions that adversely impact standards compliance. Once these are identified we will be able to implement final reclamation strategies and move to full compliance and protectiveness of the Butte residents and the local environment.

   Atlantic Richfield's maintenance approach effectively identifies and implements measures to protect the remedy work completed to date. Water collection and treatment systems are maintained on a routine basis and have proven effective in promoting consistent and efficient site operations. Some maintenance activities related to source controls are performed by Butte-Silver Bow according to the BRES program – the effectiveness of this program in site assessment and corrective measures continues to improve year to year.

2. What is your assessment of the current performance of the remedy in place at the Site?

   Surface water and effluent discharge monitoring data indicates that the site remedy for soils, surface water, and groundwater is generally effective throughout the BPSOU. There are some areas remaining for improvement in regard to meeting wet weather in-stream water quality standards for dissolved copper. Implementation of upcoming storm water BMP projects will continue progress toward consistent compliance. Atlantic Richfield also believes waiver of existing Montana DEQ hardness-based standards to equally or more protective federal biotic ligand model standards would provide a better measure of remedy performance.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?

Archived monitoring data indicates that total and dissolved forms of zinc, silver, copper, iron, and arsenic seen in surface water have decreased with time as the BPSOU remedy has been implemented. This is a result of both source area reclamation and the effectiveness of the groundwater collection and treatment system including the Metro Storm Drain, groundwater control features of the Butte Reduction Works, the Hydraulic Control Channel, and actual treatment occurring at the Butte Treatment Lagoons. Following major upgrades to the Butte Treatment Lagoons we have seen more consistent effluent discharge levels and improvement in effluent chemistry. No exceedances of Montana DEQ-7 aquatic standards have been observed since 2014.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.

   Within BPSOU there is a continuous on-site OM&M presence. This includes a variety of Atlantic Richfield suppliers who perform routine operation and maintenance tasks related to groundwater, surface water, and soils media remedies. Butte-Silver Bow performs certain OM&M tasks related to BRES and other superfund related infrastructure with funding provided by Atlantic Richfield.. Pioneer maintains responsibility for operation and maintenance of water collection and treatment systems including the Metro Storm Drain system, the West Camp Pump Station, and all infrastructure within Lower Area One, including the Butte Treatment Lagoons. All Pioneer activities are scheduled and performed according to the current revision of the site's OM&M plan. The referenced OM&M plan contains checklists and logs to complete and document daily, weekly, monthly, quarterly, and annual inspection and maintenance tasks.

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

   OM&M activities have always been conducted in accord with the most recent revision of the OM&M plan approved by EPA. General schedules associated with compliance monitoring have not deviated significantly. However, recent construction activities including an extensive upgrade of the Butte Treatment Lagoons treatment system has resulted in significant change in general duties over the last five year period. In general, operations have become more efficient due to the improved instrumentation and controls. Reliability has also been improved due to the complete redundancy of the water treatment system.

   Inspection, testing, and maintenance schedules allow tasks to be completed within routine working schedules, and at planned intervals. Redundant systems are in place to allow maintenance activities to be completed without upsetting routine operation and treatment.

   The site upgrades improve the protectiveness and effectiveness of the remedy through the addition of additional protective measures and have enhanced our ability to maintain consistent operations through non-routine events.

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.

   There have not been any unexpected OM&M difficulties or costs within BPSOU during the last five years.

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.

   As previously identified, recent upgrades have improved operating efficiency and treatment reliability of the system. Consistent operation has reduced overall lime usage while maintaining effluent treatment goals of the system. Reduced lime addition directly reduces the amount of material that must be dredged. Configuration upgrades to the primary cells have also reduced labor requirements during dredging operations. Improved control systems have reduced manual adjustments to pump systems which have increased operation efficiencies. Scheduled equipment inspections are utilized to prevent unplanned equipment failures or outages.

   As operator's become more familiar with the Butte Treatment Lagoons system additional OM&M efficiencies may be identified.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?

   During this current 5-year shakedown period of the Butte Treatment Lagoons, and in consideration of the recently completed and pending construction upgrades, it would be most beneficial to remain consistent in ongoing OM&M activities. Additionally, changes in influent flow rates to the system and/or water chemistry could result in difficulties in continuing to meet effluent water quality standards. Once all planned improvements are made a better opportunity may arise to identify additional operational efficiencies.

Silver Bow Creek/Butte Area NPL Superfund Site 5-year Review Interview Form

Site:	*Butte Priority Soils Operable Unit*		**EPA ID No:**	*MTD980502777*	
Interviewer:			**Affiliation:**		
Subject:	*Loren Burmeister*		**Affiliation:**	*Atlantic Richfield Company*	
Subject Contact Information:	*loren.burmeister@bp.com*		**Phone:**	*(406) 723-1826*	
Time:	*1430*		**Date:**	*April 28, 2015*	
Location:	*Atlantic Richfield Company, 317 Anaconda Road, Butte MT 59701*				
Interview Format:	☐ *In Person*	☐ *Phone*	☒ *email*	☐ *Mail*	
Interview Category:	*Potentially Responsible Parties (PRPs)*				

1. What is your overall impression of the remedial activities at the Site?

   Significant progress has been made in implementation of the Remedy for all impacted media including groundwater, surface water, and solid media. The groundwater remedy of capture and treatment of impacted water has proved effective in protecting surface water. The surface water remedy is continuing to be implemented and significant improvements have been observed as evidenced by recent monitoring. The solid media remedy for mine dumps and other impacted soils in Butte has essentially been fully implemented. All known locations of solid media that exceed human health criteria have been remediated and are maintained under the BRES program.

   Additional groundwater and surface water evaluations are underway which may identify additional actions. Selection of any related projects will be subject to the outcomes of an in-progress surface water technical impracticability (TI) evaluation by the EPA and ongoing Consent Decree (CD) negotiations between the Agencies and PRPs.

2. What have been the effects of this Site on the surrounding community, if any?

   Remedial activity has had a positive impact throughout Butte. The community has benefitted not only from the improvements in their health and environment, but also, remedial activities have resulted in repurposing of areas for public use and enjoyment. Specific examples include the Granite Mountain Memorial, the Copper Mountain Sports Complex, and the Original Mine Yard.

3. What is your assessment of the current performance of the remedy in place at the Site?

   The remedy is protective of human and environmental receptors and complies with exposure levels stated within the Record of Decision for solid media. Remediation of impacted groundwater has been deemed Technically Impracticable, although it is collected and managed through a water collection and treatment system. The groundwater control area maintains protectiveness of residents of central Butte by prohibiting development of residential wells for purpose of consumption or irrigation. Effluent discharge from the Butte Treatment Lagoons system and of surface water is, in general, compliant with existing Montana DEQ-7 aquatic life standards, including during recent construction periods. The surface water remedy has not achieved compliance with the standards identified in the ROD, *but is compliant with other protective measures of aquatic acute toxicity such as the Biotic Ligand Model.*

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   Multiple complaints and inquiries regarding environmental issues and the remedial process are directed to Atlantic Richfield each year. Atlantic Richfield attempts to address each specific complaint or inquiry based on the best available information and within the framework of Atlantic Richfield legal policy and the CERCLA process. Recent contention has focused on the results and interaction of Atlantic Richfield and the EPA during completion of the Health Study and concern of ardent citizenry regarding the completeness and effectiveness of the remedy completed to date.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Yes.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   Monitoring and maintenance programs associated with the remedy should be continually evaluated for effectiveness. Value-added data should be considered and, based upon experience, support performance-based decision making for adjustment of operations, performance of maintenance, or implementation of remedial actions going forward. Maintenance inspections and collection of monitoring data that does not support attainable remedy improvement or trending data should be discontinued.

Silver Bow Creek/Butte Area NPL Superfund Site 5-year Review Interview Form

Site:	*Butte Priority Soils Operable Unit*		**EPA ID No:**	*MTD980502777*	
Interviewer:	*Self-Completed*		**Affiliation:**		
Subject:	*Joe Griffin*		**Affiliation:**	*Montana DEQ*	
Subject Contact Information:	*jgriffin@mt.gov*		**Phone:**	*(406) 560-6060*	
Time:			**Date:**	*May 15, 2015*	
Location:					
Interview Format:	☐ *In Person*	☐ *Phone*	☒ *email*	☐ *Mail*	
Interview Category:	*State Agency*				

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   Implemented remedy has resulted in significant improvement towards protection of human health and the environment and compliance with ARARs in the BPSOU. However, the State believes further refinements are necessary.

   The Residential Metals Abatement Program, which is managed by Butte Silver Bow County government, is effective at protecting the citizens of Butte from exposure to lead and arsenic. The recent study that examined Butte resident's exposure to lead – which included direct involvement by the public - helped show that the Residential Metals Abatement Program is effective. Continued efforts are necessary, however, to ensure that exposure standards conform to the most current information regarding protective human health levels.

   The mine waste capping program, which is a major component of protecting human health and a major component of protecting Silver Bow Creek within the OU, has, in large part, addressed sources of surface contamination to Silver Bow Creek. Refinements to this aspect of the implemented remedy can further decrease metals loadings to Silver Bow Creek.

   Continued evaluation to determine whether reclaimed sites are operational and functional is important to protecting the implemented remedy. The program currently lacks an essential step between design/build and passing reclaimed sites on to an in-perpetuity operations and maintenance program. The program does not use the performance evaluation tool – Butte Reclamation Evaluation System (BRES) – to determine whether sites are operational and functional as required. On-going evaluations of the capping program, as well as performance evaluations of re-vegetation efforts are necessary to ensure protectiveness of the remedy and compliance with reclamation standards.

   Ongoing streamside waste removals and ground water management have been effective at significantly reducing the levels of in-stream metals. However, the State continues to disagree with the ground water remedy that left accessible, major sources of groundwater contamination in place (e.g., The Parrot, Northside, and Diggings East). Removal of such wastes would eliminate a threat to Silver Bow Creek, substantially reduce the toxicity, mobility and volume of groundwater contamination, and greatly increase the permanence and long-term effectiveness of the remedy. The State also believes further removals on the banks and beds of Silver Bow Creek are needed.

Although early source removals and rebuilding the MSD channel have had substantial effects on reducing metals discharged to Silver Bow Creek during wet weather events, additional work is necessary to meet surface water standards. The State believes the most successful approach to address wet weather contaminant loadings to Silver Bow Creek has been the retention/detention basin approach in Missoula Gulch. This approach would be equally successful in the Buffalo Gulch and MSD areas. Since removing the streamside tailings at Lower Area One and constructing the retention/detention ponds in Missoula Gulch in the mid-1990s, there has been significant improvement in storm water quality at Missoula Gulch, but not a similar level of improvement in storm water quality at the major municipal storm water system outfalls at Buffalo Gulch and MSD. EPA's 2008 Surface Water Characterization Report recommended that: "Detention/retention basins need to be installed at the base of Buffalo Gulch and the MSD subdrainages as soon as possible to reduce the suspended contaminant load."

2. What is your assessment of the current performance of the remedy in place at the Site?

   The actions taken have improved water quality in Silver Bow Creek. However, State water quality standards have not yet been met and thus additional technically practicable actions are necessary. Ground and surface water improvements will rely on effective management of stormwater, sediments, and remaining wastes, as well as continued evaluation of those remedy components through effective monitoring.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   Yes, the citizenry has articulated concerns regarding stormwater management to EPA Region 8 and the State of Montana. The opinions expressed are focused on water quality, the need for additional action, and the long term stewardship of waste left in place following completion of remedial action.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   The State, through the Natural Resource Damage Program, along with the BNRC, has produced a number of ground water studies that examine ground water contamination in the MSD-Parrot Tailings-Northside Tailings-Diggings East corridor.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

   Not in the last five years.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   For the most part – yes. A concern is the lack of comprehensive evaluation of domestic use of ground water – including drinking water and irrigation - within the established controlled ground water area (BABCGWA). The current evaluation is limited to the ground water TI zone. The Agencies will need to revisit this issue.

7. Are you aware of any changes in projected land use(s) at the Site?

   Yes, development in Butte continues to change the urban landscape. As such, future construction and infrastructure projects may potentially intersect areas not investigated. Thus, a portion of the institutional control program will have to provide for effective management of contaminated substances containing principal threat materials leading to future remedial actions.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   The implemented remedy has resulted in improvements in water quality, as well as provided protections of human health and the environment through the Residential Metals Abatement Program. The State looks forward to working with EPA to refine the implementation of remedy components, including those discussed above. The State believes that continued evaluation of surface and groundwater remedy components, as well as evaluation of un-reclaimed and previously reclaimed surface source areas is necessary to ensure protectiveness of human health and the environment and compliance with ARARs.

Silver Bow Creek/Butte Area NPL Superfund Site 5-year Review Interview Form

Site:	*Butte Mine Flooding Operable Unit*				**EPA ID No:**	*MTD980502777*		
Interviewer:	*Self-Completed*				**Affiliation:**			
Subject:	*Joe Griffin*				**Affiliation:**	*Montana DEQ*		
Subject Contact Information:					**Phone:**	*(406) 841-5041/ (406) 459-8569*		
Time:					**Date:**	*November 18, 2014*		
Location:	*Helena, MT*							
Interview Format:		*In Person*			*Phone*		*email*	☒ *Mail*
Interview Category:	*State Agency*							

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The project team of representatives from Atlantic Richfield, Montana Resources, EPA and DEQ is working well together to initiate the steps needed to evaluate the adequacy of the existing water treatment plant to treat the combined flows from the East Camp groundwater and the Horseshoe Bend surface water.

   The robust monitoring program implemented by the Montana Bureau of Mines and Geology is effectively tracking water level and water quality changes in the East Camp and West Camp.

2. What is your assessment of the current performance of the remedy in place at the Site?

   The Horseshoe Bend (HsB) Water Treatment Plant (WTP) has been operating since 2003 and although treated water is used in the mining circuit the operators have gained valuable operating experience. Performance tests showed that the WTP could treat the HsB surface water and meet discharge standards if required.

   The monitoring program is continually evaluated, revised and improved including installing pressure transducers in selected wells to obtain more frequent water level data.

   As discussed in the agencies' Feb 20, 2014 letter to AR and MR, future remedy protectiveness remains a concern. In that letter, the agencies requested that the Settling Defendants take a proactive approach towards long-term protectiveness by starting work now on the items identified in the Five-Year Review Report recommendations and follow-up actions. The State continues to support this proactive approach.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   Following reports of pit wall slope failures in 2013, citizens expressed concerns that future slope failures could potentially cause overflow of the pit water. It has also been expressed that the Horseshoe Bend Treatment Facility has not yet been operated at capacity with Berkley Pit waters and as such it has not been sufficiently evaluated as a key part of the long term remedy.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   DEQ continues with Management Assistance activities in coordination with EPA.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?
   No.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?
   Yes.

7. Are you aware of any changes in projected land use(s) at the Site?
   No.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?
   The project team is working well to address the Remedial Action Adequacy Review.

Silver Bow Creek/Butte Area NPL Superfund Site 5-year Review Interview Form

Site:	*Rocker Timber Framing Operable Unit*	**EPA ID No:**	*MTD980502777*
Interviewer:	*Self-Completed*	**Affiliation:**	
Subject:	*Daryl Reed*	**Affiliation:**	*Montana DEQ*
Subject Contact Information:		**Phone:**	*(406) 841-5041/ (406) 459-8569*
Time:		**Date:**	*November 18, 2014*
Location:	*Helena, MT*		
Interview Format:	☐ *In Person* ☐ *Phone* ☐ *email* ☒ *Mail*		
Interview Category:	*State Agency*		

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The Remedy has failed to meet the Remedial Action Objectives set forth in the Record of Decision but the current groundwater monitoring indicates the rebounded arsenic plume is not expanding.

   Recently there has been a working group with Atlantic Richfield, the agencies and their consultants tasked with updating the Conceptual Site Model, better understand the complex geochemistry and hydrogeology, and evaluate the remedy.

2. What is your assessment of the current performance of the remedy in place at the Site?

   The dissolved arsenic groundwater plume has rebounded to concentrations similar to those observed before the remedy implementation. This is most likely due to remaining source material below the depth of the remedy excavation. Arsenic in a downgradient well, RH-44, has been increasing since 2007.

   The current groundwater monitoring adequately assesses the arsenic plume but could likely be enhanced. It is anticipated that groundwater monitoring optimization will be addressed by the working group.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   The Rocker Water and Sewer District has expressed their desire to have the Controlled Groundwater Area revised to release some of the groundwater for use by the community.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

DEQ continues with Management Assistance activities in coordination with EPA.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?
   The Arsenic Rule, which established a new MCL drinking water standard, was promulgated by EPA in the Federal Register (FR) on January 22, 2001 (FR 2001). This changed the arsenic MCL standard from 50 micrograms per liter (µg/L) to 10 µg/L, with the new standard becoming enforceable on January 23, 2006. The State of Montana adopted this standard under its Safe Drinking Water Act in 2008. The new standard was promulgated based on a finding that the 10 µg/L standard was necessary for the protection of human health. EPA completed an ESD (September 2014) that changed the ARAR for arsenic in groundwater standard from 18 ug/L to 10 ug/L.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?
   Yes.

7. Are you aware of any changes in projected land use(s) at the Site?
   No.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?
   The recent collaborative efforts by the working group are encouraging.

Silver Bow Creek/Butte Area NPL Superfund Site 5-year Review Interview Form

Site:	*Warm Springs Ponds Operable Unit*	**EPA ID No:**	*MTD980502777*
Interviewer:	*Self-Completed*	**Affiliation:**	
Subject:	*Daryl Reed*	**Affiliation:**	*Montana DEQ*
Subject Contact Information:		**Phone:**	*(406) 841-5041/ (406) 459-8569*
Time:		**Date:**	*November 18, 2014*
Location:	*Helena, MT*		
Interview Format:	*In Person* ☐ *Phone* ☐ *email*		☒*Mail*
Interview Category:	*State Agency*		

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   Overall, the Warm Springs Ponds are being operated as intended in the Interim Record of Decision. The Ponds are mostly effective at removing the divalent metals in the influent surface water. However, there is ongoing concern about elevated arsenic, pH, and occasionally ammonia in the pond discharge and recent studies indicate a high degree of variability in biotic indicators downstream. These ongoing concerns warrant additional efforts to understand and correct the elevated arsenic, pH and ammonia discharges from Warm Springs Ponds.

2. What is your assessment of the current performance of the remedy in place at the Site?

   Copper and Zinc concentrations in the influent water exceed water quality standards a majority of the time.

   Compliance with the arsenic discharge standard is a continuing concern. Atlantic Richfield has made progress in understanding the complex biogeochemistry within the Ponds and initiated a liming rate optimization program to reduce the alkalinity stored in the bottom sediments which may be contributing to arsenic desorption during warmer weather with increased biological activity.

   In addition to arsenic compliance, elevated pH and suspected elevated ammonia concentrations in the Warm Springs Ponds discharge are an unresolved concern. Exceedances of the pH discharge standard are common from the late spring through the fall. Additionally, ammonia concentrations above the chronic aquatic life standard were observed in Silver Bow Creek below the ponds on March 19, 2014, at about the time when dimictic mixing of the ponds would have likely occurred[1]. These concerns are heightened by recent

[1] Ammonia concentration was 1.08 mg/L in Silver Bow Creek at Warm Springs (DEQ site SS-25; co-located with USGS gauge 12323750) on March 19, 2014 and progressively lower at each of the next three Clark Fork River sample sites downstream(near Galen, at Galen Road, and at Gemback Road). On that same day, ammonia was not detected at either of two sites in the Mill-Willow Bypass. No other surface water sample collected under the DEQ monitoring program since 2010 (n = 249) has detected ammonia in concentrations above the analytical reporting limit (0.05 mg/L).

results of macroinvertebrate biointegrity, trout density, and trout survival monitoring at sample sites immediately downstream from the Warm Springs Ponds. Mr. Dan McGuire has observed sharp declines in macroinvertebrate biointegrity scores at sites immediately downstream from the ponds in certain years[2]. At sample sites immediately downstream from the Warm Springs Ponds, Montana Fish, Wildlife, and Parks observed a nearly four-fold reduction in brown trout density between 2008 and 2009; from 708 (± 102) fish per mile to 185 (± 73) fish per mile[3]. Since 2009, brown trout density has gradually increased to 1,878 (± 283) fish per mile in 2013[4]. Montana Fish, Wildlife, and Parks also observed that survival of juvenile brown trout in the Warm Springs Ponds outfall was significantly lower than in any other Clark Fork River site during the spring and summer of 2013[5].

In light of these concerns, we encourage efforts to better understand the causes and options for correcting the elevated pH and ammonia concentrations in the Warm Springs Ponds discharge. Investigations are warranted to determine if dimictic mixing in the Ponds contributes to episodic toxic water discharges, and whether these conditions are contributing to the documented variability in macroinvertebrate biointegrity, trout density, or trout survival observed below the ponds.

The Pond berms have been strengthened to increase the dam stability and vegetation within the reconstructed Mill-Willow Bypass is maturing well.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

No.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

DEQ continues with Management Assistance activities in coordination with EPA.

For details see: **Ingman, G.**, *Clark Fork River Operable Unit monitoring, first quarter 2014 monitoring event preliminary data review*, prepared by RESPEC, Helena, MT, for Montana Department of Environmental Quality, Helena, MT.

[2] **McGuire, D., 2013**. *Clark Fork River biomonitoring macroinvertebrate community assessments, 2012*, presentation at Clark Fork River Basin Meeting, USGS – Wyoming-Montana Water Science Center, Helena, MT.

[3] **Lindstrom, J. 2011.** *Upper Clark Fork River fish sampling, 2008-2010*, prepared by Montana Fish, Wildlife, and Parks, Deer Lodge, MT.

[4] **Leon, J., P. Saffel, B. Liermann, J. Lindstrom, and T. Selch, 2013.** *Upper Clark Fork River fisheries monitoring study: 2013 Annual Report*, prepared by Montana Fish, Wildlife, and Parks, Missoula, MT.

[5] **Leon, J., P. Saffel, B. Liermann, J. Lindstrom, and T. Selch, 2013.** *Upper Clark Fork River fisheries monitoring study: 2013 Annual Report*, prepared by Montana Fish, Wildlife, and Parks, Missoula, MT.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?
   No

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?
   Yes.

7. Are you aware of any changes in projected land use(s) at the Site?
   No.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   The Warm Springs Ponds operators are implementing the Interim Remedy in a professional and diligent manner. The State encourages further investigation into the Warm Springs Ponds discharges, as discussed above.

BUTTE-SILVER BOW
OFFICE OF THE CHIEF EXECUTIVE
Courthouse, 155 W. Granite Street, Suite 106
Butte, Montana 59701-9256

July 31, 2015

Nikia Greene and Kris Edwards
U.S. EPA Region 8 Montana Office
Federal Building
10 W. 15th St., Suite 3200
Helena, MT 59626

RE: 2015 Five-Year Review Comments
Silver Bow Creek/Butte Area Superfund Site

Dear Mr. Greene and Ms. Edwards:

Thank you for providing an opportunity to provide input as part of the latest Five-Year Review of the Silver Bow Creek/Butte Area Superfund Site. On behalf of the consolidated City-County Government of Butte-Silver Bow, including its newly formed Superfund Advisory and Redevelopment Trust Authority, we submit the following comments:

Streamside Tailings Operable Unit (Silver Bow Creek)

This remedial work for this component of the Site, which we define generally as the floodplain and riparian areas of Silver Bow Creek, extending 26 miles from a point near the overpass structures of I-90/15 to the Warm Springs Ponds, is nearly complete. The transformation of this creek corridor over the past 20 years is nothing less than remarkable. Although there is some remedial work that remains, for example, through the Durant Canyon and other sub-reaches along the way, the creek today is tremendously improved. Fish have returned, and find their way upstream again to spawn and thrive. The water quality is getting better and better, as the final remedial tasks are brought on line.

Further, the integration of the remedial work these past 15 years with the restoration measures implemented by the Greenway Service District (through the Natural Resource Damage Program (NRDP)) has become a model and prototype for all other components within the Site. The successful effort has also been done cost-effectively and the results – a clean, thriving stream from Butte to the Warm Springs Ponds – will serve the communities along the corridor for decades to come. This leads to our main comment...

Just like the commitment made to clean up and restore the stream, the Agency needs to ensure that there is an equal commitment to maintain the corridor long into the future. We hope monitoring and maintenance plans are in place among the U.S. EPA, the Montana DEQ and the local Greenway Service District to sustain the benefits of the remediated/restored stream corridor. By 2020, when the next five-year review is done, Silver Bow Creek should be well on its way to full recovery.

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Lastly, it is our understanding that there are sufficient funds remaining in the Trust Account for the Streamside Tailings Operable Unit to ensure a robust monitoring and maintenance program, and in addition, a surplus that will be directed back to the NRDP for further restoration work in the Silver Bow Creek watershed. It is our expectation that those surplus funds will be invested in the first mile of Silver Bow Creek within the urban area of Butte, as part of a joint effort with the Butte Priority Soils Operable Unit remedial work. Addressing remaining contamination issues at the Silver Bow Creek headwaters is without question the best use of these remaining funds and will ensure that the long-term remedy is protected and maintained in perpetuity. Legal issues and bureaucracy have hampered the comprehensive cleanup of the headwaters for far too long. The model used along Silver Bow Creek downstream, i.e., to integrate remedy and restoration activities, should now be applied in the headwaters area to forge the best, most comprehensive clean up and restoration possible including removal of the Parrot, Northside and Diggings East tailings.

Rocker Timber Framing and Treatment Plant Operable Unit

An often-overlooked component of the Site, the Rocker Timber Yard was the first of the remedial actions declared to be complete. It was largely an in-situ cleanup process, and has been in "operation and maintenance (O&M)" for several years. Very little information is disseminated about the effectiveness of the cleanup, and we would ask the Agency to provide a more frequent update on the performance of the remedy and how it will be sustained in the long-term. As long as the groundwater within the community of Rocker is unusable by a significant number of its residents (e.g. Controlled Groundwater Area/"well ban"), it can be argued that the remedial action could do more. Removal of the arsenic and organic contaminated soils should be considered in order to restore beneficial uses of the groundwater and to further protect Silver Bow Creek.

Warm Springs Pond Operable Unit

Like the Rocker Timber Yard, the Warm Springs Ponds remedial action was also completed several years back, or declared to be complete and in the O&M phase now. Again, the only comment from Butte-Silver Bow would be to provide periodic updates as to the performance of the remedy and how it will be sustained in the long-term. For example, what is the water quality of the water flowing out of the Warm Springs Ponds? How is that water monitored? Does the water meet the same standards that are imposed at all other Operable Units within the Site? Combined with Warm Springs Creek, water discharged from the Ponds are essentially the headwaters of the Upper Clark Fork River, and it would be useful to know that the discharge water is meeting all current and applicable standards, and those standards are being applied consistently throughout the Site. There have been recent significant declines below the Ponds in trout numbers of the Upper Clark Fork River; likewise, the UCFR is also being remediated and restored to the tune of tens of millions of dollars. The Warm Springs Ponds are the integral unit linking a restored Silver Bow Creek to an eventually restored Upper Clark Fork River. More information needs to be released on the performance of the remedy at the Ponds now and into the future, as the river's long-term health is at stake.

Mine Flooding Operable Unit, aka Berkeley Pit and West Camp

There has been and continues to be great interest among Butte residents about the ongoing implementation of the remedy for the Berkeley Pit. Although there has been a substantial monitoring program in place since the pumps were turned off in 1982, and it does appear that the monitoring data show that the water in the Pit is rising as expected, citizens remain rightfully concerned. As the critical water level approaches, better assurances are needed that the remedy in place will perform effectively, in perpetuity.

For example, has a contingency plan been developed to deal with impacts in the event of a larger scale failure of a Berkeley Pit wall? Will the Horseshoe Bend Treatment Plant be ready to operate at full capacity when necessary? Will the discharged water from the Plant meet all standards for use and/or discharge to the restored watershed? Early tests and demonstrations were spotty, e.g., the presence of certain contaminants in the discharge water that would lead to gypsum scaling along Silver Bow Creek. It is also unclear how much, if any water will actually be discharged from the Plant, as opposed to being used to support active mining operations. The fact that we are getting closer than we've ever been to reaching the Critical Water Level and these answers have not been adequately answered is unacceptable. More specifically, Butte-Silver Bow would like to see a full-scale ramp up of the Horseshoe Bend Plant to full capacity to ensure proper operation and performance capability. In addition, BSB is requesting detailed water quality monitoring/modeling at and downstream of the proposed discharge point(s) to accurately determine the effects on Silver Bow Creek and the rest of the Upper Clark Fork River Basin. Changes to the chemistry of water in Silver Bow Creek could not only lead to quality impacts, but also significantly affect compliance for Superfund stormwater standards as well as BSB's wastewater treatment permit standards. These are very real and serious concerns; our community deserves answers.

Lastly, we understand the next step in the long process leading up to eventual remedial action will be a technology review, to confirm that the best available treatment method will be used at the Horseshoe Bend Plant. As we have commented for the past 20 years, Butte-Silver Bow continues to ask the Agency to compel the responsible parties to fully consider resource recovery steps. When the Horseshoe Plant was built in 2002, it was understood that there was space for a front-end module that would allow for metals and minerals recovery from the mine water – if technically and economically feasible; no technology had been identified that met these latter criteria at that time. Since construction, we are unaware of any further tests to identify emerging resource recovery and/or alternative treatment technology for Berkeley Pit water. After another decade of technological advances, we are hopeful the treatment of Berkeley Pit water will be a world-class model. We shouldn't wait any longer to test newly available technologies, or to insure that the technology at the existing plant is ready and able to operate at full capacity, in perpetuity.

Butte Priority Soils Operable Unit

To a certain extent, it may be inappropriate for Butte-Silver Bow, as a named PRP for the Butte Priority Soils, to make any comments on this component of the Site. The City-County has an integral role in the Residential Metals Abatement Program and the long-term operation and maintenance of the caps over source areas as well as the storm water control facilities. We look forward to seeing the results of the Five-Year Review, and with ARCO and the railroads, address any pertinent issues of concern. That said, we do want to make a few points.

First, we are hopeful that the water quality standards and performance measures for the Priority Soils remedy, i.e., water quality on Silver Bow Creek, will be consistent with the standards the City-County will have to meet (in the long-term) for other discharges within the OU. Butte-Silver Bow cannot be obligated to perform under the former without assurances that said performance will not create untenable obligations under the latter. Butte-Silver Bow would ask the Agency to consider parallel pathways to address long-term compliance with our municipal wastewater discharge permit, TMDL Limits, and MS4 discharge permit – all in light of Superfund decisions on ground water, storm water and surface water discharges to the one receiving stream – Silver Bow Creek.

A related concern is recognition that Butte-Silver Bow's municipal wastewater treatment plant plays a significant role in the overall collection and treatment of storm water (e.g. inflow and infiltration), and by extension, the metals removal challenges on Silver Bow Creek. The City-County sanitary sewer treatment plant has been identified and characterized in published Priority Soils documents as a significant loader of metals (primarily copper) to Silver Bow Creek. We are hopeful that $34 million improvement under construction will make a difference, both in terms of nutrients removal (the primary objective) and also metals treatment. However, there needs to be consideration relative to BSB's wastewater collection and treatment systems and potential improvements to Priority Soils surface water quality objectives.
All stakeholders in the process, including BSB, ARCO, the railroads, EPA and DEQ, are in agreement that a clean creek is the end goal. Butte-Silver Bow is committed to do its part. However, Butte ratepayers cannot be expected to absorb significant additional costs to address metals removal (e.g. tertiary metals treatment on its WWTP, expedited replacement of sanitary collection system, etc.), or be forced to demand unreasonable pretreatment requirements on potential users of the wastewater system. Any final solution for Priority Soils must consider potential impacts to current and future municipal wastewater collection, treatment operations and discharge permit compliance.

A second main comment on the Priority Soils cleanup is the need for greater commitment for a complete integration of the remedy and restoration components along the historic Silver Bow Creek corridor, which runs through the heart of the Butte community. In general, it appears there is substantive agreement that a robust restoration action can be implemented in a way that provides full protection of (if not potentially improve) the investments in remedy and its long-term maintenance. Through a collaborative effort, as was the case for the other 26 miles of Silver Bow Creek (see Streamside Tailings comments), the final restoration of the corridor can incorporate end land use features that are beneficial to the community, not to mention sustain the infrastructure role of the Creek corridor in the overall management of storm water.

In 2004, Butte-Silver Bow developed a set of criteria that we hoped would guide groundwater and surface water cleanup and restoration actions in the historic Silver Bow Creek corridor, as follows:

- Meets current water standards, thus ensuring the long-term protection of Silver Bow Creek and downstream water resources;
- Provides aesthetics (i.e., look good from afar, particularly from the Interstate) so as not to degenerate into the same "Colorado tailings mess" present for decades;
- Allows for the maximum reuse of the Lower One Area, including a pleasant walking trail, wildlife viewing areas, interpretive displays, and even space for a fairgrounds;
- Ensures a facility that is practical to maintain and operate; and
- Includes a trust fund to operate/maintain/monitor/upgrade facility in perpetuity.

We think it's time to revisit these criteria, and forge a final solution for the Priority Soils area that results in the best, most comprehensive cleanup and restoration for our citizens. The resources are available through remedy and through restoration, both from the Butte Area One/BNRC settlement and from remainders in the Streamside Tailings settlement account. The conceptual plans have been developed and released for public review. The opportunity is knocking. It's time to get it done.

Again, on behalf of all the citizens of Butte-Silver Bow, thank you for the opportunity to comment and participate in the Five-Year Review for the Silver Bow Creek/Butte Area Site.

Sincerely,

Matt Vincent
Chief Executive

Cc: Julie DalSoglio, EPA
Governor Steve Bullock, State of Montana
Sen. Jon Tester
Sen. Steve Daines
Rep. Ryan Zinke
Butte-Silver Bow Legislative Delegation
Butte-Silver Bow Commissioners
Superfund Advisory and Redevelopment Trust Authority
Public file (posted to Butte-Silver Bow website)

Letters from Community Organizations

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CITIZENS TECHNICAL ENVIRONMENTAL COMMITTEE
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May 13, 2015

Nikia Greene and Kris Edwards
U.S. EPA Region 8 Montana Office
Federal Building
10 W. 15th St., Ste. 3200
Helena, MT 59626

RE: 2015 Five Year Review Comments

Dear Nikia and Kris,

CTEC recognizes that progress has been made in Silver Bow Creek/Butte Area National Priorities List (NPL) site remedy over the last decade. Many reclaimed and rebuilt areas are so well-established that local residents have forgotten the hills of bare mining wastes that existed here only a few years ago. Aquatic and terrestrial wildlife populations in and around Silver Bow Creek continue to increase, as does recreational use of restored reaches.

While strides have been made, the long-term success of the remedy depends on learning from past experience and addressing deficiencies in the remedy where they exist. This letter describes aspects of the remedy that remain a concern to CTEC members in the expectation that they will be addressed by the Five Year Review now underway.

We have detailed comments provided starting on page 3. A summary of these comments is as follows:

1. The Parrott Tailings and other buried MSD waste should be removed; recent studies substantiate this.
2. Storm runoff needs to meet water quality standards. Now is the time to evaluate what storm water BMPs and controls are effective and pursue installation of significant new storm water controls. CTEC believes that vigorous action on stormwater control is critical to continuing improvements in Silver Bow Creek. This could include the construction of additional retention ponds/basins which have proven to be both effective and sustainable, a continued comprehensive public education program and continued oversight and coordination on all aspects of institutional controls at BPSOU.
3. The downstream-first approach to remedy creates a risk of recontamination of restored areas. Upstream areas including the BPSOU must be remedied before recontamination can happen.
4. Remedial action levels/remedial goals need to be reviewed against current standards and science.
5. Environmental justice must be served to the Butte community. Health impacts must not be concentrated among any segment of our community.

6. Cap design should be improved where caps are compromised.
7. The community needs certainty that Berkeley Pit water treatment remedy is ready for use when the Pit reaches the critical water level in 2023.
8. Remedial investigation of the Westside Soils Operable Unit must begin.
9. Unilateral Administrative Order and Remedy Work Plan guided work through 2013. The community needs to know what authority is driving the current work.
10. The Five Year Review Protectiveness Statement needs transparency. The conclusions in the Five Year Review must be current and not based on the expectation that someday all remedial goals will be met.

We look forward to release of the current Five Year Review.

Respectfully,

David Williams
President
CTEC Board of Directors

cc:
Board of Directors CTEC (via Email)
Julie DalSoglio, EPA
Sara Sparks, EPA
Daryl Reed, DEQ
Joel Chavez, DEQ
Pat Cunneen, NRDP
Doug Martin, NRDP
Matt Vincent, BSB
Jon Sesso, BSB

Silver Bow Creek/Butte Area National Priorities List (NPL) Site-wide Comments

1. The Parrott Tailings and other buried MSD waste should be removed.

CTEC has contended since our March 14, 2005 Position Paper and comments on the BPSOU Proposed Plan that the MSD buried mining waste and tailings must be removed. Public sentiment and State of Montana official position echo this opinion. Data and new studies since the 2010 Five Year Review have further substantiated this opinion.

1. MBMG (2010b, 2012) studies showed the middle alluvial aquifer is confined from much of the MSD subdrain capture system.
2. MBMG (2012) identified metal loading to Blacktail Creek between Oregon Ave and George St.
3. Parrott tailings water quality monitoring suggest a worsening of water quality in the plume and that leaching is active (MBMG 2010a, 2012).

The ROD needs to be modified to require removal of buried waste at the Metro Storm Drain (MSD) as outlined in the Butte Area One Final Restoration Plan prepared by the Butte Natural Resource Damage Restoration Council (BNRC). The remediation should be paid for by the responsible parties and not with State of Montana NRDP restoration funds which are for restoration and replacement of injured natural resources.

2. Storm runoff needs to meet water quality standards.

The BPSOU ROD pp 12-42 indicates that storm water BMPs shall be given 15 years to achieve surface water standards. Given the 2006 date of issuance for the ROD, surface water standards must be met by 2021. After this, retention and lime treatment of storm runoff is required by the ROD. CTEC considers lime treatment a last resort, given the costs, need for perpetual treatment, and uncertainty of responsibility and funding for perpetual maintenance and operation. Greater efforts to control and treat storm water using BMPs or retention/detention basins is needed immediately.

The most recent data publically available, Atlantic Richfield 2013 Wet Weather Compliance Ratio Charts show that during wet weather, runoff total recoverable copper concentrations are always exceeding and commonly up to 40 times the standards. Given this it is imperative that full efforts and funds be put into implementing storm water controls during this BMP cycle. The following needs to be considered in this Five Year Review:

1. Are issues with caps or is the waste left in place preventing attainment of storm water goals?
2. Are soil water metal salts accumulating during the summer and being flushed by storm events?
3. Are retention basins significantly more effective than hydrodynamic devices (HDDs) at treating storm water? If so then now is the time to construct additional retention/detention basins to eliminate storm flow metal loading to Silver Bow Creek.

3. The downstream-first approach to remedy creates a risk of recontamination of restored areas.

While voluntary and interim actions including those required by the 2011 Unilateral Administrative Order (UAO) such as storm water controls, waste capping, and groundwater capture and treatment have improved protection of human health and the environment in Butte, metals can still migrate downstream and recontaminate remediated reaches of SBC. The Stream Side Tailings (SST) OU is being remediated ahead of Butte Priority Soils, and the Westside Soils OUs in the headwaters is at the beginning of Superfund assessment and actions. The 5-Year Review is an opportunity to evaluate how individual OUs are progressing and how well NPL remedy is progressing as a whole. It is a chance to make sense of the patchwork of interim actions by targeting final remedy for the entire NPL site, ensuring that OU cleanup is properly prioritized so as to not recontaminate downstream areas.

The Five Year Review needs to include a section describing how the remedy is progressing site-wide as a whole, what contingencies are considering:

1. the vastly different schedules for remedy completion,
2. effects that slower cleanup upstream has on achieving remedial goals downstream,
3. potential for recontamination of remediated areas downstream.
4. evaluate if source controls and caps in the BPSOU are sufficient to withstand a 100-year storm event.

This site-wide progress section should contain a list of issues from the individual OUs and evaluate how to prioritize follow-up actions based on the severity of risks to humans and the environment and the potential for issues from one OU to affect remedy success at another OU.

4. Remedial action levels/remedial goals need to be reviewed against current standards and science.

EPA indicated at the October 2014 CTEC public meeting that solid media action levels have been reviewed. The Five Year Review needs to describe how action levels have been reviewed.

In 2012, Centers for Disease Control and Prevention (CDC) defined a new reference blood lead level of 5 micrograms per deciliter (µg/dL) to identify children with elevated blood lead levels. Risk assessments for the site have based exposure scenarios on the former level of concern of 10 µg/dL of lead in blood. If solid media action levels will not be changed by this current information, the Five Year Review needs to clearly articulate why and how public health is protected.

Since the last Five Year Review EPA issued an Explanation of Significant Differences (ESD) outlining new sampling and cleanup standards for residences. The Five year Review should require that funds are available so that RMAP can resample and remediate residential lawns that were sampled under the old protocol when requested by the land owner.

5. Environmental Justice.

Low-income residents may bear a disproportionate impact of waste left in place and require specific targeting for voluntary residential abatement because low-income households are concentrated in the heavily contaminated portions of the BPSOU and because these households are more likely to be renters relying on property owners to initiate residential sampling and abatement. The Five Year Review should specifically examine:

1. What provisions have been made to specifically reach out to low-income residents, residents who are not well connected to mainstream communication media, and citizens who are new to the area.
2. The potential for exposure to contaminated indoor dust by residents is high if their homes have not been assessed for contaminants and contaminated indoor dust is not removed.
3. Disproportionate exposure to toxins by low income citizens living in uptown Butte.
4. The challenges that low income citizens face in minimizing exposure to toxins given limited financial resources, reliance on landlords to invoke abatement, and run-down structures being prone to leaking toxic dust into living areas.

6. Cap design should be improved where caps are compromised.

The integrity of caps on waste left in place in Butte are important because they will likely be there for hundreds of years where the land is eventually developed, and in perpetuity for undeveloped areas. The 2010 Five Year Review indicated widespread issues with cap integrity. The current review should update progress made in the last five years.

If cap integrity remains a problem then the review should identify cap design methods which provide better protection and evaluate which are best applicable to the BPSOU. The review also needs to evaluate whether cap failure presents an unacceptable risk to human health which should be dealt with immediately under ROD authority or time critical removal action. The review should evaluate if funding is inadequate for Butte-Silver Bow to perform needed cap O&M.

A butte resident explained at CTEC's public meeting that soil adjacent to the Blacktail Creek Trail near California Ave shows copper accumulation at the surface. This area is overlying the Northside Tailings (EPA 2004) and the blue copper on the surface is clearly seen on recent aerial photography (Google Earth). The public is concerned about human exposure, especially children, to contaminated surface soils such as these. The soils also show a significant problem with the waste left in place decision for the Metro Storm Drain buried wastes in that the buried metal waste can wick to the surface, leaving metal precipitates which humans are exposed to and which can be washed away during storm events.

The 5-Year Review should also evaluate the effects that waste left in place has on water quality if the integrity of caps are compromised. Analytical testing of surface water runoff and groundwater leaching of contaminants from capped areas should be recommended in the 5-Year Review and provisions made if exposure to contaminated water can occur or if contaminants are determined to be mobilizing and impairing surface water quality.

7. The community needs certainty that Berkeley Pit water treatment remedy is ready for use when the Pit reaches the critical water level in 2023.
The Horseshoe Bend Water Treatment Plant has seen only minimal shakedown testing. A rigorous and long term test of the treatment capability is needed to ensure that water quality standards will be met when the plant is operating. The Pit is expected to reach the critical water level in 2023, shortly after the next 2020 Five Year Review. Additional testing of the plant must be performed during this interim so that any problems can be identified in the next Five Year Review and so that solutions are up and running significantly prior to the Pit reaching the critical water level.

There is also concern that discharge from the plant will cause gypsum scaling of Silver Bow Creek. The public has been told that EPA and Montana Resources are working on review of scaling question but has not been informed how or when that is being evaluated and the results. The Five Year Review should specifically address what is being done and provide a schedule for the public to have the results of this review prior to the next Five Year Review.

8. Remedial investigation of the Westside Soils Operable Unit must begin.
The 2010 Five Year Review indicated that remedial investigation of the Westside Soils OU would begin in 2013. This OU is a popular recreation area in Butte. The public is concerned that the area has not been evaluated for contaminants and risks to public health. The OU also drains to Silver Bow Creek and may contribute contaminants which cause water quality standards to be exceeded or present a risk of recontamination of the restored creek. Work on the OU must begin in next year. The Five Year Review should identify this as a goal and present a timeline for remedial investigation.

9. 2011 Unilateral Administrative Order and Remedy Work Plan.
The UAO Partial Remedy Implementation Work Plan guided work through 2013. The community needs to know what requirements and schedule is driving the current and future work at the site.

10. The Five Year Review Protectiveness Statement needs transparency.
Disconnect between the data presented and conclusions made in previous Five Year Reviews have not helped the public to follow statements regarding how the actions completed to date indicate that long-term protectiveness is achieved. The connection between the data and conclusions needs to be made clear. Previous Five Year Reviews have also relied on the expectation that someday all goals will be met and when that occurs that the remedy will be protective. The Five Year Review needs to evaluate the current status of the remedy and identify the risks to the public and the environment that currently exists.

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CITIZENS FOR LABOR AND ENVIRONMENTAL JUSTICE

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5/29/2015

Nikia Greene, RPM
U.S. Environmental Protection Agency, Region 8
Helena Office, Federal Building
10 West 15th Street, Suite 3200
Helena, MT 59626

Re: Five Year Review – Butte Priority Soils – Lower Area One Groundwater

Dear Nikia,

The selected remedy for groundwater promulgated in the BPSOU ROD [1] within what was termed the "Technical Impracticability (TI) Zone" was based on a model of the alluvial aquifer which has been subsequently shown to be incorrect. This area includes the Metro Storm Drain (MSD), a key component in the selected remedy, as well as wastes left in place, about 1.4 million cubic yards of contaminated tailings including the Parrott Tailings, the North Side Tailings and the Diggings East.

The ROD describes the underlying aquifer as a surface layer of reworked fluvial sediments and debris including slag and waste rock down to about 25 feet, a. shallow coarse permeable layer down to about 70 feet deep and a relatively homogeneous layer of poorly sorted rocks sands and clays down to about 250 feet. Further, the groundwater movement in the upper MSD is said to be influenced primarily by the groundwater divide characteristic creating a vertical gradient for groundwater movement. Resulting calculations for contaminant movement indicated that the Parrott Tailings would not affect the middle reaches of the area for at least a century. It was also shown that the groundwater in the MSD area ultimately expresses as surface water near the confluence with Blacktail Creek.

The North Side Tailings and Diggings East Tailings were shown to be the major contributors to shallow groundwater contamination in the MSD area. A subdrain was installed in the MSD channel to collect contaminated groundwater which would ultimately be treated in a lagoon system in Lower Area One (LAO).

Studies conducted by the Montana Bureau of Mines and Geology subsequently showed that the alluvial aquifer was structured differently than assumed in the Rod and that it consisted of three differentiable regions, an Upper, Middle and Lower alluvial aquifer. The Middle layer was found to be contaminated by the Parrott Tailings, highly transmissible and isolated from the MSD sub drain. Rather than migrating vertically, the contaminated groundwater from the Parrott Tailings is moving horizontally parallel to the MSD subdrain. The 2010 MBMG report shows hydraulic conductivity is one to two orders of magnitude larger than that of the 2004 EPA data used in the ROD[2]. The direction of this plume is not well known and could overwhelm or entirely miss the capture system in place, which was designed on an entirely different picture of groundwater movement.

Once data showed that the operational model for the proposed remedy was incorrect, a responsible approach would have been to recognize that the wastes left in place actually satisfied the definition of Principal Threat Wastes, in that they are surface soil or subsurface soil containing high concentrations of contaminants of concern that are potentially mobile due to subsurface transport[3].

The State of Montana has responded to the situation under the 2008 Montana v. ARCO Consent Decree to propose removal of the wastes left in place as part of the Conceptual Restoration Plan for Butte Area One[4]. In a recent letter, the official EPA position was stated that it is "supportive of the State's decision and is working with the State to fund and implement the State's restoration plan in coordination with EPA's Superfund remedial actions" [5]. While CLEJ applauds this attitude, it still feels that the ROD should be amended to include removal of the threat wastes from posing a serious challenge to the ill-conceived remedy in place and the already remediated lower Silver Bow Creek.

Next week CLEJ will send additional comments on other aspects of the Five Year Review.

Sincerely,

S/Mary Kay Craig and Steven F. McGrath for CLEJ

cc: Citizens Technical Environmental Committee, Butte
Rob Collins, Montana Dept. of Justice, Natural Resources Damage Program, Helena
Daryl Reed, Project Officer, Montana Department of Environmental Quality, Helena
Erik Nyland, Director, Butte Office, Senator Jon Tester

REFERENCES

1. U.S. Environmental Protection Agency, 2006, Record of Decision, Butte Priority Soils Operable Unit, Silver Bow Creek/Butte Area One Superfund Site, Butte, Montana
2. Tucci, N.J., and Icopini, G.A., 2010, Aquifer test evaluation conducted on the middle gravel unit of the alluvial aquifer in the Upper Metro Storm Drain area, Butte, Montana: Montana Bureau of Mines and Geology Open-File Report 592
3. U.S. Environmental Protection Agency, 1991, A Guide to Principal Threat and Low Level Threat Wastes, A Quick Reference Fact Sheet
4. Montana Department of Justice, natural Resource Damage Program, 2014, Draft Conceptual Restoration Plan Butte Area One
5. Communication from D. Henry Elsen, Attorney, Legal Enforcement Division, May 18, 2015 to Mary Kay Craig of Butte Citizens for Labor and Environmental Justice

George
Grant
Chapter

PO Box 563
Butte, MT 59703

June 2, 2015

Nikia Greene, RPM
U.S. Environmental Protection Agency, Region 8
Helena Office, Federal Building
10 West 15th Street, Suite 3200
Helena, MT 59626

RE: EPA Five Year Review: Butte Priority Soils, Lower Area One Groundwater

Dear Mr. Greene:

On behalf of the George Grant Chapter of Trout Unlimited I would like to take this opportunity to comment on the remedy for treating groundwater on Butte Priority Soils, Lower Area One, specifically the Northside Tailings, Diggings East Tailings and the Parrott Tailings.

It appears that the information for basing the current Record of Decision for treating the groundwater in this area, leaving the mine wastes in place, has subsequently been found to be inaccurate and that the prescribed treatment will not be effective in keeping water quality in Silver Bow Creek and subsequently the Clark Fork River from being continually degraded.

It's our understanding that data collected through recent studies conducted by the Montana Bureau of Mines and Geology shows that the original operational model for the proposed remedy was incorrect and that leaving the wastes in place, as outlined in the current ROD, would very likely not be an effective remedy for improved water quality.

While there is little doubt that much of the restoration effort in Silver Bow Creek and the upper Clark Fork River are showing remarkable improvements for fish, we believe that the recent studies showing leaving mine waste in place at the headwaters puts these restoration efforts at grave risk.

We understand that the State of Montana has recently responded to this new information and has proposed the removal of these wastes. The George Grant Chapter of Trout Unlimited formally requests that EPA amend the Record of Decision to include removal of the wastes to insure the future health of Silver Bow Creek and the upper Clark Fork River.

Thank you for your serious consideration of this request.

Sincerely,

Rich Day, President

June 24, 2015

Nikia Greene, RPM
U.S. Environmental Protection Agency, Region 8
Helena Office, Federal Building
10 West 15th Street, Suite 3200
Helena, MT 59626

Dear Nikia:

Project Green, Butte Citizens Technical Environmental Committee (CTEC), Citizens for Labor and Environmental Justice (CLEJ) and other concerned individuals/groups are interested in improving the quality of life for citizens of Butte-Silver Bow and Anaconda-Deer Lodge counties and the Clark Fork Valley watershed as a whole. This coalition of individuals and groups has developed the following vision statement:

> *Clean the Silver Bow Creek corridor to restore Silver Bow Creek and create a greenway for public enjoyment. To accomplish this requires the removal of the Parrot Tailings, Northside Tailings and Diggings East. Removal of the tailings and restoration of the creek will safeguard protection of superfund cleanup actions downstream to Missoula and Columbia River Basin.*

Testing of soils and ground water over the past several years shows each of these areas continues to be a source of contamination. We are concerned that if the soils from the above locations are left in place, the contamination will continue to move downstream and negatively affect stream remediation and restoration work to Missoula. The tailings areas are in the heart of Butte and the potential negative impact to our citizens is too big to ignore.

Our group has reviewed the technical information and conceptual design developed by BNRC and the NRDP to develop a contamination free greenway from Texas Avenue to Montana Street. The greenway area will provide an opportunity to expand the Greenway Trail and replace lost recreation resources as well as provide economic growth opportunities for the community.

Removing the contaminated soils along this corridor (Parrot Tailings, Northside Tailings, and Diggings East Tailings) will be consistent with other cleanup activities in Butte and areas downstream to Missoula; and safeguard the remedy already completed and the millions of dollars already spent in the basin. It will create a free-flowing creek and will enable a storm collection system to be designed that can accommodate contamination and storm water concerns, and we urge EPA to work with Butte-Silver Bow to accomplish this goal.

We urge EPA to work with Butte-Silver Bow, Atlantic Richfield and the State of Montana to accomplish this goal.

Thank you for the opportunity to comment.

Sincerely,

Northey Tretheway
PROJECT GREEN

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