

U.S. Environmental Protection Agency

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

Volume 5: Rocker Timber Framing and Treating Plant Operable Unit

June 2011



Final

REMEDIAL ACTION CONTRACT
FOR REMEDIAL, ENFORCEMENT OVERSIGHT, AND NON-TIME-
CRITICAL REMOVAL ACTIVITIES AT SITES OF RELEASE OR
THREATENED RELEASE OF HAZARDOUS SUBSTANCES
IN EPA REGION 8

U. S. EPA CONTRACT NO. EP-W-05-049

FINAL

Third Five-Year Review for the
Silver Bow Creek/Butte Area NPL Site
Butte, Montana

Volume 5: Rocker Timber Framing and Treating Plant Operable Unit

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Acronyms

ARAR	Applicable or Relevant and Appropriate Requirements
BA&P	Butte, Anaconda, & Pacific
BSBC	Butte/Silver Bow County
CD	consent decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Act Information System
CFR	Code of Federal Regulations
CGWA	controlled groundwater area
CTEC	Citizens Technical Environmental Committee
cy	cubic yard
DEQ	Montana Department of Environmental Quality
DNRC	Department of Natural Resources and Conservation
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FR	Federal Register
HHRA	human health risk assessment
IC	institutional control
LTMO	long-term monitoring optimization
MCL	maximum contaminant level
MBMG	Montana Bureau of Mines and Geology
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NCP	National Contingency Plan
NPL	National Priorities List
O&M	operations and maintenance
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
ppm	parts per million
RAO	Remedial Action Objectives
Rocker	Rocker Timber Framing and Treating Plant
ROD	Record of Decision
RPM	Remedial Program Manager
Site	Silver Bow Creek/Butte Area Superfund Site
SSTOU	Stream Side Tailings Operable Unit
TCLP	toxicity characteristic leaching procedure
µg/L	micrograms per liter

Section 1

Introduction

The U.S. Environmental Protection Agency (EPA) Region 8 has conducted a five-year review of the response actions implemented at the Silver Bow Creek/Butte Area Superfund Site (Site), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Information System (CERCLIS) ID: MTD980502777, in Silver Bow and Deer Lodge Counties, Montana. This review covers activities conducted from January 2005 through December 2009. This volume of the five-year review report focuses on the Rocker Timber Framing and Treating Plant (Rocker) Operable Unit (OU); separate volumes have been prepared for the other Silver Bow Creek/Butte Area Site OUs. This is the third five-year review for the Site and this is the second five-year review for the Rocker OU (OU07). The purpose of this volume of the five-year review report is to determine whether the remedy components in place at the Rocker OU are protective of human health and the environment. The methods, findings, and conclusions of this review are documented herein. In addition, this five-year review report identifies deficiencies found during the review, and identifies recommendations to address them. The Rocker OU is one of seven active remedial OUs comprising the Site.

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Section 2

Site Chronology

Table 2-1 presents important site events and relevant dates for the Rocker OU. The identified events are selective, not comprehensive.

Table 2-1
Rocker OU Chronology of Events

Event	Operable Unit	Date
Placer gold discovered in Silver Bow Creek	All	1864
Large scale underground mining in Butte	03/08	1875 - 1955
Open pit mining at Berkeley Pit	03	1955 - 1982
Major smelting period in Butte	03/08	1879 - 1900
Rocker Timber Framing and Treatment Plant constructed	07	1909
Rocker Timber Framing and Treatment Plant closed	07	ca. 1957
Discovery of mining-related contamination along Silver Creek between Butte and Warm Springs, Montana	01	9/1/1979
Hazard Ranking System Package Completed	All	12/1/1982
Silver Bow Creek Site proposed to the National Priorities List (NPL)	All	12/30/1982
Silver Bow Creek Site (Original Portion) Phase 1 Remedial Investigation Final Report	All	01/1987
State of Montana directed cleanup of 1,000 cubic yards of contaminated soil at the Rocker OU	07	1989
Technical investigations at Rocker OU	07	1989 - 1995
Baseline Human Health Evaluation for the Rocker OU completed	07	2/13/1995
Remedial Investigation/Feasibility Studies completed	07	1995
Record of Decision (ROD) for Rocker OU	07	12/22/1995
Unilateral Administrative Order Rocker OU (Remedial Design/Remedial Action)	07	3/29/1996
Remedy implementation and completion	07	1997
Remedy Operations and Maintenance	07	1998 - present
Consent Decree for Rocker OU	07	11/07/2000
Supplemental treatments in support of Streamside Tailings OU construction activities	07	2001 - 2002
Initial Five-Year Review Silver Bow Creek/Butte Area Site	All	3/23/2000
Second Five-Year Review Silver Bow Creek/Butte Area Site	All	9/30/2005

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Section 3

Background

3.1 Location and Setting

The Rocker OU covers approximately 16 acres and is located to the south of U.S. Interstate 15/90 near Rocker, Montana, approximately three miles west of Butte, in Silver Bow County (Figure 3-1). The site is bounded on the north by Silver Bow Creek and on the south by railroad lines and sidings owned by the Butte, Anaconda, & Pacific (BA&P) Railway Company (formerly Rarus Railway). The BA&P Railway has two small storage sheds at the western end of the OU and a historic office building east of the repository remains on site. The small community of Fredericksburg lies to the south of the site, while the community of Rocker is just north of Silver Bow Creek. The eastern, western, and northern boundaries of the Rocker OU adjoin the Stream Side Tailings OU (SSTOU).

3.2 Physical Characteristics

Before the remedial action was implemented, the topography of the site was variable as a result of extensive fill that had been brought in to facilitate the industrial development of the site. Prior to development, Silver Bow Creek probably traversed the site just south of the creek's present location, with gently sloping stream terraces on either side. Fill for railroad corridors now form the southern boundary, while the eastern boundary is located along a historic stream diversion. In addition, the area where wood treating processes occurred was filled approximately 15 to 18 feet deep, probably with waste rock and cinders from the nearby mining operations. A small, poorly drained depression in the east central portion of the site was probably representative of the original land surface in this area.

Post remediation, a repository of treated materials was contoured to promote proper surface drainage, leaving a knoll approximately 15 feet high which was revegetated using drought-resistant grasses. The area of treated soils was fenced to limit access and trespassing. Riprap was installed along a portion of the north side of the excavation footprint to protect against erosion during flood events in Silver Bow Creek.

3.3 Land and Resource Use

The total population of Silver Bow County in 2000 was 34,606 of which the large majority resides in the city of Butte. The approximate population of Rocker is 200. Most of Silver Bow County is forest and range land. The community of Rocker is zoned by Silver Bow County for residential, commercial, and agricultural land uses. The Rocker OU land use is limited currently to industrial and railroad uses with some recreational use on the Greenway trail along Silver Bow Creek.

Property within and near the Rocker OU is owned by ARCO, Rarus Railroad, Butte-Silver Bow County, and various private and corporate entities. The three pieces of property constituting the Rocker repository are owned by ARCO and Rarus Railroad.

These are currently zoned for commercial/industrial purposes and institutional controls (ICs) exclude residential development. Land use restrictions are in place to prevent interference with or adverse affects to the integrity or protectiveness of the remedial measures implemented pursuant to the consent decree (CD). These restrictions exclude use of any portion of the OU for residential purposes and ban the use of groundwater.

Recent changes in land use in the vicinity include the construction of a trail for recreational use adjacent to Silver Bow Creek passing by the Rocker OU. Such a trail could make access to the site easier.

3.4 History of Contamination

The Rocker Timber Framing and Treating Plant was constructed in 1909 and operated until the plant was closed in approximately 1957. The Anaconda Company, predecessor in interest to the Atlantic Richfield Company, owned and operated the site. Initially, the facility treated mining timbers with a creosote solution. Subsequently, the facility began using arsenic trioxide solutions for treatment, and this formulation became the primary treatment process up to the final days of plant operation.

During the approximate 48 year history of plant operation, spilled process materials (arsenic trioxide powder), treated wood chip residues, and dripped or leaked process solutions (creosote and caustic heated arsenic brines) have resulted in contaminated soils throughout the plant site and significant groundwater contamination. Rocker wood treating wastes were also mixed with contaminated tailings and other mining waste washed downstream to Rocker from mining/smelting facilities in Butte.

Arsenic contamination of the soils and groundwater at the Rocker site is the primary contaminant of concern. Arsenic trioxide used in the treatment process at the Rocker OU was obtained from the Anaconda Smelter. Since its solubility in water is low, the arsenic trioxide was dissolved into a heated, and very high pH (13.4) solution of caustic soda and water. The resultant mixture, containing about 6% dissolved arsenic as arsenic (III), was used to treat wood timbers in a retort. Environmental contamination at the Rocker OU from the arsenical wood treating compounds is significant as a result of incidental spills of arsenic trioxide powder and of the saturated arsenic solution, onsite disposal of debris from the retort, and treatment solution that dripped or washed off the treated timbers while they dried or awaited shipment. Contamination was found in the surface soils and at depth as well as in the groundwater. Arsenic and metals contamination from mine waste was also present at various locations at the Rocker OU.

3.5 Regulatory History Summary

EPA is the lead agency on the Rocker OU and Montana Department of Environmental Quality (DEQ) is the support agency. The Rocker OU is part of the original Silver Bow Creek Superfund site that was listed on the NPL in 1983. In 1989, the State of Montana

directed Atlantic Richfield to remove contaminated soils and debris with concentrations exceeding 10,000 milligrams per kilogram (mg/kg) arsenic. Approximately 1,000 cubic yards (cy) of contaminated material were removed to a licensed disposal facility. Areas involved in the removal action were subsequently covered with approximately one foot of "clean" fill material from a nearby off-site area. Nevertheless, other materials exceeding 10,000 mg/kg arsenic were identified at three locations remaining on the site. Between 1989 and 1995, numerous technical investigations were conducted at the site to characterize the nature and extent of soil and groundwater contamination. These investigations culminated with the final remedial investigation report in March 1995 (ARCO 1995a) and the final feasibility study in July 1995 (ARCO 1995b).

A Record of Decision (ROD) for the Rocker OU was signed in December 1995 (EPA 1995). EPA initially ordered the implementation of the ROD via a section 106 unilateral administrative order. In November 2000, EPA and Atlantic Richfield entered into a CD for implementation of the Rocker OU ROD.

3.6 Basis for Taking Action

In the 1995 ROD, EPA concluded that contaminated soils and groundwater at the Rocker site may pose an imminent and substantial endangerment to workers, trespassers, and future potential residents at or near the Rocker site. This conclusion provided the rationale for requiring response actions at the Rocker OU.

For surface soils, greater 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 PAHs) was determined to pose a cancer or non-cancer risk outside 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. No other contaminant detected at the Rocker OU groundwater posed an unacceptable excess cancer risk.

Ecological risk near the Rocker OU was evaluated as part of the larger Streamside Tailings OU. The 1995 Rocker OU ROD states that "there is no evidence to indicate that groundwater and/or soils from the Rocker OU are contributing arsenic or PAH concentrations to the streambed sediments or surface water in Silver Bow Creek."

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Section 4

Remedial Actions

Summaries of the remedial action objectives, performance standards, remedial actions selected, their implementation, and operations and maintenance (O&M) activities for the Rocker OUs as described in the *Record of Decision, Rocker Timber Framing and Treatment Plant Operable Unit, Silver Bow Creek Butte Area NPL Site, Butte, Montana* are presented below (EPA 1995).

4.1 Remedial Action Objectives

EPA and the State's overall remedial action objectives for the Rocker OU were (and still are) to reduce the current and potential human exposure to contaminated soil and groundwater. Consistent with this overall objective, the Rocker remedy was developed to meet the specific remedial action objectives listed below.

4.1.1 Groundwater

The Remedial Action Objectives (RAOs) for groundwater, as stated in the ROD, are as follows:

- Attain groundwater standards (applicable or relevant and appropriate requirements [ARARs]) or other risk-based levels for inorganic (primarily arsenic) and organic contaminants of concern for groundwater underlying and adjacent to the site, and protect human health during and after cleanup. The State ARAR for arsenic in groundwater (at the time the ROD was prepared) was 18 micrograms per liter ($\mu\text{g}/\text{L}$). Owing to the nature of the groundwater contamination, the aquifers of preferred use, and the quality/quantity of water available from water producing zones with the Rocker site, this RAO is especially important in order to prevent further contamination of the two lower aquifers.

The State groundwater standard is also applicable to the shallow aquifer, which is classified as a potential domestic water supply by the State. The shallow alluvial aquifer yields significantly less water than other water bearing zones, is generally not developed as a water resource in this area and has a lower quality than the deeper water sources. Therefore, reducing contaminant concentrations in the arsenic plume and the shallow alluvial aquifer to regulatory standards is considered a secondary objective.

- 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 degradation of groundwater underlying and adjacent to the site.
- Prevent migration of contaminated site groundwater from areas where levels exceed groundwater standards into regions where levels are within groundwater standards.

4.1.2 Soils

The RAOs for soils, as stated in the ROD, are as follows:

- Prevent human exposure to inorganic (primarily arsenic) and organic contaminants in soils which exceed risk-based or other relevant levels. Based on the Rocker baseline human health evaluation (CH₂M-Hill 1995) for the occupational and trespasser exposure scenarios, the EPA, in consultation with the State has determined that soils exceeding the risk-based soil concentration of 380 mg/kg arsenic (which represents a one in 10,000 excess cancer risk to workers or trespassers) should be remediated to break this potential pathway.
- Prevent migration of contaminants from soils to underlying and adjacent offsite groundwater, such that it would fail to comply with groundwater ARARs or other risk-based levels.

4.2 Performance Standards

The performance standard for soils and groundwater, as stated in the ROD, are as follows:

- For groundwater, clean up levels are based on the state's standards for Class I and Class II groundwater, which for arsenic is 18 µg/L.
- Excavation of soils exceeding 1,000 mg/kg arsenic to a depth of 18 inches (outside of areas remediated during the SSTOU remedy, including the rail lines, or the Rocker "source material" excavation), followed by replacement with a similar volume of uncontaminated soils suitable as a plant growth medium, followed by revegetation. Excavated materials will be disaggregated, treated with iron, and returned to an onsite repository above the water table in areas where groundwater has been treated with iron.
- Cover surface soils where arsenic concentrations exceed 380 mg/kg (outside of areas remediated during the SSTOU remedy, including the rail lines), with a minimum of 18 inches of uncontaminated soils suitable as a plant growth medium, followed by revegetation.
- Excavated soils will be tested on a routine basis, acceptable to the Agencies, to document that excavation and treatment will decrease arsenic mobility to levels below 5 milligrams per liter (mg/L) arsenic, using EPA's toxicity characteristic leaching procedure (TCLP).
- Groundwater in all aquifers must meet the 18 µg/L arsenic standard and all other standards for site constituents at appropriate points of compliance determined by the Agencies during remedial design.

- A sampling and analysis program was conducted during remedial design to provide better definition of "source materials" requiring excavation and treatment. Following the sampling and analysis program, excavation and treatment of "source materials", expected to continue releasing high concentrations of arsenic to groundwater, was accomplished. For areas where "source materials" were excavated, groundwater was treated with iron and iron/arsenic concentrations were monitored so that iron concentrations can be maintained at optimum levels to attenuate arsenic in groundwater.
- In the event that groundwater or surface water monitoring outside of the current area of arsenic groundwater contamination (above 18 µg/L) reveals that the arsenic plume has advanced laterally or with depth, the Agencies will evaluate, select, and determine what appropriate plume containment measures must be implemented.

4.3 Major Components of the Selected Remedy

The remedy for the Rocker OU is summarized as follows:

- Excavate and treat contaminated soils above 1,000 mg/kg arsenic.
- Dispose of treated soils in an on-site repository.
- Cover arsenic-contaminated soils ranging from 380 to 1,000 mg/kg remaining on site with 18 inches of clean soil and revegetate.
- Treat contaminated groundwater and rely on natural attenuation to achieve cleanup standards.
- Construct an expanded capacity water supply system for the community.
- Monitor and demonstrate that the requirements of the ROD have been met. Return the groundwater resource to the community, and provide operation and maintenance of the repository and soil covers.
- Implement ICs to ensure non-residential use of the OU, and prevent domestic groundwater use until cleanup is achieved.

The ROD for the Rocker OU recognized that achieving the arsenic concentrations acceptable for drinking water within the area of the arsenic plume was a goal that could take several years to achieve. Further development of groundwater resources was restricted (via a well ban) to protect human health by preventing direct consumption via wells and to prevent migration of the contaminated groundwater into the deeper, high quality groundwater systems in the area by the development of wells in the area surrounding the plume. The ROD stated that when it can be verified that the arsenic plume has been controlled sufficiently to prevent the threat of further migration, the restrictions on groundwater development will be lifted for some of the aquifers.

4.4 Remedy Implementation

Groundwater and soil treatment was initiated and completed in the period from April through October 1997. Soils contaminated with arsenic above 1,000 ppm were excavated to a depth of five feet below the seasonally low groundwater level and treated in a pug mill with iron sulfate and lime amendments. Soil samples were collected at 10,000 ton intervals and analyzed using TCLP methods to verify the effectiveness of the treatment process. After treatment, the average value of TCLP results for the entire project was below 0.30 mg/L leachable arsenic (well below the 5 mg/L requirement for a hazardous waste).

The remedy was implemented over a little more than two acres. The total amount of contaminated soils removed and treated (both above and below the groundwater table) was estimated at 48,000 cy. Final disposition of the treated soil materials was in an on-site repository.

The Rocker OU overlies three aquifers that are hydraulically connected to each other. Of the three, only the shallow alluvial aquifer was determined to be contaminated with arsenic. Neither the deep alluvial aquifer or the underlying Tertiary aquifer were found to be impacted by the arsenic contamination at the site. There were concerns about the hydraulic connections between the contaminated shallow alluvial aquifer and the underlying aquifers, and about potential migration of the contamination into the deeper aquifer systems.

Groundwater contaminated with arsenic above 1,000 µg/L was treated in open excavation trenches using iron sulfate, lime, and potassium permanganate amendments. Water samples were collected before and after treatment to verify the success of the operation.

The Montana Department of Natural Resources and Conservation (DNRC) instituted a groundwater control area (well ban) in 1997 to protect the aquifers from potential contamination (in addition to protecting people from drilling into and drinking contaminated groundwater). The ban restricted the development of new wells in the shallow alluvial, deep alluvial and tertiary sediment aquifers within a ¼ -mile radius of the Rocker site.

The ROD called for an alternate water supply for the Rocker community to ensure that further groundwater use did not occur. Concurrent with the cleanup at the Rocker site, approximately 2.5 miles of new water main was constructed from the existing Butte-Silver Bow County water supply line to the community of Rocker. A 300,000-gallon water supply reservoir was also constructed to provide constant flows during periods of peak water usage. Thus, the alternative water supply is in place and functioning.

The site is fenced so that access is controlled. Atlantic Richfield, the site owner, implemented deed restrictions on the property to prevent future uses inconsistent with the cleanup levels for soils at the site.

4.4.1 Implementation and Subsequent Changes to Remedy

During remedy implementation, two areas of contamination were identified that had not been included in the remedy design. Groundwater contamination on the south side of the site within the Rocker rail siding was treated with ferrous iron through a groundwater injection trench. An infiltration gallery was left in place in the event that groundwater needs to be re-dosed in this area. A second area of soil contamination was identified in the floodplain of Silver Bow Creek. These materials were excavated, treated, and stored in the on-site repository.

4.5 Remedy Operations and Maintenance

Quarterly O&M activities began in 1998. The specific objectives of the Rocker OU quarterly 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 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

More than 40 monitoring wells were installed during the remedial investigations at the Rocker OU (Figure 4-1). During remedy implementation, a total of seven wells were constructed within the remediation footprint as treated source materials were backfilled into excavated areas; thus, those wells (RH-60 through RH-66) were designated as interior “gravel wells” because their screened intervals were within the treated groundwater that was backfilled with clean gravel. The groundwater monitoring network also includes exterior and contingency (i.e., point-of-compliance) wells screened in each of the three aquifer zones. The current network monitoring groundwater quality consists of 34 wells with other site wells used to obtain water level information.

In general, the same tasks are performed during each quarterly sampling event. On the first day of an event, the water level in all site monitoring wells and staff gages in Silver Bow Creek are measured. Subsequently, the three private wells and 31 monitoring wells are sampled. Analytical parameters include 12 dissolved metals, 3 anions, and total dissolved solids. Field parameters measured include temperature, pH, conductivity, redox potential, and dissolved oxygen. Field parameters are also measured in Silver Bow Creek once during each event. Contingency wells located

outside the arsenic plume are used to monitor compliance and to determine if and when it may be appropriate, using statistical methodologies, to initiate contingency remedy actions. Provisions within statistical evaluation and implementation plan are designed to objectively identify any expansion of the spatial distribution of the arsenic groundwater plume.

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

Section 5

Progress Since Last Review

This section discusses the performance of the remedies at the Rocker OU.

5.1 Previous Statement on Protectiveness

From the second five-year review in 2005, the following statement was made regarding the protectiveness of the Rocker remedy:

The original remedy is presently protective of human health and the environment. Most remedial objectives have been attained, such as reduction in plume concentrations and protection of uncontaminated aquifers. EPA will continue to monitor the site and, if warranted, may invoke additional work or contingency measures to meet cleanup standards in groundwater and insure that the arsenic plume does not migrate. EPA certifies that the remedy for this operable unit remains protective of human health and the environment because of the presence of the alternative water supply and the institutional controls which prevent contaminated groundwater use. However, ongoing monitoring, continued implementation of institutional controls, and O&M activities are required to maintain protectiveness.

5.2 Previous Follow-Up Actions

Soils and groundwater at the Rocker OU were remediated in 1997, yet arsenic concentrations in groundwater rebounded to above 10,000 µg/L in certain wells, such as RH-62 and RH-65 below the repository. At the time the Consent Decree was prepared in fall of 2000, it was known that construction activities in the adjacent SSTOU could impact groundwater conditions at the Rocker OU and would change the location, elevation, and gradient of Silver Bow Creek in the area of the Rocker OU. These construction activities and the rebound in arsenic concentrations at the Rocker site prompted the development of a supplemental treatment plan to be implemented prior to and contemporaneous with SSTOU construction activities adjacent to the Rocker OU. The July 2000 *Streamside Tailings Operable Unit Construction – Treatment Sampling and Analysis Plan* (AERL 2000) contained in Appendix G of the CD described a two-phase strategy to determine groundwater hydraulic parameters and develop an in-situ zone to reduce arsenic concentrations.

The objectives of the supplemental treatment were to reduce arsenic concentrations at the interior well locations, determine groundwater flow characteristics (e.g., by conducting tracer tests), and to determine the effects of reagent delivery. In September 2001, alternating deliveries of potassium permanganate and ferrous sulfate were delivered into the gravel zone. Weekly sampling to assess the results of reagent delivery were conducted until February 2002; however, alteration of the groundwater flow patterns by SSTOU remedial activities made drawing conclusions about treatment effectiveness difficult. A follow-on treatment was conducted in the latter part of 2002 with more stable groundwater conditions. The results in both series of

tests indicated temporary reductions in arsenic concentrations of more than 50 percent in wells RH-62 and RH-65.

As summarized in Table 5-1, quarterly monitoring activities are the only significant activity conducted at the site since the previous five-year review in 2005. Annual qualitative monitoring inspections and evaluations of general site conditions have also been conducted at the site. No additional remedy adjustments (e.g., chemical dosing) have occurred.

Table 5-1
Actions Taken Since the Last Five-Year Review

Issues from Previous Review	Recommendations/ Follow-Up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Rebound of arsenic concentrations below repository is greater than expected.	Atlantic Richfield will continue quarterly groundwater sampling and O&M activities so that any changes in site conditions will be detected.	Atlantic Richfield	Ongoing	Quarterly sampling has continued through this five-year review report period. Data are evaluated in Section 6.	Ongoing
Rebound of arsenic concentrations below repository is greater than expected.	EPA to evaluate the protectiveness and continuation of the 1/4-mile radius well ban.	EPA	May 2011. See report in Appendix D.	EPA will require action described in report.	Ongoing

Section 6

Five-Year Review Evaluation

The five-year review team was lead by Roger Hoogerheide, an EPA Remedial Project Manager (RPM), and included EPA and state of Montana project managers of the OUs covered in the review, and technical staff from EPA's contractor, CDM, with expertise in areas of environmental engineering, hydrogeology, geochemistry, risk assessment, and community involvement.

The review was initiated in October 2009 and included the following components:

- Community notification and involvement
- Local interviews
- Document review
- Data review
- Institutional controls review
- Site Inspection

The schedule for review extended through March 2011.

6.1 Community Notification and Involvement

Display ads were placed in the local papers (the Montana Standard and the Butte Weekly). The first ad announced the start of the five-year review process and ran in the Butte Weekly and the Montana Standard on September 30, 2009.

The agencies participated in three public meetings hosted by the Citizens Technical Environmental Committee (CTEC) regarding the five-year review process. The meetings were held on November 17, 2009, February 24, 2010, and March 3, 2010.

These advertisements and details of the public meetings are summarized in the community involvement and interviews memorandum included in Appendix A of Volume 1 of this five-year review report.

EPA released a draft of the five-year review report for public review and comment from December 12, 2010 through January 31, 2011. A public meeting was held on January 11, 2011. Comments received on the Rocker OU are included in Appendix C.

6.2 Local Interviews

Interviews were conducted from January through March 2010 with several groups of people which included members of the general public, site neighbors, members of special interest groups such as the Citizen Action Group and Technical Action Committees, representatives of local government, and oversight personnel with direct

knowledge of the project. The final list of interviewees included 94 individuals. Considering the interview questions were fairly broad in nature and were not specific to any particular OU, the responses have been summarized separately in the community involvement and interviews memorandum (Appendix A of Volume 1).

6.3 Document Review

A summary list of decision and data documents reviewed in preparation for the Rocker OU five-year review includes:

- February 1995. Baseline Human Health Evaluation for the Rocker Timber Framing and Treating Plant Operable Unit, Silver Bow Creek/Butte Area (Original Portion) Superfund Site, Rocker, Montana (CH₂M-Hill 1995).
- December 1995. Record of Decision, Rocker Timber Framing and Treatment Plant Operable Unit, Silver Bow Creek Butte Area NPL Site, Butte, Montana (EPA 1995).
- July 2000. Silver Bow Creek/Butte Area NPL Site, Rocker Timber Framing and Treating Plant Operable Unit, Operations and Maintenance Plan (ARCO 2000).
- September 2005. Second Five-Year Review Report for Silver Bow Creek/Butte Area Superfund Site (EPA 2005).
- April 2006. Silver Bow Creek/Butte Area NPL Site, Rocker Timber Framing and Treating Plant Operable Unit, 2005 Annual Monitoring Report (ARCO 2006).
- April 2007. Silver Bow Creek/Butte Area NPL Site, Rocker Timber Framing and Treating Plant Operable Unit, 2006 Annual Monitoring Report (ARCO 2007).
- April 2008. Silver Bow Creek/Butte Area NPL Site, Rocker Timber Framing and Treating Plant Operable Unit, 2007 Annual Monitoring Report (ARCO 2008).
- April 2009. Silver Bow Creek/Butte Area NPL Site, Rocker Timber Framing and Treating Plant Operable Unit, 2008 Annual Monitoring Report (ARCO 2009).
- May 2009. Monitoring Report for 2008 Streamside Tailings Operable Unit Silver Bow Creek/Butte Area NPL Site (Bighorn Environmental 2009).
- April 2010. Silver Bow Creek/Butte Area NPL Site, Rocker Timber Framing and Treating Plant Operable Unit, 2009 Annual Monitoring Report (ARCO 2010).
- December 2010. Draft Rocker Timber Framing and Treatment Plant OU Controlled Groundwater Area Evaluation. (MBMG 2010).

6.4 Data Review

6.4.1 Groundwater Monitoring

The purpose of the groundwater monitoring program is to evaluate treatment results, track groundwater quality trends, and to monitor potential plume migration laterally and vertically. Also included is compliance monitoring at specified groundwater contingency wells and long-term trend analysis for the five-year review reports.

Interior, exterior, and contingency monitoring wells at the OU are defined in the consent decree work plan and included in the O&M Plan (ARCO 2000). The monitoring wells being sampled fall into three groups, based upon their relation to the existing groundwater arsenic plume. A summary of the O&M wells sampled for groundwater quality is provided in Table 6-1. The wells are shown on Figure 4-1.

**Table 6-1
Wells Sampled for Groundwater Quality at the Rocker OU**

Shallow Alluvial Wells (17 total)	Interior	RH-60, RH-61, RH-62, RH-63, RH-64, RH-65, RH-66
	Exterior	RH-5, RH-7, RH-15, RH-17, RH-19, RH-41, RH-44, RH-47
	Contingency	RH-52R
	O&M Plan Appendix A**	RH-75
Deep Alluvial Wells (8 total)	Exterior	RH-14R, RH-16, RH-18, RH-20
	Contingency	RH-12R, RH-51, RH-76
	O&M Plan Appendix A**	RH-55
Tertiary Sediment Wells (9 total)	Exterior	RH-6, RH-43, RH-48
	Contingency	Ayers, Palmer, RH-36R, RH-46, RH-53, Town Pump 1

Interior and exterior monitoring well data are not used to initiate contingency remedy actions, but are used to:

- Supplement and support decisions made from the contingency well data
- Identify trends that may result in subsequent arsenic plume migration
- Assess the location of arsenic source materials that may release arsenic to groundwater

Table 6-2 provides annual mean arsenic concentrations from key wells sampled at the Rocker OU since the last five-year review.

**Table 6-2
Mean Annual Arsenic Concentrations at Select Rocker OU Wells**

		Mean Arsenic Concentration by Year (µg/L)												
Hydro- stratographic Unit	Well	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
Gravel	RH-60	110	155	313	277	315	245	252	299	1,141	537	516	520	
	RH-62	4,280	6,991	9,900	9,390	11,685	9,735	10,845	11,283	10,951	7,655	7,460	7,250	
Shallow	RH-17	76	119	151	94	38	39	29	32	36	53	53	55	
	RH-44	553	403	395	258	244	175	196	163	135	213	254	328	
	<i>RH-52R*</i>	7	6	7	3	3	3	3	4	4	4	3	3	
	<i>RH-12R*</i>	10	9	9	8	8	7	7	8	7	7	7	7	
Deep	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	
	RH-18	11	12	12	11	11	11	11	11	11	11	10	10	
	<i>RH-51*</i>	7	8	7	6	7	6	6	6	6	6	5	5	
	RH-55	--	--	--	10	10	12	13	15	14	13	13	13	
	<i>RH-76*</i>	--	--	--	5	5	4	4	4	4	4	4	4	
	AYERS*	13	12	11	11	11	11	11	11	12	11	10	10	
	PALMER*	4	4	4	4	4	4	3	3	3	4	3	3	
Tertiary	RH-06	1,024	745	584	338	207	99	92	148	141	126	116	97	
	<i>RH-36R*</i>	12	11	12	9	10	10	10	9	10	9	9	10	
	RH-43	13	12	11	9	8	9	9	9	9	9	8	9	
	<i>RH-46*</i>	11	10	10	9	7	9	9	9	9	9	8	8	
	RH-48	141	151	93	54	27	24	22	20	15	15	13	12	
	<i>RH-53*</i>	11	13	11	12	14	11	12	13	13	12	11	12	
	TOWN PUMP*	11	11	11	11	12	11	12	12	12	12	11	11	

Note: Asterisk and italics denote contingency well

Since the second five-year review, the water quality in the treatment zone appears to continue to be in equilibrium with the hydrology and geochemistry of the site. The equilibration following the 2001 and 2002 dosing events resulted in a rebound in arsenic concentrations above 10,000 $\mu\text{g}/\text{L}$ in the gravel zone below the repository in the years immediately following these treatments. This continued into 2005 and 2006; however, since that time quarterly sample results have approached but not exceeded the 10,000 $\mu\text{g}/\text{L}$ arsenic concentration in well RH-62. The source of the arsenic appears to be arsenic-containing groundwater immediately underlying the gravel (excavated zone). There is no evidence to suggest that the source of arsenic is the gravel zone itself or the stabilized soil mass overlying the gravel zone.

Groundwater data from the interior gravel zone, exterior, and contingency wells indicates minimal expansion of the arsenic plume since completion of the remedial action and since the last five year review. Of the 34 wells included in the monitoring program, only 4 wells exhibited increased arithmetic mean concentrations between 2005 to 2009 (RH-17, RH-36R, RH-44, and RH-60). Figure 6-1 shows the trends (using annual mean concentrations) in these four wells since the last five-year review. Of these wells, only RH-36R is a contingency well. Well RH-36R shows a change of only 1 $\mu\text{g}/\text{L}$ during the review period.

Well RH-17 is a shallow exterior well located immediately north of the repository and is generally side-gradient to the overall east to west groundwater flow within the Rocker OU. During the review period, well RH-17 experienced a fairly wide range of quarterly arsenic concentrations (20 to 78 $\mu\text{g}/\text{L}$) and the average arsenic value in 2009 of 55 $\mu\text{g}/\text{L}$ was approximately 20 $\mu\text{g}/\text{L}$ higher than in 2005.

Well RH-60 is a gravel well at the east end of the repository. Viewing the time versus concentration graph for well RH-60, the increasing trend is a continuation of an apparent longer-term rebound of arsenic concentrations in this well since the original remedial action was completed. Due to well RH-60's location within the gravel zone, increasing arsenic concentrations do not necessarily indicate an expansion of plume boundaries.

Of possible significance is an increasing trend in shallow well RH-44 downgradient and west of the repository, and approximately 100 feet from Silver Bow Creek. (RH-44 is not a contingency well.) RH-44 quarterly arsenic concentrations since 1998 are shown on Figure 6-2, with the 2005-2009 review period highlighted. Average arsenic concentrations in well RH-44 steadily increased and doubled during the review period, from an average of 163 $\mu\text{g}/\text{L}$ arsenic in 2005 to 328 $\mu\text{g}/\text{L}$ arsenic in 2009 (Table 6-2). Figure 6-2 shows that post-remediation arsenic concentrations spiked to above 300 $\mu\text{g}/\text{L}$ in 2003 and 2004, but then returned to lower levels. During this five-year review period, RH-44 arsenic concentrations are showing a steady increase without seasonally returning to lower concentrations. If this trend continues, it may be an indication of plume expansion in the shallow aquifer. Figure 6-3 shows the current potentiometric surface for the shallow aquifer. With groundwater approximately 1 foot below ground surface, it is likely this shallow groundwater is

hydraulically connected to Silver Bow Creek. It should be determined if the plume is migrating and if this shallow groundwater is having (or has the potential to have) a detrimental impact on Silver Bow Creek.

During remediation of Silver Bow Creek, the reach adjacent to Rocker was lowered to prevent accumulation of sediments. The lowering of the stream channel may have impacted the potentiometric surface at the Rocker OU, and this may account for the increasing arsenic concentrations at RH-44.

The available SST OU water quality data were reviewed at stations in the vicinity of the Rocker OU to determine if the existing data were adequate to evaluate potential arsenic loading to Silver Bow Creek from the shallow groundwater. The nearest stations are SS-08A and SS-10A (Bighorn Environmental 2009). SS-08A is approximately ¼-mile upgradient of the Rocker OU repository and has arsenic concentrations of about 6 µg/L. SS-10A is about two miles downgradient of the Rocker OU and has similar arsenic concentrations to SS-08A (i.e., variable, but less than the 10 µg/L maximum contaminant level [MCL]). Station SS-10A is too far downstream to determine whether or not arsenic from the Rocker OU groundwater is impacting Silver Bow Creek locally in any significant way. The SS-10A data indicate that if there are any arsenic impacts in Silver Bow Creek immediately downstream of Rocker, they are being attenuated and/or diluted within two miles.

A report by the Montana Bureau of Mines and Geology for DEQ (MBMG 2011, Appendix D) makes recommendations for changes in the monitoring program. This report recommends follow-up discussions with Atlantic Richfield on changes to the monitoring plan for this site.

6.4.2 Qualitative Monitoring Inspection

The qualitative monitoring inspection evaluates on an annual basis the following items at the Rocker OU:

- General site conditions
- Uniformity of vegetation cover
- Presence of bare areas
- Identification of noxious weed infestations
- Location of erosive areas
- Condition of ditches and riprap
- Damage due to trespassing
- Condition of fencing

- Suggested corrective actions

Qualitative monitoring inspections are usually conducted in August of each year. Overall, site vegetation conditions at the Rocker OU have remained stable during the review period. Vegetation cover has varied slightly from year to year, but no barren areas have developed. Usually, some spot spraying of weeds is required, particularly in the rip rap areas along the north edge of the site and along the fence perimeter. No signs of surface erosion or instability have been observed on the repository cap and drainage ditches show no sign of erosion, siltation, or failure. No evidence of trespassing has been noted.

6.5 Institutional Controls Review

6.5.1 Institutional Controls and Instruments

The ROD for the Rocker OU (EPA 1995) identifies ICs in Section 10 – The Selected Remedy. With respect to contaminated soils and near surface soils, the ROD states,

“Institutional controls and monitoring will maintain the soil cover and vegetative communities, and limit land uses that would jeopardize the integrity of the cover. Institutional controls will also designate the area for continued railroad/industrial use and specifically exclude residential development as a future use (consistent with County planning document).”

With respect to the recognized health threat from the migration of arsenic into groundwater systems that were currently being used, or were thought could be used in the future, the ROD discussed the need for a well ban. The ROD stated,

“EPA believes that it is necessary to restrict shallow and deep groundwater development in order to prevent the spread of the existing arsenic plume into aquifers currently used at or near the OU. Therefore, during the term of the Rocker remedy, a groundwater well ban will be implemented for new wells within a one-quarter mile radius of the site in any of the designated three aquifer units.”

The ROD goes on to state that the well ban would be removed once sufficient evidence from the post remedial action monitoring demonstrates that the arsenic plume has been controlled sufficiently to abate the threat of exacerbating its migration. The implementation of ICs for the Rocker OU is discussed below and a summary is provided in Table 6-3.

6.5.2 Implementation

Information obtained from the CD, from a search of the county property records, and through interviews with the following individuals forms the basis of the discussion of IC implementation at the Rocker OU provided in this section.

- Daryl Reed. DEQ. December 22, 2009.
- Mike Bishop. EPA RPM. December 22, 2009.

- Rob Jordan. ARCO lands manager. December 29, 2009.

6.5.2.1 Access

Property within and near the Rocker OU is owned by ARCO and several private entities (Figure 6-4). The land parcels of concern are those associated with the repository, which contain the consolidated contaminated soils and the access point to the repository, as shown on the map. Property ownership for these parcels is listed below.

Parcel Number	Ownership
011971610148MINE	Rocker Holdings LLC
011972040220RARR	Rarus Railroad
011972149020RARR	Rarus Railroad
0119721201050000	ARCO Environmental Remediation
0119792149001BHRR	Butte/Silver Bow County (BSBC)

Rocker Holdings recently conveyed the southeast corner of parcel 011971610148MINE to ARCO (Jordan 2009) and, thus, no longer has property associated with the waste repository. However, it still has monitoring wells on its property on both sides of Silver Bow Creek (Figure 6-2).

6.5.2.2 Land and Water Use Restrictions

Groundwater Control Area

The DNRC established a controlled groundwater area (CGWA) that encompasses a 1/4-mile radius from the approximate center of the Rocker OU (DNRC 2003). The following information was taken from DNRC's website.

The effective date of this CGWA is May 30, 1997. The reason for establishing this area is contamination of the groundwater in three aquifers:

- a. *The Rocker Timber Framing Treatment Plant Operable Unit of the Silver Bow Creek-Butte Area Superfund Site,*
- b. *A small portion of the Streamside Tailings Operable Unit Superfund Site, and*
- c. *A 1/4-mile buffer zone radius around the contaminated groundwater area.*

This area is closed to all new appropriations of groundwater. This is not a permanent CGWA. During this closure, quarterly monitoring is being done to determine the effectiveness of remediation actions on the groundwater. The results of this monitoring are to be reported to DNRC. Once the determination is made that the Rocker plume has been effectively mitigated to halt the threat of further migration, the Butte-Silver Bow Health Department will re-petition DNRC to remove the CGWA designation.

The CGWA remains in place and no petition has been submitted to DRNC to remove or reduce the size of the CGWA.

**Table 6-3
Implementation and Effectiveness of Institutional Controls at Rocker Operable Unit**

Controlling Document Responsible Entity	Institutional Control and Instrument (as identified in the controlling documents)	Instrument Implementation and Use	Effectiveness of the Institutional Control in Supporting the Remedy
<p>ROD (1995) Atlantic Richfield</p>	<p>CGWA established by DNRC to implement a well ban for 3 aquifers</p>	<p>The DNRC implemented a CGWA for this site in 1997.</p>	<p>With the conversion of the Town Pump potable water source to the Rocker community water system, the implemented ICs will be effectively implemented using the CGWA designation.</p>
<p>Land and Water Use Restrictions</p>	<p>County zoning to restrict residential development via a master plan.</p>	<p>Property within the OU is zoned for non-residential use. This land is within the 100 year floodplain of Silver Bow Creek. As such, building and other restrictions on land use are controlled by floodway-related ARARs. According to the county's zoning map, this area has been proposed as "river corridor."</p>	<p>This IC has been effectively implemented using several instruments.</p>
	<p>Written private land-owner agreements to abide by provisions of the ROD and protect remedy.</p>	<p>These are applicable to private property (non-ARCO and county property). ARCO has written agreements with the other property owners to abide by the provisions in the CD. (Jordan 2009)</p>	<p>This IC is implemented and effective.</p>
	<p>Add Fencing</p>	<p>ARCO installed and maintained.</p>	<p>This IC is implemented and effective.</p>

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In the draft five-year review report for the Rocker OU, two existing domestic wells were identified as both in use and at or exceeding the 10 µg/L human health standard. EPA worked with the MBMG to look more closely at groundwater data for the Rocker site. That report is attached as Appendix D.

The report indicates that the Ayers domestic well is likely to be outside the influence of the Rocker site contamination plume. Data from that well indicate that it is in a decreasing trend and has not exceeded the human health standard in the last several months. Accordingly, monitoring should continue for this well, but a replacement water supply is not recommended.

The report indicates several concerns with the Town Pump well. Tests done by the MBMG indicate prolonged use of the well could enlarge the existing plume and otherwise adversely affect remediation of the site. Use of the Town Pump well for domestic purposes could lead to exceedances of the human health-based standard. Accordingly, action to prevent domestic/public use of this well and to prevent extensive pumping is needed to ensure protectiveness at this site.

Finally, the report also notes that some changes to the CGWA boundaries and DNRC ruling may be advisable. EPA will continue to examine this issue in consultation with DEQ.

Zoning

The pieces of property constituting the Rocker OU are currently zoned for commercial/industrial purposes and not residential. No additional instrument is needed for this IC.

Remedy Protection Agreements

The ROD states that ARCO must obtain agreements from the land owners that are enforceable by ARCO and the United States to abide by the obligations and restrictions established in the CD or are necessary to implement, ensure non-interference with, or ensure protectiveness of the remedial measures to be performed at the site. According to the ARCO lands manager, ARCO has obtained these agreements.

6.5.2.3 Cooperation and Funding

The RPM for the Rocker OU has indicated that ARCO has fully cooperated with the provisions identified in the CD regarding cooperation in funding community water supplies and ensuring access by DEQ and EPA (Bishop 2009).

6.5.3 Effectiveness

With the exception of the “deed restrictions”, all of the ICs identified in the CD have been implemented for the Rocker OU. With the conversion of the Town Pump potable water source to the Rocker community water system, the implemented ICs will be effective at protecting the selected remedy for the OU. However, as noted above,

more IC work regarding the Town Pump well should be done to ensure long-term protectiveness.

6.6 Site Inspection

EPA and DEQ project managers and their contractors attended a site inspection of the Rocker OU on October 7, 2009. Site photos can be found in Appendix A. During this site inspection, monitoring wells were examined for security and integrity, and the site conditions observed.

The site inspection determined that nine wells were in need of repair. Wells RH-17, RH-37, RH-26, RH-8, RH-16, RH-15, RH-60, RH-52R, and RH-19 showed evidence of frost heaving (the interior PVC pipe had pushed above the outer casing) and the wells could no longer be capped and locked. Atlantic Richfield has since made necessary repairs to these wells. Other minor issues during the site inspection included:

- Fencing, along the north and west sides of the repository area, was in marginal condition and falling down in places.
- The gate on the west side of the site was not secured.
- Vehicle tracks on the repository cap were greater than six inches deep in places; these tracks could eventually develop into erosional rills and compromise cap integrity.

Atlantic Richfield has since made the necessary repairs at the site.

While the site inspection identified several minor issues, all of these issues should have been identified and corrected as part of the annual qualitative inspection of general site conditions conducted each August as part of O&M activities. It is recommended that EPA and state project managers re-evaluate the annual qualitative inspections and participate in these annual inspections in the future.

It was also noted that the recreational greenway trail adjacent to the reconstructed Silver Bow Creek channel had been constructed to the edge of the Rocker OU. A new bridge had been installed across Silver Bow Creek with the intent that the trail would continue along the south bank of Silver Bow Creek, along the toe of the Rocker repository. This is a land use change in that the likelihood of trespass will increase because the site is easily accessible to the public. Thus it will be important that the site access restrictions (e.g., fencing and gates) be maintained to make trespass less likely.

Section 7

Technical Assessment

7.1 Question A – Is The Remedy Functioning As Intended By The Decision Documents?

Remedial Action Performance

No. EPA must address the Town Pump well use, as discussed earlier. EPA must require additional monitoring of Silver Bow Creek to ensure that the Rocker site is not causing violations of standards in surface water.

Arsenic concentrations in the most contaminated wells in the tertiary and deep aquifers dropped by 35 percent and 38 percent, respectively, since 2006. Because EPA projected moderate difficulty in meeting the ARARs in a limited part of the groundwater system (i.e., the shallow alluvium), the RAOs were prioritized according to the actual or potential use of these groundwater zones. The prime objective is to prevent pollution from reaching the high quality lower aquifers which are currently used (tertiary groundwater system) and that have the potential to be used (deep alluvium). Monitoring to date has documented the effectiveness of the remedy in meeting this prime objective. Institutional controls prevent exposure pathways in the shallow groundwater. The soils component of the remedy continues to perform as designed.

Remedy O&M

Monitoring of the plume continues on a quarterly basis, and repository cap and other site maintenance actions are implemented, as necessary, on an annual basis. Costs for system operation and O&M have been within an acceptable range. However, it is recommended that the monitoring network undergo long-term monitoring optimization (see Appendix D).

Early Indicators of Potential Issues

EPA will continue to examine whether additional work is needed to address non-compliance with performance standards in the shallow, deep, or tertiary aquifers. EPA will consider the petition for a waiver of standards in certain aquifers, in accordance with the CD. Atlantic Richfield submitted a petition for standard waiver in 2007 that has not yet been reviewed by the Agencies. Finally, EPA will continue to examine the existing institutional controls relevant to these aquifers.

The reason for the increasing arsenic concentrations in shallow well RH-44 should be investigated and the potential for shallow groundwater to impact water quality in Silver Bow Creek should be considered. Well RH-44 is located less than 100 feet from Silver Bow Creek and, with a depth to water of only about 1 foot below ground surface, interactions between groundwater and surface water may allow arsenic from the Rocker OU to enter Silver Bow Creek. As there are no other shallow alluvial wells downgradient of RH-44, this increasing trend may indicate that the down-gradient

portion of the arsenic plume could parallel Silver Bow Creek for some distance or discharge to Silver Bow Creek near RH-44. Surface water quality data are available from station SS-10A about 2 miles downstream. Arsenic concentrations are below the MCL at this location, but the station is too far downstream from the Rocker OU to conclude there is no impact above standards. Groundwater sampling from temporary or permanent wells and surface water sampling from temporary sampling stations in that area could evaluate the current or potential contribution, if any, of arsenic contamination to Silver Bow Creek from shallow groundwater.

Implementation of Institutional Controls

The DNRC implemented institutional controls on groundwater wells for three aquifers, eliminating a potential pathway for arsenic contaminated water in the shallow alluvial aquifer to enter both the deep alluvial and tertiary aquifers through well installation. This ban also controls the exposure pathway for humans from the contaminated groundwater in the shallow alluvial aquifer. The Town Pump well needs additional consideration and action to prevent unhealthy use and plume migration.

7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used At The Time of Remedy Selection Still Valid?

Changes in Standards and To Be Considereds

No. Since implementation of the remedy at the Rocker OU, a revised drinking water standard for arsenic has been promulgated. The Arsenic Rule was published in the Federal Register (FR) on January 22, 2001 (66 FR 6976). This changed the arsenic MCL of 50 µg/L to 10 µg/L, with this new standard becoming enforceable on January 23, 2006. The state adopted this standard in 2008. Because the revised arsenic standard is based on protection of human health, the revised arsenic MCL is being applied prospectively at all Superfund sites. The National Contingency Plan (NCP) states that ARARs are frozen at the time of the ROD, unless new, post-ROD standards are "necessary to ensure that the remedy is protective of human health and the environment". (40 Code of Federal Regulations [CFR] Section 430(f)(1)(ii)(B)(1)). The NCP also states that new standards can be adopted for a remedy using an Explanation of Significant Differences, rather than a ROD modification (40 CFR Section 300.435(c)(2) and accompanying preamble language at 55 FR 8772). Therefore, it is recommended that EPA issue an Explanation of Significant Differences (ESD) that adopts the new arsenic standard for the entire Rocker OU.

Currently, the shallow groundwater system in the area of the Rocker OU is not used as a drinking water source, but may be in the future. The lower arsenic standard should be applied as the cleanup standard for the Rocker OU, replacing the prior standard of 18 µg/L. If the new standard is applied to the Rocker OU, this will significantly affect the interpretation of the arsenic results in the contingency wells. Based on data during the review period, 5 of the 10 contingency wells (Ayers, RH-

36R, RH-46, RH-53, and Town Pump) have had or currently have a quarterly arsenic concentration equal to or above 10 µg/L arsenic.

Changes in Exposure Pathways

As long as exposure pathways have been broken and remain incomplete, the remedy should remain protective. Risks are manageable with maintenance of site access restrictions (e.g., fencing, locked gates, keeping the area unattractive for trespassing). Whether or not arsenic in shallow groundwater is impacting or has the potential to impact Silver Bow Creek is a data gap to be filled. The MBMG is studying the groundwater migration and the arsenic plume in greater detail to examine this issue.

Changes in Toxicity and Other Contaminant Characteristics

Minor changes in toxicity values for human health (i.e., oral cancer slope factor for arsenic or PAH's) would not alter the conclusions of the human health risk assessment (HHRA) or result in a change to the protectiveness of the remedy.

Changes in Risk Assessment Methods

No information gathered during the risk assessment review changes the human health based standards in the ROD.

Expected Progress Towards Meeting RAOs

Although the arsenic concentrations in the shallow aquifer and gravel zone beneath the repository have rebounded to a greater extent than originally anticipated, the concentrations are, on the whole, significantly reduced compared to pre-remediation results. The highest levels of arsenic in groundwater generally coincide with the location of past operations at the site and the arsenic plume has not expanded beyond the site's contingency wells. Any expansion of the arsenic plume will be detected under the current monitoring program. ICs prevent exposures to contaminated groundwater. However, the remedy is still considered to have a moderate uncertainty when considering the potential time-frame to achieve the arsenic cleanup standard of 18 µg/L (as designated in the ROD) or any revised standard.

7.3 Question C: Has any Other Information Come to Light that Could Call Into Question the Protectiveness Of The Remedy?

No. No additional information has been identified that would call into question the protectiveness of the remedy. The site will continue to be monitored for any changes in this regard. However, data and information obtained from the supplemental treatment plan prepared in conjunction with the SSTOU and implemented in 2001 and 2002 may be useful if any further action at the site is proved necessary.

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Section 8

Issues

Based on information collected during preparation of this five-year review report, the following issues were identified.

**Table 8-1
Rocker OU Issues Summary**

Issue No.	Issue	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1	Rebounds of arsenic concentrations below the repository are greater than expected in groundwater.	No	Yes
2	Atlantic Richfield submitted a technical impracticability evaluation for a waiver of the arsenic standard in groundwater in 2007.	No	No
3	The Town Pump well exceeds the recently-promulgated 10 µg/L drinking water standard for arsenic. While the facility has switched to the community alternative water supply, there is no requirement for the facility to stay on the alternative water supply.	Yes	Yes
4	Increasing arsenic concentrations in shallow well RH-44 adjacent to Silver Bow Creek may indicate groundwater impacts to surface water. This is a data gap.	Yes	Yes
5	The ¼-mile radius controlled groundwater area may be overly restrictive.	No	No
6	The monitoring plan is not ideal for the current phase of the remedy.	No	No
7	The new arsenic standard of 10 µg/L is not in a decision document	No	No

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Section 9

Recommendations and Follow-Up Actions

Table 9-1 presents recommendations and follow-up actions for the Rocker OUs.

Table 9-1
Recommendations and Follow Up Actions

Issue	Recommendations and Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date
1,2	Evaluate whether additional treatment or a TI waiver is needed. Review the TI waiver petition submitted in 2007.	Atlantic Richfield/EPA/DEQ	EPA/DEQ	September 30, 2012
3	Follow up to ensure Town Pump continues to use the community water supply and not groundwater	EPA/DEQ	EPA/DEQ	December 31, 2011
4	Evaluate the current or potential contribution, if any, of arsenic contamination to Silver Bow Creek from shallow groundwater.	Atlantic Richfield	EPA/DEQ	September, 30, 2011
5	Evaluate the protectiveness and continuation of the ¼-mile radius well ban.	EPA/DEQ/BSB	EPA	September, 30, 2011
6	Update the monitoring plan to optimize groundwater sampling.	EPA/DEQ	EPA/DEQ	September, 30, 2011
7	Write a decision document to update the arsenic standard.	EPA/DEQ	EPA/DEQ	September 30, 2012

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Section 10

Protectiveness Statements

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 CGWA for the Rocker area and the Rocker residents were provided with an alternate community water system. Existing wells within the CGWA 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 TI 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.

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Section 11

Next Review

The next five-year review for the Rocker OU is required by September 30, 2015, five years from the date of this review.

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Section 12

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