FINAL

# RECORD OF DECISION

## ROCKER TIMBER FRAMING AND TREATING PLANT OPERABLE UNIT SILVER BOW CREEK/ BUTTE AREA (Original Portion) NPL SITE ROCKER, MONTANA

December, 1995

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## RECORD OF DECISION

**ROCKER TIMBER FRAMING AND TREATING PLANT OPERABLE UNIT**
**SILVER BOW CREEK/BUTTE AREA, (Original Portion) NPL SITE**

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) and the Montana Department of Environmental Quality (MDEQ) present the Record of Decision (ROD) for the Rocker Timber Framing and Treating Plant Operable Unit (Rocker OU) of the Silver Bow Creek/Butte Area (original portion) National Priorities List (NPL) site. The ROD is based on the Administrative Record for the site, the Remedial Investigation/Feasibility Study (RI/FS), the Baseline Human Health Evaluation, the Proposed Plan, the public comments received (including those from the potentially responsible parties (PRPs) and local government), and responses of EPA and MDEQ to these comments. The ROD presents a brief outline of the RI/FS for the Rocker OU, actual and potential risks to human health and the environment presented at the Rocker OU, and the selected remedy for the Rocker OU. EPA guidance was used in preparation of the ROD. The ROD has the following three purposes:

1. To certify that the remedy selection process was carried out in accordance with the requirements of the Comprehensive Environmental, Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), (42 U.S.C. §§ 9601 *et seq.*), and to the extent practicable, the National Contingency Plan (NCP);

2. To outline the engineering components and remediation goals of the selected remedy; and

3. To provide the public with a consolidated source of information about the site history, characteristics, and risk posed by the conditions at the Rocker OU, as well as a summary of the cleanup alternatives considered, their evaluation, and the rationale behind the selected remedy.

The ROD is organized into three distinct sections:

1. The **Declaration** functions as an abstract for the key information contained in the ROD and is the section of the ROD signed by the EPA Assistant Regional Administrator and the MDEQ Director;

2. The **Decision Summary** provides an overview of the site characteristics, the alternatives evaluated, and the analyses of those options. The Decision Summary also identifies the selected remedy and explains how the remedy fulfills statutory requirements. The Decision Summary includes, as an Appendix, the final applicable or relevant and appropriate requirements (ARARs) for the site and waivers of any of these ARARs; and

3. The **Responsiveness Summary** addresses public comments received on the Proposed Plan, the RI/FS, and other information in the Administrative Record, which were not responded to previously.

DECLARATION

# DECLARATION FOR THE RECORD OF DECISION

**SITE NAME AND LOCATION**
Silver Bow Creek/Butte Area (Original Portion) NPL Site
Rocker Timber Framing and Treating Plant Operable Unit
Rocker, Montana

**STATEMENT OF BASIS AND PURPOSE**

This decision document presents the selected remedy for the Rocker Timber Framing and Treating Plant Operable Unit of the Silver Bow Creek/Butte Area site near Rocker, Montana (the Rocker OU). The selected remedial action was chosen by EPA, with the concurrence of the Montana Department of Environmental Quality ("MDEQ" or "State"), in accordance with the requirements of CERCLA, as amended, and the NCP. This decision is based on the Administrative Record for the site. The State of Montana has played a significant role during the remedy selection process for this site and concurs with EPA on the selected alternative as indicated by concurrence on the ROD.

**ASSESSMENT OF THE SITE**

Actual or threatened releases of hazardous substances at and from the Rocker OU, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

**ROLE OF THE OU WITHIN THE SITE STRATEGY:**

The Rocker OU is one operable unit in the Silver Bow Creek/Butte Area (original portion) NPL Site. The Rocker OU addresses the geographic area surrounding and contamination associated with the former Rocker Timber Framing and Treating Plant near Rocker, Montana. This remedy decision presents the final decision for the Rocker OU. There is some overlap between this operable unit and the Streamside Tailings operable unit where rail lines extend through the Rocker OU, where stream deposited wastes occur in a depression between the rail lines in an area historically used to store logs for the framing mill (Rocker stull storage area), and in the current 100 year flood plain of Silver Bow Creek, which flows through the Rocker OU area. Both cleanups will be coordinated to avoid duplication of effort.

## DESCRIPTION OF THE SELECTED REMEDY

### COMPONENTS OF THE SELECTED REMEDY:

The remedy selected by EPA, with the concurrence of the State, addresses surface soil, alluvium and fill, and groundwater contaminated by wood treating compounds and mining waste in the Rocker OU. The EPA has selected the final remedy for the Rocker (OU) after considering all written comments and oral testimony received during the public comment period. The remedy has been modified from the proposed plan in response to public comment. The changes that have been made in the remedy from the proposed plan are considered significant; but are considered a logical outgrowth of the public comments received.

The primary purpose of the remedy is to protect human health from threats posed by direct contact with contaminated surface soils or exposure to contaminated groundwater. With respect to contaminated groundwater, the primary objective is to prevent contamination of groundwater resources (deep alluvium and tertiary groundwater systems) under current use (or that have the potential to be developed) by the community that are in hydraulic connection with the Rocker OU arsenic plume. An extension of this objective is to make the groundwater resource available to the community at the earliest opportunity. The secondary objective of the groundwater remedy is to reduce contaminant concentrations in the arsenic plume and the shallow alluvial aquifer to regulatory standards.

The Rocker remedy includes contingency measures to address the arsenic contamination of the shallow alluvial aquifer where remediation goals involve moderate uncertainty and may at a future date dictate an ARARs waiver and/or establishing containment goals. EPA fully expects to meet the primary groundwater remediation goal stated above. Achieving this goal is consistent with a major EPA theme of "pollution prevention".

FINAL REMEDY (with contingency measures):

The remedy selected utilizes treatment of the arsenic-laden source materials that contribute to groundwater contamination and surface soil hot spots to the maximum extent practicable, in order to reduce mobility of the arsenic, in combination with standard excavation, treatment, and on-site disposal technologies. Limited circumstances may occur where solidification with cement may also be required to reduce arsenic mobility to below Agency "characteristic" levels for hazardous wastes prior to disposal. The groundwater remedy includes utilization of natural and enhanced arsenic attenuation processes, and contingent hydraulic controls to contain and treat any (unexpected) groundwater migration off-site. Also, a portion of the groundwater remedy includes a temporary well ban to prevent development of the nearby groundwater and an alternative water supply for the residents of the community of Rocker to use while the well ban is in effect. The remedy requires institutional controls to limit future land uses (to prevent residential land use). Monitoring of the vegetative cover and monitoring of groundwater is also required (to document trends in water quality and determine if contingent remedies might be needed and to assure protection of domestic water supplies). The estimated cost for this remedy is $5,400,000 (compared to $7,340,000 for the remedy proposed in the proposed plan). Each component of the remedy is described in more detail below. However, for a complete understanding of the remedy, please refer to the subsequent Decision Summary part of the ROD.

- **Groundwater Source Material Removal and Treatment of Shallow Groundwater**

  Arsenic groundwater "source material" is defined as soils and other substrate materials that previously have been contaminated with concentrated wood treating solutions and other arsenic waste, and which continue to act as a source to ongoing groundwater contamination. The area containing "source material" was preliminarily defined in the feasibility study to be within the 10,000 parts per billion arsenic groundwater plume/ five feet deep into the saturated zone. The selected remedy for "source materials" (approximately 41,000 cubic yards) is excavation, subsequent chemical fixation utilizing complete mixing of iron sulfate, lime, and water with the arsenic contaminated media, and then backfilling the excavated area above the water table with this amended material to the extent practicable. Disposal of treated wastes will only occur in areas where iron has been added to the shallow groundwater beneath the waste repository as described below. The addition of iron to adsorb and immobilize arsenic is considered by the Agency to be an innovative treatment technology.

During remedial design, an on-site pilot-scale treatment, disposal, and testing process will be implemented in order to optimize amendment dose rates and confirm (using EPA's toxicity characteristic leaching procedure (TCLP)) that treated wastes will be below characteristic levels for hazardous wastes. Following iron treatment and lime addition, limited volumes of highly concentrated wastes may have arsenic concentrations higher than the 5 ppm specified for "characteristic" hazardous wastes. For these materials, the remedy will include solidification, by cement addition, prior to disposal on-site. A testing program for the duration of the remedy will be designed following the pilot-scale testing.

The use of ferrous sulfate to fixate arsenic and render it immobile is well documented in the literature and has been validated in part by ARCO's test program at Montana Tech. It should be emphasized that this process is consistent with the administrative record developed for the Rocker OU and the use of this treatment process is responsive to concerns identified during the remedial investigation/feasibility study and public comment period.

A better definition of the specific quantity and locations of "source material" to be removed and treated will occur after the Record of Decision, during the Remedial Design phase of the Superfund process. During these subsequent sampling and analytical investigations, if $^{+3}$arsenic "source material" is identified in addition to that defined within the 10,000 ppb groundwater arsenic isopleth, such as at the old vat, other known treatment areas, and the off-loading trench, this "source material" would also be removed, treated and disposed of in the OU repository. If additional "source material" repositories are required, in excess of the volume available in the excavation/backfill areas, an approved plan must be developed and implemented consistent with the technologies developed in this ROD.

During the excavation of "source materials", care must be taken to properly abandon any existing monitor wells that would have to be removed as well as minimizing the release of pore waters from the saturated zone by utilizing proper excavation equipment and associated removal techniques. It is very probable that the exposed groundwater in the excavation would contain elevated arsenic concentrations. Therefore, iron sulfate solution would be added to and mixed with the groundwater and the pH would also be adjusted as necessary. The excavation would then be backfilled up to the water table with washed gravel, properly compacted and then covered with a filter blanket to maintain porosity. This recently iron-enriched shallow groundwater can then move laterally and deeper into the lesser concentrated portions of the plume, thus enhancing the rate of arsenic attenuation in the plume. However, it is recognized that this process will be limited to the more permeable zones in the aquifer and the effectiveness will diminish as iron precipitates reduce aquifer permeability. The area of contamination is expected to continue shrinking as natural attenuation continues and lower concentration groundwater (from up gradient areas) continue to flow through the site. Treatment of contaminated groundwater by such an in-situ technology is considered an innovative technology by EPA, and together with the innovative iron treatment of arsenic wastes (described above) is consistent with the statutory preference for such remedies.

The excavated solids will have oversize materials removed and disposed of at the local municipal landfill, consistent with State and Federal solid waste disposal requirements. The final site surface contours will be designed in such a manner that 18-inches of additional non-contaminated cover soil can be added to provide an adequate vegetative growth zone and protective cover over the treated materials/hotspot areas and promote proper surface drainage, and other ARARs are met. An adequate number of monitor wells would then be completed into the permeable zone and into deeper portions of the alluvial aquifer to permit ongoing groundwater monitoring to document the trends in groundwater quality improvement around the source removal area, within and outside of the remaining arsenic plume.

- **Contaminated Surface and Near-Surface Soils**

The surface and near surface soils outside of the source area removal zone, to the site boundary, will be systematically sampled and analyzed for arsenic concentrations. Sampling will not occur in areas being remediated by the adjoining Streamside Tailings operable unit. The area utilized for the loading and off-loading of the local recreational railroad will be included within the area to be sampled and potentially remediated. A soil arsenic concentration of 380 parts per million (ppm) corresponds to a one in 10,000 excess cancer risk for trespassers, recreationists or workers that frequent the OU and who may be exposed via the direct contact pathway. Soils greater than this concentration pose a risk exceeding the EPA acceptable risk range. Those areas found to be greater than 380 ppm arsenic but less than 1000 ppm will be covered directly with 18-inches of growth media and revegetated.

Surface areas found in excess of 1000 ppm arsenic (hot spots) shall be excavated to a maximum depth of 18-inches. The excavated highly contaminated soil will be treated in a manner identical to the source "materials" utilizing iron sulfate and lime (described previously). Limited circumstances may occur where iron-treated materials, when tested using EPA's toxicity characteristic leaching procedure (TCLP), will exceed concentrations that would classify the materials as a "characteristic" hazardous waste. A contingent solidification (by concrete addition) treatment procedure is provided for in the remedy to address this limited potential circumstance. The resulting treated wastes will then be disposed of on-site in an on-site repository above the water table where groundwater has been treated with iron below. Excavated/covered areas will be revegetated with appropriate species of draught resistant grasses that are self-reproducing and that are consistent with the remedial objectives of this ROD (minimizing surface erosion and utilization of soil moisture). The final site contours must be compatible with the ongoing use of the railroad corridor, and promote good surface water run-on/off control.

The excavation, treatment and on-site disposal of high concentration soils and groundwater "source materials" will prevent uncontrolled contaminant releases via surface and groundwater pathways and will prevent direct contact with this highly toxic chemical. These aspects of the remedy are consistent with the Streamside Tailings OU remedy. Coordination between operable units will continue, which is important with respect to excavation and disposal of wastes from both operable units.

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 documents).

- **Well Ban and Alternative Water Supply**

Given the hydraulic connections between the shallow and deeper alluvium and the tertiary aquifer, 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 well ban will be removed once sufficient evidence from the post monitoring efforts determines that the arsenic plume has been controlled sufficiently to abate the threat of further migration.

To further reduce the possibility of ground water use and contamination spread and to provide residents of the community of Rocker adequate water to meet demands during the period of the well ban, an alternative water supply will be provided. Current users of groundwater can continue to utilize this resource. Routine monitoring of the quality of domestic/commercial groundwater supplies within the area of the well ban shall be conducted. The alternate water supply and well ban together contribute to the Agency's objective of preventing pollution of important water supplies connected to the current area of contamination.

- **Contingent Remedy**

  In the unlikely event that plume migration occurs (laterally or vertically), additional hydraulic controls may be implemented to contain the plume. The contingent remedy would be determined necessary if plume advancement is detected in a lateral or vertical direction into surface or ground water with arsenic concentrations below the 18 ppb standard, that would result in long term arsenic contamination that exceeds the State standard.

- **Groundwater Monitoring:**

  Water quality sampling and analysis for nearby existing well users and for key monitoring wells developed for the Rocker site will also continue on a seasonal/four times-per-year frequency. EPA, in consultation with the State, will make a decision at the time of the 5 year review, or other appropriate times, regarding: the need for contingent remedies (as described above), or the removal of groundwater restrictions, or other appropriate refinements to the remedy.

- **Coordination With Streamside Tailings OU**

  For areas within the floodplain, the Rocker Remedy will be coordinated with the Streamside Tailings OU proposed remedy particularly with respect to waste repositories. Contamination occurring along the railroad sidings within the Rocker OU will be remediated to arsenic and metals concentrations consistent with the recreational land use projected as part of the Streamside Tailings OU remedy.

This innovative remedial action breaks the surface, direct-contact pathway for recreationists, trespassers, or workers that may frequent the site. It will also free up the site for future use as an industrial site. In addition, the remedy assures that the primary groundwater remedial action objective of protection of the quality and continued use of the tertiary aquifer, the regionally preferred groundwater source, is achieved.

STATUTORY DETERMINATIONS

The selected alternative is protective of human health and the environment as described above. The selected alternative will comply with or achieve all Federal and State requirements (i.e., ARARs), except where a waiver of such requirements has been determined to be appropriate (see Appendix 1), and is cost-effective.

The selected remedy uses permanent solutions to the maximum extent practicable for this site and utilizes the development of alternate treatment technologies to the maximum extent practicable. It also satisfies the statutory preference for remedies that employ treatment that reduces the toxicity, mobility, or volume of contamination through treatment and that use alternative treatment technologies.

Since hazardous substances above health-based levels will remain onsite, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Max H Dodson for — 12/22/95

William Yellowtail — Date
Regional Administrator
United States Environmental Protection Agency
Region VIII

In concurrence:

Mark A Simonich — 12/21/95

Mark Simonich — Date
Director
Montana Department of Environmental Quality

# DECISION SUMMARY

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# DECISION SUMMARY

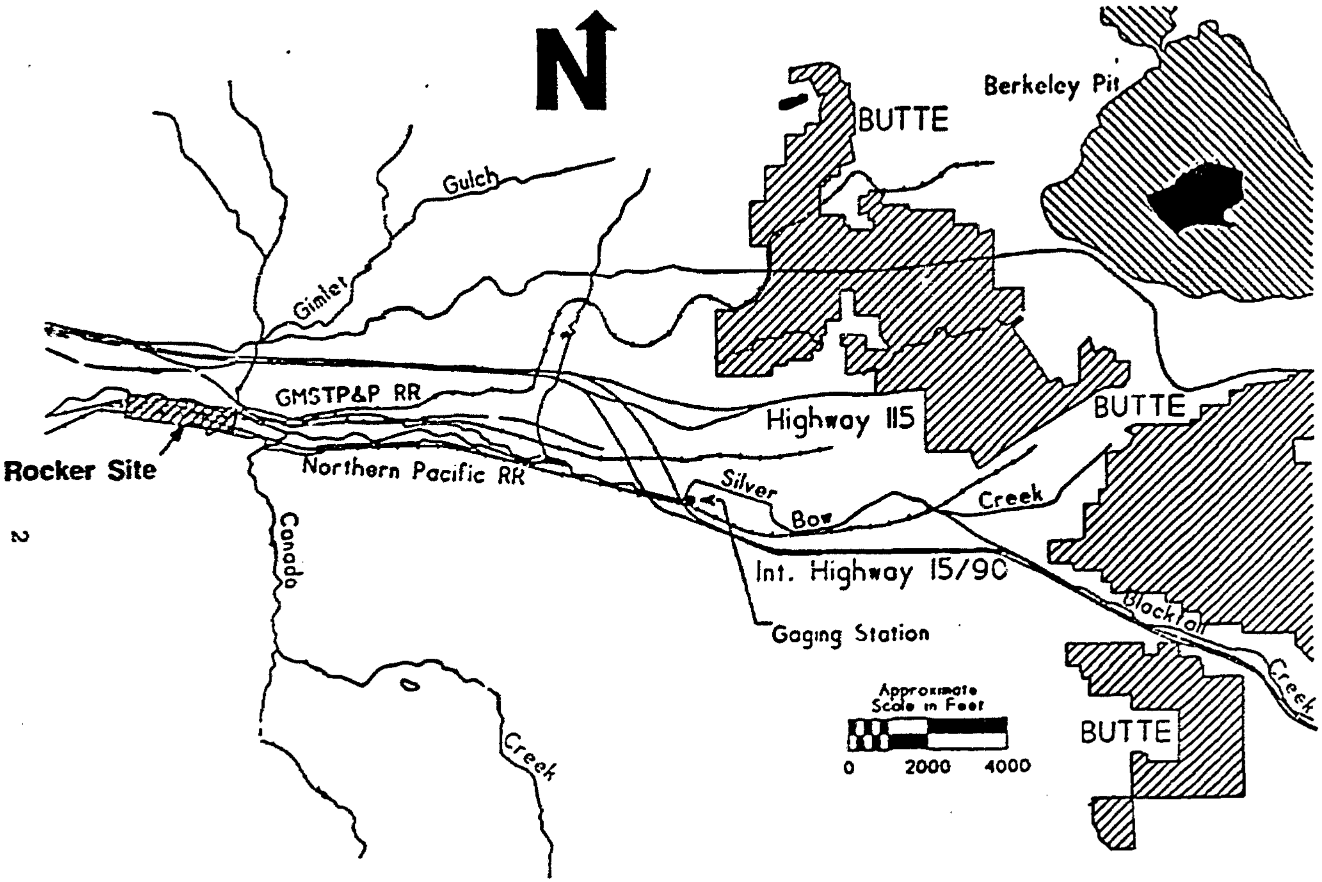
## 1. SITE NAME, LOCATION, AND DESCRIPTION

Silver Bow Creek/Butte Area (original portion) NPL Site
Rocker Timber Framing and Treating Plant Operable Unit -
Butte, Montana

The Rocker Timber Framing and Treating Plant Final Remedial Action operable unit (Rocker OU) is part of the Silver Bow Creek/Butte Area (original portion) NPL site. The Rocker OU is located approximately 7 miles west of the community of Butte, Montana (Silver Bow County) and adjacent to the community of Rocker, Montana. The OU consists of an area previously used for the treatment, storage, and shipping of mine timbers using creosote and arsenic (see Figure 1.1), involving both surface soil and groundwater contamination. The waste in the Rocker OU also contains mine waste from upstream sources.

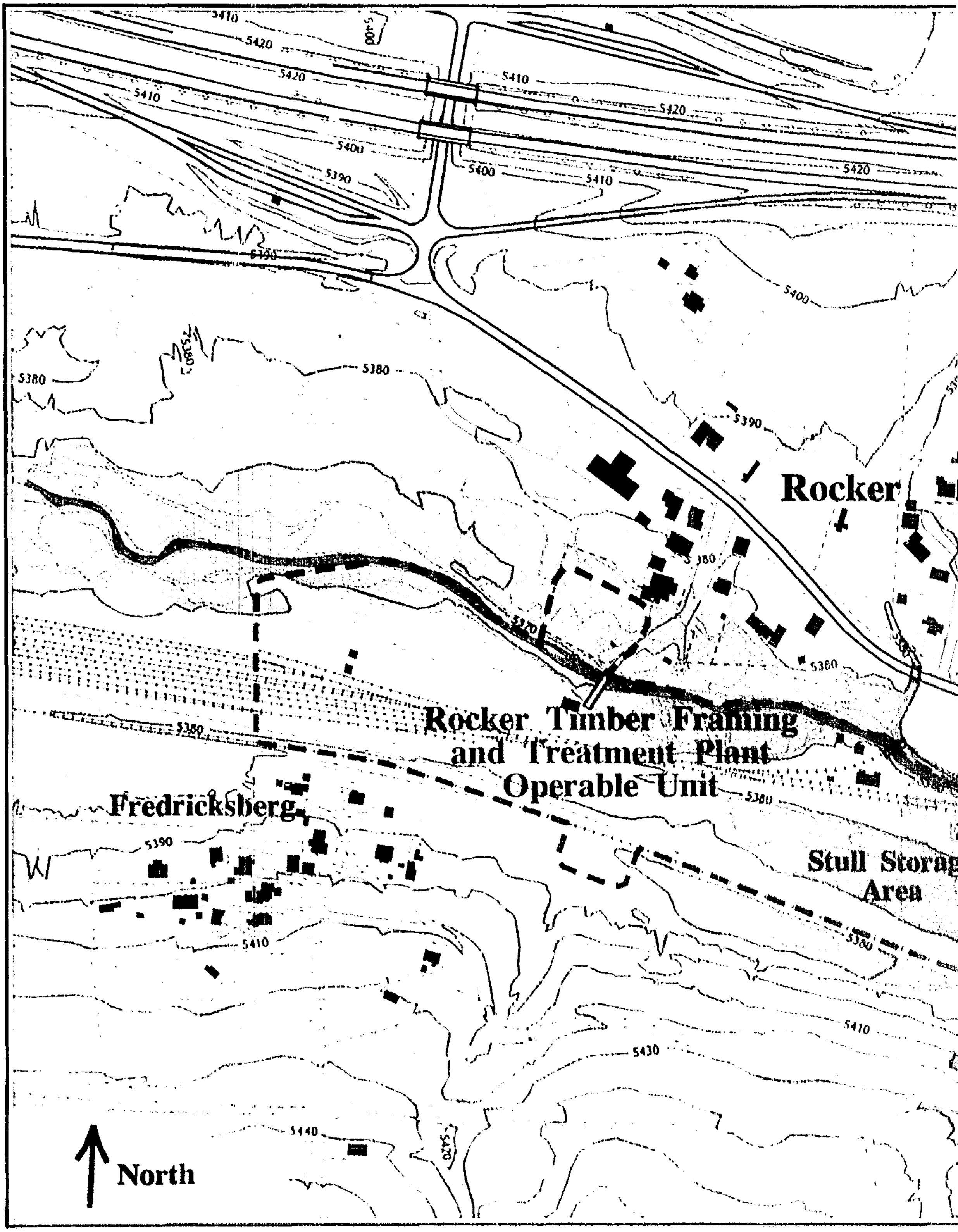
The general boundaries of the OU are a stream diversion on the east end of the Rocker OU, and Silver Bow Creek to the north (including a small storage area north of the creek). The western boundary includes the western limit of the rail siding used for this OU and the full extent of groundwater contamination down gradient from the Rocker Timber Framing and Treating Plant. The boundary to the south is the rail line and a small off-loading area. The Rocker OU covers approximately 16 surface acres. This area contains contaminants from the former treating operation mixed with mining waste transported down Silver Bow Creek and/or that was brought in for fill on the site. This OU does not include treating plant contaminants which may have migrated into Silver Bow Creek. Stream monitoring during the Rocker remedial investigation did not demonstrate that there is ongoing contaminant migration from the OU to Silver Bow Creek.

The topography of the site is variable as a result of extensive fill that has been brought in to compliment 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 (stull storage area) probably is representative of the original land surface in this area (Figure 1.2).

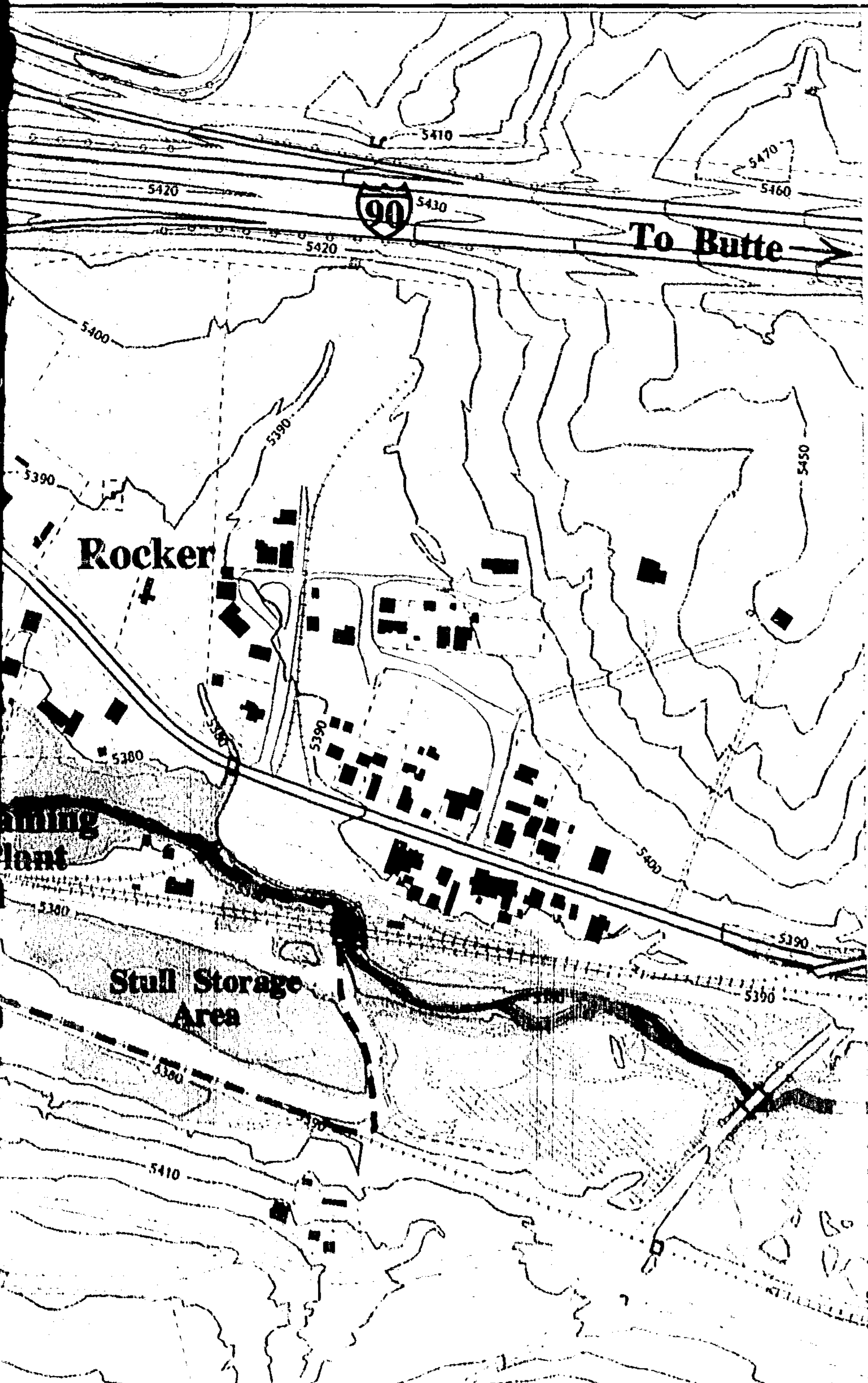



SOURCE: USGS 7.5-minute topographic quadrangle maps.
North Butte and South Butte (Montana-Silver Bow Co.) revised 1987

**FIGURE 1.1**
**SITE LOCATION MAP**
ROCKER TIMBER FRAMING AND TREATING



Rocker
Rocker Timber Framing
and Treatment Plant
Operable Unit
Fredricksberg
Stull Storag
Area
North
5420
5410
5400
5390
5380
5370
5430
5440




# Rocker, Montana

## Floodplain derived by GIS

- 100-year Floodplain
- Woods
- Water
- Building
- Boundary of Rocker Superfund Operable Unit
- Floodplain survey transect
- Paved road
- Gravel road
- Railroad
- Bridge
- Fence
- Wall
- Guardrail

**Figure 1.2**

Base map digitized from aerial photographs of 1991 by Horizons, Inc., of Rapid City. The floodplain shown on this map is the area where a surface model derived from the 2-foot contours shown on this map is lower than a surface model derived from the 100-year flood elevations at survey transects from a 1:9000 scale map by CH2M Hill: "Silver Bow Creek Flood Modeling Study."

These data were obtained by NRIS from the sources named above. NRIS does not guarantee the data for functionality, accuracy, or being free from errors. The user assumes responsibility to verify usability for their purposes.

Scale of Feet

0 200 400 600 800

Contour interval 2 feet

Montana State Library
NRIS Natural Resource Information System
Map #96epa14 - 12/15/95

Most of the site is currently used for a rail siding. Rarus Railroad has an active line and siding and two small storage sheds at the western end of the OU. 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 Streamside Tailings OU.

Natural resources associated with the Rocker OU identified to date are described in the State of Montana's report on natural resource damages entitled Rocker Groundwater Injury Assessment Report. Evaluation of natural resource issues by federal or tribal authorities has not occurred.

Silver Bow Creek forms the predominant surface drainage feature. Groundwater identified within the boundaries of the OU include three distinct water bearing zones. The shallow alluvium (extending from ground surface to about 20 feet) has been extensively contaminated from site activities. This groundwater zone has a low yield and water chemistry generally reflects the sulfate type waters characteristic of Silv r Bow Creek and Silver Bow Creek alluvium. This groundwater is intermittently recharged from Silver Bow Creek; although at times discharge also is released to surface drainage. The deep alluvium (from about 20 feet below ground surface to the top of the Tertiary) has a higher yield more suited to domestic groundwater development and a very high quality bicarbonate type water chemistry. This groundwater zone is thought to be recharged from areas to the south of the ou. This part of the saturated zone has received contamination down to about 40 feet in depth. Both the shallow and deep alluvium are primary porosity aquifers composed of sorted silts, clays, sands and gravels. The high yield tertiary aquifer produces large (commercial) volumes of good quality water (in excess of 100 gallons per minute) from zones of secondary/fracture permeability within a silty matrix (with limited sand lenses). The tertiary alluvium extends from 80 feet below ground surface to as little as 13 feet on the western end of the OU where the tertiary alluvium ramps up. This sedimentary unit is known to be several hundred feet deep. All of the groundwater zones have been demonstrated to be in hydraulic communication. All of the groundwater zones are classified by the State as potentially usable for domestic and commercial consumption. The deep alluvium and tertiary alluvium aquifers are used currently for domestic and commercial use, and increased usage is very likely as development occurs in the Rocker area.

## 2. OPERABLE UNIT HISTORY AND ENFORCEMENT ACTIONS

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 (ARCO), 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. Rocker wood treating wastes are also mixed with contaminated tailings and other mining waste washed downstream to Rocker from mining/smelting facilities in Butte.

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.

The Rocker Timber Framing and Treating Plant operable unit is part of the original Silver Bow Creek Superfund Site, that was listed on the National Priorities List (NPL) on September 8, 1983.

In 1989, the State of Montana directed ARCO to remove contaminated soils and debris with concentrations exceeding 10,000 parts per million arsenic. Approximately 1,000 cubic yards 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, materials exceeding the 10,000 parts per million (ppm) concentration have been identified at three locations remaining on the site.

Investigations that have been conducted of the Rocker OU include: investigations of surface waters upstream and downstream of Rocker conducted for ARCO in 1987 and 1988 by Hydrometrics Inc. In 1989, a Phase II investigation report, also developed by Hydrometrics, was submitted. The State's Phase I Remedial Investigation for Silver Bow Creek addressed the Rocker OU preliminarily. In 1989, data was also collected along Silver Bow Creek, including limited information pertinent to the Rocker OU, by CH2M Hill for the State of Montana. Under the State's unilateral order, ARCO performed soil sampling to delineate soils exceeding 10,000 parts per million in 1989. The remedial investigation of the Rocker OU began in the Fall of 1991, under an administrative order on consent (Docket No. CERCLA-VIII-91-14) between EPA and ARCO (August, 1991, and amended June, 1993). A historical data report was compiled by ARCO in 1991, as required by the administrative order. During the period 1991 through 1994 several detailed investigations of the Rocker site progressed with ARCO providing information regarding the nature and extent of contamination in soils and groundwater as necessary, regarding the Rocker OU. In May of 1994, the Montana Bureau of Mines and Geology conducted an important pump test that evaluated the connection between the Rocker site and an adjacent commercial well. The interpretive report for this effort was submitted to EPA in August, 1994. This investigation/report provided information that significantly influenced EPA's interpretation of the potential impact of the Rocker OU to domestic water supplies in the area. All of these studies are described and interpreted in the Final Remedial Investigation, 1995. The Rocker Final Feasibility Study, July, 1995, considered 7 alternatives to abate the contamination problems and human health threats documented in the Baseline Human Health Evaluation, 1995.

EPA's Potentially Responsible Party Search identified ARCO as the potentially responsible party for the Rocker OU. An action to recover EPA's past and future response costs for the Rocker OU and other portions of the Silver Bow Creek/Butte Area (original portion) NPL Site is currently pending in Federal district court.

**3. HIGHLIGHTS OF COMMUNITY PARTICIPATION**

EPA has conducted the required community participation activities through: several public meetings discussing the development of the RI/FS and Proposed Plan, a 30-day public comment period, a formal public hearing, and a meeting shortly after the close of public comment to present EPA's revised position regarding the Selected Remedy in this ROD. Specifically included with this ROD is a Responsiveness Summary that summarizes public comments and EPA responses, in consultation with the State. In addition, EPA implemented its Community Relation Plan throughout the conduct of the RI/FS. This involved interviews with local residents, community leaders, and periodic fact sheets describing the status of the CERCLA activities at the site. EPA will continue to involve and inform the public as the Remedial Action is implemented.

The Baseline Human Health Evaluation for the Rocker OU was completed and released to the public in March, 1995. A fact sheet and a public meeting was held to explain this report. The RI for the Rocker OU was released to the public in April, 1995. Several public meetings were held as the RI was being developed to keep the community current with the preliminary findings of the investigations. The Final report was discussed at two public meetings. Prior to the completion of the Rocker FS, two public meetings were held to discuss the screening of technologies and the development of remedial alternatives for detailed analysis in the FS. Rocker OU FS was released on July 13, 1995 contemporaneously with EPA's proposed plan. The notice of availability of the RI/FS and the Proposed Plan was published in the Butte newspaper, The Montana Standard, on July 13, 1995. The Proposed Plan was mailed to all individuals on the Rocker mail route and to individuals and organizations who had previously expressed an interest in the OU. The formal public comment period was open for 30 days and closed August 11, 1995. During the public comment period, two public meetings were held to explain the RI/FS and proposed plan. The public hearing was held August 9, 1995 and a transcript of public comments was recorded. Comments were also received in written form subsequent to EPA's public hearing. All comments have been recorded and specific responses from EPA are provided in Appendix 2 of this record of decision.

## 4. SCOPE AND ROLE OF THIS OPERABLE UNIT WITHIN SITE STRATEGY

EPA has identified ten OUs within the Silver Bow Creek/Butte Area site. These are: Rocker Timber Framing and Treating Plant, Priority Soils, Non-Priority Soils, Active Mining Area, Mine Flooding, Warm Springs Ponds Active Area, Warm Springs Inactive Area, Mill-Willow Bypass ERA, Warm Springs Ponds Final Decision, and Streamside Tailings. EPA is the lead agency for remedial activities at the Rocker OU and other OUs, and the State of Montana is the lead agency for the Streamside Tailings OU.

The Streamside Tailings OU has a close relationship to the Rocker OU because it includes an evaluation of the risk of mine wastes within Silver Bow Creek, its associated flood plain deposits, and railroad grade materials and potential spillage that extend through the Rocker OU. Care was taken during the planning stages of these two projects to have the investigations compliment each other both in terms of the remedial investigation and the risk assessment. No effect of the Rocker OU on Silver Bow Creek has been documented. The remedies for each of these OUs are being determined contemporaneously and will continue to be coordinated. Coordination between these two projects is particularly important during remedial design with respect to waste disposal.

Remediation in the Rocker OU is considered a priority by EPA because of potential risks to human health which would be caused by the release of the contaminated waters to aquifers under current use by residents and potential risks from direct contact exposure to workers and trespassers to contaminated soils. Remedial actions undertaken in the Rocker OU will address these threats, and all other threats identified in the Baseline Risk Assessment.

The remedy presented in this ROD represents the final remedial action for the Rocker Timber Framing and Treating Plant OU.

## 5. SUMMARY OF SITE CHARACTERISTICS

REMEDIAL INVESTIGATION
The Remedial Investigation (RI) for the Rocker OU was conducted by the responsible party, ARCO, with EPA and State oversight. The RI was conducted in accordance with CERCLA, the NCP, and the EPA guidelines and in compliance with the Administrative Order on Consent (Docket No. CERCLA-VIII-91-14). The Order became effective on August 2, 1991 and field investigations continued through 1995.

The purpose of the RI was to summarize site and background data collection activities and results and to collect additional data where necessary in order to satisfy the NCP requirements for an RI (40 CFR Section 300.430(d)), in order to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives.

Previous Studies
The Rocker Timber Framing and Treating Plant was part of the original Silver Bow Creek Superfund site, which was listed on the National Priorities List (NPL) on September 8, 1983. This NPL listing was amended on July 22, 1987 to include large areas around the city of Butte, Montana. As part of the original site listing and investigation, preliminary investigations were conducted that included the Rocker OU. These prior studies, and other data collection activities described earlier (Table 5.1) were compiled by ARCO in order to determine if sufficient data were available to characterize the nature and extent of contamination at the Rocker OU. This information was submitted to EPA in a Historical Data Assessment Report.

Field investigations conducted during each field season from 1991 through 1995 encompassed all suspected sources of contamination including: stream sediment, surface and subsurface soil, surface water, groundwater, potential underground storage tank, and a vadose zone study. This record of decision is supported by all of the investigations that were conducted on the Rocker OU and that were summarized and interpreted in the Final Remedial Investigation and Feasibility Study; however, only the more salient aspects of these investigations are summarized here.

Both of the wood treating compounds used, creosote and arsenic, were detected in the soils and groundwater at the Rocker site. The extent of environmental contamination from these original compounds is traced by their chemical and physical characteristics and the history of use and handling at the Rocker facility.

Table 5.1 Summary of Previous Investigations Performed at the Rocker Site

| Investigation | Activity | Objectives |
|---|---|---|
| Public health and environmental assesement data summary report, Rocker and Ramsay areas (CH2M Hill 1989) | Groundwater quality monitoring and offsite soil sampling | Collect supplemental data for public health and environmental assessment.<br><br>Evaluate metals concentrations in surface soils in and adjacent to populated areas in Rocker and Ramsay |
| Investigation of potential resources contamination near Rocker (Hyrometrics 1988, 1989) | Surface water and groundwater quality monitoring and soil profiles | Evaluate Rocker site and Gimlet as potential sources of metals and organic contamination to Silver Bow Ck. Provide an understanding of the type and extent of soils and tailings. Groundwater quality monitoring. |
| Rocker Timber Framing and Treating Site soil removal conducted in 1989 (Keystone 1991) | Soil removal | Removal of ~1000 yards of arsenic contaminated soil and wood chips. |
| Historical data assessment report (PTI, 1991) | Historical data review | Assess the quality of historic data generated during earlier investigations. |
| Remedial investigations (Keystone 1992 and PTI 1992) | Groundwater, surface water, and soils data collection | Groundwater, surface water and soils quality assessment. |

Creosote is a mixture of polynuclear aromatic hydrocarbon (PAH) compounds derived principally from distillation of coal tars. The density of the prepared creosote can range from slightly denser than to lighter than water. Because it has a high adsorption coefficient, creosote adheres to soil particles and is not exceptionally mobile in the environment. It is also resistant to biologic and chemical decay, and thus is persistent. Gradually, creosote will breakdown into individual PAH compounds which are mobile in groundwater but which also become susceptible to biologic and chemical decomposition. The biologic decomposition of the PAH compounds becomes important as it consumes oxygen with the potential to enhance arsenic mobility in a reducing groundwater environment. At the Rocker site wood treating creosote compounds were detected in only a limited number of borings and shallow groundwater samples in the immediate vicinity of the historical treatment area, attesting to either its limited use or subsequent decomposition. Creosote is an important contaminant at the Rocker OU primarily because it can have an effect on arsenic mobility. Concentrations found on the OU, however, have not been detected at concentrations exceeding EPA's acceptable carcinogenic risk range, nor non-cancer hazard index.

PAH Surface Soil Contamination
Creosote (PAH) contamination is present in the surface and subsurface in a small area extending from the historical creosote treating area and extending northwest toward Silver Bow Creek (Figure 5.1). Elevated PAH's were also detected in samples taken along the railroad right-of-way across the south side of the site and in the holding pond area on the east side of the site. The PAH contamination from the railroad surface samples are interpreted to be incidental contamination associated with the railroad track ties and not directly attributed to wood treating processes at the site. The holding pond area PAH contamination indicates either an incidental contamination from site wastes or unrelated PAH's from another source such as the nearby rail line. Total PAH's in surface soils range from non-detectable quantities to over 10,000 ppb. The highest values were found in the northwest portion of the site and on the east side of the holding pond.

PAH Subsurface Soil Contamination
PAH's were detected in subsurface soils in essentially the same areas as the surface samples. Higher concentrations, up to 62,430 ppb, were found immediately beneath the creosote plant and wood treating area (Figure 5.2). No samples with PAH's above 10,000 ppb were found in the subsurface at the holding pond or along the railroad ballast. At one location north of the treatment plant adjacent to Silver Bow Creek, total PAH's of 22,887 ppb were found in one sample from a depth of 14 to 16 feet. Odors and oil sheens were also noted in this boring suggesting creosote disposal may have occurred in this area.

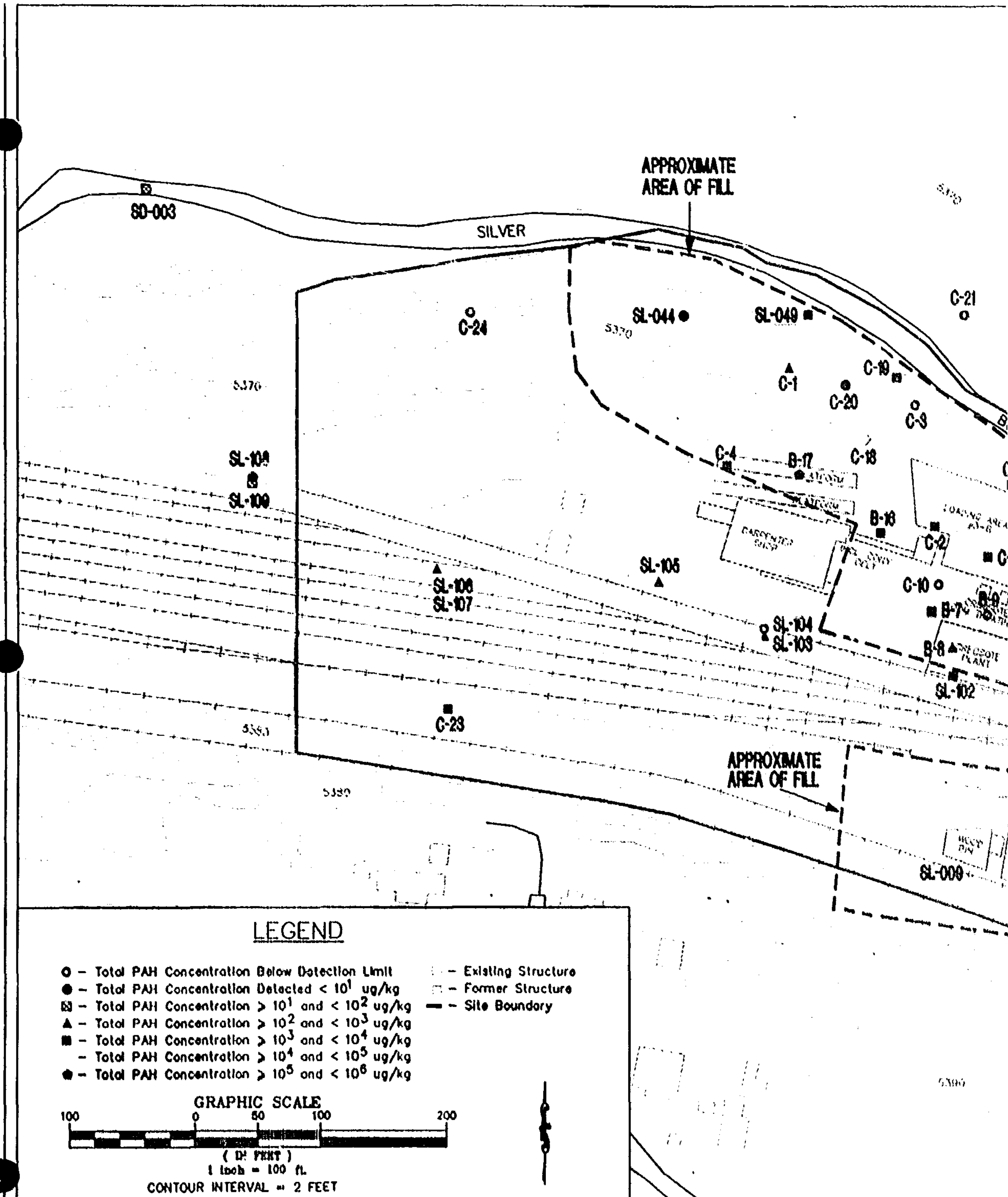
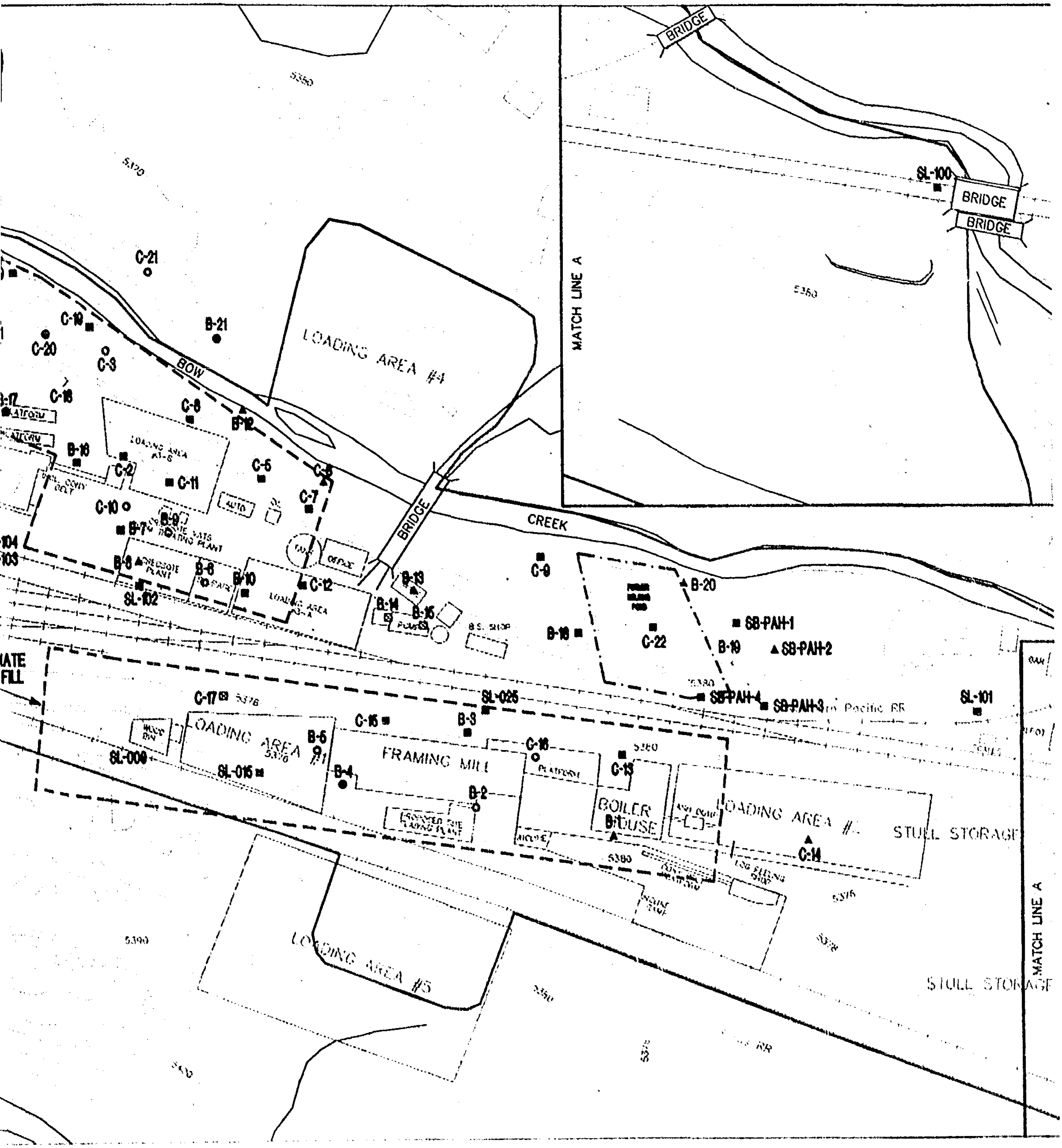



FIGURE 5.1
TOTAL PAH CONCENTRATIONS IN SURFACE SOILS
ROCKER TIMBER FRAMING AND TREATING PLANT OPERABLE UNIT, ROCKER, MT

ARCO

\ACAD\ARCO\ROCKER1\FIG4-2.DWG REV. 1 2\24\95



BRIDGE
BRIDGE
BRIDGE
BRIDGE
SL-100
MATCH LINE A
LOADING AREA #4
C-21
C-19
B-21
C-20
C-3
BOW
CREEK
C-18
C-8
B-12
B-16
C-2
C-11
C-5
C-6
C-10
C-7
B-7
B-9
B-8
B-6
B-10
C-12
SL-102
B-13
B-14
B-15
C-9
B-20
B-18
C-22
SB-PAH-1
B-19
SB-PAH-2
SB-PAH-4
SB-PAH-3
SL-101
C-17
SL-025
C-15
B-3
B-5
LOADING AREA #1
FRAMING MILL
SL-009
SL-016
B-4
C-16
C-13
B-2
BOILER HOUSE
B-1
LOADING AREA #2
STULL STORAGE
C-14
LOADING AREA #5
STULL STORAGE
MATCH LINE A

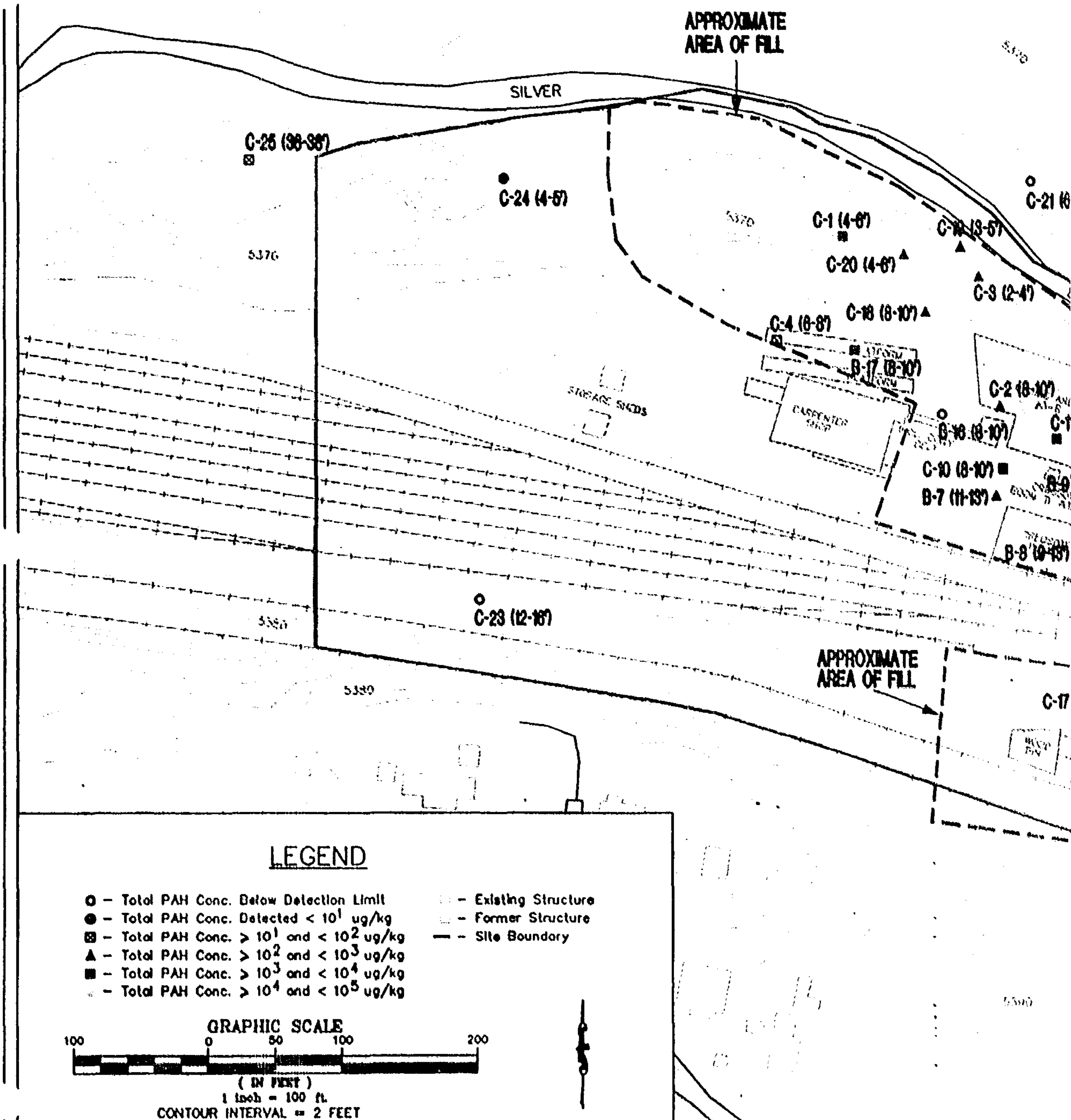
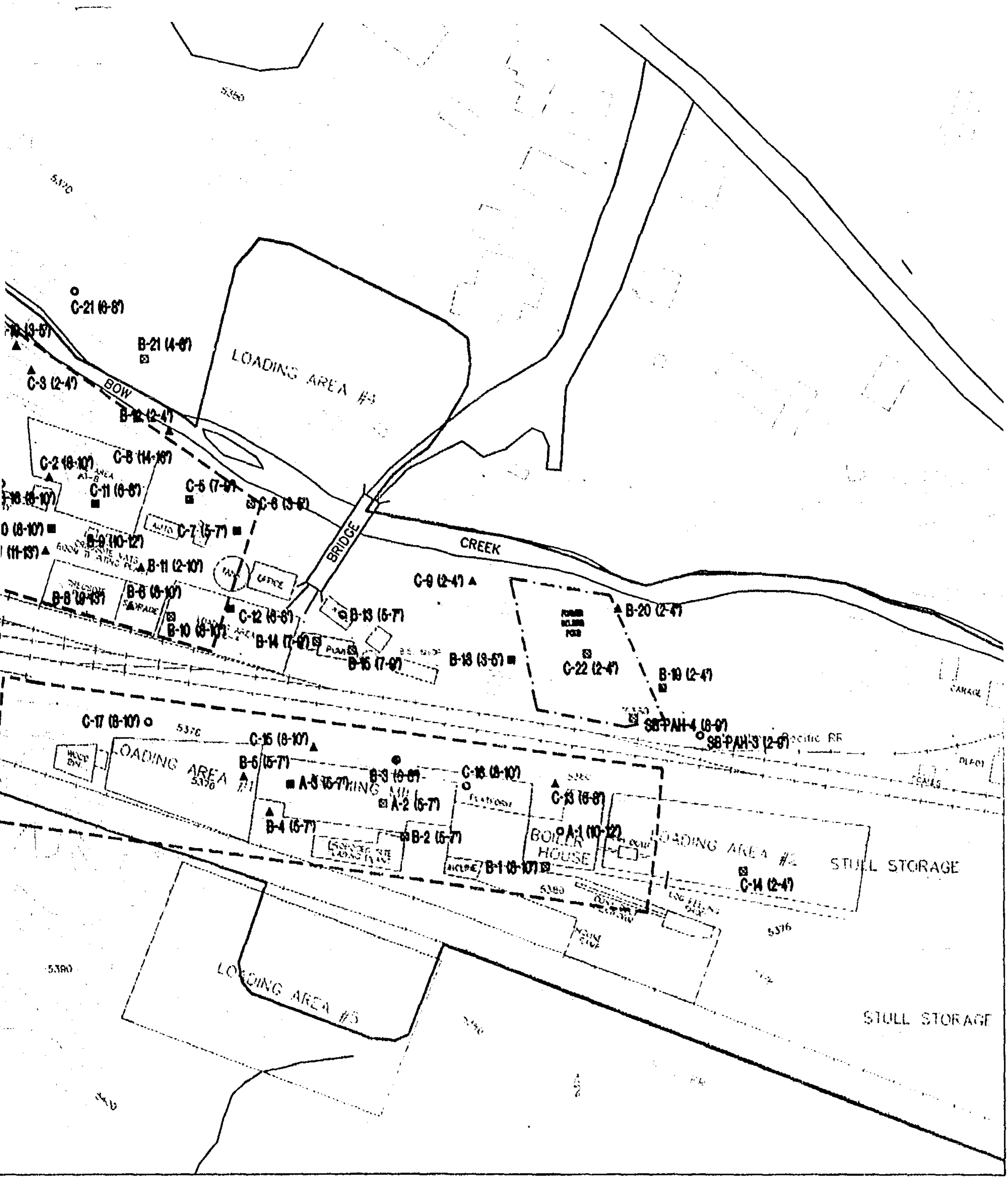



FIGURE 5.2
PAH CONCENTRATIONS IN SUBSURFACE SOILS
ROCKER TIMBER FRAMING AND TREATING PLANT OPERABLE UNIT, ROCKER, MT

\ACAD\ARCO\ROCKER1\7104-51.DWG REV. 1 2\24\96

ARCO



5380
C-21 (6-8')
B-21 (4-6')
C-3 (2-4')
BOW
LOADING AREA #3
B-12 (2-4')
C-2 (8-10')
C-8 (14-16')
C-11 (6-8')
C-5 (7-9')
C-6 (3-6')
C-7 (5-7')
B-9 (10-12')
B-11 (2-10')
OFFICE
B-8 (10-13')
B-6 (8-10')
C-12 (6-8')
B-10 (8-10')
B-14 (7-9')
B-13 (5-7')
B-16 (7-9')
BRIDGE
CREEK
C-9 (2-4')
B-20 (2-4')
B-18 (3-5')
C-22 (2-4')
B-19 (2-4')
SB-PAH-4 (6-9')
SB-PAH-3 (2-6')
GARAGE
C-17 (8-10')
5376
C-15 (8-10')
LOADING AREA #1
B-5 (5-7')
A-3 (5-7')
B-3 (6-8')
C-16 (8-10')
A-2 (5-7')
C-13 (6-8')
B-4 (5-7')
B-2 (5-7')
A-1 (10-12')
BOILER HOUSE
B-1 (8-10')
LOADING AREA #2
STULL STORAGE
C-14 (2-4')
5376
5380
LOADING AREA #5
STULL STORAGE

PAH Groundwater Contamination
PAH's were detected in 7 shallow alluvial aquifer wells extending from the treatment plant to the northwest. The highest total PAH concentration was 822 ppb in the well immediately downgradient of the historical creosote treatment plant area (Figure 5.3).

Summary of PAH Contamination
PAH's associated with the wood treatment operations using creosote at the Rocker OU are present in the soils, aquifer matrix and in low concentrations in the shallow alluvial aquifer. The extent of PAH contamination is small and indicating either minimal use of creosote or post disposal degradation and flushing. PAH's contribute to the overall environmental contamination at the Rocker OU but are not significant relative to observed groundwater concentrations of arsenic.

Arsenic Contamination
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 has been found in the surface soils and at depth as well as in the groundwater. Arsenic and metals contamination from mine waste is also present at various locations at the Rocker OU.

Arsenic Contamination in Surface Soils
Most of the arsenic contaminated surface soils with arsenic greater than 10,000 ppm were removed in the 1989 interim action taken at the Rocker OU (Figure 5.4). Only one sample collected from the vicinity of the loading trench on the west central side of the site and a sample from the railroad right-of-way immediately south of the treatment area contained an arsenic concentration greater than 10,000 ppm. Numerous soil samples, approximately evenly distributed over the site north of the central railroad tracks, had arsenic concentrations between 1,000 and 10,000 ppm.

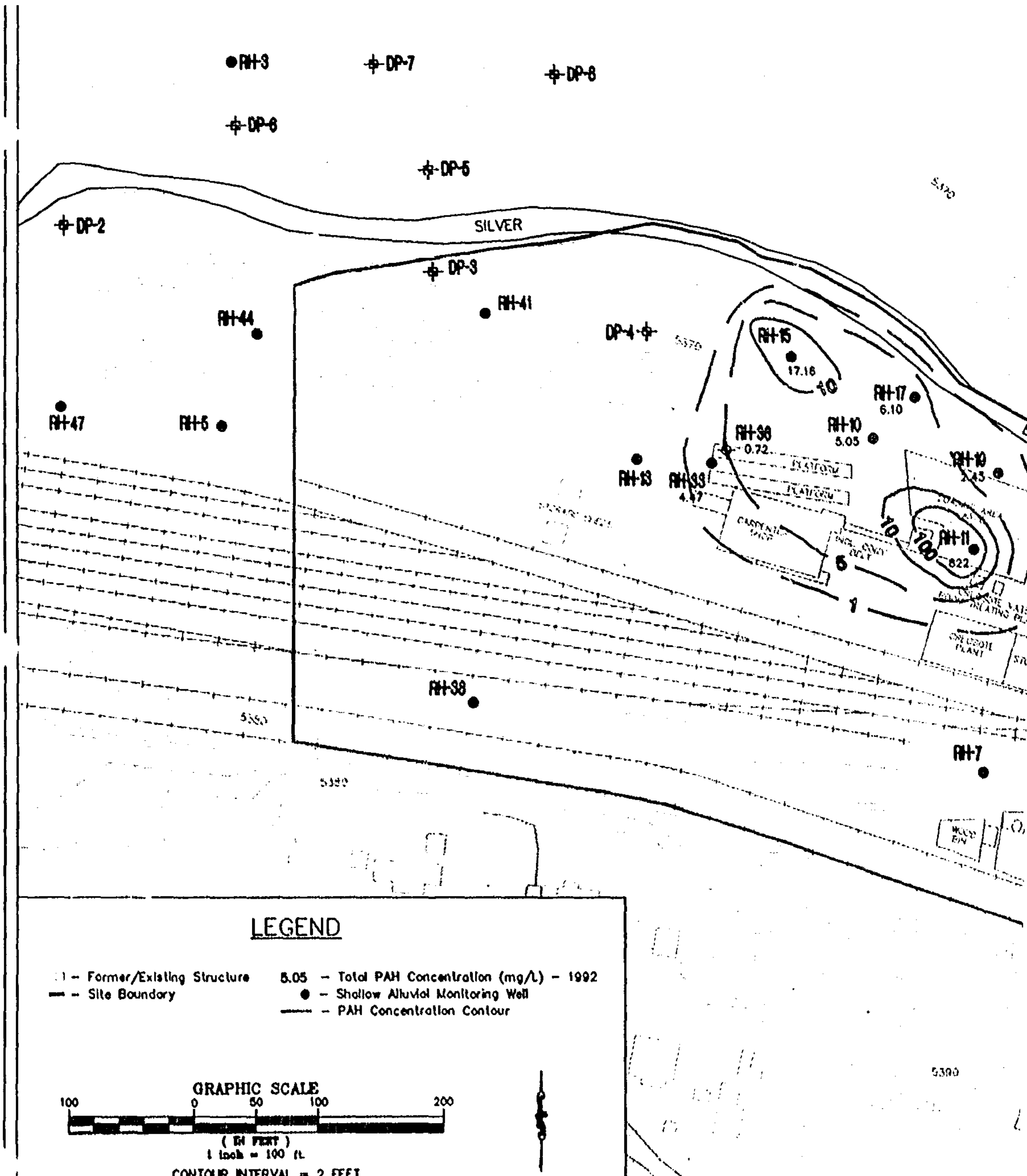
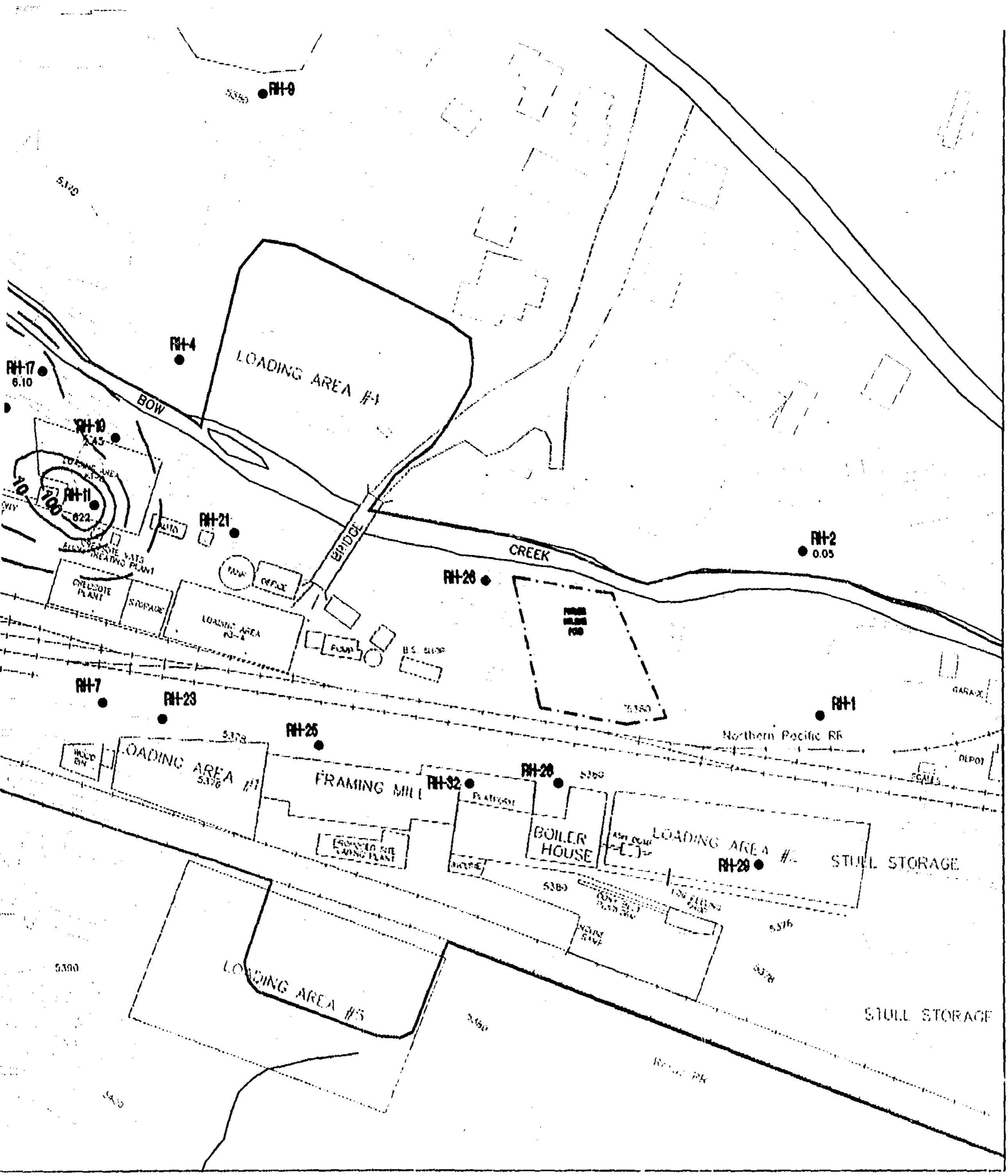



FIGURE 5.3
TOTAL PAH, 1992 CONCENTRATIONS
IN SHALLOW ALLUVIAL MONITORING WELLS
ROCKER TIMBER FRAMING AND TREATING
PLANT OPERABLE UNIT, ROCKER, MT

ARCO

\ACAD\ARCO\ROCKER1\FIG4-63.DWG REV. 1 2\28\95


RH-9
5370
RH-4
LOADING AREA #4
RH-17
6.10
BOW
RH-10
RH-11
622
10
100
RH-21
BRIDGE
CREEK
RH-2
0.05
RH-26
CREOSOTE PLANT
STORAGE
LOADING AREA
OFFICE
PUMP
B.S. SHOP
RH-7
RH-23
RH-25
RH-1
Northern Pacific RR
5378
LOADING AREA #1
FRAMING MILL
RH-32
RH-28
BOILER HOUSE
LOADING AREA #2
STULL STORAGE
RH-29
DEPOT
SCALES
5380
5376
LOADING AREA #5
5390
STULL STORAGE

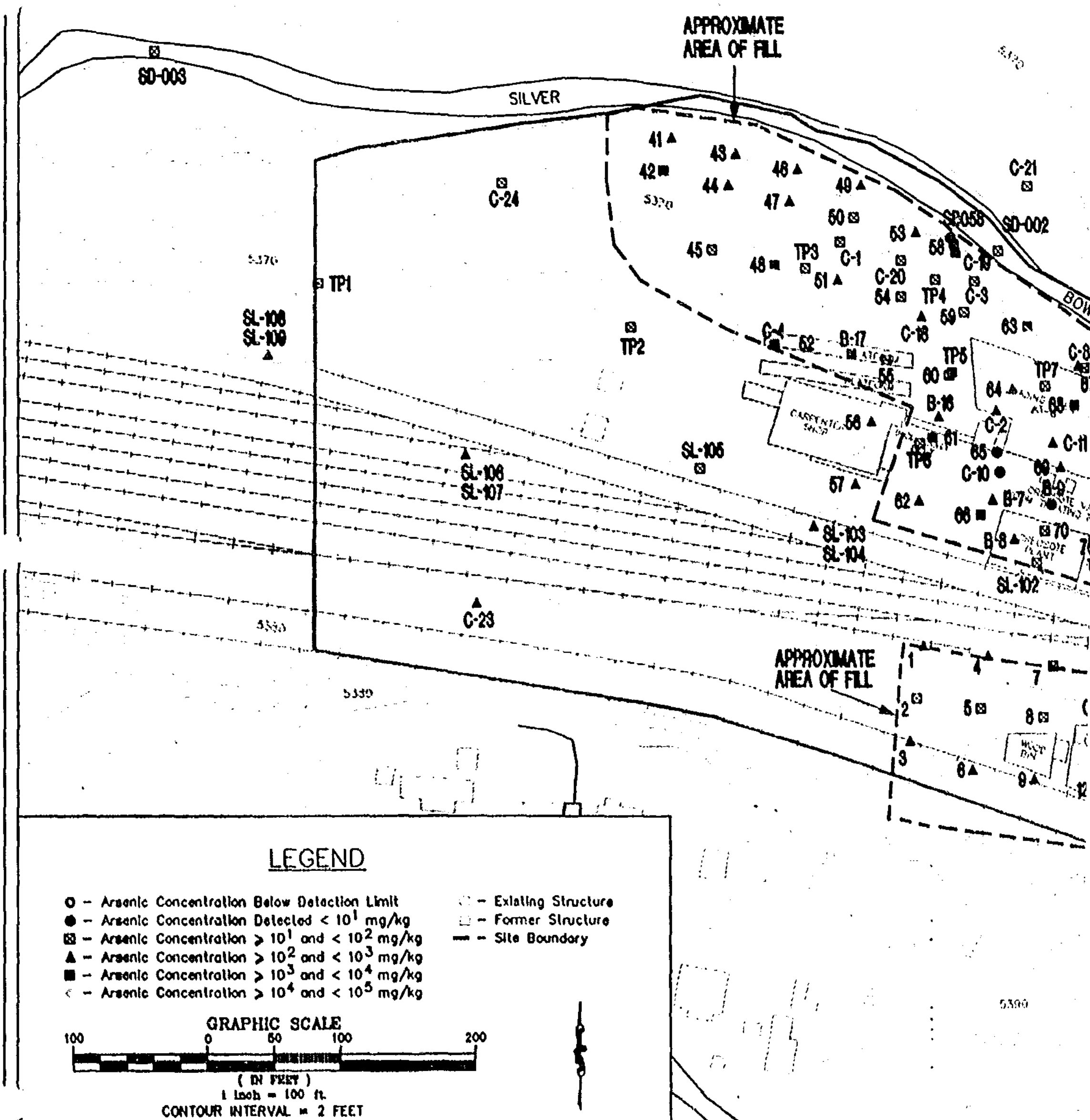
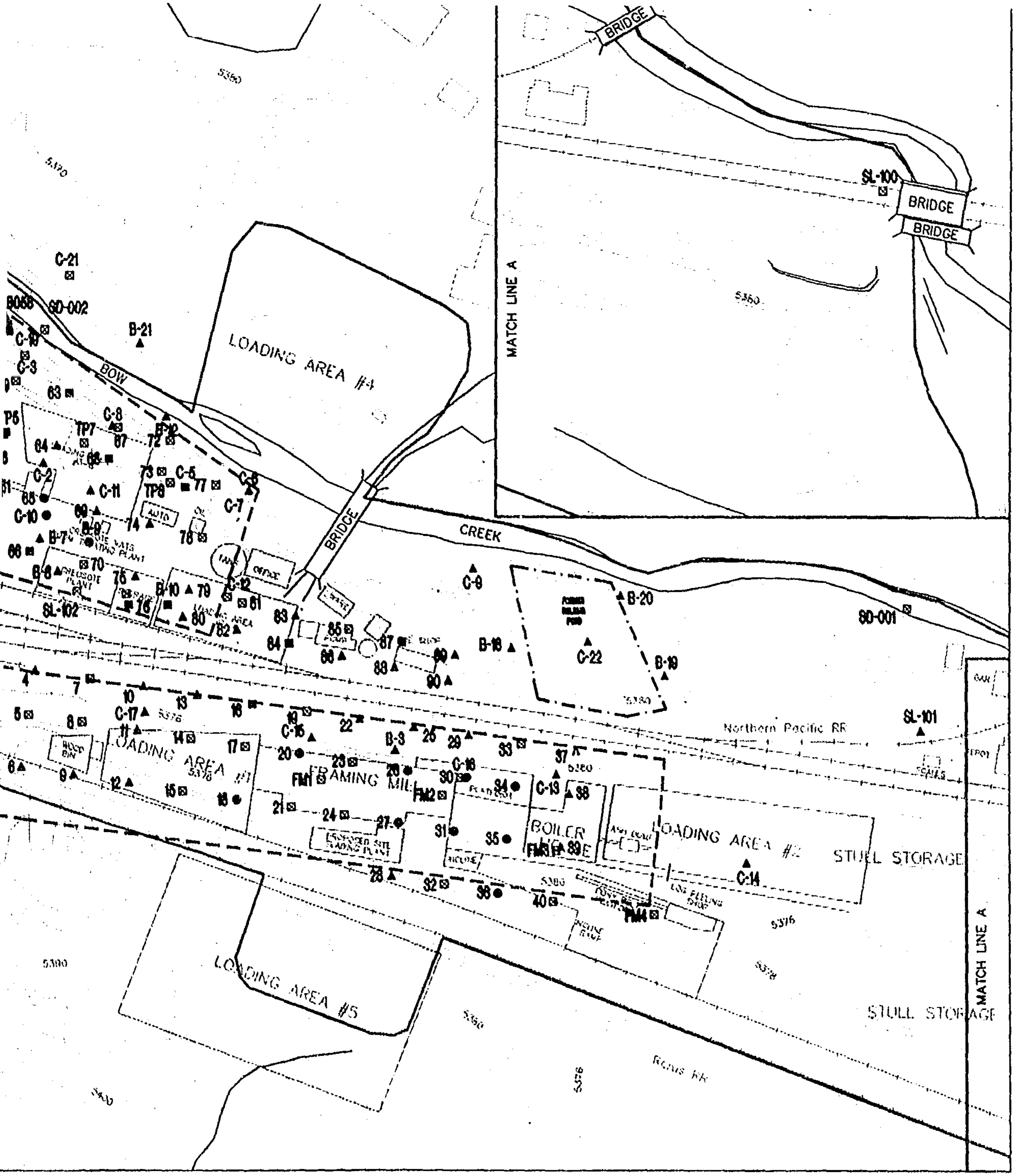



FIGURE 5.4

**ARSENIC CONCENTRATIONS IN SURFACE SOILS ROCKER TIMBER FRAMING AND TREATING PLANT OPERABLE UNIT, ROCKER, MT**

ARCO

\ACAD\ARCO\ROCKER1\FIG4-1.DWG REV. 1 2/23/93


BRIDGE
BRIDGE
BRIDGE
SL-100
MATCH LINE A
LOADING AREA #4
BOW
CREEK
BRIDGE
C-21
SD-002
B-21
C-9
B-20
SD-001
B-18
C-22
B-19
SL-101
Northern Pacific RR
SL-102
LOADING AREA #1
FRAMING MILL
BOILER HOUSE
LOADING AREA #2
STULL STORAGE
C-14
LOADING AREA #5
MATCH LINE A
STULL STORAGE

Arsenic Contamination in Subsurface Soils (above the water table)
Arsenic concentrations in the subsurface soils between the surface and the water table have generally lower arsenic concentrations except at one location (Figure 5.5). A single boring at the loading trench detected arsenic of 7,524 ppm at a depth of 8-10 feet. Arsenic concentrations in all other samples in this sample depth grouping were less than 1,000 ppm.

Arsenic Contamination in Alluvium (at and below the water table)
At several locations in the historical treatment plant area and extending to the northwest arsenic concentrations in the alluvium at and below the water table have elevated arsenic concentrations between 1,000 and 10,000 ppm and including one sample with a concentration of 42,900 ppm located in the historical treatment plant (Figure 5.6).

Arsenic Contamination in Groundwater
Arsenic mobility in groundwater at the Rocker OU is highly variable depending on geochemical conditions in the aquifer (available iron and oxidation/reduction potentials) and on the oxidation state of the arsenic ($As^{+}$III is more mobile than As $^{+}$V). In areas of high iron and high oxidation potential, arsenic rapidly adsorbs onto the aquifer matrix with iron oxyhydroxides and becomes essentially immobilized. Under reducing conditions or in the absence of iron, arsenic is much more mobile. Both geochemical conditions are likely present at various locations at the Rocker site probably associated with PAH contamination or areas of natural organic deposits where surface soils are saturated. However, the shallow alluvial groundwater is generally considered to be oxidizing. Unfortunately, two significant groundwater producing strata with good quality water are in hydraulic communication with the arsenic plume and have the potential to become contaminated.

Concentrations of arsenic exceeding 100 ppb are present in all three hydrogeologic units identified at the Rocker Site; although arsenic migration into the deep alluvium (20 to 80 feet below ground surface) and the tertiary alluvium has been very limited. The shallow alluvial aquifer has the highest concentrations covering the largest area. (refer to arsenic isopleth maps and x-section)

Several areas of arsenic contamination are present. The smallest areas include the holding pond area on the east side and area southeast (upgradient) of the treatment plant area. The elevated arsenic in these areas may be due to either incidental disposal of arsenic enriched wood treating chemicals or the result of leaching mine waste materials or both. A third arsenic plume was detected in well RH-5 on the west side of the site.

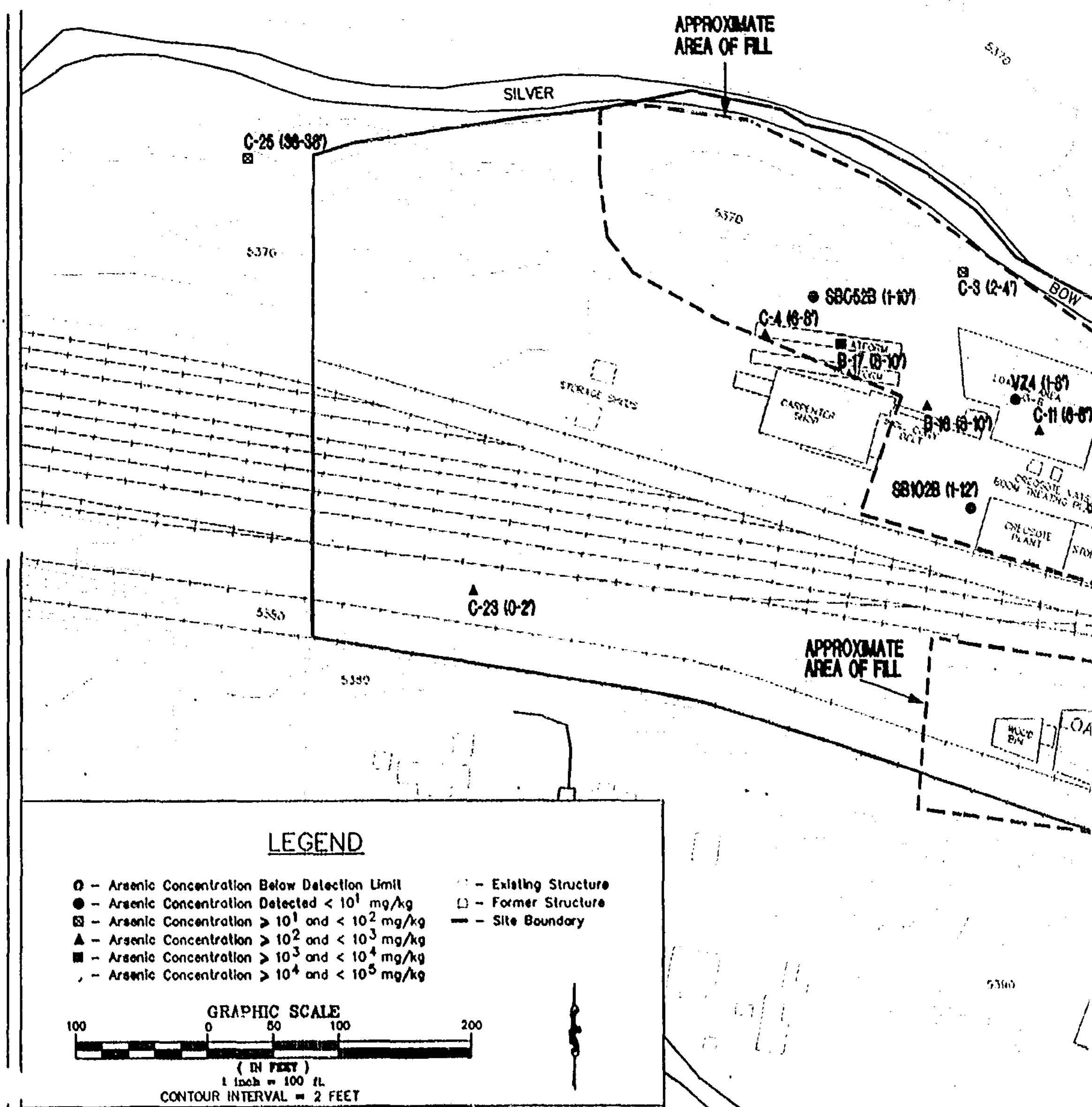
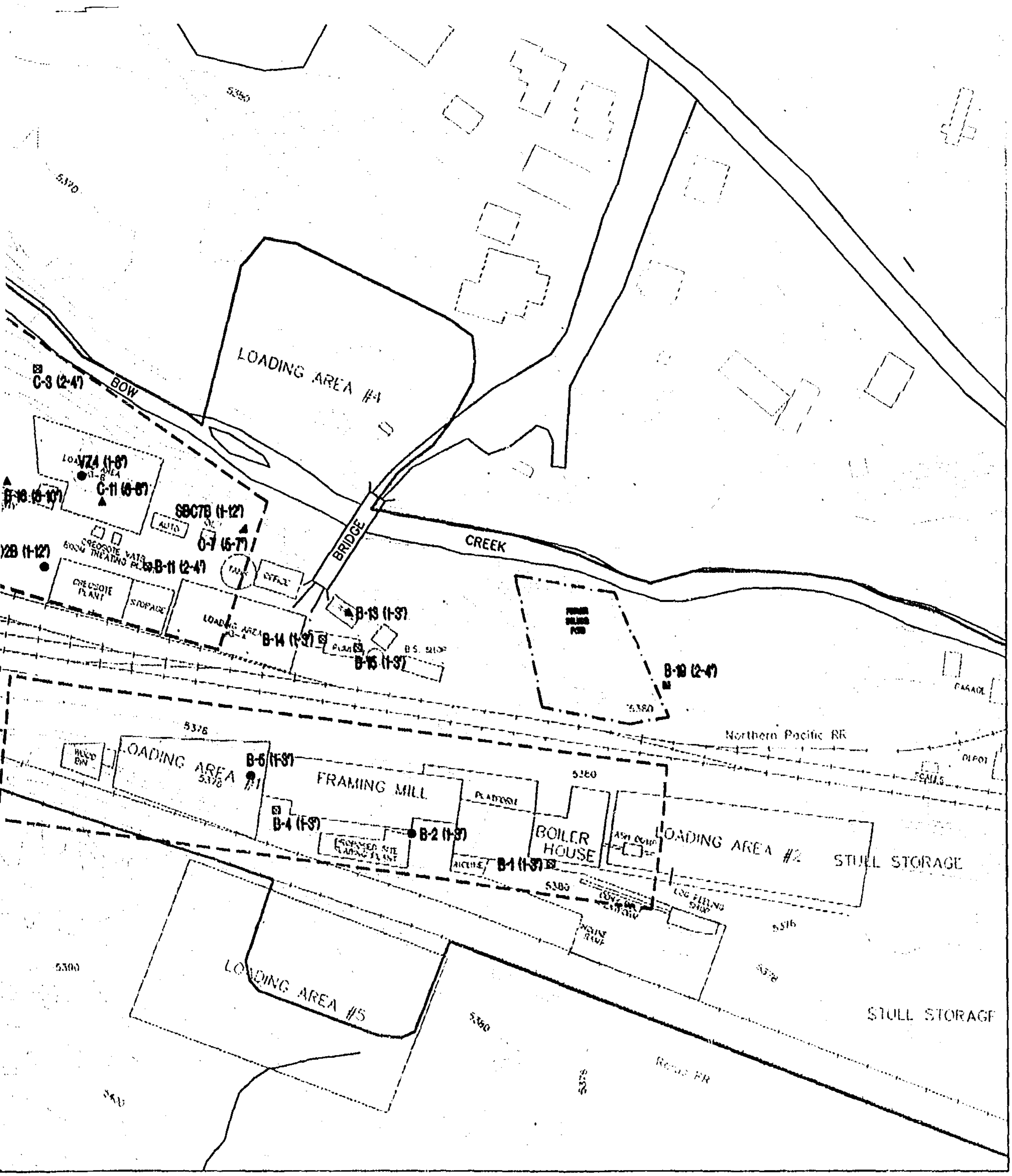



FIGURE 5.5
ARSENIC CONCENTRATIONS
IN SUBSURFACE SOILS ABOVE THE WATER TABLE
ROCKER TIMBER FRAMING AND TREATING
PLANT OPERABLE UNIT, ROCKER, MT

\ACAD\ARCO\ROCKER1\F104-3.DWG REV. 1 2\24\95

ARCO


LOADING AREA #4
BOW
CREEK
BRIDGE
C-3 (2-4')
VZ4 (1-8')
C-11 (6-8')
B-16 (8-10')
SBC7B (1-12')
C-7 (5-7')
B-11 (2-4')
CREOSOTE VATS
CREOSOTE PLANT
STORAGE
OFFICE
AUTO
B-13 (1-3')
B-14 (1-3')
B-15 (1-3')
B.S. SHOP
B-19 (2-4')
GARAGE
Northern Pacific RR
DEPOT
LOADING AREA #1
B-5 (1-3')
FRAMING MILL
B-4 (1-3')
B-2 (1-3')
BOILER HOUSE
B-1 (1-3')
LOADING AREA #2
STULL STORAGE
LOG FILLING STOP
LOADING AREA #5
STULL STORAGE
5376
5380
5360
5370
5350

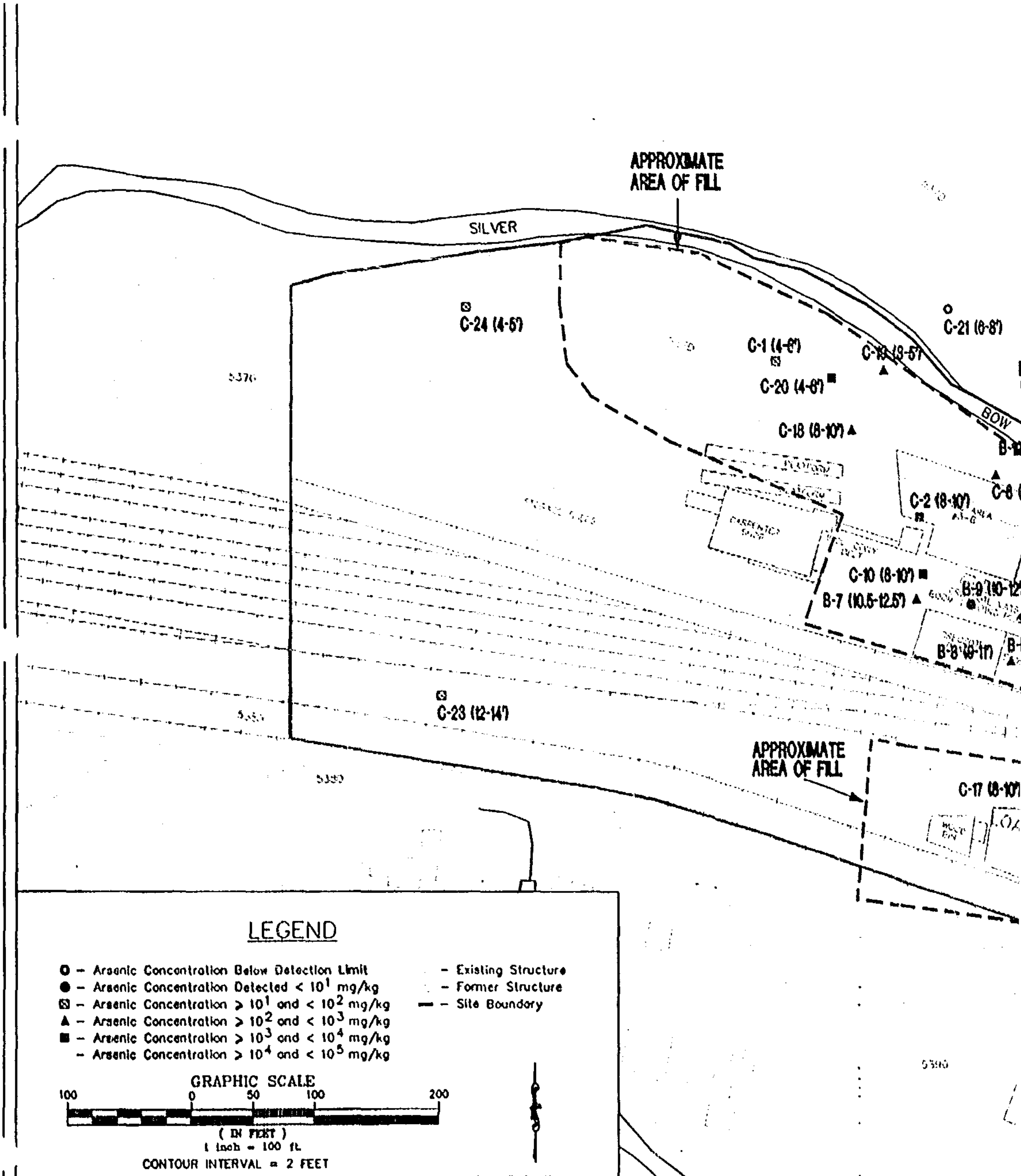
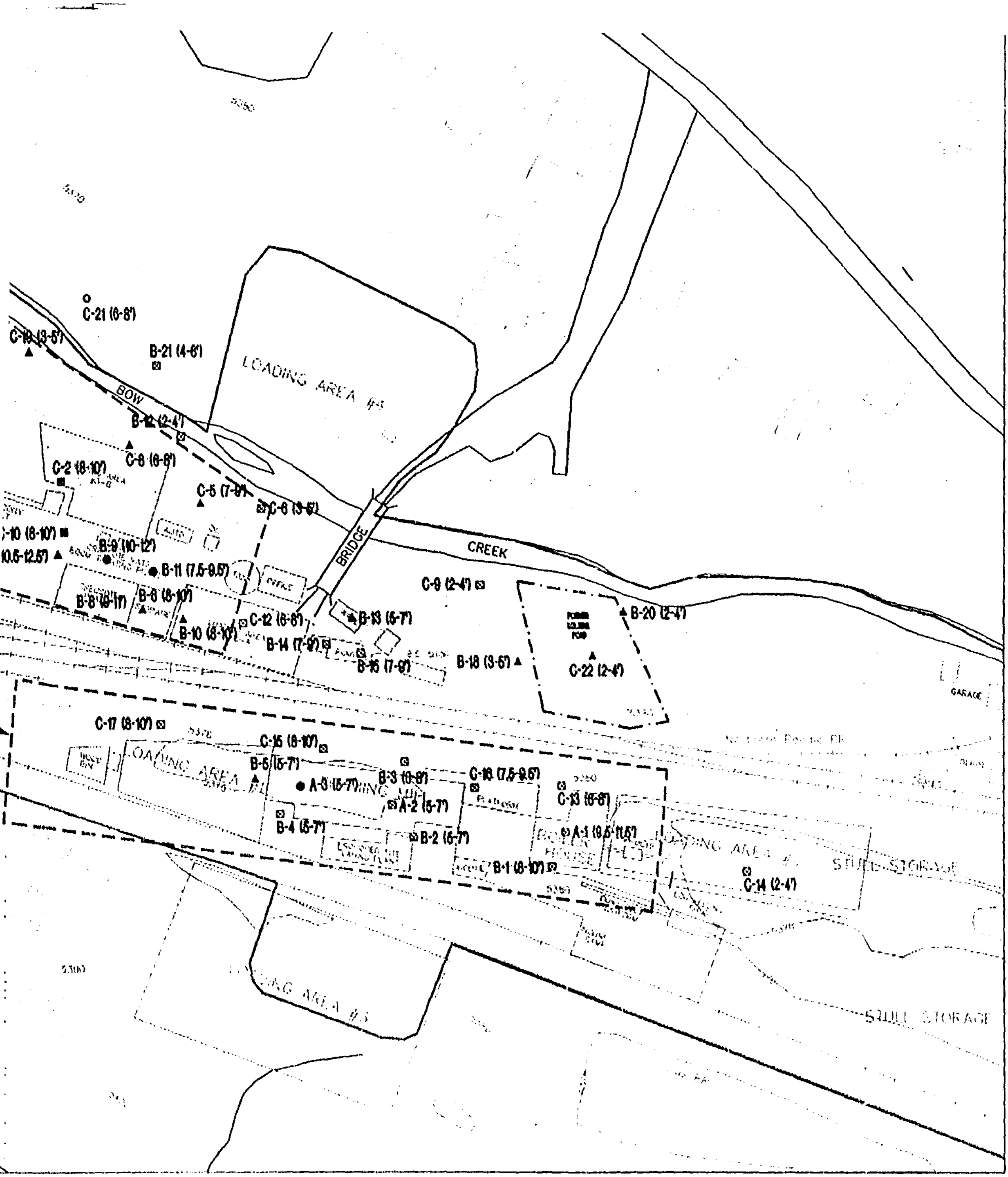



FIGURE 5.6
ARSENIC CONCENTRATIONS IN SUBSURFACE SOILS AT OR BELOW THE WATER TABLE
ROCKER TIMBER FRAMING AND TREATING PLANT OPERABLE UNIT, ROCKER, MT

\ACAD\ARCO\ROCKER1\FIG4-4.DWG REV. 1 2\24\95



C-21 (6-8')
C-19 (3-5')
B-21 (4-6')
LOADING AREA #4
BOW
B-12 (2-4')
C-8 (6-8')
C-2 (8-10')
C-5 (7-8')
C-6 (3-5')
C-10 (8-10')
B-9 (10-12')
B-11 (7.5-9.5')
B-8 (8-11')
B-6 (8-10')
B-10 (8-10')
C-12 (6-8')
BRIDGE
CREEK
C-9 (2-4')
B-13 (5-7')
B-14 (7-9')
B-15 (7-9')
B-18 (3-5')
B-20 (2-4')
C-22 (2-4')
GARAGE
C-17 (8-10')
C-15 (8-10')
B-5 (5-7')
LOADING AREA
A-3 (5-7')
B-3 (0-8')
C-16 (7.5-9.5')
C-13 (6-8')
A-2 (5-7')
B-4 (5-7')
B-2 (5-7')
A-1 (9.5-11.5')
B-1 (8-10')
C-14 (2-4')
STILL STORAGE
LOADING AREA #3
STILL STORAGE

The largest, and most concentrated arsenic plume, up to 25,700 ppb arsenic, is located in the shallow alluvial aquifer beneath the center of the site and extending west and northwest from the historical treatment area and the backfilled loading trench (Figure 5.7). Definition of the northwest side of the plume is obscured by some mixing with Silver Bow Creek and a lack of wells at proper depths in this direction. Concentrations within the plume along the east to west flow line diminish rapidly down to approximately 100 ppb over a length of approximately 300 to 400 feet. The final investigation of the groundwater plume occurred in the Spring of 1995 on the north side of Silver Bow Creek. Concentrations of arsenic in all three hydrogeologic units were less than 10 ppb, indicating the plume had not migrated beneath Silver Bow Creek.

Elevated arsenic in the deep alluvial aquifer is restricted to one well on the west side of the site where a concentration of approximately 6,000 ppb was detected at a depth of 30 to 40 feet (Figure 5.8). The alluvial aquifer contains downward gradients in this area and the most concentrated portion of the plume in the shallow alluvium passes over the top of this location.

Knowledge of elevated arsenic concentrations in the Tertiary sediments aquifer is limited to a single well (Figure 5.9 & 5.10). This well is located high in the stratigraphic section along the west side of the site where the Tertiary sediments ramp up to near surface. The shallow and deep alluvial aquifers contain elevated arsenic concentrations adjacent to where the sand bed yielding water to this well probably subcrops and the arsenic enriched groundwater in this well is probably coming directly from the alluvial aquifer to the east. The extent of the arsenic plume in this strata was also limited by the recent Tertiary sediments wells located north of Silver Bow Creek where arsenic concentrations were found to be less than 10 ppb in the Spring of 1995.

<u>Remedial Investigation Summary of Major Findings:</u>

1. Arsenic is present in soils across the site. However, the highest levels of arsenic are fairly localized and coincide with past operations, generally diminishing with depth below ground surface. Concentrations increase abruptly near the water table. The highest arsenic concentrations occur immediately above and below the water table, where they serve as the long term source of arsenic for groundwater contamination.

2. PAHs in soils are localized. The highest levels of PAHs coincide with historical creosote operations and diminish rapidly, both vertically and horizontally away from the source.

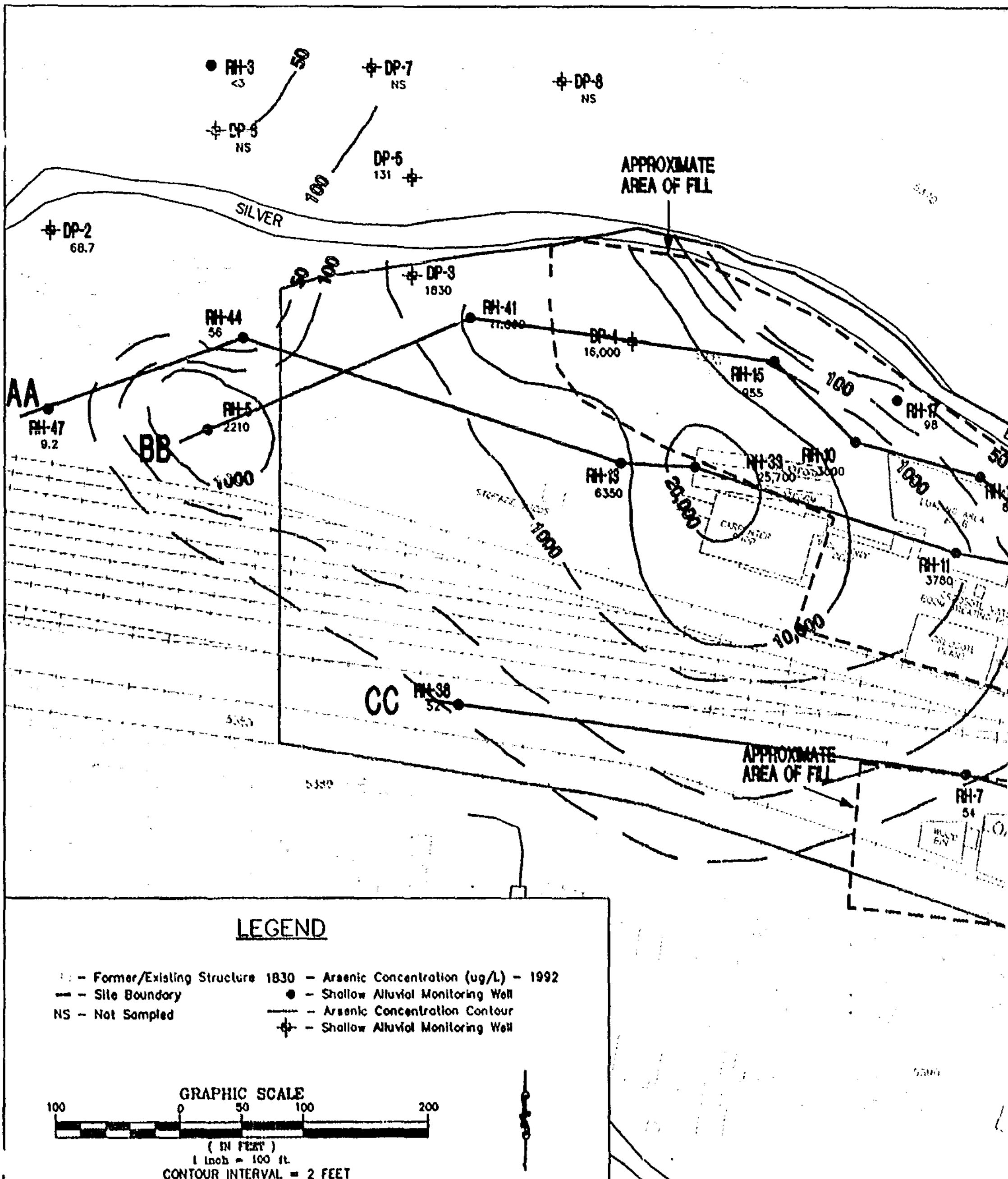
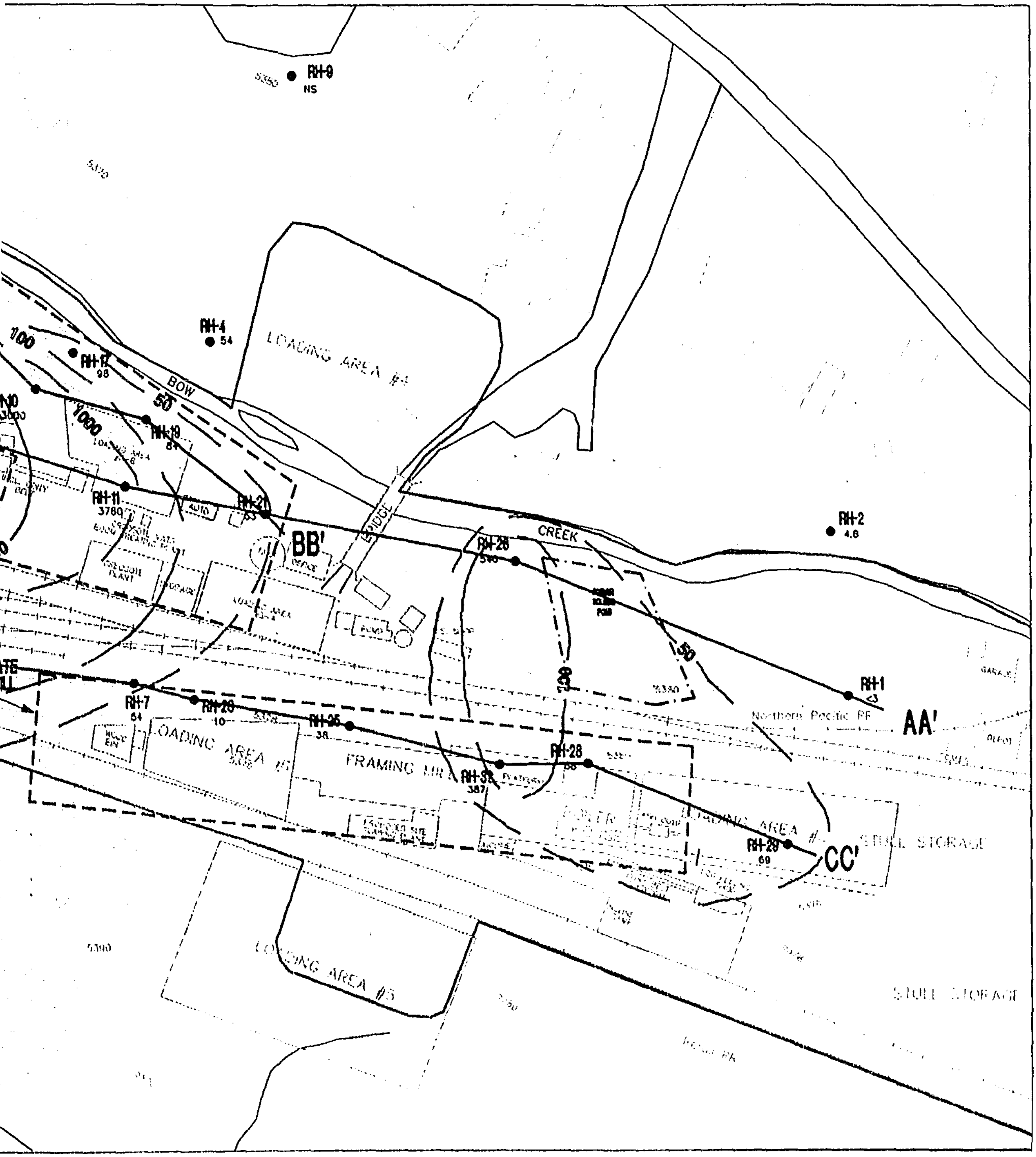



FIGURE 5.7
CROSS SECTION LOCATION MAP FOR ARSENIC - 1992
IN SHALLOW ALLUVIAL MONITORING WELLS
ROCKER TIMBER FRAMING AND TREATING
PLANT OPERABLE UNIT, ROCKER, MT

\ACAD\ARCO\ROCKER1\1103-4.DWG REV. 1 3\1\93

ARCO



RH-9
NS
RH-4
54
LOADING AREA #4
BOW
CREEK
BRIDGE
RH-17
98
RH-19
84
RH-11
3780
RH-21
63
BB'
RH-2
4.8
RH-1
<3
AA'
Northern Pacific RR
RH-7
54
RH-20
10
RH-25
38
RH-28
88
RH-33
387
RH-29
69
CC'
LOADING AREA #5
FRAMING MILL
STULL STORAGE
LOADING AREA #3
STULL STORAGE
GARAGE
100
50
1000
50
100

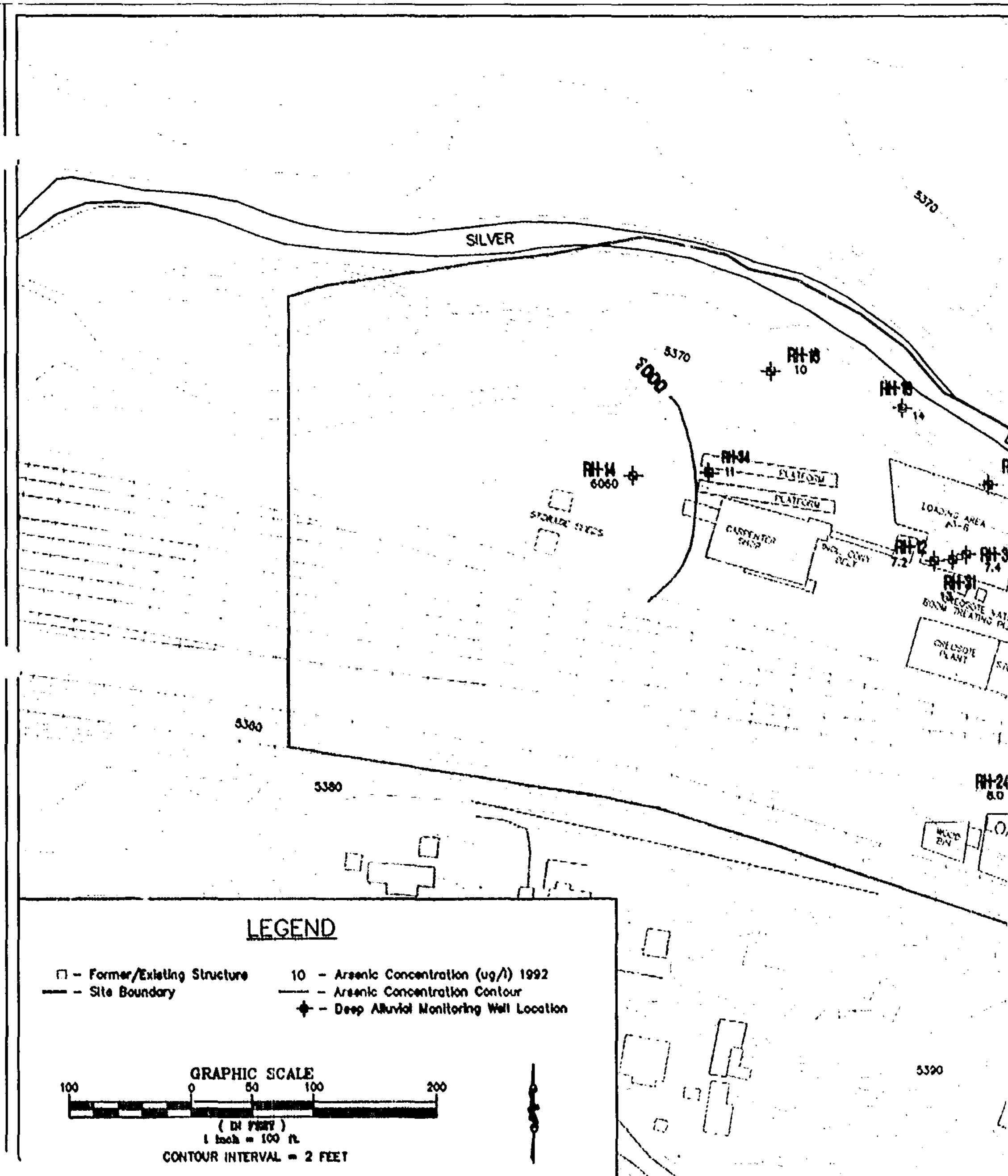
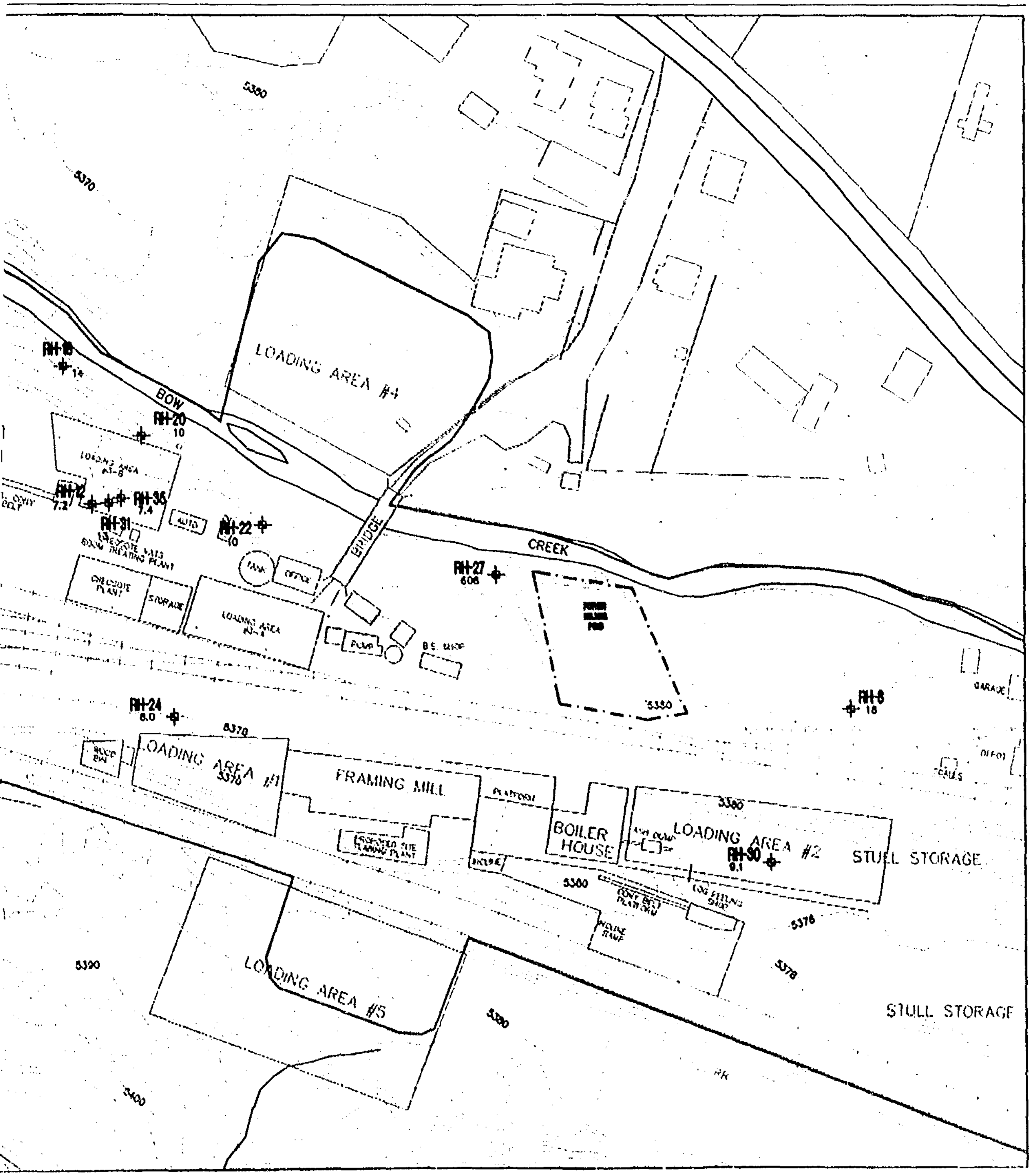



FIGURE 5.6
ARSENIC (ug/l) - 1992
IN DEEP ALLUVIAL MONITORING WELLS
ROCKER TIMBER FRAMING AND TREATING
PLANT OPERABLE UNIT, ROCKER, MT

ARCO

\ACAD\ARCO\ROCKER1\7104-48.DWG REV. 2 3\8\93



5380
5370
LOADING AREA #4
BOW
CREEK
BRIDGE
RH-20
10
RH-35
7.4
RH-22
10
TANK
OFFICE
CREOSOTE PLANT
STORAGE
PUMP
RH-27
606
5350
RH-6
18
GARAGE
DEPOT
SCALES
RH-24
8.0
LOADING AREA #1
FRAMING MILL
PLATFORM
BOILER HOUSE
LOADING AREA #2
RH-30
9.1
STULL STORAGE
5380
LOADING AREA #5
5390
5400
STULL STORAGE

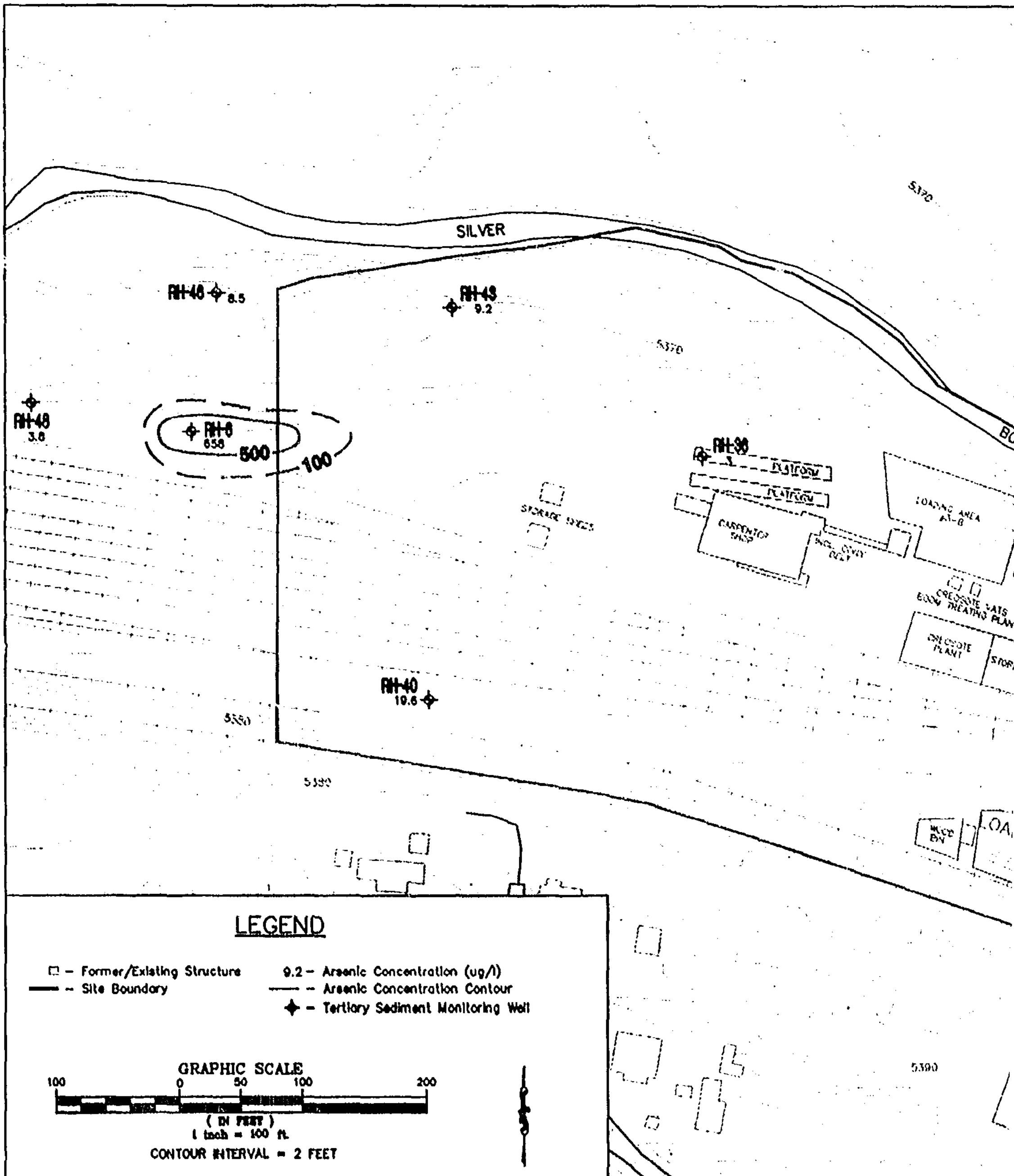
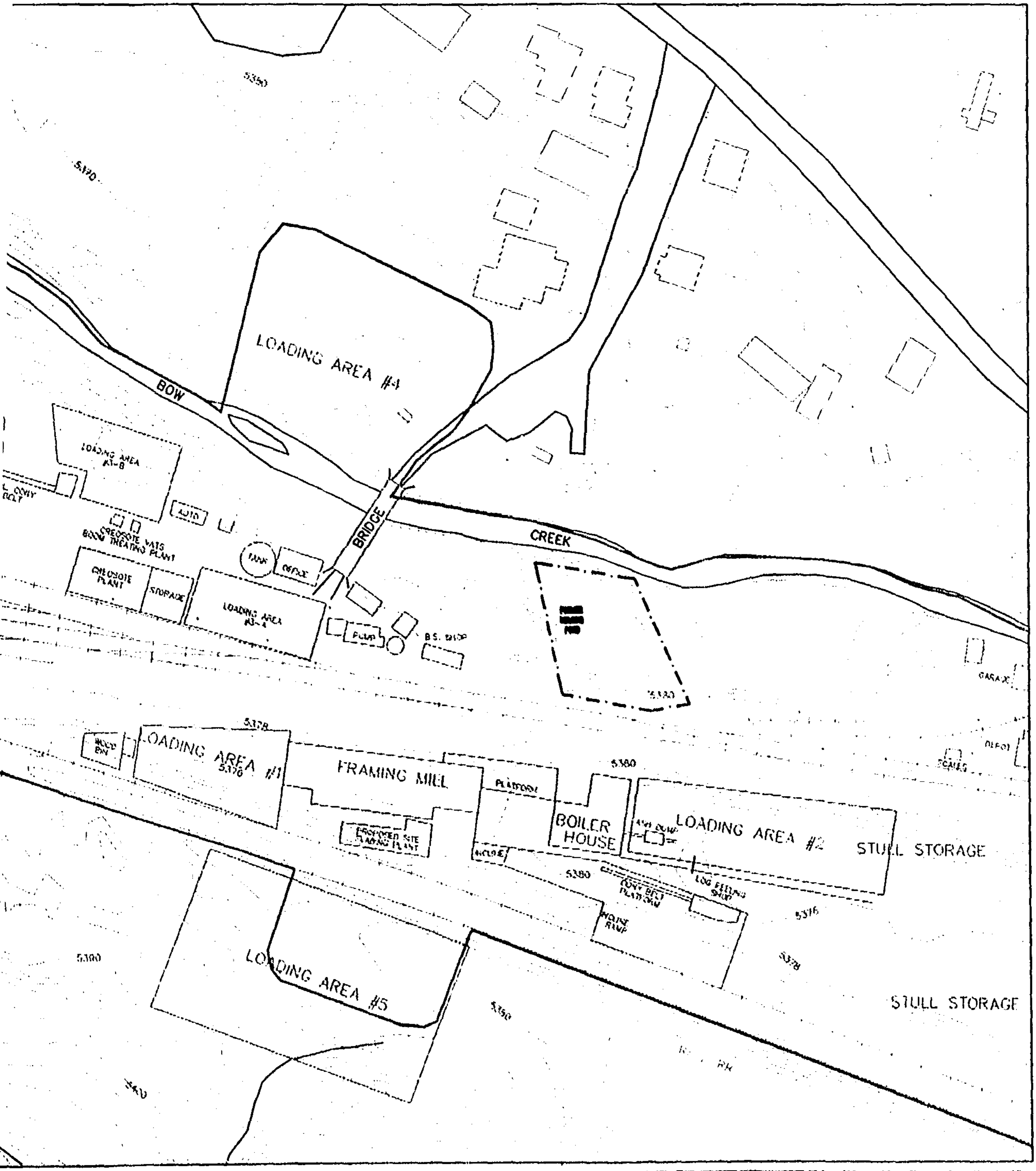



FIGURE 5.9
ARSENIC (ug/l) - 1992
IN TERTIARY SEDIMENTS MONITORING WELLS
ROCKER TIMBER FRAMING AND TREATING
PLANT OPERABLE UNIT, ROCKER, MT

\ACAD\ARCO\ROCKER1\FIG4-48.DWG REV. 1 2\27\95



5350
LOADING AREA #4
BOW
CREEK
BRIDGE
LOADING AREA #3-B
CREOSOTE VATS
BOOM TREATING PLANT
CREOSOTE PLANT
STORAGE
LOADING AREA #3-A
TANK
OFFICE
PUMP
B.S. SHOP
[redacted]
5380
GARAGE
5378
LOADING AREA #1
5376
FRAMING MILL
PLATFORM
5380
DEPOT
SCALES
BOILER HOUSE
LOADING AREA #2
STULL STORAGE
PROPOSED SITE PLANING PLANT
5380
CONV BELT PLATFORM
INCLINE RAMP
5376
5378
5390
LOADING AREA #5
5350
STULL STORAGE

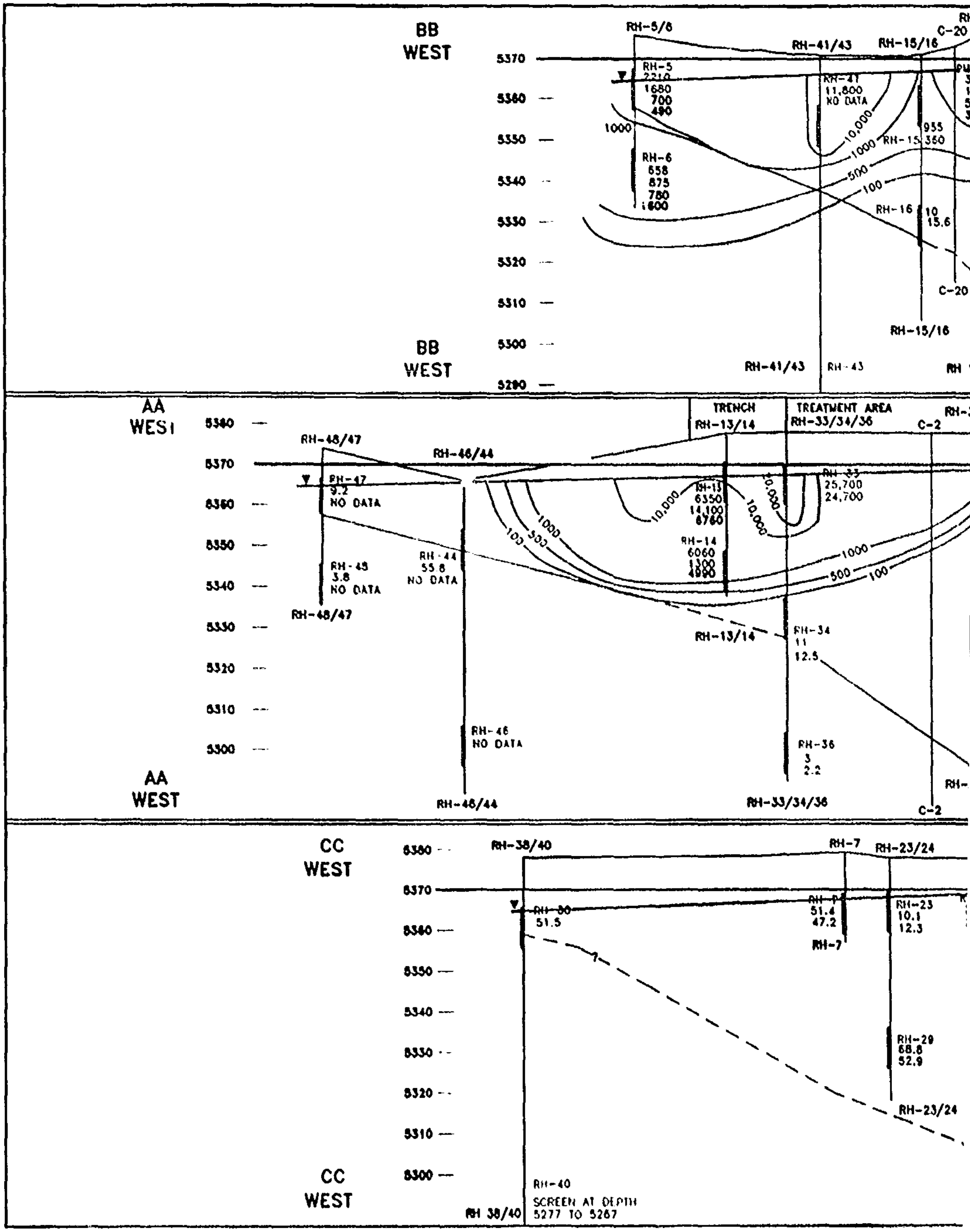
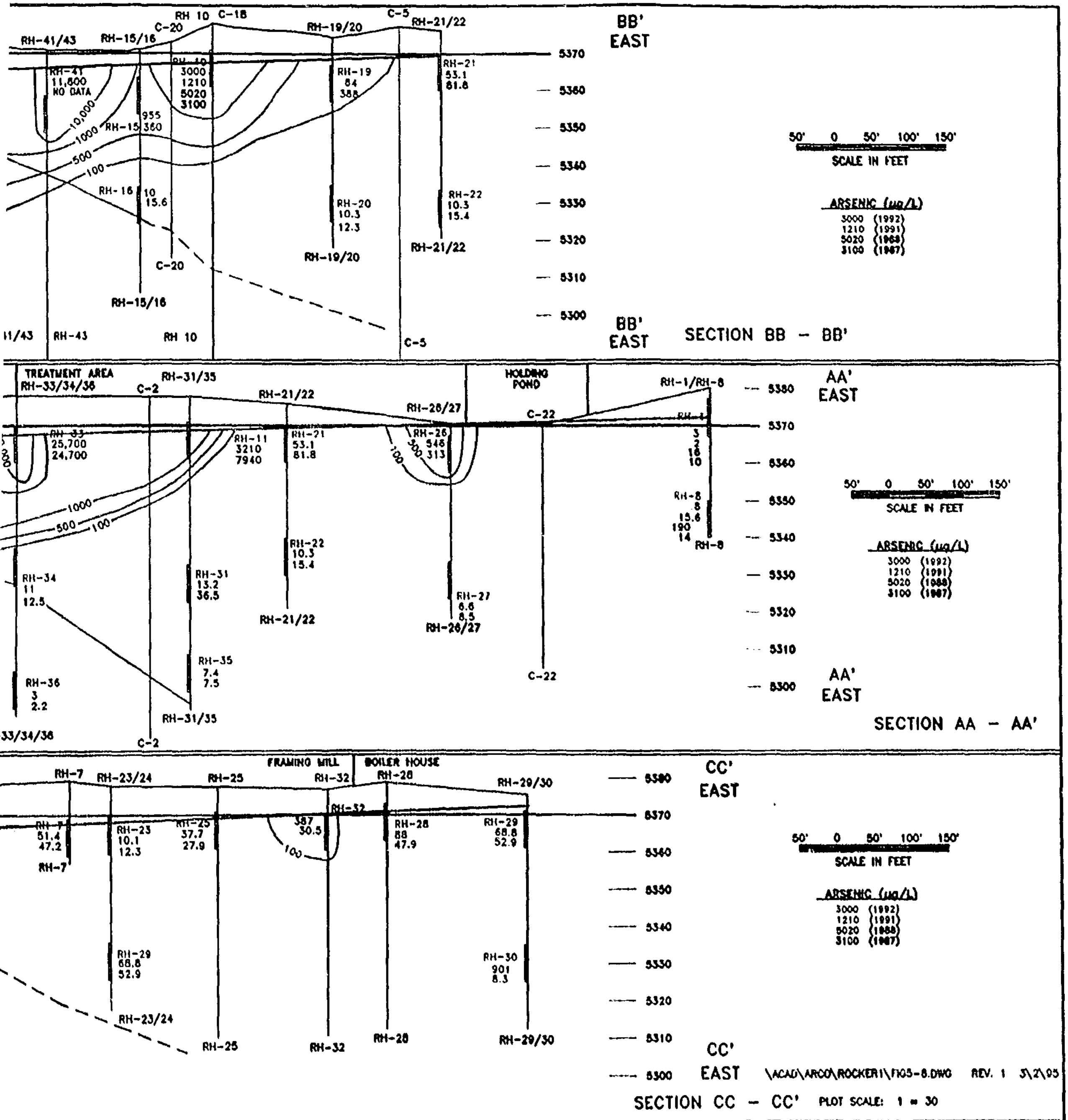



FIGURE 5.10 -- CROSS-SECTIONS OF ARSENIC PLUME (1992)



BB'
EAST
RH-41/43
RH-15/16
C-20
RH 10
C-18
RH-19/20
C-5
RH-21/22
RH-41
11,800
NO DATA
RH-10
3000
1210
5020
3100
RH-19
84
388
RH-21
53.1
81.8
RH-15
955
360
10,000
1000
500
100
RH-16
10
15.6
RH-20
10.3
12.3
RH-22
10.3
15.4
5370
5360
5350
5340
5330
5320
5310
5300
50' 0 50' 100' 150'
SCALE IN FEET
ARSENIC (ug/L)
3000 (1992)
1210 (1991)
5020 (1988)
3100 (1987)
RH-43
SECTION BB - BB'
TREATMENT AREA
RH-33/34/36
C-2
RH-31/35
RH-21/22
RH-26/27
HOLDING POND
C-22
RH-1/RH-8
AA'
EAST
RH-33
25,700
24,700
RH-11
3210
7940
RH-21
53.1
81.8
RH-26
546
313
3
2
16
10
RH-8
8
15.6
190
14
5380
RH-22
10.3
15.4
RH-34
11
12.5
RH-31
13.2
36.5
RH-27
6.6
8.5
RH-35
7.4
7.5
RH-36
3
2.2
SECTION AA - AA'
FRAMING MILL
BOILER HOUSE
RH-7
RH-23/24
RH-25
RH-32
RH-28
RH-29/30
CC'
EAST
51.4
47.2
RH-23
10.1
12.3
RH-25
37.7
27.9
387
30.5
RH-28
88
47.9
RH-29
68.8
52.9
RH-30
901
8.3
SECTION CC - CC'
PLOT SCALE: 1 = 30
\ACAD\ARCO\ROCKER1\FIG5-8.DWG
REV. 1 3\2\95

3. 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.

4. PAH-impacted groundwater is localized to the previous treatment area. No impacts to surface water quality have been observed. However, the creosote/PAH accumulations which occur in the same region as the highly contaminated arsenic plume creates an oxygen demand which maintains arsenic in its reduced, more mobile form.

5. Taken together, the more coincident arsenic/PAH plumes provide a long term source of arsenic to the groundwater systems.

6. Gross arsenic contamination in the upper portion of the shallow alluvial groundwater is predominantly attenuated over a distance of a several hundred feet by indigenous iron oxyhydroxides in the aquifer. The oxygenated and neutral pH conditions in groundwater on portions o_ the site appear to be important factors in limiting desorption of the arsenic. However, hydraulic gradients are not static and with future development of groundwater resources these conditions can change.

7. Although vertical downward hydraulic gradients appear to be present, they have not resulted in significant downward migration of arsenic except in limited areas (associated with the deep alluvium and Tertiary sediments aquifers). Geochemical conditions, principally iron in the shallow alluvium, and hydraulic gradients have kept the arsenic from deeply penetrating the alluvial aquifer beneath the site and apparently have limited the spread of the arsenic plume. This is despite the apparent continued release of arsenic speciated as arsenite (arsenic III) into the shallow groundwater beneath the site. Maintaining an oxidized condition in the alluvial aquifer is critical to minimizing movement of arsenite species. Increases in groundwater use affecting hydraulic gradients and or changes in geochemistry in any of the three hydrologic units will result in a change in the fate and transport of the arsenic from the Rocker Site. More specifically, if downward hydraulic gradients are increased, arsenic migration into two significant, high quality aquifers (deep alluvium and Tertiary sediments) will result. The lack of iron in these particular groundwater resources can allow arsenic to migrate considerable distances.

8. The high concentration of arsenic "source materials" and resultant concentration of arsenic in the shallow groundwater presents a threat to the current and future use of the deep alluvial aquifer and to the deeper, more productive portions of the Tertiary aquifer. Both of these threatened aquifers have low arsenic attenuation capacities and are aquifers currently used or planned for use by local residents and businesses. The high concentration also poses a threat to potential uses of the shallow aquifer, which is classified by the State as a potential source of drinking water.

9. Soil arsenic contamination also poses a threat to recreational users, trespassers, and workers. Although residential use is not expected at the Rocker OU, there remains the potential for a health threat unless this use is restricted.

## 6. SUMMARY OF SITE RISKS

The Rocker OU baseline risk assessment intentionally avoided an evaluation of ecological risks. Ecological risk has been evaluated as part of the Streamside Tailings Operable Unit which is immediately adjacent to, and up and down stream from, the Rocker Operable Unit. The Rocker risk assessment also did not address the inhalation pathway, because it was determined that this issue was more appropriately addressed in the context of the more expansive Streamside Tailings risk assessment. The review of water quality information from both the Silver Bow Creek and Rocker investigations do not indicate water quality degradation in Silver Bow Creek as a result of the Rocker operable unit. The potential for future effects to Silver Bow Creek are not expected when considering the selected remedy.

Rocker Human Health Evaluation:
The primary purpose of the Rocker baseline risk assessment was to characterize the current and future potential human health risks from contamination on site, assuming the site is not cleaned up. The contaminants of greatest concern on this site are residuals from the wood treating process, which primarily include arsenic (originally applied as a caustic arsenic solution to the timbers) and the components of creosote (polynuclear aromatic hydrocarbons or PAHs). The risk assessment also considered other metal contaminants associated with the arsenic trioxide powders that were used on the site and that are also present in mine waste rock used for railroad fill and tailings that were deposited adjacent to Silver Bow Creek OU and within the Rocker OU.

Human health risks from contaminants located on the Rocker OU (wood treating by-products, and limited streamside tailings and mine waste) were evaluated to determine possible effects to workers, trespassers, and future potential residents of the

Rocker site. The risk assessment evaluated all reasonable current and potential uses of the land and EPA determined that, if institutional controls were placed on the site to prevent residential use, occupational and recreational uses were the most likely uses for the OU. In addition, assumptions were made to try to characterize exposure to individuals that would experience the most risk from the OU. For this reason, the EPA chose to consider a future worker scenario that represented a normal work day being spent on OU. This scenario evaluated risks if the Rocker OU was developed to accommodate some business venture at this location in the future. With the multiple railroad side tracks and the flat adjacent area, the EPA considered it very plausible that an industrial venture could locate on site at some future date. The remedy was revised however, following a discussion with local County planning officials, residents and businessmen to better reflect potential land uses. County planning documents propose a limitation on building within 100 feet of the Silver Bow Creek floodplain. A close inspection of the trail tracks on site indicate that this is a switching yard, with little potential for loading/off-loading other than from the northernmost rail line. Owners of the major truck fueling facility just north of the Rocker OU, indicated that they could see no potential for further industrial/commercial development of the Rocker rail siding. This was in part due to the current location of a similar type of facility nearby at the Butte Port of Entry.

The risk assessment also evaluated potential human health concerns associated with exposure to the contaminated soils beneath the cap to represent a condition where a landowner chose to make improvements to the site that would move the clean fill currently covering the contaminants. Figure 6.1 presents the conceptual model to illustrate the potential for exposures to contaminants at the Rocker OU.

Risks have been evaluated considering both noncancer adverse effects and the potential for cancers to develop as a result of contact with site contaminants. Tables 6.1 and 6.2 present the cancer and noncancer risk estimates for soils and groundwater at the Rocker OU. Although 31 chemicals detected at the Rocker OU and were evaluated as chemicals of potential concern, only arsenic was concluded to be at concentrations posing sufficient risk to require that a remedial action be taken. One other chemical, cadmium, was found in groundwater at two locations at levels that exceeded the maximum contaminant levels (MCLs). Each of these locations were in areas of known contamination from sulfide materials associated with the Streamside Tailings OU (railroad fill and stream over bank deposits), and one of them

**Table 6.1**
**Summary of Risk Estimates for Surface Soil**
*Rocker Timber Framing and Treatment Plant, Rocker, MT*

| Surface Soil Area | Exposed Individual | Exposure Route | Noncancer Hazard Index | | Excess Lifetime Cancer Risk | |
|---|---|---|---|---|---|---|
| | | | Average Case | Reasonable Maximum Case | Average Case | Reasonable Maximum Case |
| **Current Soil Conditions (Cover material in place)** | | | | | | |
| On Soil Cover | Current Occupational | Ingestion | --- | 0.04 | --- | 7x10-6 |
| | Current Trespass | Ingestion | --- | 0.03 | --- | 7x10-6 |
| | Future Residential | Ingestion | 0.04 | 0.28 | 3x10-6 | 6x10-5 |
| Outside Soil Cover | Current Occupational | Ingestion | --- | 7.5 | --- | 1x10-3 |
| | Current Trespass | Ingestion | --- | 6.2 | --- | 1x10-3 |
| | Future Residential | Ingestion | 8.2 | 55.8 | 5x10-4 | 1x10-2 |
| **Potential Future Soil Conditions (Assumes cover material was never brought in)** | | | | | | |
| Without Soil Cover | Current Occupational | Ingestion | --- | 3.1 | --- | 6x10-4 |
| | Future Trespass | Ingestion | --- | 2.6 | --- | 6x10-4 |
| | Future Residential | Ingestion | 3.4 | 22.9 | 2x10-4 | 5x10-3 |

Note: Averge-case exposures are not quantified for occupational or trespass scenarios due to lack of data regarding central tendencies for these receptor types.

**Table 6.2**
**Summary of Risk Estimates for Groundwater**
*Rocker Timber Framing and Treatment Plant, Rocker, MT*

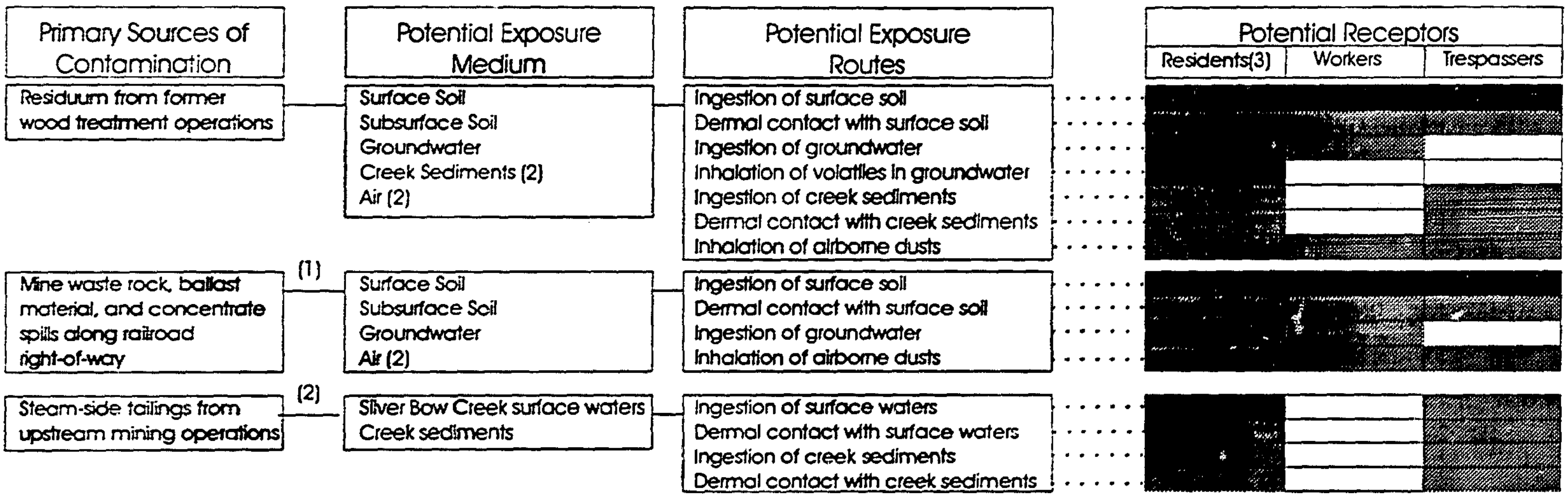
| Water-Bearing Zone | Exposed Individual | Exposure Route | Noncancer Hazard Index | | Excess Lifetime Cancer Risk | |
|---|---|---|---|---|---|---|
| | | | Average Case | Reasonable Maximum Case | Average Case | Reasonable Maximum Case |
| Shallow Zone | Future Resident | Ingestion | 243 | 443 | 1x10-2 | 8x10-2 |
| | | Inhalation | <0.01 | <0.01 | | |
| Intermediate and Deep Zones | Future Resident | Ingestion | 44 | 79 | 2x10-3 | 1x10-2 |
| | | Inhalation | <0.01 | <0.01 | | |

a. Shallow wells include RH-1 thru 5, 7, 9, 10, 11, 13, 15, 17, 29, 21, 23, 24, 25, 26, 28, 19, 32, 33, 38, 41, and 47.
Intermediate wells include RH-8, 12, 14, 16, 18, 20, 22, 24, 27, 30, 31, and 34.
Deep wells include RH-6, 35 thru 37, 40, 43, and 46.

b. No volatile carcinogens were detected in groundwater.

Figure 6-1

Conceptual site Model for Potential Exposures
Rocker Timber Framing and Treating Plant




= Pathway is or could be complete; data are available and pathway is evaluated quantitatively

= Pathway is or could be complete; data are lacking or pathway is judged to be minor. Qualitative analysis only.

= Pathway is not complete; no evaluation required.

(1) Risks were considered for this pathway although this portion of the site is not specifically associated with the Rocker OU, which is intended to include only the areas affected by the wood treating operations.

(2) Health risks associated with exposure to creek sediments, surface water, and inhalation of airborne dusts were considered as part of the Stream-Side Tailings Operable Unit and are not quantified here.

(3) Residential risks are for hypothetical future conditions. Currently, residences do not exist on the Rocker OU.

was up-gradient from the Rocker wood treating operations. For these reasons, elevated cadmium concentrations in groundwater should respond to the remedy selected for the Streamside Tailings OU. Arsenic remains as the contaminant focused on for remediation for the Rocker OU.

Noncancer effects were developed by adding the ratios of known exposure concentrations to known safe levels for all chemicals of concern on the site. Using this method, a value greater than "one" would indicate a concern for noncancer potential effects. Values greater than "one" were calculated for the reasonable maximum exposure to current and future workers, current trespassers to the site, and future potential residents. Arsenic is the main chemical of concern that influences the noncancer hazard index.

When EPA evaluates the risk of developing cancer from contaminants on a site, they consider individuals being exposed to site contaminants for several years. The potential adverse effects of developing cancer are represented in the risk assessment as a number of excess cancers that might be expected for a population of people. For example, the excess cancers could be one in one thousand people. This projection means that over a long period of exposure to contaminants one person out of a thousand might develop cancer as a result of that exposure. This projected risk is over and above the one-in-four risk that each of us has of developing cancer in our lifetime from other causes. EPA considers corrective action to reduce such risks if the risk of developing cancer is greater than one additional cancer per million people. EPA's acceptable range for clean up of contaminants can allow contaminant levels that correspond to excess cancer risks up to one in ten-thousand excess cancers.

The excess cancer risks calculated for persons who might contact contaminated soils outside of the existing soil cover are in the range of one additional cancer per one thousand individuals for current workers and trespassers (using reasonable maximum exposure assumptions). The evaluation of future use of the site by workers and trespassers, assuming that the clean soil cap has been disturbed, reveals a one-in-ten thousand excess cancer risk (using reasonable maximum exposure assumptions). For surface soils, greater than 95% of the cancer and non-cancer risk is due to the presence of arsenic. No other contaminant was determined to pose a risk outside of EPA's acceptable risk range. The remedy contained in this ROD addresses arsenic as the contaminant that exceeds EPA's acceptable risk range. An arsenic soil concentration of 380 ppm arsenic corresponds to one excess cancer per ten-thousand individuals. The risks associated with arsenic levels in cover materials at background levels will be approximately one excess cancer per one-hundred thousand individuals.

The cancer risk projected for individuals drinking groundwater from the shallow alluvium, and the intermediate/deep alluvium are one person per 100 individuals and 2 persons per one thousand individuals, respectively (using average exposure assumptions). When considering the reasonable worst case exposure assumptions, the shallow groundwater poses an excess cancer risk of 8 persons per one hundred individuals; while the intermediate/deep alluvial groundwater presents an excess cancer risk of one person per one hundred individuals. Arsenic contributes over 99% of the future potential cancer risk of consuming groundwater from the shallow, intermediate, and deep alluvial groundwater systems. No other contaminant detected on the Rocker OU poses an unacceptable excess cancer risk. It should be emphasized that no individuals are presently exposed to contaminated groundwater at the Rocker site. The remedy is consistent with EPA's theme of pollution prevention by preventing contamination of groundwater in current use in the vicinity of the Rocker OU. With the implementation of the remedy, the arsenic groundwater plume will be contained and is not expected to migrate any further toward existing groundwater users. In addition, the arsenic plume should dissipate after source removal; however, the precise time frame to attain the State arsenic standard of 18 ppm remains uncertain.

EPA has 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 provides the rationale for requiring response actions at the Rocker OU.

## 7. REMEDIAL ACTION OBJECTIVES

EPA and the State's overall remedial action objective for the Rocker OU is to reduce the current and potential human exposure to contaminated soil and groundwater. Consistent with this overall objective, the Rocker remedy has been developed to meet the following specific remedial action objectives:

Groundwater

- Attain groundwater standards (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 is 18 parts per billion. 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 site, this remedial action objective 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.

Soils

- Prevent human exposure to inorganic (primarily arsenic) and organic contaminants in soils which exceed risk-based or other relevant levels. Based on the Rocker Human Health Evaluation 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 parts per million arsenic (which represents a 1 in 10,000 excess cancer risk to workers or trespassers) should be remediated to break this potential pathway.

- Prevent migration of contaminants that would impact surface water to the degree that would cause non-compliance with surface water ARARs or other risk-based levels. The EPA, in consultation with the State, have concluded that surficial soils exceeding 1,000 parts per million arsenic have the potential over the long term to be released to surface water or groundwater, and therefore should be remediated.

- 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.

The USEPA Office of Solid Waste and Emergency Response (OSWER) is aware of the difficulty of restoring some aquifers to health-based cleanup criteria as a result of a study they conducted to evaluate the effectiveness of groundwater extraction systems in achieving specified goals. The findings indicate that groundwater extraction systems were generally effective in containing the contaminant plume and that these systems can achieve significant contaminant mass removal. However, although the contaminant concentration decreased significantly after initiation of extraction, they tended to level off at concentrations above their cleanup goals (i.e., MCLs or state standards). Following source removal, the Rocker remedy relies on continuing natural flushing of groundwater with lower arsenic concentrations (concentrations in the shallow alluvial aquifer have been observed to be less than 10 ppb in areas not affected by the Rocker OU) and natural attenuation to be effective in reducing arsenic concentrations in the current area of the plume. The iron additions to the groundwater source area will also contribute to enhanced attenuation processes for a limited area around the source treatment. Consistent with EPA guidance, however, the Rocker remedy also contains contingency measures to control the arsenic plume that may be implemented in the unlikely event that they are needed.

Because EPA has projected moderate difficulty in meeting the ARARs in a limited part of the groundwater system (only shallow alluvium), the Remedial Action Objectives have been 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). The source removal actions, in situ groundwater treatment, and the contingency measures to contain the plume will meet the primary objectives previously established. Monitoring will document the effectiveness of the remedy on the aquifer that has the least potential for development (shallow alluvium) and the need for contingency plume containment measures. EPA will also evaluate the practicability of meeting the State standard in the shallow alluvium during remedy implementation. This approach is consistent with EPA's guidance regarding groundwater remedies and the Agency's theme of pollution prevention.

## 8. DESCRIPTION OF ALTERNATIVES

**Alternative 1:**

This is the no action alternative. If implemented, there will be no further remedial action at the site. All site features and site contamination would remain as is. Maintenance of the existing soil cover as a requirement of the earlier removal action would continue, as would natural attenuation of the arsenic in the groundwater plume. Because wastes will remain in place, there will be monitoring of local groundwater wells every 5 years at a minimum. Consideration of this alternative is required by the NCP.

The No Action Alternative would include monitoring of current conditions and the continuing use of specific institutional controls.

**Alternative 2**

This alternative would require additional institutional controls to protect against intrusion of the soil cover and maintenance of the existing soil covers. An alternate water supply would be made available to the local residents during the term of the remedy, or until ARARs are met, and institutional controls (well ban) would be implemented. Subsequent reference to well bans as an institutional control will be for the term described here. Hot spot areas would be covered with soil of suitable thickness, these areas revegetated, and institutional controls implemented to prevent intrusion. This alternative relies on natural attenuation of arsenic for the plume. Sediment control barriers to control runon and runoff and dust suppression would be used to control offsite migration of contaminants during construction of the soil cover. Long-term monitoring of the soil cover and groundwater would be implemented.

Source Control:
Implement additional institutional controls, maintain existing soil cover, and continue groundwater monitoring;

Plume Control:
Provide alternate water supply, continue groundwater monitoring, add appropriate institutional controls, and continue natural attenuation;

Hot Spot Abatement:
Cover hot spots with clean soil, revegetate, and add appropriate institutional controls.

**Alternative 3**

Source materials (soils and debris) would be excavated to the water table, replaced with clean borrow materials, and revegetated. Excavated soils would be temporarily stored onsite prior to transportation and disposal at a RCRA Subtitle C disposal site. An alternate water supply would be made available to the local residents. This alternative relies on natural attenuation of arsenic for the plume. Hot spot areas would be overlaid with a clean soil cover and these areas revegetated. Sediment control barriers and dust suppression would be used to control offsite migration of contaminants during construction and excavation activities. Additional institutional controls to prevent intrusion of the covers and well bans would be implemented along with long-term monitoring of the groundwater and soil cover.

Source Control:
Conduct excavation of contaminated source material to water table, offsite disposal to hazardous waste site, replacement of excavated soils with clean backfill, revegetation, and additional institutional controls;

Plume Control:
Provide alternate water supply, continue groundwater monitoring, add appropriate institutional controls, and natural attenuation;

Hot Spot Abatement:
Cover of hot spots with clean soil, revegetate, and add appropriate institutional controls.

**Alternative 4**

Source materials (soils and debris) would be excavated to approximately 5 feet below the water table. Iron in the form of ferrous sulfate would be distributed in the excavation prior to backfilling with clean borrow materials and revegetated. This would enhance the natural attenuation of arsenic in the saturated zone. Excavated soils would be temporarily stored onsite prior to transportation and disposal at a RCRA Subtitle C disposal site. An alternate water supply would be made available to the local residents. This alternative relies on both natural and enhanced attenuation of arsenic for the plume. Hot spot areas would be overlaid with a clean soil cover and these areas revegetated. Sediment control barriers and dust suppression would be used to control offsite migration of contaminants during construction of the cover. Additional institutional controls to prevent intrusion of the covers and well bans would be implemented along with long-term monitoring of groundwater and the soil cover.

Source Control:
Conduct excavation of contaminated source material five (5) feet below water table, dewater, dispose offsite in a hazardous waste repository, add iron salt to groundwater, replace excavated soils with clean backfill, revegetate, implement additional institutional controls with enhancements;

Plume Control:
Provide alternate water supply, continue groundwater monitoring, add appropriate institutional controls, and continue natural attenuation with enhancements;

Hot Spot Abatement:
Cover hot spots with clean soil, revegetate, and add appropriate institutional controls.

**Alternative 5**

This alternative would be identical to Alternative No. 4 for the source and hot spot areas. However, plume remediation would include the installation of wells to facilitate the injection of iron (ferrous sulfate) to fix the arsenic associated with the plume. Additional institutional controls and long-term monitoring are also the same as described in Alternative No. 4.

Source Control:
Conduct excavation of contaminated source material five (5) feet below water table, add iron salt, dispose offsite at a hazardous waste repository, replace excavated soils with clean backfill, revegetate, implement additional institutional controls with enhancements;

Plume Control:
Provide an alternate water supply, inject iron via wells to promote enhanced attenuation, continue groundwater monitoring, and add appropriate institutional controls;

Hot Spot Abatement:
Cover hot spots with clean soil, revegetate, and add appropriate institutional controls.

**Alternative 6**

Source soils and debris would be excavated to approximately 5 feet below the water table. Large debris unsuitable for backfill would be separated from the soils and disposed at a nearby landfill. Soils would then be mixed with ferrous sulfate and cement and placed back in the excavation. An alternate water supply would be made available to the local residents. This alternative relies primarily on natural attenuation of arsenic for the plume. Hot spot areas would be overlaid with a clean soil cover and these areas revegetated. Sediment control barriers and dust suppression would be used to control offsite migration of contaminants during construction and excavation activities. Additional institutional controls to prevent intrusion to the cover and backfilled areas and well bans would be implemented along with long-term monitoring of groundwater and the soil cover.

Source Control:

Excavation of contaminated source material five (5) feet below water table, offsite disposal of debris unsuitable for backfilling, mixing of excavated soils with cement or other pozzolanic material and iron salt (ferrous sulfate), backfilling the amended soils, adding cover soil, and revegetation;

Plume Control:

Provide alternate water supply, continue groundwater monitoring, add appropriate institutional controls, and continue natural attenuation with enhancements;

Hot Spot Abatement:

Cover hot spots with clean soil, revegetate, and add appropriate institutional controls.

**Alternative 7**

This alternative would be identical to Alternative No. 4 for the source and hot spot areas. However, plume remediation would include installation of a series of groundwater extraction wells to collect plume waters. Standard alkaline chemical and physical treatment technologies would be used to remove arsenic from the groundwater. Treated waters would be reinjected to the contaminated local aquifer through a series of injection wells. Treatment sludges would then be disposed at an appropriate landfill. Hot spot areas would be overlaid with a clean soil cover and these areas revegetated. Sediment control barriers and dust suppression would be used to control offsite migration of contaminants during construction and excavation activities. Additional institutional controls to prevent intrusion of the soil covers and well bans would be implemented along with long-term monitoring of groundwater and the soil cover.

Source Control:

Conduct excavation of contaminated source material five (5) feet below water table, offsite disposal to a hazardous waste repository, iron salt addition to groundwater, and replacement of excavated soils with clean backfill, revegetation and additional institutional controls;

Plume Control:
Provide alternate water supply, pump and treat sitewide contaminated shallow groundwater, effluent reinjection to site groundwater, treatment sludge disposal to appropriate offsite waste repository, groundwater monitoring;

Hot Spot Abatement:
Covering of hot spots with clean soil, revegetation, and add appropriate institutional controls.

## 9. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the NCP, nine evaluation criteria must be used to evaluate legal, technical, and policy considerations that are important for selecting remedial alternatives (40 CFR Section 300.430(f)(1)). Seven of these evaluation criteria serve as the basis for conducting the detailed analyses found in the Feasibility Study and this section. The two remaining criteria, state acceptance and community acceptance, were evaluated during the public comment period for the proposed plan and that evaluation is reflected here.

The first two of the nine criteria are minimum, or "threshold," criteria that must be met by any selected alternative. The next five criteria are considered to be "balancing" criteria and are important criteria in the selection of a remedial action. The last two, are considered to be "modifying" criteria. The nine evaluation criteria as defined in the NCP are as follows:

**Threshold Criteria**

(1) **Overall protection of human health and the environment.** Alternatives shall be assessed to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site by eliminating, reducing, or controlling exposures to levels consistent with established remediation goals. Overall protection of human health and the environment draws on the assessments of the other evaluation criteria that follow, especially long-term effectiveness and permanence, short term effectiveness, and compliance with ARARS.

(2) **Compliance with ARARs.** The alternatives shall be assessed to determine whether they attain applicable or relevant and appropriate requirements under federal environmental laws and state environmental or facility siting laws, or provide grounds for invoking a waiver.

**Balancing Criteria**

(3) **Long-term effectiveness and permanence.** Alternatives shall be assessed for the long-term effectiveness and permanence that they afford, along with the degree of certainty that the alternative will prove successful.

(4) **Reduction of toxicity, mobility, or volume (TMV) through treatment.** The degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume shall be assessed.

(5) **Short-term effectiveness.** The impacts during the term of the remedy considering: risks posed to the community, impacts to workers, environmental impacts and the time until protection is achieved.

(6) **Implementability.** The ease or difficulty of implementing the alternatives considering: technical feasibility, administrative feasibility, and the availability of services and materials.

(7) **Cost.** The types of costs include: Capital costs, annual operation and maintenance (O&M) costs, net present value of capital and O&M costs.

**Modifying Criteria**

(8) **State acceptance.**
The state concerns that shall be assessed include the following:

(a) The state's position and key concerns related to the preferred alternative and other alternatives; and

(b) State comments on ARARs or the proposed use of waivers.

(9) **Community acceptance.** This assessment includes a determination of the components of the proposed remedy that are either supported or opposed by the affected community.

COMPARATIVE ANALYSIS BY CRITERIA

The alternatives are evaluated <u>against each other</u> for the each of the nine evaluation criteria. There is one commonality to all of the alternatives: Each alternative, with the exception of the No Action Alternative and the selected remedy (a combination of alternatives 2 and 6), uses the same action for managing hot spot areas. Surficial soils that exceed the action level of 380 parts per million arsenic (corresponding to EPA's acceptable excess cancer risk of $10^{-4}$) should be capped with

18 inches of soil. Thus, there is no difference among the alternatives in terms of hot spots for the nine criteria.

## (1) Protection of Human Health and the Environment

### Human Health

The No Action Alternative is not protective of human health since no actions would be taken and arsenic would remain at high levels in soils and groundwater. All other alternatives (the action alternatives) except Alternative Two are judged to be protective of human health to some degree. This evaluation varies as to long term permanence and reliability, because some of the alternatives rely on institutional controls and natural attenuation more than others. CERCLA and the National Contingency Plan state a preference for alternatives which rely on engineering solutions rather than alternatives which rely on institutional controls. Accordingly, the alternatives provide a progression in terms of an increasing reliance on engineering technologies generally resulting in increasi g protectiveness. Alternative 2 relies solely on institutional controls/natural attenuation and is considered the least protective. Alternative 3 is more protective because it involves excavation of arsenic source materials down to the water table with disposal off site. Alternatives 4 through 7 involve removal of arsenic source materials down to 5 feet below the water table surface with disposal off site and each include iron additions in the source area. These engineering treatments are considered more protective of human health. However, alternatives 5, 6, and 7 each deal with reducing arsenic contaminant levels in the plume surrounding the source area which provides an increasing level of protection. Of the plume control technologies, pump and treat (alternative 7) is considered most protective; although it is uncertain what time frame would be required to attain the state arsenic standard.

Protection and short- and long-term risk reduction are achieved with the provision of institutional controls and an alternate water supply for Alternatives 2 through 7. As long as institutional controls remain in place and potable water is supplied by the alternate water source to prevent consumption of groundwater from any of the three aquifers, human health would be protected by each of the action alternatives.

### Environment

The Rocker OU remedial investigation did not document an impact of site contaminants to the sediments or surface waters of Silver Bow Creek. Therefore, this evaluation of "protection of the environment" is not done in the context of biologic receptors. Rather, this criteria is evaluated with respect to the extent of groundwater contamination remaining following the remedial action involved in each alternative, and its potential to eventually impact Silver Bow Creek. The No-Action Alternative would not be protective of the environment. Alternative 2 would also not be protective of the environment, since no action would be directly taken to reduce the contamination in the plume or the source areas. The remainder of the action alternatives would achieve protection of the environment to varying degrees.

Alternative 3 would achieve limited protection of the environment through removal of at least some of the source material (the unsaturated portion). Alternative 6 is more protective than Alternative 3 because saturated source material would be addressed. However, the uncertainties associated with pozzolanic stabilization of the arsenic materials in the saturated zone may limit the protectiveness of Alternative 6. Alternative 4 is the most protective of the environment for the alternatives that address only source remediation. The excavation and appropriate disposal of the saturated and unsaturated materials would be very effective at removing the source contamination. In addition, the iron salts added to the excavation prior to backfilling would provide some attenuation of arsenic mobility in the plume.

Alternative 5 provides source removal, plus the potential to provide a degree of protection in the plume area through immobilizing arsenic in the groundwater and would be protective of the environment. Alternative 7 would be most protective of the environment because it incorporates source removal, plus removal of contaminants from the aquifers in the plume area.

### (2) Compliance with ARARs

There are a number of ARARs which apply to the alternatives. The primary ARAR of concern at this site is the State of Montana's standard of 18 $\mu g/L$ for arsenic in the groundwater. The 18 $\mu g/L$ standard would not be met by any of the alternatives in the short term. Alternatives 5 and 7 include the implementation of remedial actions specific to the plume area that would reduce the time to meet ARARs, and are therefore more likely to achieve compliance in a shorter time frame. Alternatives 4 and 6, through implementation of source control actions, could potentially meet groundwater ARARs in the long-term, although there is uncertainty concerning the length of time to achieve compliance (particularly in the fine textured silts and clays in the shallow alluvial aquifer). Because Alternative 3 does not include removal of arsenic sources from the saturated zone, it is not expected that ARARs can be met in the foreseeable future. Alternatives 1 and 2 would also not likely meet groundwater ARARs at anytime in the foreseeable future.

There is no ARAR which applies to arsenic contamination in soils at this site. All other ARARs at this site can be met by all of the action Alternatives (2-7).

### (3) Long-term Effectiveness and Permanence

Long-term effectiveness and permanence are not achieved by Alternatives 1 and 2. Under Alternative 1, arsenic contamination in the soil and groundwater at the site would remain unabated and uncontrolled. Similarly, under Alternative 2, arsenic in soil and groundwater would remain. The effectiveness of Alternative 2 is dependent upon the institutional controls that are put in place. Because of the coordination required among federal, state, and local agencies, the possibility that institutional controls can be changed or removed, and the long time period before natural attenuation improves the groundwater concentrations, institutional controls by themselves are not effective or permanent.

The long-term effectiveness and permanence of Alternative 6 is questionable because the pozzolanic reaction may not proceed properly in the materials backfilled in the saturated zone of the source area. In addition, the relatively high pH associated with the pozzolanic materials may actually tend to increase the mobility of the arsenic, rather than decrease mobility.

Alternatives 3 and 4 include the excavation of the source and provision of an alternate water supply. With Alternative 4, the deeper excavation into the saturated zone of the source area, in concert with the addition of iron sulfate prior to backfilling, provide a greater degree of effectiveness and permanence. A greater volume of contaminated source materials will be removed from the site and properly disposed under Alternative 4 as compared to Alternative 3, contributing to enhanced long-term effectiveness and permanence.

Alternative 5 is judged to have greater permanence due to the enhanced attenuation in the plume associated with injection of iron salts. However, the long-term effectiveness is uncertain because of the anticipated difficulty in injecting iron salts into the plume area such that all the arsenic will be immobilized. Arsenic immobilization in the heterogeneous aquifer will be a function of the varying permeabilities of the aquifer, effectiveness of the injection well layout, and/or short circuiting of the treatment solutions. Arsenic immobilization will occur in the preferential flow paths and may be less effective in the less permeable portions of the aquifer. Field evaluation could remove some of the uncertainties associated with this remedial approach.

Alternative 7 has moderate effectiveness and permanence because of the questionable ability to extract arsenic-contaminated groundwater over time. Arsenic in the aquifer beneath the site can be extracted from the areas of preferential flow, but it may be problematic to remove the arsenic from the lower permeability soils in the heterogeneous aquifer. Arsenic concentrations in groundwater are likely to decrease asymptotically over time and the cost-effectiveness of operating the treatment system will also decline. It is assumed that the extraction wells at the site will be "pulsed" (cycling the groundwater pumps off and on to allow washing of the unsaturated soil column). This may make operation of the treatment system problematic unless sufficient storage is provided for flow equalization. The treatment process to be used in Alternative 7 is a proven and effective method for arsenic removal from water.

### (4) Reduction of Toxicity, Mobility, or Volume (TMV) Through Treatment

#### Toxicity

None of the alternatives reduce the intrinsic toxicity of the arsenic through treatment. Even Alternatives 5 and 7, which address treatment of the arsenic in the plume, do not reduce the toxicity of the arsenic; rather, they reduce the mobility of the arsenic.

#### Mobility

Alternatives 1 and 2, since they provide no actions for either the source or plume, do nothing to decrease the arsenic mobility.

Alternatives 3 and 4 will reduce the mobility of the contaminants in the excavated soils, assuming that the wastes are placed in a secure, lined facility. The addition of iron salts prior to backfilling (Alternative 4) will tend to reduce the mobility of the arsenic in the plume in the vicinity of the source removal area.

Alternative 6 should result in decreased arsenic mobility in the source area through addition of iron salts and pozzolanic materials to the backfilled source soils. However, the mobility reduction is uncertain, especially in the saturated zone, due to the potential to actually increase arsenic mobility due to the elevated pH associated with the pozzolanic materials that are added to the soils.

Alternatives 5 and 7 will decrease arsenic mobility, both in the source area and in the plume area. The mobility reduction in the source area soils will be similar to Alternative 4, and is associated with soil removal and disposal offsite. Alternative 7 will not intrinsically reduce the mobility of the arsenic within the plume. However, the removal of arsenic, by pumping from the preferential flow paths within the plume, will tend to limit further downgradient migration of the plume. Alternative 5, through the injection of iron salts into the plume, will tend to reduce mobility of the arsenic within the plume. As long as the injection wells are properly located, Alternative 5 should also tend to reduce further downgradient migration of the arsenic in the plume.

### Volume

Alternative 6 will not reduce the volume of contaminants, and in fact, will result in considerable increase in volume. The excavation and addition of cementing agents to the source soils will result in bulking of the soils, and a net increase in volume of up to 20 percent.

Alternatives 4, 5, 7 and to a lesser extent, Alternative 3, would also result in an increase in volume of contaminated soil. The process of excavating the source soils will also result in bulking of these soils. The likely increase in volumes would be approximately 10 percent.

Alternatives 1 and 2 would not result in any net change in volumes of contaminated materials.

### (5) Short-term Effectiveness

Short-term effectiveness is judged upon potential risks to the community, onsite workers, and the environment during remedial action and the time until compliance with ARARs or protection of human health is achieved. There is some small degree of risk to workers implementing each of the alternatives, with the exception of the No Action alternative.

Alternative 2 has the shortest time to complete the remedial action (alternate water supply and groundwater monitoring). Alternatives 3 and 4 each have similar soil excavation requirements in the source area and the provision of an alternate water supply. These two alternatives are essentially equivalent in terms of risk to workers and impacts on the community during implementation.

Alternative 6 will require the onsite stabilization of excavated soil so the time to achieve protection is longer than that for Alternatives 3 and 4 and approximately equal to Alternative 5. Material handling during this alternative is greater than for Alternatives 3 and 4 and has a higher risk of community, worker, and environmental exposure.

Alternative 5 requires the construction of an onsite facility to house the mechanical equipment necessary to supply iron salt to the injection wells. This alternative will have construction time periods equivalent to Alternative 6.

Alternative 7 requires the construction of a treatment facility at the site. The time to complete this remedial action is longer than any of the other alternatives. Soil excavation during remedial action presents the same risks as Alternative 4. Installation of the groundwater extraction system and the construction of the treatment system pose minimal impacts to site workers. Vehicular traffic and construction of the treatment facility may cause some nuisance to the community during implementation.

## (6) Implementability

### Technical Implementability

Alternatives 1 and 2 do not require any remedial action, and therefore are simplest from a technical implementability standpoint.

All of the other alternatives (3 through 7) utilize standard construction techniques, materials and equipment, therefore, they present no unusual implementability concerns. However, both Alternatives 5 and 7 would require additional field testing to refine design criteria prior to implementation. Alternative 5 is also more difficult to implement because of the expectation that injection wells will periodically plug, requiring ongoing injection well construction.

The treatment plant associated with Alternative 7 will likely require equipment not available locally. However, the technology is standard, and reliable equipment is available from a number of vendors within the U.S.

### Administrative Implementability

The No Action Alternative is the most easily implemented from an administrative standpoint, since only future groundwater monitoring would have to be implemented. Essentially, this alternative is already implemented.

The administrative implementability of the remainder of the alternatives is primarily associated with implementation of Institutional Controls, and the coordination required among the various local, state, and Federal government entities. The Institutional Controls that must be implemented do not vary significantly among the action alternatives, since all action alternatives must have institutional controls to protect groundwater sources during and following remediation. It is judged that the primary differences among the action alternatives would be associated with the length of time required to achieve the cleanup goals. In other words, it is likely that it will be relatively easier, and more acceptable to the public, to implement institutional controls for those alternatives that are perceived to require lesser time to reach the cleanup goals.

Alternative 2 does not address remediation of either the source or the plume, and would likely require thousands of years before the arsenic would be naturally attenuated. For this reason, institutional controls would have to be maintained indefinitely and it is judged that it would be very difficult to maintain these institutional controls under this alternative from an administrative perspective.

The alternatives that address only the source, and not the plume (3, 4, and 6), will likely require hundreds of years before natural attenuation would allow complete use of the site aquifers. These alternatives would require implementation and maintenance of institutional controls during the attenuation period. There would be considerable resistance, on the part of the agencies and the public, to embark on a program of institutional controls for a time period of hundreds of years.

It is likely that the institutional controls for Alternatives 5 and 7 would be more easily implemented, since both the source and the plume would be addressed. The time required for institutional controls under Alternatives 5 and 7 (from 30 to 100 years) would likely result in relatively less opposition to the implementation of institutional controls for this period.

**(7) Cost**

A budget level cost analysis was performed for each of the alternatives. The analysis includes an estimate of capital costs, annual operation and maintenance (O&M) costs and the net present worth (NPW) of the alternative assuming a seven percent discount rate and a 30 year period for ongoing O&M costs.

| Summary of Costs by Alternative | | | |
|---|---|---|---|
| Alternative | Capital Cost | Annual O&M Costs | Net Present Worth |
| 1 | $ 0 | $ 29,848 | $ 94,255 |
| 2 | 1,253,704 | 102,544 | 2,526,177 |
| 3 | 3,060,182 | 102,544 | 4,332,655 |
| 4 | 4,316,074 | 102,544 | 5,588,546 |
| 5 | 6,601,818 | 486,888 | 12,643,637 |
| 6 | 8,190,371 | 102,544 | 9,462,844 |
| 7 | 6,216,151 | 508,617 | 12,527,603 |

**(8) State acceptance.**

The State has been consulted during the pr cess leading up to the Rocker ROD. Concerns expressed by the State have been addressed during the course of document development resulting in State concurrence on the principle documents supporting the ROD including the Baseline Human Health Evaluation, Remedial Investigation, and Feasibility Study. Care has been taken during the investigations for the Rocker OU to coordinate issues with the adjoining State-lead Streamside Tailings OU, including the final remedy selected for that OU.

The State concurred in the proposed plan for the Rocker OU. The State also supports the selection of this remedy, and concurs in the selected remedy.

**(9) Community acceptance.**

Through advance consultation, EPA believes that the community has accepted the remedy selected in the Rocker ROD. Public comments received during community comment period indicated that the community supported innovative technology for the Rocker remedy, if it was workable in a short time period. The community also expressed opposition to off-site disposal of waste on Smelter Hill. Primarily, the community emphasized the continued use of groundwater by area residents and long term protection of groundwater resources that they prefer to use. A parallel issue is the Community's need for an alternate water supply during the term of the ban on additional development of groundwater resources.

## 10. THE SELECTED REMEDY

The remedy selected by EPA, with the concurrence of the State, addresses surface soil, alluvium and fill, and groundwater contaminated by arsenic in the Rocker OU. The remedy selected is a variation of Alternatives #4 and #6 evaluated in the feasibility study, and the preferred final remedy developed in the proposed plan. The EPA has selected the final remedy for the Rocker OU considering all written comments and oral testimony received during the public comment period. The remedy has been modified from the proposed plan in response to public comment. The changes that have been made in the remedy from the proposed plan are considered significant; but are considered a logical outgrowth of the public comments received. The rationale for these changes are addressed in Section 13 of this record of decision.

The primary purpose of the remedy is to protect human health from threats posed by direct contact with contaminated surface soils or exposure to contaminated groundwater through active cleanup of relevant media. With respect to contaminated groundwater, the primary objective is to prevent contamination of groundwater resources (deep alluvium and tertiary groundwater systems) under current use (or that have the potential to be developed) by the community that are in hydraulic contact with the Rocker OU arsenic plume. This purpose includes making the groundwater resource available to the community at the earliest opportunity. A secondary objective of the groundwater remedy is to reduce contaminant concentrations in the arsenic plume and the shallow alluvial aquifer to regulatory standards.

Consistent with OSWER Directive 9283.1-03, the Rocker OU remedy includes contingency measures to address the arsenic contamination of the shallow alluvial aquifer where remediation requirements involve moderate uncertainty and may at a future date dictate an ARARs waiver and/or establishment of containment goals. After the remedy has been implemented and with persuasive monitoring data that allows EPA, in consultation with the State, to conclude that it is technically impracticable to attain ARARs in the arsenic plume present in the shallow alluvial aquifer, a Technical Impracticability Waiver could be granted by the Agency. This waiver cannot be granted, however, without convincing evidence after source removal, that trends in decreasing arsenic concentrations will not meet remediation requirements in a reasonable time frame. EPA's consideration of a Technical Impracticability waiver, following implementation of the remedy, may be limited to the smallest extent of the groundwater system (possibly limited to fine grained saturated materials in the shallow alluvium). This portion of the groundwater system has the lowest potential for development owing to low water yields.

However, EPA fully expects to meet the primary remediation goal stated above. Achieving this goal is consistent with a major EPA theme of "pollution prevention".

**FINAL REMEDY (with contingency measures):**

The remedy selected utilizes treatment of the arsenic-laden source materials that contribute to groundwater contamination and surface soil hot spots to the maximum extent practicable, to reduce mobility of the arsenic in combination with standard excavation and on-site disposal technologies. The selected remedy includes utilization of natural and enhanced arsenic attenuation processes, and contingent hydraulic controls to contain and treat any unexpected groundwater migration off-site. Also, part of the groundwater remedy includes a temporary well ban to prevent development of the nearby shallow and deeper portions of the alluvial aquifer as well as an alternative water supply for the residents of the community of Rocker. The remedy requires institutional controls to limit future land uses (to prevent residential land uses), monitoring of the vegetative cover, and monitoring of groundwater (to document trends in water quality and determine if contingent remedies might be needed, and to assure protection of domestic water supplies). The estimated cost for this remedy is $5,400,000 (compared to $7,340,00 for the preferred remedy in the proposed plan).

- **Groundwater Source Material Removal and Treatment of Shallow Groundwater**
  Arsenic groundwater "source material" is defined as soils and other substrate materials that previously have been contaminated with concentrated wood treating solutions and other arsenic waste, and which continue to act as a source to ongoing groundwater contamination. The area containing "source material" was preliminarily defined in the feasibility study to be within the 10,000 parts per billion arsenic groundwater plume/ five feet deep into the saturated zone. The selected remedy for "source materials" (approximately 41,000 cubic yards) is excavation, subsequent chemical fixation utilizing complete mixing of iron sulfate, and lime with the arsenic contaminated media, and then backfilling the excavated area above the water table with this amended material to the extent practicable and in compliance with solid waste requirements. Disposal of treated wastes will only occur in areas where iron has been added to the shallow groundwater beneath the waste repository as described below. The addition of iron to adsorb and immobilize arsenic is considered by the Agency to be an innovative treatment technology. The excavation and treatment of high concentration soils and other substrate

materials must reduce arsenic mobility to below levels that would be characteristic in relation to designating the material a hazardous waste to be eligible for on-site repository disposal.

During remedial design, an on-site pilot-scale treatment, disposal, and testing process will be implemented in order to optimize amendment dose rates and confirm (using EPA's toxicity characteristic leaching procedure (TCLP)) that treated wastes will be below characteristic levels for hazardous wastes. Following iron treatment and lime addition, limited volumes of highly concentrated wastes may produce leachate with arsenic concentrations higher than the 5 ppm specified for "characteristic" hazardous wastes, following the EPA toxicity characteristic leaching procedure. For these materials, the remedy will include solidification, by cement addition, prior to disposal on-site. A testing program for the duration of the remedy will be designed following the pilot-scale testing.

The use of ferrous sulfate to fixate arsenic and render it immobile is well documented in the literature (in EPA's administrative record) and has been validated in part by ARCO's test program at Montana Tech (Chatham, 1995). It should be emphasized that this process is consistent with the administrative record developed for the Rocker OU and the use of this treatment process is responsive to concerns identified during the remedial investigation/feasibility study and public comment period.

A better definition of the specific quantity and locations of "source material" to be removed and treated will occur after the Record of Decision, during the Remedial Design phase of the Superfund process. During these subsequent sampling and analytical investigations, if $^{+3}$arsenic "source material" is identified in addition to that defined within the 10,000 ppb groundwater arsenic isopleth, such as at the old vat, other known treatment areas, and the off-loading trench, this "source material" will also be removed, treated and disposed of in the OU repository. If additional "source material" repositories are required, in excess of the volume available in the excavation/backfill areas, an approved plan must be developed and implemented consistent with the technologies and ARARs specified in this ROD.

During the excavation of "source materials", care must be taken to properly abandon any existing monitor wells that would have to be removed as well as minimizing the release of pore waters from the saturated zone by utilizing proper excavation equipment and associated removal techniques. The excavated "source materials" will be placed on a nearby drainage pad constructed of impermeable materials where free liquids will drain back into the exposed excavation (in conformance with appropriate ARARs). It is very probable that the exposed groundwater in the excavation will contain elevated arsenic concentrations. Therefore, iron sulfate solution with iron concentrations approximately 10 times greater than the arsenic concentrations (consistent with Chatham, 1995) should be added to and mixed with the groundwater and the pH should also be adjusted to between 7.0 and 8.0 with milk of lime as necessary. The excavation will then be backfilled up to the water table with washed gravel, properly compacted and then covered with a filter blanket to maintain porosity. The resulting iron-enriched shallow groundwater can then move laterally and deeper into the lesser concentrated portions of the plume, thus enhancing the rate of arsenic attenuation in the plume. However, it is recognized that this process will be limited to the more permeable zones in the aquifer and the effectiveness will diminish as iron precipitates reduce aquifer permeability. The area of contamination is expected to continue shrinking as natural attenuation continues and lower concentration groundwater (from up gradient areas) continue to flow through the site. Treatment of contaminated groundwater by such an in-situ technology is considered an innovative technology by EPA, and together with the innovative iron treatment of arsenic wastes (described above) is consistent with the statutory preference for such remedies.

The excavated solids will have oversize materials removed that are unsuitable for chemical fixation and backfilling. Such materials will be removed and disposed of at an offsite landfill, consistent with State and Federal solid and hazardous waste disposal requirements. The contaminated materials separated from the oversize material will be treated with iron and lime as described previously. The treated materials will be placed on the backfilled gravel layer in the excavated zone (above the iron treated ground water) resulting in a net surface elevation somewhat higher than the original surface. The final site surface contours will be designed in such a manner that 18-inches of additional non-contaminated cover soil can be added to provide an adequate vegetative growth zone and protective cover over the treated materials/hotspot areas and promote proper surface drainage, and other ARAR standards are met. An adequate number of monitor wells would then be completed into the permeable zone and into deeper portions of the alluvial aquifer to permit ongoing groundwater monitoring to document the trends in groundwater quality improvement around the source removal area, within and outside of the remaining arsenic plume.

- **Contaminated Surface and Near-Surface Soils**
  The surface and near surface soils outside of the "source material" removal zone, to the site boundary, will be systematically sampled and analyzed for arsenic concentrations. Sampling will not occur in areas being remediated by the adjoining Streamside Tailings operable unit. The area utilized for the loading and off-loading of the local recreational railroad will be included within the area to be sampled and potentially remediated. A soil arsenic concentration of 380 parts per million (ppm) corresponds to a one in 10,000 excess cancer risk for trespassers, recreationists or workers that frequent the OU and who may be exposed via the direct contact pathway. Soils greater than this concentration pose a risk exceeding the EPA acceptable risk range. Those areas found to be greater than 380 ppm arsenic but less than 1000 ppm will be covered directly with 18-inches of growth media and revegetated.

  Surface areas found in excess of 1000 ppm arsenic (hot spots) shall be excavated to a maximum depth of 18-inches. The excavated highly contaminated soil will be treated in a manner identical to the source soils utilizing iron sulfate and lime (described previously). Investigation derived wastes stored in drums on site will also be treated in this manner and disposed of consistent with State and Federal solid and hazardous waste regulations. Limited circumstances may occur where iron-treated materials, when tested using EPA's toxicity characteristic leaching procedure (TCLP), will exceed concentrations that would classify the materials as a "characteristic" hazardous waste. A contingent solidification (by concrete addition) treatment procedure is provided for in the remedy to address this limited potential circumstance. The resulting treated wastes will then be disposed of on-site in an on-site repository above the water table where groundwater has been treated with iron below. Excavated/covered areas will be revegetated with appropriate species of draught resistant grasses that are self-reproducing and that are consistent with the remedial objectives of this ROD (minimizing surface erosion and utilization of soil moisture). The final site contours must be compatible with the ongoing use of the railroad corridor, and promote good surface water run-on/off control.

The excavation, treatment and on-site disposal outside of the flood plain of high concentration soils and groundwater "source materials" will prevent uncontrolled contaminant releases via surface and groundwater pathways and will prevent direct contact with this highly toxic chemical. These aspects of the remedy are consistent with the Streamside Tailings OU remedy. Coordination between operable units will continue, which is important with respect to excavation and disposal of wastes from both operable units.

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 documents).

- **Well Ban and Alternative Water Supply**

A serious potential health threat at the Rocker OU involves the opportunity for migration of arsenic into ground water systems currently being used, and that have the potential for continued development. These ground water resources are the water supply of choice for area residents and businesses. Given the hydraulic connections between the shallow and deeper alluvium and the tertiary aquifer, 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 to prevent increased ground water utilization that could influence the arsenic plume migration. The well ban will be removed once sufficient evidence from the post monitoring efforts determines that the arsenic plume has been controlled sufficiently to abate the threat of further migration.

To further reduce the possibility of groundwater use and contamination spread and to provide residents of the community of Rocker adequate water to meet demands during the period of the well ban, an expanded capacity alternative water supply will be provided. Current users of groundwater can continue to utilize this resource. Routine monitoring of the quality of domestic/commercial groundwater supplies within the area of the well ban shall be conducted. The alternate water supply and well ban together contribute to the Agency's objective of preventing pollution of important water supplies connected to the current area of contamination.

- **Contingent Remedy**

  In the unlikely event that plume migration occurs (laterally or vertically), additional hydraulic controls may be implemented to contain the plume. The contingent remedy would be determined necessary if plume advancement is detected in a lateral or vertical direction into surface or ground water with arsenic concentr .tions below the 18 ppb standard, that would result in long term arsenic contamination that exceeds the State standard.

- **Groundwater Monitoring:**

  Water quality sampling and analysis for nearby existing well users and for key monitoring wells developed for the Rocker site will also continue on a seasonal/four times-per-year frequency. EPA, in consultation with the State, will make a decision at the time of the 5 year review, or other appropriate times, regarding: the need for contingent remedies (as described above), or the removal of groundwater restrictions, or other appropriate refinements to the remedy.

- **Coordination With Streamside Tailings OU**

  The Rocker Remedy will be coordinated with the Streamside Tailings OU proposed remedy particularly with respect to waste repositories. Contamination occurring along the railroad sidings within the Rocker OU will be remediated to arsenic and metals concentrations consistent with the recreational land use projected as part of the Streamside Tailings OU remedy.

This innovative remedial action breaks the surface, direct-contact pathway for recreationists, trespassers, or workers that may frequent the site. It will also free up the site for future use as an industrial site. In addition, the remedy assures that the primary groundwater remedial action objective of protection of the quality and continued use of the tertiary aquifer, the regionally preferred groundwater source, is achieved.

## 11. PERFORMANCE STANDARDS

Section 7 of this ROD presented the Remedial Action Objectives for the Rocker OU. These stated EPA' (in consultation with the State) overall remedial action objectives are to reduce the current and potential human exposure to contaminated soil and groundwater. More detailed objectives for both soils and groundwater were also conveyed. The final determination of state and federal ARARs for the Rocker OU is presented in Appendix 1. The purpose of this section is to identify those key requirements and ARAR standards which will measure the success of implementing the remedial action.

For soils there is no federal or state chemical specific ARAR; therefore, the clean up levels were set on health based concentrations of arsenic that were within EPA's acceptable excess cancer risk range, as determined by EPA's Baseline Human Health Evaluation. The arsenic concentration determined acceptable for surface soils to address the direct contact pathway for trespassers, recreationists, and workers is 380 parts per million (ppm). An additional criteria of 1,000 ppm arsenic is established for removal/treatment of contaminated surface soils. These highly contaminated materials pose a greater risk of potential release of arsenic from the OU via surface erosion and/or leachate migration to groundwater (if institutional controls were to fail). In addition, the specific criteria for "source material" excavation will be refined during remedial design. The performance standards are:

- For groundwater, clean up levels are based on the state's standards for Class I and Class II groundwater, which for arsenic is 18 parts per billion (ppb).
- Excavation of soils exceeding 1,000 ppm arsenic to a depth of 18 inches (outside of areas remediated during the Streamside Tailings OU 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 also been treated with iron.

- Cover surface soils where arsenic concentrations exceed 380 ppm (outside of areas remediated during the Streamside Tailings OU 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 parts per million arsenic, using EPA's toxicity characteristic leaching procedure (TCLP).

- Groundwater in all aquifers must meet the 18 ppb 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, will be conducted during remedial design which will 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, will be accomplished. For areas where "source materials" are excavated, groundwater will also be treated with iron and iron/arsenic concentrations will be 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 ppb arsenic) 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.

The narrative in this section describes what performance standards will be met during or at completion of the remedial action selected for the Rocker OU and the documentation that will be maintained to verify compliance with these standards. The specific approach to document that performance standards are or will be met are described below. Detailed monitoring programs, acceptable to the Agencies, will be developed during the remedial design phase of this project. The remedial design phase of this project, will:

- Provide sampling and analysis plans that are consistent with the objectives of this ROD;
- Conduct the final stages of investigation (sampling and analysis) to verify volumes of surface soils or source area materials to be excavated and/or covered;

- Provide interpretive reports documenting final areas requiring excavation/covering consistent with this ROD;
- Provide surface and groundwater monitoring plans in order to demonstrate compliance with the implementation of the remedy and long term trends with respect to groundwater quality, involving monitoring wells on or near the Rocker OU and nearby private wells utilized for domestic water supplies;
- Conduct additional bench/field scale investigations to optimize the form and amount of iron, lime, cement additions to the various media (high concentrations soils, source area materials, and groundwater) that are being remediated consistent with this ROD;
- Develop a monitoring and maintenance plan: for the soil/vegetative cover, run on/run off as appropriate, and topographic features that isolate waste repositories from the floodplain;
- Develop a revegetation plan that will provide a vegetative cover consistent with the long term objectives of controlling erosion, and utilizing moisture in the root zone (so as to minimize through-flow of moisture to groundwater);
- Develop a plan that includes descriptions of required: equipment, materials, construction time frames, location of utilities potentially disturbed by pipeline construction, and required surface access agreements in order to install the alternate water supply and storage tank consistent with this ROD and a plan for implementation, in coordination with local land owners and authorities, for institutional control implementation, including the temporary groundwater well ban.

## 12. STATUTORY DETERMINATIONS

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve the overall protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under federal and state environmental and siting laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and must utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatments that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following subsections discuss how the selected alternative meets these statutory requirements.

## PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy is protective of human health for the following reasons:

- Breaks the direct contact pathway for trespassers and workers potentially exposed to contaminated soils;
- Protects current and future groundwater users by containing the existing groundwater plume, preventing increased use of aquifers to avoid direct contact and spread of the plume, treating contaminated soils and other material and ground water in the source area, and allows for natural attenuation of the arsenic plume.

## COMPLIANCE WITH ARARS

The selected alternative will comply with the federal and state requirements that have been determined legally applicable or relevant and appropriate to the Rocker OU remedial action, as described in Appendix 1.

Treated contaminated soils and sediments will be disposed of in compliance with federal and state solid waste and reclamation regulations through excavation, treatment and disposal above treated groundwater. The State remediation standard of 18 ppb arsenic is the primary ground water ARAR for the Rocker OU remedy. As noted, Appendix 1 provides a list of all of the ARARs for the selected remedy.

There is no basis nor need for an ARAR waiver at this time in conjunction with the remedy. However, the remedy is considered to have moderate uncertainty when considering the potential to achieve the State arsenic standard of 18 ppb in groundwater moving through the fine grain shallow alluvium. The remedy is expected to achieve significant reductions in arsenic concentrations within the current arsenic plume. This action is expected to meet the primary remediation goals of protecting the quality of the deep alluvium and tertiary groundwater systems. A determination will be made following implementation of the remedy whether the State standard can be met in a reasonable time frame in the shallow alluvial groundwater system. If it is found to be technically impracticable from an engineering perspective to achieve the State arsenic standard, an ARAR waiver for a limited portion of the aquifer will be sought. The saturated fine grained shallow alluvium where this potential is greatest is the groundwater resource that has the least likelihood of being developed owing to its low yield and close proximity to ground surface.

## COST EFFECTIVENESS

The selected remedy is cost effective compared to the other alternatives evaluated. Of the other alternatives considered, including the preferred alternative in the proposed plan, the cost of this remedy ($5.4M) falls mid-range between alternative 2 ($2.5M) and alternative 7 ($12.5). The cost of the preferred alternative identified in the proposed plan was estimated to be $7.34M. The decreased cost of the remedy from the proposed plan was a result of EPA's refinement of the remedy, based on public comment, to dispose of excavated highly arsenic contaminated materials on-site, after treatment. EPA also evaluated the cost of the remedy in terms of the high value of the groundwater resource in this area. Residents have expressed a preference to use groundwater from the Tertiary alluvium aquifer because of the increased cost associated with purchasing treated water from the Butte municipal water supply. The Tertiary alluvium aquifer has been demonstrated to provide adequate water quality and quantity to support commercial development (which is likely in this area). The state Natural Resource Damage Program conducted an evaluation of the increased cost of purchasing Butte water, and concluded that there is an increased cost of $607.00 per acre foot of water over the cost of using groundwater supplies (Literature Review and Estimation of Municipal and Agricultural Values of Groundwater Use in the Upper Clark Fork River Drainage, 1995). The Tertiary alluvium is recognized by residents and well drillers to be the preferred groundwater producing zone in the area between Rocker and Ramsey (several miles down stream). The remedy acknowledges the value of this groundwater resource to area residents by maintaining as the highest priority, the protection of the quality of the Tertiary aquifer. The remedy also provides protection to on-site workers and trespassers, and returns the property to productive use. In addition, consistent with the remedial action objectives, the remedy strives to remove the water well ban (for new wells within one quarter mile of the groundwater plume) as soon as possible. Accordingly, the costs associated with this remedy are proportional to its overall effectiveness.

## UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES)

The selected alternative uses permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. EPA in, consultation with the State, has determined that the selected remedy provides the best balance in terms of long-term effectiveness and permanence; reduction of toxicity, mobility, or volume achieved through treatment; short-term effectiveness; implementability; and cost, while also considering the statutory preference for treatment as a principal element, and State and community acceptance.

From the evaluation of alternatives in the feasibility study, EPA has concluded that arsenic source removal and treatment was essential if improvements in groundwater quality were expected in a reasonable time frame. If the highest levels of arsenic and creosote are left in the groundwater (without treatment), EPA concludes that these materials would present a long term source of contamination to the three aquifers identified. Following excavation/treatment, of groundwater and solid materials from the source area, with disposal of treated solids above the water table, EPA concludes that this alternative treatment will permanently adsorb arsenic with ferric iron oxy-hydroxide precipitates that will remain stable under the environmental conditions present at the Rocker OU.

Other technologies evaluated in the feasibility study did not adequately address the removal/treatment of mobile arsenic in pore waters contained in the fine grained materials within the saturated zone. Outside of the source area following excavation, the remaining arsenic groundwater plume is expected to dissipate quickly from natural/enhanced attenuation (resulting to some extent from iron addition to groundwater in the source area) and from the flushing of higher quality alluvial groundwater containing less than the state standard of 18 ppb arsenic entering the OU from an upstream direction. However, the extent to which the fine grained materials in the saturated zone may slowly release arsenic to the groundwater outside of the source removal area and the net effect on the quality of the shallow alluvial aquifer is moderately uncertain. The remedy includes a plume containment contingency to protect the more valuable deep alluvial and Tertiary aquifers in the unlikely circumstance that plume migration occurs.

The selected remedy has been designed as a permanent solution. Adherence to the performance standards for the remedy will ensure the continued safety of the surrounding population, workers implementing the remedy and environment. Thus, the selected remedy meets the statutory requirement to utilize permanent solutions and treatment technologies, to the maximum extent practicable.

**PREFERENCE FOR TREATMENT AS PRINCIPAL ELEMENT**

The selected remedy combines several treatment approaches to reduce the mobility of arsenic in both contaminated soils and groundwater. Contaminated surface soils (exceeding 1,000 ppm arsenic) and source area contaminated alluvium/fill materials will be treated with iron, lime and cement as necessary to reduce arsenic mobility. In addition, iron additions to groundwater in the source area will adsorb arsenic with iron oxy-hydroxides that will precipitate; thereby capturing the arsenic in a form that will remain stable under the environmental conditions present at the Rocker OU.

This satisfies the statutory preference for remedies that reduce the toxicity, mobility, or volume of contamination through treatment.

## 13. DOCUMENTATION OF SIGNIFICANT CHANGES

CERCLA Section 117(b) requires an explanation of any significant changes to the selected alternative as presented in the Proposed Plan, which was made available for public comment. In developing the final remedy, five significant changes were made to the Proposed Plan:

1) Alternate Water Supply:
New water users (within one quarter mile of the site) would be provided water from this source. This was changed from the one half mile figure used in the proposed plan. This distance was considered by EPA's geohydrologists to be an adequate area of protection that would prevent future groundwater development that might influence arsenic plume migration. This determination was based on professional judgment and the geohydrologic information available for the Rocker OU.

2. Change in Waste Treatment and Disposal:
EPA revised their finding regarding the designation of Rocker wastes as listed hazardous wastes governed by RCRA Subtitle C. This change is based on EPA's evaluation of the waste listings under EPA's RCRA regulations, the lack of clear documentation regarding waste sources, and site conditions. The RCRA waste listings do not describe exactly the waste produced at the Rocker Wood Treating Plant. Accordingly, the listings do not apply to the waste. Additionally, the NCP Preamble states that where it is not possible to identify the exact source of wastes, RCRA requirements need not be identified. Here Rocker wood treating wastes are mixed with mining waste (fill brought in for railroad grades, stream diversion, and to raise the topography 5 to 8 feet under the Rocker Wood Treating Plant) to form an indivisible harm at the site, and the exact source cannot be identified. Following excavation and treatment with ferrous iron, the excavated wastes will pass EPA's TCLP test regarding the RCRA hazardous waste characteristic determination. Therefore, wastes will be disposed of in solid waste repositories on site. This is consistent with the comments made by the community of Anaconda to not locate the waste on Smelter Hill. In addition, Rocker residents indicated that a local repository was acceptable to them if an acceptable location could be found.

3. EPA's Universal Treatment Standards:
The remedy will require that Rocker excavated and treated wastes to ultimately meet TCLP characteristic levels as a condition for on site disposal rather than the universal treatment standards described in the proposed plan. The remedy was also revised to include solidification with cement, in the event that treated wastes exceed the TCLP standard of 5 ppm arsenic. The cost estimate to add this component to the remedy, did not exceed the cost contingency factored into the original cost of the remedy. Because it is expected that there will be very limited need for concrete addition, an adjustment to total cost of the remedy was not made.

4. Well Ban:
EPA's geohydrologists concluded that one quarter mile well ban around the arsenic plume would provide an adequate buffer so that future groundwater development would not influence arsenic plume migration. The proposed plan used one half mile for the water well ban.

5. Pump and Treat Contingency:
EPA removed the pump and treat contingency for the Rocker remedy for the following reasons:

- It was considered unlikely that plume migration would be detected following implementation of the remedy;
- In the event that plume migration is detected, other plume containment alternatives are available, without adding the significant additional expense of a treatment plant;
- It was considered to be not cost effective to install pump and treat technologies when natural groundwater flow and attenuation are expected to cause significant decreases in arsenic concentrations in groundwater; and
- The Proposed Plan recognized that over the long term the cost effectiveness of pump and treat to remove the arsenic remaining in very fine grained lenses of the alluvium would diminish.

These significant changes are considered to be a logical extension of the comments received during the public comment period. During a follow up meeting with the major stake-holders on this site (PRP, Communities, and environmental groups) after the close of public comment, EPA presented a revised position that addressed public comments (the remedy contained in the ROD). The representatives were largely supportive of the revisions to the remedy, although the PRP sought clarification regarding the precise volumes slated for source area removal. EPA has clarified this issue in the ROD with respect to the work to be done during the remedial design phase of the project to better define "source materials" to be removed during the remedy by limiting areas of investigation to known areas of processing and areas where the mobile form of arsenic ($^{+++}As$) is present. Another minor adjustment was made in the ROD to update the calculations made regarding excess cancer risk from exposure to arsenic contaminated soils. EPA revised the cancer slope factor used in this calculation in June, 1995 from 1.75 mg/kg-day to 1.5 mg/kg-day. The changed slope factor altered the soil arsenic concentration that poses an excess cancer risk of one in ten thousand to 382 ppm., compared to 327 ppm from the Rocker Baseline Human Health Evaluation, completed prior to the change in the cancer slope factor.

# REFERENCES

This Record of Decision is supported by the Administrative Record for the Rocker OU (maintained in EPA's Helena, Montana Office) and the following documents that have been cited in the text.

ARCO. 1995. Rocker Timber Framing and Treating Operable Unit-Final Remedial Investigation.

ARCO. 1995. Rocker Timber Framing and Treating Plant Operable Unit Feasibility Study.

Chatham, William H. April 1995. Treatability Study Iron Flood Method for In-situ Remediation of Arsenic at the Rocker Timber Framing and Treating Plant Operable Unit, Phase I - Batch Tests

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Harper, T.R., and Kingham, N.W. 1992. Removal of arsenic from wastewater using chemical precipitation methods. Water Environment Research, Vol. 64, pp. 200-203.

Murray, Lamont and Associates. 1993. Supplement to: Legal Memorandum, dated April 2, 1992, Pertaining to Institutional Controls at the Rocker Timber Framing and Treating Plant (Rocker) Operable Unit.

State of Montana Natural Resource Damage Program. 1995. Literature Review and Estimation of Municipal and Agricultural Values of Groundwater Use in the Upper Clark Fork River Drainage.

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U.S. Environmental Protection Agency. 1988. Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites. EPA/540/G-88/003. December 1988.

U.S. Environmental Protection Agency. 1990. Suggested ROD Language For Various Groundwater Remediation Options (D). EPA/9283.1-03(10/90). October 1990.

# APPENDIX 1

**ARARs For The**
**Rocker Timber Framing and Treating Plant OU**

# IDENTIFICATION AND DESCRIPTION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, STANDARDS, CONTROLS, CRITERIA, OR LIMITATIONS FOR THE SILVER BOW CREEK/BUTTE AREA SUPERFUND SITE - ORIGINAL PORTION - ROCKER TIMBER FRAMING AND TREATMENT PLANT OPERABLE UNIT

## INTRODUCTION

Section 121(d) of CERCLA, 42 U.S.C. Section 9621(d), certain provisions of the current National Contingency Plan (the NCP), 40 CFR Part 300 (1990), and guidance and policy issued by the Environmental Protection Agency (EPA) require that remedial actions taken pursuant to Superfund authority shall require or achieve compliance with substantive provisions of applicable or relevant and appropriate standards, requirements, criteria, or limitations from State environmental and facility siting laws, and from federal environmental laws, at the completion of the remedial action and/or during the implementation of the remedial action, unless a waiver is granted. These requirements are threshold standards that any selected remedy must meet. See Section 121(d)(4) of CERCLA, 42 U.S.C. § 9621(d)(4); 40 CFR § 300.430(f)(1). EPA calls standards, requirements, criteria, or limitations identified pursuant to section 121(d) ARARs, or applicable or relevant and appropriate requirements.

ARARs are either applicable or relevant and appropriate. Applicable requirements are those standards, requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those standards, requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to hazardous substances, pollutants, contaminants, remedial actions, locations, or other circumstances found at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site such that their use is well suited to the particular site. Factors which may be considered in making this decision are presented in 40 CFR Section 300.400(g)(2). Compliance with both applicable and relevant and appropriate requirements is mandatory[1]

Each ARAR or group of related ARARs is identified by a specific statutory or regulatory citation, a classification describing whether the ARAR is applicable or relevant and appropriate, and a description which summarizes the requirements and addresses how and when compliance with the ARAR will be measured (some ARARs will govern the conduct of the implementation of the remedial action, some will govern the measure of success of the remedial action, and some will do

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[1] See CERCLA Section 121(d)(2)(A), 42 U.S.C. § 9621

both)[2]. The descriptions given here are provided to allow the reader a reasonable understanding of each requirement without having to refer constantly back to the statute or regulation itself and to provide an explanation of how the requirement is to be applied in the specific circumstances involved a this operable unit.

Also contained in this list are policies, guidance or other sources of information which are "to be considered" in the selection of the remedy and implementation of the Record of Decision (ROD). Although not enforceable requirements, these documents are important sources of information which EPA and the State of Montana Department of Environmental Quality Sciences (MDEQ) may consider during selection of the remedy, especially in regard to the evaluation of public health and environmental risks; or which will be referred to as appropriate in selecting and developing cleanup actions[3].

Finally, this list contains a non-exhaustive list of other legal provisions or requirements which should be complied with during the implementation of this ROD.

ARARs are divided into contaminant specific, location specific, and action specific requirements, as described in the NCP and EPA guidance. For contaminant specific ARARs, ARARs are listed according to the appropriate media.

Contaminant specific ARARs govern the release to the environment of specific chemical compounds or materials possessing certain chemical or physical characteristics. Contaminant specific ARARs generally set health or risk based numerical values, or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.

Location specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of cleanup activities because they are in specific locations. Location

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[2]. 40 CFR Section 300.435(b)(2); Preamble to the Proposed NCP, 53 Fed. Reg. 51440 (December 21, 1988); Preamble to the Final NCP, 55 Fed. Reg. 8755-8757 (March 8, 1990). The Atlantic Richfield Company (ARCO), the named liable party for the site, argues that this NCP requirement is not consistent with the CERCLA statute. However, ARCO did not challenge the NCP in the District of Columbia Court of Appeals in a timely manner, and therefore have waived the right to assert this argument. See Section 113(a) of CERCLA, 42 U.S.C. Section 9613(a).

[3]. 40 CFR Section 300.400(g)(3); 40 CFR Section 300.415(i); Preamble to the Final NCP, 55 Fed. Reg. 8744-8746 (March 8, 1990).

specific ARARs relate to the geographic or physical position of the site, rather than to the nature of the site contaminants.

Action specific ARARs are usually technology or activity based requirements or limitations on actions taken with respect to hazardous substances.

Only the substantive portions of the requirements are ARARs[4]. Administrative requirements are not ARARs and thus do not apply to actions conducted entirely on-site. Administrative requirements are those which involve consultation, issuance of permits, documentation, reporting, recordkeeping, and enforcement. The CERCLA program has its own set of administrative procedures which assure proper implementation of CERCLA. The application of additional or conflicting administrative requirements could result in delay or confusion[5]. Provisions of statutes or regulations which contain general goals that merely express legislative intent about desired outcomes or conditions but are non-binding are not ARARs.[6]

Many requirements listed here are promulgated as identical or nearly identical requirements in both federal and State law, usually pursuant to delegated environmental programs administered by EPA and the States, such as the requirements of the federal Clean Water Act and the Montana Water Quality Act. The preamble to the new NCP states that such a situation results in citation to the State provision as the appropriate standard, but treatment of the provision as a federal requirement. ARARs and other laws which are unique to State law are listed in the State ARAR section of this document.

Only those state standards that are identified in a timely manner and are more stringent that federal requirements may be applicable or relevant and appropriate. To be an ARAR, a state standard must be "promulgated", which means that the standard is of general applicability and is legally enforceable[7].

This document constitutes MDEQ's and EPA's formal identification and detailed description of ARARs for remedial action at the Rocker Operable Unit. The ARARs analysis is based on section 121(d) of CERCLA, 42 U.S.C. Section 9621(d); CERCLA

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[4]. 40 CFR Section 300.5. <u>See also</u> Preamble to the Final NCP, 55 Fed. Reg. 8756-8757 (March 8, 1990).

[5]. Preamble to the Final NCP, 55 Fed. Reg. 8756-8757 (March 8, 1990); Compliance with Other Laws Manual, Vol. I, pp. 1-11 through 1-12.

[6]. Preamble to the Final NCP, 55 Fed. Reg. 8746 (March 8, 1990).

[7]. 40 CFR Section 300.400(g)(4).

Compliance with Other Laws Manual, Volumes I and II, OSWER Dirs. 9234.1-01 and-02 (August 1988 and August 1989 respectively); various CERCLA ARARs Fact Sheets issued as OSWER Directives; the Preamble to the Proposed NCP, 53 Fed. Reg. 51394 et seq. (December 21, 1988); the Preamble to the Final NCP, 55 Fed. Reg. 8666-8813 (March 8, 1990); and the Final NCP, 40 CFR Part 300 (55 Fed. Reg. 8813-8865, March 8, 1990), and the substantive provisions of law discussed in this document.

**FEDERAL ARARS**

I. FEDERAL CONTAMINANT SPECIFIC REQUIREMENTS

1. Groundwater Standards - Safe Drinking Water Act (Relevant and Appropriate)[8]

The National Primary Drinking Water Standards (40 CFR Part 141), better known as maximum contaminant levels and maximum contaminant level goals (MCLs and MCLGs), are not applicable to the Rocker operable unit area because the aquifer underlying the area is not a current public water supply, as defined in the Safe Drinking Water Act, 42 U.S.C. § 300f(4). These standards are relevant and appropriate standards, however, because there is groundwater in the area which is a potential source of drinking water, ground water use through private wells occurs in the area, and the aquifer feeds Silver Bow Creek, which is designated as a potential drinking water source. In the identification of State standards following this section, the State notes that the subject aquifers are Class I and Class II aquifers which means they have the potential for drinking water use, that State ground water standards are applicable to the aquifer, and that State nondegradation standards are also applicable. This adds considerable weight to EPA's determination to require cleanup to identified ground water standards at the Rocker operable unit.

Use of these standards for this action is fully supported by EPA regulations and guidance. The Preamble to the National Contingency Plan clearly states that MCLs are relevant and appropriate for ground water that is a current or potential source of drinking water (55 F.R. 8750 - March 8, 1990), and this determination is further supported by requirements in the regulations governing conduct of RI/FS studies found at 40 CFR Section 300.430(e)(2)(i)(B). EPA's guidance on Remedial Action for Contaminated Groundwater at Superfund Sites states that "MCLs developed under the Safe Drinking Water Act generally are ARARs for current or potential drinking water sources." MCLGs which are above zero are relevant and appropriate under the same conditions (55 F.R. 8750-8752 - March 8, 1990). See also, State of Ohio v. EPA, 997 F.2d 1520 (D.C. Cir. 1993), which upholds EPA's application of MCLs and non-zero MCLGs as ARAR standards for ground water which is a potential drinking water source. EPA notes that ARCO, the identified liable party for the Rocker operable unit, in its ARARs scoping document submitted to EPA, agrees that MCLs and non-zero MCLGs are appropriate ARARs for the Rocker operable unit.

As noted earlier, standards such as the MCL and MCLG standards are promulgated pursuant to both federal and state law.

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[8]. 42 U.S.C. Sections 300f et seq.

Under the Safe Drinking Water Act, EPA has granted the State of Montana primacy in implementation and enforcement of the Safe Drinking Water Act. Pursuant to the Public Water Safety Act, 75-6-101 et. seq., M.C.A. and ARM 16.20.203 and .204, the MCLs specified in 40 CFR Part 141 (Primary Drinking Water Standards) are incorporated.

| Chemical | MCLG | MCL |
|---|---|---|
| A. Arsenic | N.A.[9] | 0.05 milligrams per liter (mg/l)[10] |
| B. Barium | 2.0 mg/l[11] | 2.0 mg/l[12] |
| C. Cadmium | 0.005 mg/l[13] | 0.005 mg/l[14] |
| D. Chromium | 0.1 mg/l[15] | 0.050 mg/l[16] |
| E. Copper | 1.3 mg/l[17] | 1.3 mg/l[18] |
| F. Lead | N.A.[19] | 0.015 mg/l[20] |
| G. Benzo-(a)pyrene | N.A.[21] | 0.0002mg/l[22] |

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9. An MCLG and a revised MCL for arsenic may be promulgated by EPA in the near future. Such standards may be relevant to five-year reviews of the remedy, conducted pursuant to section 121(c) of CERCLA.

10. 40 CFR Section 141.11.

11. 40 CFR Section 141.51.

12. 40 CFR Section 141.62.

13. 40 CFR Section 141.51

14. 40 CFR Section 141.62.

15. 40 CFR Section 141.51.

16. 40 CFR Section 141.61.

17. 40 CFR Section 141.51

18. 40 CFR Section 141.80(c). The requirement is an action level rather than a simple numerical standard.

19. The MCLG for lead is zero, which is not considered appropriate for Superfund site cleanups.

20. 40 CFR Section 141.80(c), which establishes an action level rather than a pure numerical standard.

21. The MCLG for benzo(a)pyrene is zero, and is not considered appropriate for CERCLA actions.

| | | |
|---|---|---|
| H. Ethyl-benzene | 0.7 mg/l[23] | 0.7 mg/l[24] |
| I. Xylene | 10.0 mg/l[25] | 10.0 mg/l[26] |

Some of these standards are also incorporated by Resource Conversation and Recovery Act standards for ground water found at 40 CFR Part 264, Subpart F, which is incorporated pursuant to State law at ARM 17.54.702. The RCRA standards are the same or less stringent than the MCLs or MCLGs identified above. Such standards are relevant and appropriate standards for the Rocker ou.

These standards apply throughout the aquifers at and surrounding the Rocker operable unit. These standards will govern the measurement of success of the remedial action, and, when achieved along with other ground water standards identified in the State ARAR identification section, will indicate the completion of remedial action. The arsenic standard will be used in part to determine whether contingency measures shall be implemented at the Rocker ou, as described in the ROD. Compliance points for measurement of remedial action success and for determining the implementation of contingency measures will be determined during remedial design. Remedial Design documents will also establish which of the above listed contaminants will be actually monitored.

2. Air Standards - Clean Air Act[27] (Applicable)

Limitations on air emissions resulting from cleanup activities or emissions resulting from wind erosion of exposed hazardous substances are set forth in the action specific requirements, below.

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22. 40 CFR Section 141.61.

23. 40 CFR Section 141.51.

24. 40 CFR Section 141.61.

25. 40 CFR Section 141.51.

26. 40 CFR Section 141.61.

27. Standards are promulgated pursuant to the Clean Air Act - 42 U.S.C. sections 7401 et seq.

3. Surface Water - Ambient and Point Source Discharges (Applicable).

CERCLA and the NCP provide that federal water pollution criteria that match designated or anticipated surface water uses are the usual surface water standards to be used at Superfund cleanups, as relevant and appropriate standards, unless the State has promulgated surface water quality standards pursuant to the delegated State water quality act. The State of Montana has designated uses for Silver Bow Creek, and has promulgated specific standards accordingly. Those standards and their application to the Rocker operable unit are identified in the State ARAR identification section of this document. These standards will be applied to all contaminants of concern identified in the Rocker operable unit Remedial Investigation, to point sources created by the Rocker operable unit cleanup and to ambient water quality in Silver Bow Creek.

## II. FEDERAL LOCATION SPECIFIC REQUIREMENTS

1. Floodplain Management Order (Applicable)

This requirement (40 CFR Part 6, Appendix A, Executive Order No. 11,988) mandates that federally funded or authorized actions within the 100 year flood plain avoid, to the maximum extent possible, adverse impacts associated with development of a floodplain. Compliance with this requirement is detailed in EPA's August 6, 1985 "Policy on Floodplains and Wetlands Assessments for CERCLA Actions." Based on EPA's analysis of the current 100 year flood plain, most of the remedial measures to be taken at the Rocker operable unit will not be within the current 100 year flood plain, including source material excavation and subsequent re-disposal. However, if Rocker operable unit measures are done within the 100 year flood plain and cause adverse impacts, specific measures to minimize adverse impacts may be identified following consultation with the appropriate agencies.

If the remedial action selected for the Rocker operable unit is found to potentially affect the floodplain, the following information will be produced: a Statement of Findings which will set forth the reasons why the proposed action must be located in or affect the floodplain; a description of significant facts considered in making the decisions to locate in or affect the floodplain or wetlands including alternative sites or actions; a statement indicating whether the selected action conforms to applicable or local floodplain protection standards; a description of the steps to be taken to design or modify the proposed action to minimize the potential harm to or within the floodplain; and a statement indicating how the proposed action affects the natural or beneficial values of the floodplain.

2. Protection of Wetlands Order (Applicable)

This requirement (40 CFR Part 6, Appendix A, Executive Order No. 11,990) mandates that federal agencies and the potentially responsible party for the federally required activity avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists. Section 404(b)(1), 33 U.S.C. Section 1344(b)(1), also prohibits the discharge of dredged or fill material into waters of the United States. Together, these requirements create a "no net loss" of wetlands standard.

An examination of wetlands at the Rocker operable unit was performed, in consultation with the U.S. Fish and Wildlife Service. Wetlands were identified on or near the Rocker operable unit. However, the remedial action for the Rocker operable unit is not expected to have an impact on wetlands. Further documentation of this is required during remedial design.

3. The Endangered Species Act (Applicable)

This statute and implementing regulations (16 U.S.C. Sections 1531 - 1543, 50 CFR Part 402, and 40 CFR Section 6.302(h)) require that any federal activity or federally authorized activity may not jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify a critical habitat.

Endangered species were evaluated during the Rocker operable unit RI/FS. No endangered species were identified for the Rocker operable unit. Therefore, no further action in compliance with this ARAR is required, unless endangered species use is subsequently identified and adverse impacts may occur.

4. The National Historic Preservation Act (Applicable)

This statute and implementing regulations (16 U.S.C. Section 470, 40 CFR Section 6.310(b), 36 CFR Part 800) require federal agencies or federal projects to take into account the effect of any federally assisted undertaking or licensing on any district, site building, structure, or object that is included in, or eligible for, the Register of Historic Places. If effects cannot be avoided reasonably, measures should be implemented to minimize or mitigate the potential effect. In order to comply with this ARAR, EPA, MDEQ, and the PRP may consult with the State Historic Preservation Officer (SHPO), who can assist in identifying listed or eligible resources, and in assessing whether proposed cleanup actions will impact the resources and any appropriate mitigative measures. Additionally, in April 1992, ARCO, EPA, MDEQ, SHPO, the National Council on Historic Preservation, and local governments entered into a Programmatic Agreement to ensure the appropriate consideration of cultural and historical resources in a systematic and comprehensive manner throughout the Clark Fork Basin, in connection with response actions at the four Clark Fork Basin Superfund sites. The results of the Programmatic Agreement may provide additional consideration of the factors to be addressed under this ARAR, and the two historical ARARs described below.

Cultural and historical resources were evaluated during the Rocker operable unit RI/FS. At this time, the selected remedial action for the Rocker operable unit is not expected to impact the identified resources. This will need continued evaluation and monitoring during remedial action implementation.

Indian cultural and historical resources are also subject to the protections of this act, and have not been addressed under prior evaluations or the Second Programmatic Agreement. Such resources will need further evaluation and identification during the remedial design process for the Rocker operable unit.

5. Archaeological and Historic Preservation Act (Applicable)

The statute and implementing regulations (16 U.S.C. Section 469, 40 CFR Section 6.301(c)) establish requirements for evaluation and preservation of historical and archaeological data, which may be destroyed through alteration of terrain as a result of federal construction projects or a federally licensed activity or program. If eligible scientific, prehistorical, or archaeological artifacts are discovered during site activities, they must be preserved in accordance with these requirements.

6. Historic Sites, Buildings, and Antiquities Act (Applicable)

This requirement states that "in conducting an environmental review of a proposed EPA action, the responsible official shall consider the existence and location of natural landmarks using information provided by the National Park Service pursuant to 36 CFR Section 62.6(d) to avoid undesirable impacts upon such landmarks. The Programmatic Agreement activities described above should aid all parties in compliance with this ARAR.

7. Migratory Bird Treaty Act of 1918, as amended (Applicable)

This requirement (16 U.S.C. Sections 703 et seq.) establishes a federal responsibility for the protection of the international migratory bird resource and requires continued consultation with the U.S. FWS during remedial design and remedial construction to ensure that the cleanup of the site does not unnecessarily impact migratory birds. Specific mitigative measures may be identified for compliance with this requirement during remedial design.

8. Bald Eagle Protection Act of 1940, as amended (Applicable)

This requirement (16 U.S.C. Sections 668 et seq.) establishes a federal responsibility for protection of bald and golden eagles, and requires continued consultation with the U.S. FWD during remedial design and remedial construction to ensure that any cleanup of the site does not unnecessarily adversely affect the bald and golden eagle. At this time, bald or golden eagles have not been identified at the Rocker operable unit and no further efforts are likely to be required. However, specific mitigative measures may be identified for compliance with this requirement, if bald or golden eagles are identified at the Rocker operable unit.

9. Resource Conservation and Recovery Act, as amended (Applicable for the Treatment Unit - Relevant and Appropriate for the Re-Disposal Units)

Any discrete waste units created by the Rocker site cleanup must comply with the siting restrictions and conditions found at 40 CFR § 264.18(a) and (b).

III. FEDERAL ACTION SPECIFIC REQUIREMENTS

1. Air Standards (Applicable)

These standards, promulgated pursuant to section 109 of the Clean Air Act, are applicable during conduct of the remedial action to releases into the air from any Rocker operable unit cleanup activities.

A. Lead - No person shall cause or contribute to concentrations of lead in the ambient air which exceed 1.5 micrograms per cubic meter (mg/cm) of air, measured over a 90-day average.

These standards are promulgated at ARM Section 16.8.815 as part of a federally approved State Implementation Plan (SIP), pursuant to the Clean Air Act of Montana, MCA 75-2-101 et seq.. Corresponding federal regulations are found at 40 CFR Section 50.12.[28]

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[28]. The ambient air standards established as part of Montana's approved State Implementation Plan in many cases provide more stringent or additional standards. The federal standards by themselves apply only to "major sources", while the State standards are fully applicable throughout the state and are not limited to "major sources". See ARM 16.8.808 and 16.8.811-.821. As part of an EPA-approved State Implementation Plan, the state standards are also federally enforceable. Thus, the state standards which are equivalent to the federal standards are identified in this section together. A more detailed list of State standards, which include standards which are not duplicated in federal regulations, is contained in the State ARAR identification section.

B. Particulate matter that is 10 microns in diameter or smaller (PM - 10) - No person shall cause or contribute to concentrations of PM - 10 in the ambient air which exceed:

- 150 micrograms per cubic meter of air, 24 hour average, no more than one expected exceedence per calendar year.

- 50 micrograms per cubic meter of air, annual average.

These regulations are promulgated at ARM Section 16.8.821 as part of a federally approved SIP, pursuant to the Clean Air Act of Montana, MCA 75-2-101 et seq.. Corresponding federal regulations are found at 40 CFR Section 50.6.

Ambient air standards under section 109 of the Clean Air Act are also promulgated for carbon monoxide, hydrogen sulfide, nitrogen dioxide, sulfur dioxide, and ozone. If emissions of these compounds were to occur at the site in connection with any cleanup action, these standards would also be applicable. See ARM 16.8.811, .814, .816, .817, and .820 and 40 CFR Part 50.

C. Asbestos - Standards promulgated at 40 CFR Section 61.145 and 61.150 govern demolition and waste disposal for asbestos demolition operations. If asbestos is encountered during any Rocker operable unit cleanup, these standards would be applicable.

2. Solid Waste (Applicable), Surface Mining Control and Reclamation (Relevant and Appropriate), and RCRA (Applicable and Relevant and Appropriate) Requirements

Upon further examination of the waste-types present at the Rocker operable unit, EPA has determined that RCRA requirements are not applicable to the source material waste after treatment, if the excavated and treated source material waste does not fail characteristic criteria for hazardous waste found at 40 CFR Part 261 Subpart C, which is incorporated into applicable State law, following treatment. This determination is based on the limited knowledge of the treatment plant process, the source of arsenic at the site, and the mixture of various waste sources at the Rocker operable unit. Instead, the following solid waste and other requirements described in 2.A, B., and C. are applicable or relevant and appropriate to the re-disposal of Rocker operable unit wastes. RCRA requirements which are applicable to the excavation and treatment of the excavated source material waste prior to treatment, assuming the waste fails characteristic criteria for RCRA hazardous waste, follow at 2.D.

A. Requirements described at 40 CFR Sections 257.3-1(a), 257.3-3, and 257.3-4, governing waste handling, storage, and disposal in general[29].

B. Reclamation and closure regulations found at 30 CFR Parts 816 and 784, governing coal and to a lesser extent, non-coal mining, are relevant and appropriate requirements. These requirements are also relevant and appropriate to the capping and revegetation of contaminated soils at the site outside of the excavation area, and require a minimum 18 inch soil growth medium as a cap.[30]

C. RCRA regulations found at 40 CFR Sections 264.116 and .119 (governing notice and deed restrictions), and Sections 264.228(a)(2)(iii)(B), (C), and (D) and .251(c), (d), and (f) (regarding run-on and run-off controls), are relevant and appropriate requirements for the type of waste planned for re-disposal following treatment at the Rocker operable unit.[31]

D. RCRA regulations found at the following regulations are applicable to the excavation and treatment of the source material:

i. Standards for Generators of Hazardous Waste

The RCRA regulations at 40 CFR Part 262 establish standards that apply to generators of hazardous waste. These standards include § 262.34 which allows for short-term on-site accumulation of hazardous waste in containers. The substantive standards at 40 CFR Part 262 are applicable for any generation (including excavation) of hazardous waste.

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29. Solid Waste regulations are promulgated pursuant to the federal Solid Waste Disposal Act, as amended by the Resource Conversation and Recovery Act, 42 U.S.C. 6901 et seq. They are applicable regulations, although the State of Montana has the lead role in regulating solid waste disposal in the State of Montana.

30. The Surface Mining Control and Reclamation Act is promulgated at 30 U.S.C. Sections 1201 - 1326.

31. As noted earlier, federal RCRA regulations are incorporated by reference into applicable State Hazardous Waste Management Act regulations. See ARM 17.54.702. Use of select RCRA regulations for the active management of solid waste, including mining waste, is appropriate when discrete units are addressed by a cleanup and site conditions are distinguishable from EPA's generic determination of low toxicity/high volume status for mining waste. See Preamble to the Final NCP, 55 Fed. Reg. 8763 - 8764 (March 8, 1990), CERCLA Compliance with Other Laws Manual, Volume II (August 1989 OSWER Dir. 9234.1-02) p. 6-4; Preamble to Proposed NCP, 53 Fed. Reg. 51447 (Dec. 21, 1988), and guidance entitled "Consideration of RCRA Requirements in Performing CERCLA Responses at Mining Wastes Sites," August 19, 1986 (OSWER). Here, site conditions and waste characteristics make the limited RCRA requirements cited here relevant and appropriate requirements.

ii. Standards for Transporters of Hazardous Waste

The RCRA regulations at 40 CFR Part 263, establish standards that apply to transporters of hazardous waste. These standards include requirements for immediate action for hazardous waste discharges. These substantive standards are applicable for any on-site transportation.

iii. Containers

The RCRA regulations at 40 CFR Part 265, subpart I, establish standards that apply to short-term on-site accumulation of hazardous waste in containers.[32] These substantive standards are applicable for any short-term on-site accumulation and treatment of hazardous waste in containers.

iv. Miscellaneous Unit

The RCRA regulations at 40 CFR Part 264, Subpart X, establish standards that apply to miscellaneous units for the treatment, storage, and disposal of hazardous wastes. These standards include design and operating requirements designed to protect human health and the environment. These substantive standards are applicable for any on-site treatment or storage of hazardous wastes in a miscellaneous unit.

v. Chemical, Physical, and Biological Treatment

The RCRA regulations at 40 CFR Part 265, subpart Q, establish standards that apply to chemical, physical, and biological treatment in miscellaneous units. These sbustantive standards are applicable, along with 40 CFR Part 264, Subpart X, to any chemical or physical treatment in a miscellaneous unit.

vi. Waste Piles

40 CFR Part 264, Subpart L, applies to owners and operators of facilities that store or treat hazardous waste in piles.[33] The regulations include requirements for the use of run-on and run-off control systems and collection and holding systems to prevent the release of contaminants from waste piles unless certain specified criteria are met. These substantive standards are applicable to any storage in waste piles at the site.

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[32] A container is defined as any portable device in which a material is stored, transported, treated, disposed or otherwise handled. § 260.10

[33] "Pile" means any non-containerized accumulation of solid, nonflowing hazardous waste that is used for treatment or storage. 40 CFR § 260.10.

3. Point Source (Applicable)

If point sources of water contamination are created by any Rocker remediation activity, applicable Clean Air Act and Clean Water Act standards would apply to those discharges. Specific parameters for such discharges are not identified here, but are reflected in the identification of State of Montana ARAR's section of this document. These regulations would also include storm water runoff regulations found at 40 CFR Parts 121, 122, and 125 (general conditions and industrial activity conditions).

4. Dredge and Fill Requirements (Applicable)

Regulations found at 40 CFR Part 230 address conditions or prohibitions against depositing dredge and fill material into water of the United States. If remediation activities would result in an activity subject to these regulations, they would be applicable.

5. Underground Injection Control (Applicable)

Requirements found at 40 CFR Part 144, promulgated pursuant to the Safe Drinking Water Act, allow the re-injection of treated ground water into the same formation from which it was withdrawn for aquifers such as the aquifer beneath the Rocker site, and address injection well construction, operation, maintenance, and capping/closure. These regulations would be applicable to any reinjection of ground water.

IV. TO BE CONSIDERED DOCUMENTS (TBCs)

The use of documents identified as TBCs is addressed in the introductory portion of the ARAR identification. A list of TBC documents is included in the Preamble to the NCP, 55 Fed. Reg. 8765 (March 8, 1990). Those documents, plus any additional similar or related documents issued since that time, will be considered by EPA and MDHES during the conduct of the RI/FS, during remedy selection, and during remedy implementation.

V. OTHER LAWS (Non-exclusive list)

CERCLA defines as ARARs only federal environmental and state environmental and facility siting laws. Remedial design, implementation, and operation and maintenance must nevertheless comply with all other applicable laws, both state and federal, if the remediation work is done by parties other than the federal government or its contractors. The following "other laws" list, both here and in the State ARAR section of this document, are included to provide a reminder of other legally applicable requirements for actions being conducted at the Rocker operable unit. They do not purport to be an exhaustive list of such legal requirements, but are included because they set out related concerns that must be addressed and, in some cases, may require some advance planning. They are not included as ARARs because they are not "environmental or facility siting laws." As applicable laws other than ARARs, they are not subject to ARAR waiver provisions.

Section 121(e) of CERCLA exempts removal or remedial actions conducted entirely on-site from federal, state, or local permits. This exemption is not limited to environmental or facility siting laws, but applies to other permit requirements as well.

1. The federal Occupational Health and Safety Act regulations found at 29 CFR Section 1910.95 are applicable to worker protection during conduct of RI/FS or remedial activities. Such requirements must be addressed in a Health and Safety Plan for the remedial action implementation, and are independently enforceable by OHSA.

2. Off-Site Transportation of Hazardous or Contaminated Waste

Any off-site transportation and disposal of waste or debris would be subject to applicable laws and regulations. Such requirements are not analyzed in detail here.

**STATE OF MONTANA ARARS**

As provided by Section 121 of CERCLA, 42 U.S.C. § 9621, only those state standards that are more stringent than any federal standard and that have been identified by the state in a timely manner are appropriately included as ARARs. To be an ARAR, a state standard must also be "promulgated", which means that the standards are of general applicability and are legally enforceable.

VI. MONTANA CONTAMINANT SPECIFIC REQUIREMENTS

1. Surface Water Quality Standards - Ambient and Point Source (Applicable)

If a point source is created by the Rocker operable unit remediation, the following standards are applicable:

ARM 16.20.604(1)(b)(Applicable) provides that Silver Bow Creek (mainstem) from the confluence of Blacktail Deer Creek to Warm Springs Creek is classified "I" for water use.

The "I" classification standards are contained in ARM 16.20.623 (Applicable) of the Montana water quality regulations. This section states:

[T]he goal of the state of Montana is to have these waters fully support the following uses: drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

ARM 16.20.604(1)(b) allows a gradual attainment of WQB-7 requirements in already impacted streams by providing that point source discharges be permitted at the higher concentration of (1) the applicable standards specified in department Circular WQB-7, (2) the site-specific standards, or (3) one-half of the mean instream concentrations[34] immediately upstream of the discharge point. This effectively requires eventual attainment of the Circular WQB-7 levels in the stream, while allowing consideration of the current, impacted stream quality (a graduated reduction of point source discharge concentrations based on the mean instream concentration where the stream is substantially degraded).

For the primary contaminants of concern, the WQB-7 levels are listed below. WQB-7 provides that "whenever both Aquatic Life Standards and Human Health Standards exist for the same analyte,

[34] Mean instream concentration is the monthly mean instream concentration, as defined by the MDEQ Water Quality Bureau.

the more restrictive of these values will be used as the numeric Surface Water Quality Standard."

Surface water standards:

Arsenic: 18 μg/l[35]
Acenaphthene: 20 μg/l[36]
Barium: 1,000 μg/l[37]
Benzo[a]anthracene: 0.044 μg/l[38]
Benzo[b]flouranthene: 0.044 μg/l[39]
Benzo[k]Flouranthene: 0.044 μg/l[40]
Benzo[a]Pyrene: 0.02 μg/l[41]
Cadmium: 1.1 μg/l[42]
Copper: 12 μg/l[43]
Dibenz[a,h]Anthracene: 0.044 μg/l[44]
Iron: 300 μg/l[45]
Lead: 3.2 μg/l[46]
Manganese: 50 μg/l[47]
Zinc: 110 μg/l[48]

I classification standards also include th^ following criteria:

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[35] Human Health Standard.

[36] Human Health Standard.

[37] Human Health Standard.

[38] Human Health Standard.

[39] Human Health Standard.

[40] Human Health Standard.

[41] Human Health Standard.

[42] Chronic Aquatic Life Standard based on 100 mg/l hardness.

[43] Chronic Aquatic Life Standard based on 100 mg/l hardness.

[44] Human Health Standard.

[45] Human Health Standard.

[46] Chronic Aquatic Life Standard based on 100 mg/l hardness.

[47] Human Health Standard.

[48] Chronic Aquatic Life Standard based on 100 mg/l hardness.

1. Dissolved oxygen concentration must not be reduced below 3.0 milligrams per liter.

2. Hydrogen ion concentration (pH) must be maintained within the range of 6.5 to 9.5.

3. No increase in naturally occurring turbidity, temperature, concentrations of sediment and settleable solids, oils, floating solids, or true color is allowed which will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish or other wildlife.

4. No discharges of toxic, carcinogenic, or harmful parameters may commence or continue which lower or are likely to lower the overall water quality of these waters.

Additional restrictions on any discharge to surface waters are included in:

ARM 16.20.633 (Applicable), which prohibits discharges containing substances that will:

(a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;

(b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;

(c) produce odors, colors, or other conditions which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;

(d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant, or aquatic life;

(e) create conditions which produce undesirable aquatic life.

ARM 16.20.925 (Applicable), which adopts and incorporates the provisions of CFR Part 125 for criteria and standards for the imposition of technology-based treatment requirements in MDEQ permits. Although the permit requirement would not apply to on-site discharges, the substantive requirements of Part 125 are applicable, i.e., for toxic and nonconventional pollutants, treatment must apply the best available technology economically achievable (BAT); for conventional pollutants, application of the best conventional pollutant control technology (BCT) is required. Where effluent limitations are not specified for the particular industry or industrial category at issue, BCT/BAT technology-based requirements are determined on a case by case basis using best professional judgment (BPJ). See CERCLA Compliance with Other Laws Manual, Vol. I, August 1988, p. 3-4 and 3-7.

Applicable for both surface water and ground water, § 75-5-605, MCA, provides that it is unlawful to cause pollution as defined in § 75-5-103 of any state waters or to place or cause to be placed any wastes where they will cause pollution of any state waters. Because the Rocker operable unit excavated source material waste will be treated and re-disposed of in a manner such that releases will be minimized and further attenuated by the iron addition to ground water immediately below the re-disposed waste so that releases of contaminants above state WQB-7 standards beyond the immediate attenuation zone (the iron plug immediately below the re-disposed solid waste) will not occur, the selected Rocker operable unit remedial action is expected to be in compliance with this requirement. Remedial Design should demonstrate this.

Section 75-5-308, MCA, allows MDEQ to grant short-term exemptions from the water quality standards or short-term use that exceeds the water quality standards for the purpose of allowing certain construction or emergency environmental remediation activities. Such exemptions typically extend for a period of 30 to 60 days, but may be extended beyond this time frame for this action. However, any exemption must include conditions that minimize to the extent possible the magnitude of the violation and the length of time the violation occurs. In addition, the conditions must maximize he protection of state waters by ensuring the maintenance of beneficial uses immediately after termination of the exemption. Water quality and quantity monitoring and reporting may also be included as conditions. The addition of iron to the ground water as part of the Rocker operable unit remedial action qualifies for this exemption. The exact nature of application will be described in Remedial Design, to further indicate compliance with this standard.

Because ground water at the Rocker operable unit does flow into Silver Bow Creek, the standards identified above regarding contaminant specific water quality parameters are also ambient standards for the Rocker ou, and exceedances of these standards from Rocker ou contamination must be prevented. These standards and the beneficial uses for Silver Bow Creek are considered supported when the concentrations of toxic, carcinogenic, or harmful parameters in these waters do not exceed the applicable standards specified in department Circular WQB-7 identified above when stream flows equal or exceed the stream flows specified in ARM 16.20.631(4) (10 year 7 day low flow, i.e., minimum consecutive 7 day average flow which may be expected to occur on the average of once in 10 years).

As noted in the Record of Decision explicitly, exceedances of the arsenic standard in surface water from Rocker ou contamination may be the basis for contingency measures to intercept and control the groundwater plume.

2. Groundwater Quality Standards

In addition to the standards set forth below, relevant and appropriate MCLs and MCLGs are included in the federal ARARs identified above.

Montana Groundwater Pollution Control System (Applicable)

ARM 16.20.1002 classifies groundwater into Classes I through IV based on the present and future most beneficial uses of the groundwater, and states that ground water is to be classified according to actual quality or actual use, whichever places the ground water in a higher class. Class I is the highest quality class; Class IV the lowest.. Based upon its specific conductance, the groundwater in and around the Rocker operable unit, including the three aquifers described in the ROD, should be considered Class I or Class II groundwater.

ARM 16.20.1003 establishes the groundwater quality standards applicable with respect to each groundwater classification. Concentrations of dissolved substances in Class I or II groundwater may not exceed the human health standards listed in department Circular WQB-7. For the primary contaminants of concern, these levels are listed below. Levels that are more stringent than the MCL or MCLG identified in the federal portion of the ARARs are set out in underlined type.

Groundwater Standards:

Arsenic: 18 µg/l
Acenaphthene: 20 µg/l
Barium: 1,000 µg/l
Benzo[a]anthracene: 0.044 µg/l
Benzo[b]flouranthene: 0.044 µg/l
Benzo[k]Flouranthene: 0.044 µg/l
Benzo[a]Pyrene: 0.02 µg/l
Cadmium: 5 µg/l
Copper: 1,000 µg/l
Dibenz[a,h]Anthracene: 0.044 µg/l
Iron: 300 µg/l
Lead: 15 µg/l
Manganese: 50 µg/l
Zinc: 5000 µg/l

These standards apply throughout the aquifers at and surrounding the Rocker operable unit. These standards will govern the measurement of success of the remedial action, and, when achieved, will indicate the completion of remedial action. The arsenic standard will be used in part to determine whether contingency measures shall be implemented at the Rocker ou, as described in the ROD. Compliance points for measurement of remedial action success and for determining the implementation of contingency measures will be determined during remedial design. Remedial Design documents will also establish which of the above listed contaminants will be actually monitored.

ARM 16.20.1003 also requires that concentrations of dissolved or suspended substances must not exceed levels which render the waters harmful, detrimental or injurious to public health. Maximum allowable concentrations of these substances also must not exceed acute or chronic problem levels which would adversely affect existing beneficial uses or the designated beneficial uses of groundwater of that classification.

The 1995 Montana Legislature enacted several revisions to the Montana Water Quality Statutes. Except as reflected in the analysis above, none of these changes has altered the application of these water quality requirements to the Rocker operable unit. One provision exempted from the permit requirements certain discharges from a water conveyance structure or certain ground water discharged to surface water, but these exemptions do not apply if the discharged water contains "industrial waste." See § 75-5-401, MCA, as amended. "Industrial waste" means a waste substance from the process of business or industry or from the development of any natural resource . . ." § 75-5-103(10), MCA. Since the contamination found in the water in this operable unit is industrial waste, these new exemptions would not apply here.

Because the ground water at the Rocker operable unit has not demonstrated loading or effect on the surface water near the site, additional remediation beyond the above identified ground water standards is not required.

3. Air Standards - Montana Clean Air Act (Applicable)

Limitations on air emissions resulting from cleanup activities or emissions resulting from wind erosion of exposed hazardous substances are set forth in the federal action specific requirements and the action specific requirements, below.

## VII. MONTANA LOCATION SPECIFIC REQUIREMENTS

### 1. Solid Waste Management Regulations[49] (Applicable)

Regulations promulgated under the Solid Waste Management Act, §§ 75-10-201 et seq., MCA, specify requirements that apply to the location of any solid waste management facility.[50]

Under ARM 17.50.505(1) (formerly 16.14.505(1)), a facility for the treatment, storage or disposal of solid wastes:

(a) must be located where a sufficient acreage of suitable land is available for solid waste management;

(b) may not be located in a 100-year floodplain;

(c) may be located only in areas which will prevent the pollution of ground and surface waters and public and private water supply systems;

(d) must be located to allow for reclamation and reuse of the land;

(e) drainage structures must be installed where necessary to prevent surface runoff from entering waste management areas; and

(f) where underlying geological formations contain rock fractures or fissures which may lead to pollution of the ground water or areas in which springs exist that are hydraulically connected to a proposed disposal facility, only Class III disposal facilities may be approved[51].

The unit or units created by the excavation of the source materials, subsequent treatment, and redisposal, are subject to

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[49] Solid wastes are regulated pursuant to Article 17, Chapter 50 while hazardous wastes are regulated pursuant to Article 17, Chapter 54. If material, including contaminated soils, remains characteristic after treatment, it must be managed pursuant to Article 17, Chapter 54.

[50] Under ARM 17.50.503 (formerly 16.14.503), solid wastes are grouped into two categories: Group II and Group III wastes. Group III wastes include wood wastes and non-water solids (including inert solid waste such as brick, dirt, rock and concrete and industrial mineral wastes which are essentially inert and non-water soluble and do not contain hazardous constituents). Group II wastes include decomposable wastes and mixed solid wastes containing decomposable material but excluding regulated hazardous waste. Pursuant to ARM 17.50.503, clean fill is not a waste. Wastes at this operable unit not classified as hazardous wastes are Group II wastes.

[51] Group III wastes consist of primarily inert wastes, including "industrial mineral wastes which are essentially inert and non-water soluble and do not contain hazardous waste constituents." ARM 17.50.503(1)(b) (formerly 16.14.503(1)(b)). The highly contaminated and leachable Rocker operable unit waste would not qualify as Class III waste.

these requirements, as such activity is obviously active management and disposal of solid waste material - see footnote 36 of the Streamside Tailings operable unit Record of Decision ARAR identification. The primary excavation and re-disposal area identified in the Rocker operable unit ROD, which is outside of the current 100 year flood plain, is in compliance with these requirements. If additional re-disposal units are required, such as the Streamside excavation areas suggested in the ROD, remedial design shall demonstrate compliance with these requirements.

The capping and revegetation of contaminated soils above 380 parts per million arsenic without excavation also can comply with these requirements, because most if not all of that activity will occur outside of the current 100 year flood plain. Because the Streamside Tailings operable unit extends through the Rocker operable unit and addresses waste within the 100 year flood plain, and thus such wastes are not addressed here.

2. Floodplain and Floodway Management Act and Regulations[52] (Applicable)

The Streamside Tailings operable unit remedial action is expected to address most if not all of the contamination within the current 100 year floodplain of Silver Bow Creek at and near the Rocker operable unit. However, if during Remedial Design, Rocker operable unit activities are determined to be necessary within the current 100 year flood plain, the following requirements would be applicable to those actions.

The Floodplain and Floodway Management Act and regulations specify types of uses and structures that are allowed or prohibited in the designated 100-year floodway and floodplain. Since the SST Operable Unit lies primarily within the 100-year floodplain of Silver Bow Creek, these standards are applicable to all actions contemplated for this operable unit.

A. <u>Allowed uses</u>

The law recognizes certain uses as allowable in the floodway and a broader range of uses as allowed in the floodplain. Residential use is among the possible allowed uses expressly recognized in both the floodway and floodplain. "Residential uses such as lawns, gardens, parking areas, and play areas," as

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[52] The "floodway" is the channel of a watercourse or drainway and those portions of the floodplain adjoining the channel which are reasonably required to carry and discharge the floodwater of the watercourse or drainway. ARM 36.15.101(13).

The "floodplain" is the area adjoining the watercourse or drainway which would be covered by the floodwater of a base (100-year) flood except for sheetflood areas that receive less than one foot of water per occurrence. The floodplain consists of the floodway and flood fringe.

well as certain agricultural, industrial-commercial, recreational and other uses are permissible within the designated floodway, provided they do not require structures other than portable structures, fill or permanent storage of materials or equipment. § 76-5-401, MCA; ARM 36.15.601 (Applicable). In addition, in the flood fringe (i.e., within the floodplain but outside the floodway), residential, commercial, industrial, and other structures may be permitted subject to certain conditions relating to placement of fill, roads, floodproofing, etc. § 76-5-402, MCA; ARM 36.15.701 (Applicable). Domestic water supply wells may be permitted, even within the floodway, provided the well casing is watertight to a depth of 25 feet and the well meets certain conditions for floodproofing, sealing, and positive drainage away from the well head. ARM 36.15.602(6).

B. <u>Prohibited uses</u>

Uses prohibited anywhere in either the floodway or the floodplain are:

1. solid and hazardous waste disposal; and
2. storage of toxic, flammable, hazardous, or explosive materials.

ARM 36.15.605(2) and 36.15.703 (Applicable[53]); see also ARM 36.15.602(5)(b) (Applicable).

In the floodway, additional prohibitions apply, including prohibition of:

1. a building for living purposes or place of assembly or permanent use by human beings;

2. any structure or excavation that will cause water to be diverted from the established floodway, cause erosion, obstruct the natural flow of water, or reduce the carrying capacity of the floodway; and

3. the construction or permanent storage of an object subject to flotation or movement during flood level periods.

§ 76-5-402, MCA (Applicable).

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[53] One commenter asserted that these regulations are not applicable to the Rocker OU. EPA and MDEQ have evaluated these arguments and have determined that these are applicable requirements. Under the NCP, 40 CFR § 300.400(g)(1), EPA and MDEQ must make an "objective determination of whether the requirement specifically addresses a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found" at the site. EPA and MDEQ have made the determination here that these requirements specifically address the hazardous substances and location involved and are applicable legal requirements. While these prohibitions are applicable requirements, exactly how these prohibitions apply to specific mining wastes being addressed in this operable unit and the manner in which these prohibitions apply to specific actions requires some analysis. The floodplain management regulations include a version of this prohibition in three different provisions. ARM 36.15.605(2) and 36.15.703, applicable to the floodway and the flood fringe, respectively, state this prohibition generally as noted above. ARM 36.15.602(5)(b), applicable to the floodway, allows storage of materials and equipment under certain conditions, but provides "Storage of flammable, toxic, or explosive materials shall not be permitted."

Neither the regulations nor the Floodplain Management Act defines the terms disposal, storage, solid waste, hazardous waste, toxic materials or hazardous materials. In most contexts, the regulations are clear enough, by their plain meaning, to be easily implementable. As applied to the specific circumstances at this operable unit, however, these terms require some interpretation. The initial disposal of these materials does not constitute a violation of the regulations. However, actions taken to actively manage these materials as part of the remedial action effectively trigger applicability of such requirements in certain circumstances.

Summarized here, the agency's analysis has determined that the arsenic pole treatment waste and tailings and mining wastes in the Rocker OU are included in the term solid wastes, as well as the terms toxic materials or hazardous materials, and that the prohibition on the disposal or storage of those wastes/materials within the floodplain applies to actions which constitute the active management/disposal of those wastes as part of the remedial action. The agencies further note that, if there were some jurisdictional prerequisite which were technically not met for applicability, the requirements identified here would be relevant and appropriate requirements as described for this remedial action. In such case, the agencies would apply these requirements as relevant and appropriate considering the factors set forth at 40 CFR § 300.400(g)(2)(i) through (viii).

C. <u>Applicable considerations in use of floodplain or floodway</u>

Applicable regulations also specify factors that must be considered in allowing diversions of the stream, changes in place of diversion of the stream, flood control works, new construction or alteration of artificial obstructions, or any other nonconforming use within the floodplain or floodway. Many of these requirements are set forth as factors that must be considered in determining whether a permit can be issued for certain obstructions or uses. While permit requirements are not directly applicable to remedial actions conducted entirely on site, the substantive criteria used to determine whether a proposed obstruction or use is permissible within the floodway or floodplain are applicable standards. Factors which must be considered in addressing any obstruction or use within the floodway or floodplain include:

1. the danger to life and property from backwater or diverted flow caused by the obstruction or use;

2. the danger that the obstruction or use will be swept downstream to the injury of others;

3. the availability of alternate locations;

4. the construction or alteration of the obstruction or use in such a manner as to lessen the danger;

5. the permanence of the obstruction or use; and

6. the anticipated development in the foreseeable future of the area which may be affected by the obstruction or use.

<u>See</u> § 76-5-406, MCA; ARM 36.15.216 (Applicable, substantive provisions only). Conditions or restrictions that generally apply to specific activities within the floodway or floodplain are:

1. the proposed activity, construction, or use cannot increase the upstream elevation of the 100-year flood a significant amount (½ foot or as otherwise determined by the permit issuing authority) or significantly increase flood velocities, ARM 36.15.604 (Applicable, substantive provisions only); and

2. the proposed activity, construction, or use must be designed and constructed to minimize potential erosion.

For the substantive conditions and restrictions applicable to specific obstructions or uses, see the following applicable regulations:

Excavation of material from pits or pools - ARM 36.15.602(1).

Water diversions or changes in place of diversion - ARM 36.15.603.

Flood control works (levees, floodwalls, and riprap must comply with specified safety standards) - ARM 36.15.606.

Roads, streets, highways and rail lines (must be designed to minimize increases in flood heights) - ARM 36.15.701(3)(c).

Structures and facilities for liquid or solid waste treatment and disposal (must be floodproofed to ensure that no pollutants enter flood waters and may be allowed and approved only in accordance with MDEQ regulations, which include certain additional prohibitions on such disposal) - ARM 36.15.701(3)(d).

Residential structures - ARM 36.15.702(1).

Commercial or industrial structures - ARM 36.15.702(2).

## VIII. MONTANA ACTION SPECIFIC REQUIREMENTS

### 1. Air Quality Standards[54] (Applicable) (Excavation, earth-moving, transportation, treatment system operation)

Dust suppression and control of certain substances likely to be released into the air as a result of earth moving, transportation, and similar actions may be necessary to meet air quality requirements. Certain ambient air standards for specific contaminants and particulates are set forth in the federal action specific section above. Additional air quality regulations under the state Clean Air Act, §§ 75-2-101 et seq., MCA, are discussed below.

ARM 16.8.818. Ambient air quality standard for settled particulate matter. Particulate matter concentrations in the ambient air shall not exceed the following 30-day average: 10 grams per square meter.

[54] Each of the ambient air quality standards includes in its terms specific requirements and methodologies for monitoring and determining levels. Such requirements are also applicable requirements. In addition, ARM 16.8.807 and 16.8.809, Ambient Air Monitoring; Methods and Data, respectively (Applicable), require that all ambient air monitoring, sampling and data collection, recording, analysis and transmittal shall be in compliance with the Montana Quality Assurance Manual except when more stringent requirements are determined by DEQ to be necessary.

Montana has promulgated standards to regulate emissions of certain contaminants into the air. The state emission standards are enforceable under the Montana Clean Air Act, §§ 75-2-101 et seq., MCA.

The following air emission standards are applicable at the site:

ARM 16.8.1401. Airborne Particulate Matter. Emissions of airborne particulate matter from any stationary source shall not exhibit an opacity of 20 percent or greater, averaged over six consecutive minutes. This standard applies to the production, handling, transportation, or storage of any material; to the use of streets, roads, or parking lots; and to construction or demolition projects.

ARM 16.8.1404. Visible Air Contaminants. No source may discharge emissions into the atmosphere that exhibit an opacity of 20 percent or greater, averaged over six consecutive minutes. This standard is limited to point sources, but excludes wood waste burners, incinerators, and motor vehicles.

ARM 16.8.1427. Odors. If a business or other activity will create odors, those odors must be controlled, and no business or activity may cause a public nuisance.

The Butte area, which includes Rocker, has been designated by EPA as non-attainment for total suspended particulates, as well as PM-10. 40 CFR § 81.327. ARM 16.8.1401(4) requires that any new source of airborne particulate matter that has the potential to emit less than 100 tons per year of particulates shall apply best available control technology (BACT); any new source of airborne particulate matter that has the potential to emit more than 100 tons per year of particulates shall apply lowest achievable emission rate (LAER). The BACT and LAER standards are defined in ARM 16.8.1430.

ARM 26.4.761 (Relevant and Appropriate) specifies a range of measures for controlling fugitive dust emissions during mining and reclamation activities. Some of these measures are relevant and appropriate to control fugitive dust emissions in connection with excavation, earth moving, mixing, and transportation activities conducted as part of the remedy at the site.

ARM 16.8.1103 requires sources for which air quality permits are required to use best available control technology (BACT) or to meet the lowest achievable emission rate (LAER), as applicable.

2. Water Quality Statute and Regulations (Applicable):

a. Nondegradation: Section 75-5-303, MCA[55] states that existing uses of state waters and the level of water quality necessary to protect the uses must be maintained and protected.[56]

ARM 16.20.1011 provides that any groundwater whose existing quality is higher than the standard for its classification must be maintained at that high quality unless degradation may be allowed under the principles established in § 75-5-303, MCA, and the nondegradation rules at ARM 16.20.706 et seq.

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[55] As modified by Chapters 495 through 501, Laws of Montana, 1995.

[56] Pursuant to 75-5-317, MCA, the following sources of pollution are considered nonsignificant activities, and not subject to the nondegradation rules promulgated pursuant to 75-5-303:

1) existing activities (as of April 29, 1993) that are non-point sources of pollution;

2) existing activities after April 29, 1993 when reasonable land, soil and water conservation is applied and existing and anticipated uses will be fully protected

3) changes in existing water quality resulting from an emergency or remedial activity that is designed to protect the public health or the environment and is approved, authorized, or required by the department;

4) the use of fluids, sealants, additives, disinfectants, and rehabilitation chemicals in water well or monitoring well drilling, development, or abandonment, if used according to department-approved water quality protection practices;

5) discharges of water from water well or monitoring tests, hydrostatic pressure and leakage tests conducted in accordance with department-approved practices;

6) short-term changes allowed under 75-5-308 (short-term exemptions)

7) nonpoint sources that cause short-term changes in existing water quality resulting from customary activities involving the use of water established by an existing water right or state permit;

8) any other activity that is nonsignificant because of its low potential for harm to human health and the environment in conformance with the new criteria required to be established in 301(5)(c).

Although a number of the exemptions refer to nonpoint sources, it is important to note that EPA's definition of point source is quite expansive. The term point source is defined to include any discernable, confined, and discrete conveyance from which pollutants are or may be discharged. 33 USC §1362(14). EPA has proposed that discernable non-process discharges from mill tailings and other locations at a mine site are subject to point source permit requirements. *see* EPA draft Memorandum entitled, "Legal Bases to Expand the Clean Water Act Definition of Point Source in the Context of Mine Sites," from Dana J. Stotsky, Attorney, Air Water, and General Law Section, Office of Regional Counsel to Mike Reed, Chief, Compliance Section, Region VIII and Melanie Pallman, Environmental Engineer, Compliance Section, Region VIII, dated October 28, 1991. Courts have also upheld EPA's expansive definition. *see e.g.* Washington Wilderness Coalition v. Hecla Mining Co. 870 F. Supp. 983 (E.D. Wash. 1994). Therefore, exemptions for nonpoint sources should not affect the implementation of the nondegradation rules to this remedial action to any large extent.

b. Stormwater Runoff:

a. Pursuant to authority under the Water Quality Act, and ARM 16.20.601 et seq. and 16.20.1301 et seq., Title 16, Chapter 20, Sub-Chapter 6, and Title 16, Chapter 20, Sub-Chapter 13, including ARM 16.20.1314, the Water Quality Division has issued general stormwater permits for certain activities. The substantive requirements of the following permits are applicable for the following activities:

(1) for construction activities: General Discharge Permit for Storm Water Associated with Construction Activity, Permit No. MTR100000 (November 17, 1992).

(2) for mining activities: General Discharge Permit for Storm Water Associated with Mining and with Oil and Gas Activities, Permit No. MTR300000 (May 18, 1993).[57]

(3) for industrial activities: General Discharge Permit for Storm Water Associated with I dustrial Activity, Permit No. MTR000000 (October 26, 1994).[58]

Generally, the permits require the permittee to implement Best Management Practices (BMP) and to take all reasonable steps to minimize or prevent any discharge which has a reasonable likelihood of adversely affecting human health or the environment. However, if there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with the activity, an individual MPDES permit or alternative general permit may be required.

c. Groundwater Act (Applicable) (Construction and maintenance of groundwater wells)

Section 85-2-505, MCA, precludes the wasting of groundwater. Any well producing waters that contaminate other waters must be plugged or capped, and wells must be constructed and maintained so as to prevent waste, contamination, or pollution of ground water.

[57] This permit covers point source discharges of storm water from mining and milling activities (including active, inactive, and abandoned mine and mill sites) including activities with Standard Industrial Code 14 (metal mining).

[58] Industrial activities are defined as all industries defined in 40 CFR 122, 123, and 124, excluding construction, mining, oil & gas extraction activities and stormwater discharges subject to effluent limitations guidelines. This includes wood treatment operations, as well as the production of slag.

d. Substantive MDEQ Permit Requirements (Applicable) (Point source discharges)

40 CFR Part 122, Subpart C and ARM regulations set forth substantive requirements applicable to permitted discharges. Although permits are not required here, substantive requirements including the requirement to properly operate and maintain all facilities and systems of treatment and control are applicable.

3. Solid Waste Management Regulations (Applicable) (Redisposal unit or units)

ARM 17.50.505(2) (formerly 16.14.505(2)) specifies standards for solid waste management facilities, including the requirements that:

i. Class II landfills[59] must confine solid waste and leachate[60] to the disposal facility. If there is the potential for leachate migration, it must be demonstrated that leachate will only migrate to underlying formations which have no hydraulic continuity with any state waters;

ii. adequate separation of group II wastes from underlying or adjacent water must be provided;[61] and

iii. no new disposal units or lateral expansions may be located in wetlands.

Because the excavated source material will be treated to pass RCRA leachability characteristic tests, and because the waste will be placed on clean gravel material which will be situated above iron treated ground water, the Rocker ou remedial action selected in this ROD will likely meet requirements i and ii above. Remedial design should demonstrate compliance with these requirements.

ARM 17.50.505 also specifies general soil and hydrogeological requirements pertaining to the location of any solid waste management facility.

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[59] Generally Class II landfills are licensed to receive Group II and Group III waste, but not regulated hazardous waste. Class III landfills may only receive Group III waste.

[60] Leachate is defined as a liquid which has contacted, passed through, or emerged from solid waste and contains soluble, suspended, or miscible materials removed from the waste. ARM 16.14.502(25).

[61] The extent of separation shall be established on a case-by-case basis, considering terrain and the type of underlying soil formations, and facility design. The Waste Management Division of the Department of Environmental Quality has generally construed this to require a 10-20 foot separation from groundwater.

ARM 17.50.506 (formerly 16.14.506) specifies design requirements for landfills.[62] Landfills must be designed to contain a composite liner and leachate collection system which comply with specified criteria.

ARM 17.50.511 (formerly 16.14.521) sets forth general operational and maintenance and design requirements for solid waste management systems. Specific operational requirements, specified in ARM 17.50.511[63] are run-on and run-off control systems requirements, requirements that sites be fenced to prevent unauthorized access, and prohibitions of point source and nonpoint source discharges which would violate Clean Water Act requirements.

ARM 17.50.530 (formerly 16.14.530) sets forth the closure requirements for landfills.[64] Class II landfills must meet the following criteria:

i. install a final cover that is designed to minimize infiltration and erosion.

ii. design and construct the final cover system to minimize infiltration through the closed unit by the use of an infiltration layer that contains a minimum 18 inches of earthen material and has a permeability less than or equal to the permeability of any bottom liner, barrier layer, or natural subsoils or a permeability no greater than 1 X 10-5 cm/sec, whichever is less;

iii. minimize erosion of the final cover by the use of a seed bed layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth and protecting the infiltration layer from frost effects and rooting damage;

iv. revegetate the final cover with native plant growth within one year of placement of the final cover.[65]

ARM 17.50.531 (formerly 16.14.531) sets forth post closure care requirements for Class II landfills. Post closure care must be conducted for a period sufficient to protect human health and the

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[62] Landfills are defined as an area of land or an excavation where wastes are placed for permanent disposal, and that is not a land application unit, surface impoundment, injection well, or waste pile. ARM 17.50.502(25).

[63] ARM 17.50.511(1)(j), 17.50.511(1)(k), and 17.50.511(1)(l).

[64] Closure means the process by which the operator closes all or part of the facility.

[65] ARM 17.50.530(1)(b) allows the department to approve an alternative final cover design if it achieves the reduction in infiltration and protection from erosion to a level at least as equivalent as the stated criteria.

environment. Post closure care requires maintenance of the integrity of the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the cover and comply with the groundwater monitoring requirements found at ARM Title 16, chapter 14, subchapter 7.

As for the solid waste requirements of ARM sections 17.50.506, .520, and .530 -.531 listed above, Section 75-10-206, MCA, allows variances to be granted from solid waste regulations if failure to comply with the rules does not result in a danger to public health or safety or compliance with specific rules would produce hardship without producing benefits to the health and safety of the public that outweigh the hardship. If remedial design can demonstrate compliance with the performance standards identified in the ROD, including the performance standard relating to a showing that leachate from treated solid waste will not leave the solid waste unit and enter the surrounding aquifer, certain of these requirements, most notably the liner and leachate collection and removal system requirements, will be subject to variance in implementing the Rocker operable unit remedy. The scope and manner of applying the variance can be determined in finalizing and approving of the remedial design.

4. Transportation of Solid Waste (Applicable)

For solid wastes, § 75-10-212 prohibits dumping or leaving any debris or refuse upon or within 200 yards of any highway, road, street, or alley of the State or other public property, or on privately owned property where hunting, fishing, or other recreation is permitted.

ARM 17.50.523 (formerly 16.14.523) requires that such waste must be transported in such a manner as to prevent its discharge, dumping, spilling, or leaking from the transport vehicle.

5. Reclamation Requirements (Relevant and Appropriate) (Soil capping and excavation)

ARM 26.4.631 requires the prevention and minimizing water pollution during reclamation activities.

ARM 26.4.633 states that all surface drainage from a disturbed area must be treated by the best technology currently available (BTCA). Treatment must continue until the area is stabilized.

ARM 26.4.634 states that disturbed drainages will be restored to approximate pre-disturbance configuration.

ARM 26.4.640 provides that discharge from sedimentation ponds, permanent and temporary impoundments, and diversions shall be controlled by listed devices, where necessary, to reduce erosion and minimize disturbance of the hydrologic balance.

ARM 26.4.641 requires practices to prevent drainage from acid or toxic forming spoil material into ground and surface water.

ARM 26.4.501 and 501A give general backfilling and final grading requirements.

ARM 26.4.514 sets out contouring requirements.

ARM 26.4.519 provides that an operator may be required to monitor settling of regraded areas.

ARM 26.4.638 specifies sediment control measures to be implemented during operations.

ARM 26.4.702 specifies requirements for redistributing and stockpiling of soil for reclamation.

ARM 26.4.703 specifies requirements for use of materials other than or in conjunction with soil for final surfacing in reclamation.

ARM 26.4.711 requires that a diverse, effective, and permanent vegetative cover of the same seasonal variety native to the area of land to be affected shall be established except on road surfaces and below the low-water line of permanent impoundments. Vegetative cover is considered of the same seasonal variety if it consists of a mixture of species of equal or superior utility when compared with the natural (or pre-existing) vegetation during each season of the year. (See also ARM 26.4.716 below regarding substitution of introduced species for native species.)

ARM 26.4.713 provides that seeding and planting of disturbed areas must be conducted during the first appropriate period for favorable planting after final seedbed preparation but may not be more than 90 days after soil has been replaced.

ARM 26.4.714 requires use of a mulch or cover crop or both until an adequate permanent cover can be established. Use of mulching and temporary cover may be suspended under certain conditions.

ARM 26.4.716 establishes the required method of revegetation, and provides that introduced species may be substituted for native species as part of an approved plan.

ARM 26.4.718 requires the use of soil amendments and other means such as irrigation, management, fencing, or other measures, if necessary to establish a diverse and permanent vegetative cover.

ARM 26.4.728 sets forth requirements for the composition of vegetation on reclaimed areas.

ARM 26.4.751 requires measures to prevent degradation of fish and wildlife habitat.

ARM 26.4.761 contains measures for controlling fugitive dust emissions during mining and reclamation activities.

## IX. OTHER LAWS

As explained above in Section IV., these laws are independently applicable rather than ARARs for the site.

### 1. Surface Water and Groundwater Act, 85-2-101 *et. seq.* MCA

Section 85-2-101, MCA, declares that all waters within the state are the state's property, and may be appropriated for beneficial uses. The wise use of water resources is encouraged for the maximum benefit to the people and with minimum degradation of natural aquatic ecosystems.

### 2. Groundwater and Surface Water Appropriation

Parts 3 and 4 of Title 85, MCA, set out requirements for obtaining water rights and appropriating and utilizing water. All requirements of these parts are laws which must be complied with in any action using or affecting waters of the state.

ARM Chapter 16, Sub-Chapter 1, entitled Water Reservations, implements the provisions in Parts 3 and 4 of Title 85, MCA.

### 3. Groundwater

Section 85-2-516, MCA, states that within 60 days after any well is completed a well log report must be filed by the driller with the DNRC and the appropriate county clerk and recorder.

### 4. Controlled Ground Water Area:

Pursuant to section 85-2-507 MCA, the State may grant either a permanent or a temporary controlled ground water area. The maximum allowable time for a temporary area is four years.[66]

Pursuant to 85-2-506 MCA, designation of a controlled groundwater area may be proposed if i) excessive groundwater withdrawals

[66] If a temporary controlled ground water area is granted, the statute requires the State agency responsible for the petition to commence studies to determine the designation or modification of a permanent controlled ground water area.

would cause contaminant migration; ii) groundwater withdrawals adversely affecting groundwater quality within the groundwater area are occurring or are likely to occur; iii) groundwater quality within the groundwater area is not suited for a specific beneficial use.

5. Occupational Health Act, §§ 50-70-101 et seq., MCA.

ARM § 16.42.101, along with the similar federal standard in 29 CFR § 1910.95, addresses occupational noise.

ARM § 16.42.102, along with the similar federal standard in 29 CFR § 1910.1000 addresses occupational air contaminants.

6. Montana Safety Act

Sections 50-71-201, 202 and 203, MCA, state that every employer must provide and maintain a safe place of employment, provide and require use of safety devices and safeguards, and ensure that operations and processes are reasonably adequate to render the place of employment safe.

7. Employee and Community Hazardous Chemical Information Act

Sections 50-78-201, 202, and 204, MCA, state that each employer must post notice of employee rights, maintain at the work place a list of chemical names of each chemical in the work place, and indicate the work area where the chemical is stored or used. Employees must be informed of the chemicals at the work place and trained in the proper handling of the chemicals.

8. Montana Asbestos Control Act

The provisions of the Montana Asbestos Control Act, Sections 75-2-501 et seq., MCA, and implementing rules establish standards and procedures for the accreditation of asbestos-related occupations and control of the work performed by persons in asbestos-related fields. If asbestos is encountered at the Rocker ou, these health and safety standards would be independently applicable.

# APPENDIX 2

**Responsiveness Summary**
**For The**
**Rocker Timber Framing and Treating Plant OPERABLE UNIT**

# RESPONSIVENESS SUMMARY ORGANIZATION

During the public comment period for the Rocker operable unit proposed plan, EPA received both oral and written comments from the public, local government, and the potentially responsible party for the Rocker operable unit, the Atlantic Richfield Company (ARCO). The attached Responsiveness Summary reprints the written comments received in total and response to each substantive point raised in each written comment. A transcript of all oral comments submitted during the public hearing on the proposed plan are included in the administrative record for the Rocker operable unit and were considered by EPA and the State of Montana Department of Environmental Quality in reaching a decision for remedial action at the Rocker operable unit. However, the oral comments were duplicative of the written comments and are not responded to separately in this Responsive Summary.

The written comments and EPA's response to those comments are presented showing public comments first, local government comments next, and ARCO comments last.

# RESPONSIVENESS SUMMARY

## Response To Public Comments

## COMMENTS OF
## THE CITIZENS' TECHNICAL ENVIRONMENTAL COMMITTEE

**COMMENT:**
The Citizens' Technical Environmental Committee (CTEC) wishes to add the following comments, and two resolutions passed by CTEC members present at our monthly meeting on August 10th, 1995, to comments being solicited on the Proposed Plan for the Rocker Timber Framing and Treating Plant Operable Unit.

**RESPONSE:**
*No Response Required*

**COMMENT:**
First, CTEC would like to express its appreciation for the hard work that you and the staff at EPA's Montana office have put into this project. The preferred alternatives put forth by the EPA provide a good effort to attempt to remediate the site.

**RESPONSE:**
*Comment Noted - Thank You.*

**COMMENT:**
The technical assistants with CTEC have genuine concern about the hydraulic conne ivity between unimpacted aquifers and the arsenic plume. There is also concern about the overall picture, chemically speaking, when iron additions are introduced into the plume, and the effectiveness of those additions to reach and adsorb the arsenic in the plume. We believe, however, that with close monitoring, that the iron-flooding technology proposed by ARCO should be given a chance, and further advances in studies dealing with arsenic and ground water problems be considered along the way.

**RESPONSE:**
*Comment Noted - EPA disagrees that ARCO's proposal is implementable, but has adopted some aspects of ARCO's proposal.*

**COMMENT:**
It is hoped that the innovative technology will prove successful, but milestones for meeting standards must be defined up front. Resolution #4, passed by members of CTEC, supports the ARCO proposal, in principle, with stipulations. Resolution #2 supports the decision to send removed material to Smelter Hill, if a removal is deemed necessary.

**RESPONSE:**
*Comment Noted - ARCO's proposal is not accepted, as explained in EPA's response to ARCO's proposed plan comments. In response to community concerns and cost-effectiveness issues, EPA has not chosen the Smelter Hill repository.*

**COMMENT:**
In evaluation of the nine criteria, in accordance with the NCP, we believe that the Rocker community's support of the ARCO proposal sends a message to all involved in what the community wants. Therefore we support the effort to try the innovative technology first, and follow through with the EPA's remedy, in whole, if the standards are not met in five years.

**RESPONSE:**
*Comment Noted - EPA has attempted to include community concerns fully in the selected remedy.*

Respectfully submitted,

Shannon Wilson
Senior Technical Assistant, CTEC

Enclosures

# COMMENTS OF CTEC

## COMMENT:

**Proposed Resolutions Before the Membership**
**August 10, 1995**
**Resolution #4**

**ROCKER OPERABLE UNIT - ARCO PROPOSAL**

Whereas, the Rocker Operable Unit is contaminated with arsenic and must be remediated to protect human health and the environment and,

Whereas, community support of a remedy is essential to successful implementation of a remedy;

The Citizens' Technical Environmental Committee issues the following resolution in regard to the ARCO proposal:

1. CTEC supports the use of innovative technologies for remediation of the Rocker Operable Unit, under the following stipulations:

a. Benchmarks for success (i.e., standards within a timeframe) must be clearly stated within the Record of Decision (ROD). This includes clear indication of how long the in-situ treatment will be conducted before a determination is made whether it has been a success or failure. CTEC believes that this should be no longer than five years.

## RESPONSE:

*As can be noted in EPA's response to ARCO comments, EPA has serious concerns regarding the implementability of ARCO's proposed remedy and the time frames projected for the associated investigations. ARCO has not been specific regarding how the iron flood technology will be intimately mixed with aquifer materials. In earlier discussions, they suggested utilizing several trenches cut across the site to introduce the iron to the shallow aquifer and admitted that this technique did not replicate the complete mixing experiments conducted at Montana Tech. EPA feels that if the iron flood cannot be successfully introduced into the aquifer matrix, it is highly probable that its effectiveness will be marginal at best. For this reason, EPA feels that it must reject the ARCO plan as submitted as the primary remedy component at the Rocker Site.*

*EPA considers two elements of the selected remedy to be innovative: 1.) The iron addition to attenuate arsenic in the ground water, and 2.) Iron addition to contaminated soils and fill excavated from the site. The contingent remedy, should it be deemed necessary, focuses on plume containment. The placement of coarse gravel in the iron treated water table, was included with the remedy to allow on-going iron attenuation within and down gradient from this area. The high permeability could also allow pumping of ground water from the down gradient fringe of the arsenic plume into the iron-rich zone where arsenic would be attenuated. The selected remedy can be implemented the first field season following implementation of a consent decree or unilateral order with the potentially responsible party (ARCO).*

## COMMENT:

b. Frequent monitoring (monthly) of the wells utilized for human consumption needs to be done within the immediate vicinity, to ensure arsenic concentrations are within safe drinking water standards, and to provide early warning of plume advancement.

## RESPONSE:

*Quarterly monitoring of key wells is contemplated at this time; however, the details of a monitoring program will be developed during the remedial design phase of the project.*

**COMMENT:**

c. The measure of success should meet, at least, the federal MCL standards of 50 ug/L within the entire area of the arsenic plume.

**RESPONSE:**

*The State standard of 18 ug/l arsenic in the ground water is the objective for the Rocker remedy. Trends in water quality will be developed in order to assess the projected time frames till the State standard is achieved.*

**COMMENT:**

d. The ROD needs to state what will happen if the arsenic plume advances, and how ARCO will handle this.

**RESPONSE:**

*In the ROD, contingent plume containment actions can be implemented, in the event that plume migration occurs.*

**COMMENT:**

e. If the in-situ treatment does not prove successful, ARCO needs to follow through with the EPA's preferred remedy. This would not only include removal of source contamination, but the other measures stated in the EPA preferred remedy.

**RESPONSE:**

*EPA's final remedy utilizes a combination of arsenic source removal, treatment and on-site disposal, combined with hot spot remediation and enhanced and natural attenuation for shallow groundwater remediation.*

**COMMENT:**

2. CTEC believes that the Rocker Water & Sewer District must obtain a legally binding agreement with ARCO before the ROD is issued, addressing that ARCO will follow through with their proposed plan, and other stipulations in the ROD, no matter what happens with Superfund reauthorization.

**RESPONSE:**

*This is not an issue addressed by the laws that direct Superfund clean up activities. This issue is more appropriately addressed to the Rocker Sewer and Water District.*

**COMMENT:**

**Proposed Resolutions Before the Membership**
**August 10, 1995**
**Resolution #2**

**ROCKER OPERABLE UNIT - SMELTER HILL REPOSITORY SITE**

Whereas, the Preferred Alternatives for the remediation of the Rocker Operable Unit, developed by the U.S. EPA calls for the removal of soil contaminated by arsenic and,

Whereas, removal of contaminated soil from the Rocker Operable Unit, if it is necessary, to prevent further contamination of groundwater and,

Whereas, to protect human health and the environment, contaminated soils must be placed in a repository and,

Whereas, contaminated soils must not be placed in an unimpacted area and,

Whereas, the Smelter Hill site is already an impacted area;

The Citizens' Technical Environmental Committee, supports the U.S. EPA's proposed repository site of Smelter Hill.

**RESPONSE:**

*Comments noted - Thank you. EPA has considered ARCO's and citizen group comments to EPA's Proposed Plan and as a result, EPA has chosen to modify the final remedy primarily by elimination of the need to transport the excavated soils from Rocker to the Smelter Hill Repository. Rather, EPA's final remedy will involve removing the contaminated source materials, placing washed gravels into the exposed groundwater after additional iron compounds have been added to help accelerate the attenuation of arsenic in the shallow groundwater system, and then treating the excavated materials with additional iron and cement (if necessary), and then backfilling above the water table on-site for final disposal. The source materials will have fixated arsenic with a dramatically reduced permeability to minimize any leachate production. The disposal area will be outside of the 100-year floodplain. This approach reduces capital costs and utilizes an already impacted site as a disposal area.*

## COMMENTS OF THE CLARK FORK-PEND OREILLE COALITION

### COMMENT:

Thank you for providing the Clark Fork-Pend Oreille Coalition with the opportunity to comment on the Proposed Plan for the Rocker Timber Framing and Pole Plant Site. While we support the general concepts of EPA's plan, we believe it must be modified to effectively protect human health and the environment the at Rocker site.

### RESPONSE:

*Comment Noted*

### COMMENT:

Our comments will detail the changes that we believe must be made to assure that the clean up plan protects the high quality aquifers below, and adjacent to the site. They will focus on four sections of the proposed plan: 1) the Alternate Water Supply; 2) Contaminated Soil Removal; 3) Groundwater Source Area Removal; and 4) the Proposed Contingency Measures.

*No response required*

### COMMENT:

The Coalition supports EPA's commitment to provide an alternate water supply for existing and future users in the Rocker area To meet these demands, the proposed plan calls for upgrading the current six inch water supply line from Butte. However, the plan does not identify the source of that water; nor does it indicate that the Butte Silver Bow County government has agreed to forfeit any of its water so that Rocker's water needs can be met.

We urge EPA to identify the source of this alternate water supply prior to signing the Record of Decision (ROD). Specifically, we recommend that EPA: 1) estimate Rockers' existing water needs, including water for fire suppression, 2) estimate the Unreasonably expected" future needs, and 3) secure the water needed to satisfy these demands.

The Clark Fork basin is over-appropriated. In addition, the Big Hole basin, another potential water source, is also experiencing increased demands. We believe the water supply issue must be resolved now since EPA is relying on relatively unproven technologies to remediate groundwater contamination at the site. If the water supply issue cannot be resolved prior to the ROD, the Coalition requests that EPA select a remedy that utilizes proven technologies - i.e. complete source removal, and pumping and treating of contaminated groundwater.

### RESPONSE:

*During implementation of EPA's final remedy, an interim well ban will be required which in turn will require the addition of an alternative water supply for additional residential and community needs. With ongoing monitoring, it is estimated that the development of local deeper groundwater resources will reduce the problems of long term surface water appropriations.*

### COMMENT:

The Coalition supports EPA's idea of removing contaminated soils from the site and placing them in a RCRA-approved repository. However, we disagree with the criteria used to determine what soils should be removed, and the strategy for revegetating these areas.

The Proposed Plan calls for removing surface soils with concentrations exceeding 1,000 ppm arsenic down to a depth of 18 inches; backfilling these areas with 18 inches of growth media; and revegetating them.

We believe that all contaminated soils exceeding the 1,000 ppm arsenic concentration should be removed, not just the upper 18 inches. These soils continue to contaminate ground and surface waters in the project area and must be removed to protect human health and the environment. In addition, we believe that a minimum of 24 inches of growth media should be used in the removal areas. Re-establishment of vegetation is a critical component of the proposed plan - increasing the depth of growth media will increase the likelihood successful revegetation.

**RESPONSE:**

*As can be noted in the final remedy, EPA has been sensitive to many of the proposed plan comments and has relocated the final repository for excavated, treated source material soils to the Rocker site itself, outside the 100-year floodplain. The addition of cement to solidify the materials to prevent erosion and leachate production has also been included as a contingency for excavated soils and fill (in the event iron treatment does not pass EPA's "characteristic" TCLP test. EPA believes that removal of other hot spots to an 18-inch depth is appropriate because any minor leachate production to the shallow groundwater from such residuals will be attenuated either naturally or through the enhanced attenuation resulting from iron additions to ground water. In addition, the 18-inch revegetated soil cover is adequate in this climate to prevent significant infiltration of rain or snowmelt to minimize any leachate production. The cover soil, with appropriate institutional controls regarding future land use is protective of human health and the environment.*

**COMMENT:**

The Coalition supports source removal as the best way to improve water quality in the shallow aquifer, and to protect water quality in the deeper groundwater system. However, we do not believe EPA has adequately addressed the sources of arsenic in the proposed plan.

- The plan calls for removing all solid materials from the groundwater plume that exceed a concentration of 10,000 ppb arsenic because EPA considers that these materials are the primary source of contamination to the shallow aquifer. The state water quality standard for arsenic is 18 ppb, yet EPA will only remove solid materials in areas that exceed 10,000 ppb - nearly three orders of magnitude higher than the state standard. The Coalition believes a more conservative estimate should be used to delineate "source materials". Specifically, we suggest 1,800 ppb - or two orders of magnitude higher than the standard - be used as the cutoff value.

**RESPONSE:**

*Given the complexities of wood treating materials and secondary mineralization, EPA intends to better define source materials to groundwater during the remedial design phase of the project. The 10,000 ppb isocontour was chosen primarily to provide preliminary source definition for purposes of the feasibility study.*

**COMMENT:**

- The plan also calls for using iron salt additions to stabilize the arsenic plume. EPA must assure that the iron salts are uniformly distributed throughout the entire > 18 ppb arsenic plume. Yet the cleanup plan only calls for adding iron salts to the free-draining pore water, and to groundwater "exposed" during removal. If this unproven technology is to have any chance for success, EPA must modify the proposed plan to assure uniform distribution of the iron salts throughout the entire arsenic plume.

**RESPONSE:**

*Given the physical and chemical conditions in the shallow aquifer, there are no methods to fully guarantee the distribution of iron salts throughout the shallow aquifer. Therefore, EPA has chosen a method to introduce the iron in such a way as to enhance the rate of attenuation in areas where arsenic concentrations are clearly elevated and provide future iron supply for additional attenuation capacity as flow gradients move the iron downgradient. The iron rich, oxidized shallow groundwater must be utilized to attenuate arsenic where enhanced enrichment is not possible.*

**COMMENT:**

- Finally, it is not clear how the EPA will "project whether or not the 18 ppb arsenic standard will be achieved within a reasonable time frame." This prediction is absolutely critical because it will determine all future remedial actions at the site. Therefore, we urge EPA to clearly identify the methodology they will use to make this projection.

**RESPONSE:**

*Response: Again, given the physical and chemical conditions at the site, even with aggressive measures to remediate the shallow groundwater system as is demonstrated in the final remedy, there is no way to make specific time determinations on when the aquifer may federal or state cleanup goals. This issue will be closely monitored.*

**COMMENT:**

The Coalition recommends that EPA retain the pump and treat option as a contingency measure, and that the other measures be removed from further consideration. We are absolutely opposed to the notion that clean water should be pumped into the contaminated aquifer to help dilute the arsenic plume. Clean water supplies are scarce in the upper Clark Fork and dilution of contaminants is not an acceptable use of these critical resources. In addition, we believe the aquifer grouting concept is highly suspect and would be next to impossible to successfully implement. Therefore, we urge EPA to retain the pump and treat contingency and to drop the other measures from consideration.

**RESPONSE:**

*EPA has retained a contingency measure regarding capture and pump back, in the unlikely event that substantial and unacceptable movement of contamination occurs. Source removal is the best response to the situation, and EPA's remedy provides for that.*

**COMMENT:**

Also, we urge EPA to include a reopener clause in the ROD that requires ARCO to implement these contingency measures if the iron salt additions do not stabilize the arsenic plume - <u>regardless of any changes in the federal Superfund law.</u> If ARCO is unwilling to sign such an agreement, we request that EPA select a cleanup plan that emphasizes complete removal of all contaminated soils and pumping and treating all groundwater supplies that exceed applicable state and federal standards.

**RESPONSE:**

*EPA intends to maintain its maximum authority under Superfund law to assure that this site is properly and satisfactorily remediated.*

**COMMENT:**

That concludes our comments on the Rocker Proposed Plan. We hope our comments will be helpful and will be glad to discuss them with you in the future.

**RESPONSE:**

*Comment Noted - Thank you.*

## COMMENTS OF THE CONFEDERATED SALISH AND KOOTENAI TRIBES

### INTRODUCTORY COMMENTS

**COMMENT:**
The Confederated Salish and Kootenai Tribes (Tribes) wish to commend you for your efforts in developing the Proposed Plan for the Rocker Timber Framing and Treating Plant Operable Unit of the Silver Bow Creek/Butte Area Superfund Site. Your efforts in providing technical information to the Tribes is especially appreciated.

***RESPONSE:***
*Comment noted - Thank You.*

**COMMENT:**
The Tribes offer the following comments on the Proposed Plan in accord with the Tribes fiduciary responsibilities as a trustee of natural resources associated with the entire Clark Fork River Basin which, of course, includes the Silver Bow Creek/Butte Area Superfund Site.

The Tribes wish to first underscore the fact that the Tribes retained, in accordance with the 1855 Treaty of Hellgate, rights to hunt, fish, graze, and gather natural resources in the Clark Fork River Basin, including the Silver Bow Creek drainage, which is a portion of the Tribes' aboriginal and ceded territory. The rights of access, egress, use, and enjoyment of natural resources are incidental to the Treaty-retained rights. The fishery of the Clark Fork Basin is of particular concern to the Tribes as is, obviously, the habitat and environment supporting the fishery.

The Tribes have, in addition, and since time immemorial, depended and relied on the resources of the Clark Fork River Basin, including the Silver Bow Creek and Anaconda areas for cultural and spiritual renewal. As a direct consequence of that reliance, the Tribes have identified Traditional Cultural Properties in the area, as that phrase is used in the National Historic Preservation Act.

***RESPONSE:***
*Above comments noted.*

### TECHNICAL COMMENTS

**COMMENT:**
The Proposed Plan outlines a set of actions which would be undertaken for the purpose of remediation of the contamination at the Rocker Timber Framing and Treating Plant Operable Unit (Operable Unit). These actions contain components directed toward the provision of an alternative water supply; groundwater source area removal; groundwater arsenic plume attenuation; and the removal and capping of contaminated soils.

***RESPONSE:***
*No response required.*

**COMMENT:**
The provision of an alternative water supply would serve new users within a one-half mile radius of the Operable Unit, and would serve as a contingency supply for present groundwater users within the one-half mile radius should a release of arsenic occur at the Operable Unit.

**RESPONSE:**
*The final remedy includes a well ban for aquifers within a 1/4-mile radius of the site. An alternative water supply will also be provided.*

**COMMENT:**

The Proposed Plan contemplates the removal of materials (sources) which contribute major amounts of soluble arsenic to the groundwater plume. These materials are described as being generally situated within the 10,000 micrograms of arsenic per liter iso-concentration line of the groundwater plume. This material extends from above to five feet below the phreatic surface. The removed materials would be transported and disposed of in a RCRA Title C facility to be constructed on Smelter Hill. Prior to filling the excavation, iron (II) sulfate would be added to the excavation to increase attenuation of dissolved arsenic. A well ban within the one-half mile area around the Operable Unit would be put in place for the duration of the remedial action, in order not to perturb hydraulic gradients controlling contaminated groundwater plume behavior. Non-engineered controls (Institutional Controls) in the form of land use restrictions may be required to prevent disturbance of the excavated area.

**RESPONSE:**

*The above comments are correct except that in the final remedy, the well ban is 1/4-mile for the aquifers identified during the remedial investigation and the excavated soils will be treated and solidified (as necessary) and disposed of on-site.*

**COMMENT:**

The effect of natural and enhanced arsenic plume attenuation will be assessed over the first one or two, five-year review cycles which are mandated where contaminants are left in place. According to the Proposed Plan, pump and treat actions for the groundwater plume may be needed to "...better achieve project remedial action objectives".

**RESPONSE:**

*Source removal and natural and enhanced attenuation is the means used to remediate the alluvial aquifer.*

**COMMENT:**

The removal and capping of contaminated soils outside of the arsenic source excavation area would entail two components. Contaminated surface soils exceeding 1000 milligrams of arsenic per kilogram of soil (parts per million) would be excavated to a depth of 18 inches. The excavated material would be disposed of in a RCRA Subtitle C facility on Smelter Hill at Anaconda. Surface soils exceeding 320 parts per million arsenic would be capped with 18 inches of clean fill. This cover material would be culturally manipulated and amended such that a suitable substrate for drought-tolerant, native grass species would result. An assemblage of Institutional Controls would be put into place to prevent disturbance of the cap, prohibit residential development, and provide for the repair of the cap should it be disturbed.

**RESPONSE:**

*The above is correct except that an action level of 380 ppm arsenic to be used and that excavated soils will be disposed of on-site utilizing treatment and solidification technologies.*

**COMMENT:**

Given the uncertainties and technical difficulties associated with in situ groundwater treatment and the pumping and treating of the contaminated groundwater plume, the remedial actions offered in the Proposed Plan seem reasonable. These actions, including the provision of an alternative water supply during the remedy; source removal; treatment; and monitoring and periodic assessment of remedial action progress, should provide a phased approach to eventual attainment of remedial action goals for the contaminated groundwater plume.

**RESPONSE:**

*The final remedy differs from the Proposed Plan in that the excavated source soils will be treated and disposed of on-site utilizing iron fixation and solidification technology.*

**COMMENT:**

The Operable Unit is situated within the Streamside Tailings Operable Unit. The same inorganic contaminants occur within each operable unit, although the distribution and concentrations of contaminants may differ within the operable units. The remedy proposed for the Rocker Operable Unit is focused primarily on the contaminants posing risks to human health in soils and groundwater resulting from the operation of the Timber Framing and Treating Plant. The remedy for the Streamside Tailings

Operable Unit is focused on railroad bed contamination and human health and environmental risks posed by tailings/contaminated soils and contaminated surface and groundwater.

**RESPONSE:**
*Comment noted and agreed with.*

**COMMENT:**
The Proposed Plan for the Rocker Operable Unit recognizes the different emphasis in the response for the two operable units. The Proposed Plan also recognizes the need for consistency between the two response actions. The Proposed Plan points out that the investigations for the two operable units were complementary. The Proposed Plan states that the remedies for the two operable units are being coordinated.

**RESPONSE:**
*Comment noted and agreed with.*

**COMMENT:**
While the need for coordination and complementarity between the two operable units is obvious and is clearly common knowledge, the Proposed Plan does not provide a structure or set of procedures which, if in place and complied with, would insure such coordination and complementarity. There is a need for phasing of the remedial actions, as is recognized in the Proposed Plan.

**RESPONSE:**
*Comment noted and agreed with.*

**COMMENT:**
There should be a separate effort undertaken to formulate and design the structure and procedures necessary to effect coordination between the two remedial actions. The outcome should identify a set of activities which will insure complementarity and consistency of response both within and between the two operable units. The remediation goals of each action should be assured by the endeavor.

**RESPONSE:**
*The need for coordination is clear. This will be addressed in the Remedial Design phases of both projects.*

## CONCLUSION

**COMMENT:**
The foregoing comments are submitted on proposed actions which may have significant impact on the Tribes, who are one of several governmental natural resource trustees in the Clark Fork Basin. As noted above, in several pieces of recent correspondence to EPA, and in comments submitted to EPA and to the Montana DEQ on the Streamside Tailings Operable Unit Proposed Plan, the areas which will and may be affected by the Proposed Plan, constitute an important fraction of the Tribes ceded and aboriginal territories subject to the 1855 Treaty of Hellgate and other protections.

**RESPONSE:**
*Comment noted. EPA intends to keep the Tribes fully informed at this site.*

**COMMENT:**
The Tribes offer these comments in a cooperative and collaborative spirit with the goal of achievement of the greatest degree of cleanup. They are offered with the explicit expectation that, as efforts proceed and plans and designs are initiated, the Tribes will be consulted in a meaningful manner in a timely fashion on a government-to-government basis.

**RESPONSE:**
*The comments are appreciated, and EPA will strive to maintain such a relationship with the Tribes.*

**COMMENT:**
Such consultation must include, without limit, the recognition of the presence of the Tribes' Traditional Cultural Properties; specific consultation on fisheries and water-related issues, and general technical consultation. In this regard, the matter of the selection of the Anaconda Area as a present and possible future repository for hazardous wastes without the involvement of the Tribes in the site selection process is a matter of immediate relevance and concern.

**RESPONSE:**
*Comment noted. The Smelter Hill site is no longer the repository for treated contaminants.*

**COMMENT:**
We greatly appreciate the opportunity to comment, and again thank you for your efforts. We look forward to discussing these comments with you.

Sincerely,

| | |
|---|---|
| Marion Yoder | Phil Tourangeau |
| Tribal Attorney | Clark Fork Coordinator |

cc: Mr. Brian Antonioli, MT DEQ
Mr. James Ford, " "

## COMMENTS OF SHANNON WILSON

Oral Comments submitted by Shannon Wilson, Senior Technical Assistant, CTEC, addressing the Proposed Plan for the Rocker Timber Framing and Treating Operable Unit.

**COMMENT:**
I am Shannon Wilson, the Senior Technical Assistant for the Citizens' Technical Environmental Committee (CTEC), and am making comment on the some of the issues that CTEC will be looking at during our monthly meeting tomorrow night. CTEC will be submitting additional written comments this week after consensus from our membership, indicating support for particular plan.

**RESPONSE:**
*Comment Noted*

**COMMENT:**
Alternate water supply: Rocker has a need for the expanded water service, however CTEC's staff is concerned about the additional loss of water from the Big Hole River. The additional water supplied by the Butte water system could be detrimental to the health of the Big Hole River during years of low precipitation. However, any additional stresses need to be avoided when trying to contain the arsenic plume. This is why the plume needs to be dealt with aggressively, to ensure that the community of Rocker will have the water they need eventually to help facilitate growth. So every effort should be made to make the alternate water supply temporary.

**RESPONSE:**
*EPA's final remedy includes well ban for a period while effectiveness of the remedy is being monitored and evaluated. Further, an alternative water supply will be provided to make water available during the interim period and to reduce the threat of plume migration. EPA has conferred with Butte/Silver Bow County government and does not believe this will cause significant or harmful depletion of the Big Hole River. EPA believes that the final remedy selected utilizes the most aggressive plume remedy components.*

**COMMENT:**
Groundwater source area removal; CTEC's staff agrees that in order to control the release of arsenic into the groundwater, the source needs to be dealt with. There is concern about accelerating the release of arsenic into the surrounding groundwater once excavation begins. With monitoring in place, detection of a release should kick in a pump and treat solution to help maintain the gradient towards the source removal area. A well ban within the immediate area is essential for the term of the remedy, however we would like to see this as only a temporary ban, as the levels of contamination to start to decline in the shallow aquifer. After source removal, iron additions to the system should be used, but should not be considered as an only option. After initial adsorption by the iron, studies have shown that As(V) could be slowly released from coprecipitates, as crystallite growth caused desorption of As(V). Also, an increase of pH can cause desorption of the arsenic.[1] However, with most of the source material removed, this problem should be minimized.

**RESPONSE:**
*See previous comment. EPA agrees that source removal and subsequent groundwater treatment are important components of the final remedy and are necessary to achieve clean up of the site. The well ban will be temporary. Potential problems with excavation and arsenic mobility will be addressed through the addition of iron to the groundwater.*

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[1] Fuller, C.D., Davis, J.A., Waychunas, G.A., "Kinetics of arsenate adsorption and coprecipitation," Geochimica et Cosmochimaica Acta, Vol. 57, pp. 2271-2282.

**COMMENT:**

Analysis of pumping test data requires an appreciation of all the facts that can affect the drawdown data. Precipitation that fell during the period of the pump test on the Town Pump well may have masked a delayed response to the pumping. Although drawdown was not observed in the shallow wells, a decrease in water levels in eight of the deeper system wells was noted. Separation of the aquifers by a aquitard still can permit water and contaminants to move between aquifers, depending on the hydrostatic head in the aquifer. The Montana Bureau of Mines and Geology, in their report of the pump test, did not believe the aquifer was stressed enough. With the constant pump rate of 100 gpm being performed for the test, it is feasible with development in Rocker that levels much more than this could be demanded of the aquifer. We believe with further development, migration of arsenic into the high quality waters of the deep aquifer is very likely.

**RESPONSE:**

*EPA believes that the interpretation of the pump test data and other weight of evidence support the connection of the arsenic plume migration pathway to the tertiary aquifer and CTEC's concerns here. EPA appreciates the CTEC candor and support. More detailed responses on this issue are presented in the response to ARCO comments on the proposed plan.*

## COMMENTS OF
## MARY KAY CRAIG

### RE: ROCKER O/U COMMUNITY ACCEPTANCE

**COMMENT:**

Over the past three years, I have attended most every public meeting on the Rocker Arsenic contamination, whether hosted by EPA or by the TAG-funded Citizens' Technical Environmental Committee of which I have been president for the past year. I am familiar with the site and its history. I am aware that a new Town Pump well proved to be amazingly productive; thus, giving the folks at Rocker reason to believe they could provide a far lower cost water for development than new residences and industry could get by hooking into the county water system. As a member of a Butte-Silver Bow County committee on development of a water quality district, I learned that of the three entrances to the city, the Rocker entrance is likely to experience greatest growth.

**RESPONSE:**

*Comment Noted*

**COMMENT:**

I spoke at your oral public comment hearing July 9th, 1995 at Rocker. I was surprised by the last minute agreement between the Rocker Water and Sewer District and ARCO as discussed at that hearing. Since "en I have become familiar with the offer made by ARCO to the Rocker Water and Sewer District and have some additional comments:

I personally favor removing the source of contamination quickly and thoroughly, if possible. I believe the data you have developed clearly shows interaction between the upper shallow aquifer and the deeper, highly productive aquifer from which the community of Rocker should be able to provide water for growth and development. I believe you should require the contamination above the groundwater be removed immediately without hesitation as a first step in your cleanup decision. I believe the excavated contaminated soil should be placed in a repository on Smelter Hill along with other arsenic contaminated material from the Anaconda area.

**RESPONSE:**

*The final remedy continues to require that source materials be excavated, treated and solidified to reduce continued movement of arsenic into the shallow alluvial aquifer. Based upon many comments, EPA now believes that on-site disposal of these materials is more cost effective but maintains equal protectiveness.*

**COMMENT:**

I am aware of the issues involved in removal below the groundwater table by traditional technologies, and the contention that contaminants might spread during removal. I support use of innovative technologies when they are reasonably timed. One innovative technology that has not yet been considered is liquid nitrogen injection to freeze the contamination in place and allow removal in a safe manner. The World Trade Center in New York City was built with many stories underground, below the groundwater table, by use of this method. This technology was suggested by Montana Tech students during the comment period for remedy at the Montana Pole Treatment Site in Butte two years ago. Please check out the viability of use of this method in order to be done with the site quickly.

**RESPONSE:**

*Use of ground-freezing techniques utilizing liquid nitrogen or flooding or piping with chillers and ammonia are extremely expensive. These very specialized techniques are generally utilized on sites to stabilize the surrounding soils where structural components such as foundations for additional buildings or structural caissons are utilized. EPA believes that use of the proper excavation techniques to minimize subsurface disturbance and subsequent additional iron additions will be adequate to deal with short term impacts to groundwater caused by excavation in the shallow alluvial aquifer.*

**COMMENT:**

From everything I have been able to discern about the Preferred Remedy, it could take up to 30 or 50 years to determine if the iron injection innovative technology works. I do not believe this to be a reasonable time frame, particularly when the people of Rocker are hoping to have a clean groundwater source. The ARCO proposal to Rocker Water and Sewer District seems to be better, with a five year proving period at most. Yet, if that technology doesn't work, the proposal is that the Preferred Remedy you have selected would then kick in -- once again, are we looking at 30 to 50 years from then? Please be very specific in your ROD as to what kind of timing is involved. Please consider the concessions made by the people of Rocker in order to get ARCO's five year timing -- they did not pursue other avenues that they could have sans the ARCO proposal.

**RESPONSE:**

*Given the sites' physical features and complicated arsenic geochemistry, EPA recognizes that it is probable that no other technologies exist that can clean the site up any faster without massive negative environmental impacts and grossly excessive costs. EPA guidance requires that balance of cleanup effectiveness and cost in conjunction with being protective of human health and the environment. Further, EPA believes that the final remedy does that and that in a short period of time, use of the deeper tertiary aquifer will be available to the residents of Rocker. ARCO's proposed remedy would not do this, but would take a considerable time period for implementation and evaluation. Given the problems with the implementability and effectiveness of the ARCO proposal, EPA agrees that it is not acceptable.*

**COMMENT:**

At the oral comment hearing, Rick Larsen from Butte-Silver Bow responded to my concerns about draw-down of the Big Hole for use in Rocker's growth by saying that the B-SB government had assured him there would be no impact on the Big Hole with a new 12-inch pipe to Rocker. He said that the B-SB government would use more water from the Moulton Reservoir to offset that coming from the Big Hole. Please obtain this assurance in writing from the Butte-Silver Bow owned water company and refer to it in your ROD.

**RESPONSE:**

*In the time since the close of public comment, EPA did not secure the assurance that you indicate is appropriate. However, there has been additional discussion regarding this issue with Butte/Silver Bow County and EPA will seek these assurances during remedial design, before the alternate water supply is implemented. Please realize that the alternate water supply is also intended to be temporary, in that residents should be given access to tertiary groundwater as soon as the remedy can be demonstrated to be effective.*

**COMMENT:**

Due to its having been a processed arsenic, imported for industrial use, I believe the Arsenic at Rocker to be highly bioavailable as compared to other arsenic in the headwaters, and certainly more dangerous than "background" arsenic, if that is inorganic arsenic. Because of this and the connection between arsenic and skin and other cancers, I believe you must stay with your 338 ppm EPA standard for cleanup, not allow the up to 1,000 ppm ARCO favors.

**RESPONSE:**

*The final remedy recognizes the importance of the 380 ppm action level and believes it to be fully justified at the Rocker OU. See EPA's Baseline Human Health Risk Assessment and EPA's responses to ARCO comments on the Baseline Human Health Risk Assessment.*

**COMMENT:**

"Background arsenic" should not be considered in determining cleanup levels. I question whether any comparison with "background arsenic" is valid. First, as stated above, the arsenic in the O/U is processed--highly bioavailable--while "background arsenic" levels normally refers to that naturally occurring in an area. Secondly, there is some question as to whether the "background" arsenic is, indeed, natural. As Albert Molignoni pointed out at a meeting a couple of weeks ago, Rocker is not a mineralized area, so it would seem odd to have background levels of arsenic there. Also, many people I've spoken with believe it is unnaturally present, having been blown across from the Anaconda Smelter. Prevailing winds blow in that direction and the entire area between Butte and Anaconda has been continually denuded of trees in the memories of anyone living today. It is only since the Anaconda smelter was shut down over a decade ago, that we are now finally seeing lush growth of junipers and the pines that follow them across that same stretch.

**RESPONSE:**

*The consideration of background arsenic did not play a role in the determination of EPA's final remedy. Based on recent data, EPA believes that the cleanup standard for arsenic is above background.*

**COMMENT:**

Any T. I. Waiver request by ARCO is frivolous: I do not believe a Technical Impracticability waiver should ever be employed at this site. Given its small size, the fact that it is adjacent to and may adversely interact with the Streamside Tailings O/U, and the probability that a technology such as injection of liquid nitrogen is safe and cost effective, I believe you need make no contingency reference to the possibility of a T.I. waiver in your ROD.

**RESPONSE:**

*EPA agrees that a TI waiver is inappropriate to consider at this time. However, given the difficulty of groundwater cleanups and the recognition that the Rocker OU remedy's ability to meet the State standard of 18 ug/l is considered moderately uncertain, it is appropriate for EPA to consider contingencies (particularly to maintain the quality of the adjoining uncontaminated aquifers). In the event that the remedy as proposed and the contingency measures are unable to attain the State standard in a reasonable time frame, a TI demonstration may be appropriate. Recognize, that if this is the outcome from this remedy, the primary objective of protecting the tertiary and deep alluvial groundwater on this site should still be accomplished.*

**COMMENT:**

Misleading information from ARCO on safety of aquifer: I remain concerned about the information given by Sandy Stash of ARCO at a recent public meeting at Rocker. She indicated that Rocker residents and/or the water and sewer district could drill into the deep aquifer with no adverse effect. Certainly, the data you have gathered speaks otherwise, showing the distinct likelihood that they could cause induced infiltration of the contaminants into these new wells they might drill. Please assure that this data from ARCO has not been relied on by the Rocker Water and Sewer District to where they may find themselves with a more severely contaminated area than at present.

**RESPONSE:**

*EPA's final remedy is protective of the deeper alluvial aquifer. EPA also disagrees with ARCO's view of the hydrology in the area. A water well ban is included for new wells within one quarter mile of the arsenic plume. Wells into the tertiary aquifer would not be allowed until the remedy is demonstrated to be effective.*

**COMMENT:**

I concur with other issues discussed in the CTEC comments -- specifically regarding the need for ARCO to not be allowed to back out of the cleanup if Superfund law changes and with regard to the need for very specific criteria for measuring the success or failure of the iron injection innovative technology if you decide to allow it to be employed.

**RESPONSE:**

*See comment provided to CTEC.*

**COMMENT:**

Thanks, Mike, for your serious commitment to a good cleanup of the Rocker O/U. You have patiently explained the information on this complex site and have gone out of your way to attend our meetings and respond to our questions. We appreciate it.

**RESPONSE:**

*Comment Noted - Thank You.*

## COMMENTS OF JOY ITTYCHERIAH

### COMMENT:

The background level of arsenic in natural waters should be defined clearly before remediation starts to determine if the method of remediation is effective in reducing pollution or potential pollution.

### RESPONSE:

*The site is technically very complex. The selection of the remedy was based upon the selection of the best, cost effective technologies, given site conditions and other geochemical factors, not on the determination of "background "groundwater concentrations. It is important to note that the last round of water quality samples from all three aquifers identified on the site that are considered outside of the contaminated zone had arsenic concentrations less than 8 ug/l. Monitoring will continue after remediation to monitor the success of the remedy and it further actions are ultimately deemed necessary, additional actions could be undertaken.*

### COMMENT:

ARCO should implement a remediation method that not only meets but exceeds EPA and Montana regulations to prevent further remediation to the same site. This should be done quickly using curre ly available technologies to prevent groundwater pollution from occurring.

### RESPONSE:

*EPA believes its choice of a final remedy is very aggressive and quickly implementable and offers the best choice for site remediation, given our understanding of the system.*

### COMMENT:

Unless monitoring wells are placed adjacent to currently existing wells and continuous monitoring (24-hour) of groundwater for Arsenic is performed, residents using well water may ingest Arsenic-contaminated water before, during or after remediation (if the remediation is ineffective). Therefore, all affected residents using well water should be provided with an alternative source of water immediately and the increase in cost to use this new water source should be subsidized by ARCO.

### RESPONSE:

*EPA will require routine water quality monitoring to assure that Rocker residents are clearly protected. An alternative water supply is being provided in the final remedy.*

### COMMENT:

If ARCO's alternative of iron treatment to stabilize the Arsenic in the plume is chosen, then ARCO must provide proof after completing remediation that the iron stabilization was effective and will prevent Arsenic from entering the aquifer except in naturally-occurring concentrations. However, to determine remediation effectiveness, exact details of the treatment plan and expected outcomes should be provided to the EPA and the representatives of the Rocker community prior to start of remediation and before final approval of the remediation method to be used at this site. Mobilization of any other naturally-occurring elements into the aquifer should also be monitored during the addition of iron both in the testing and the "real" application phases to prevent any unexpected contamination of groundwater. Finally, even though iron hydroxide may be naturally-occurring at this site, its concentration is determined by nature and the environmental effects of the addition of large concentrations of this or any other iron salt should also be evaluated prior to final approval of the remediation method.

### RESPONSE:

*ARCO's plan will not be implemented since it is not considered either implementable nor effective or protective (see EPA's comments to the ARCO plan). With regard to your concerns relative to iron oxihydroxides and its affect regarding attenuation of arsenic, this issue will be closely monitored as well.*

## COMMENT:

If ARCO's method to add Iron salts is ineffective, then a) a manmade channel should be built to move the water around the current location of the Arsenic plume - OR - b) a temporary dam should be built and water pumped around the area of the Arsenic plume. This will allow the ground to dry up (if kept covered to prevent additional moisture, i.e., snow and rain, from entering this zone) and then the area can be excavated and treated similarly to other hot spots as defined in the EPA proposal. However, it is presumed that either of these two water-channeling methods are probably cost-prohibitive when compared to treatment with iron salts (if shown to be effective) and should be implemented in case of an environmental emergency or if other methods are ineffective.

## RESPONSE:

*Thank you for your suggestions. EPA believes that its final remedy is the most suitable is remediating the site given the technical complexities that must be considered.*

# COMMENTS OF
# JOHN SONDEREGGER

## Re: Rocker Site Proposed Plan

## COMMENTS:

As you may recall, the reason that I was quite late for the public meeting at the Butte Community Center was because our Hydrogeology Field Camp had started. That ran through August 1st. After that I had a previous commitment to my mother, daughter, and grandson (latter two live in New York) to visit Wisconsin and meet up with them. Upon returning to Montana, I was scheduled to be in the field with a grad student at the Mike Horse Mine. What is included is an overview of the written comments that will be mailed no later than Monday, August 14th. This will be very quick and probably incomplete.

1. I have only agreed with removal of "hot spots" ABOVE the water table. Apparently you have misunderstood me.

2. The in-situ treatment of dissolved arsenic with an iron solution should be given a fair chance.

3. You and the EPA consultants have repeatedly ignored the ability of naturally occurring ferric hydroxide coatings on the minerals in the alluvial units to attenuate arsenic. The document on feldspar attenuation of arsenic, which I gave to you last spring, has likewise been ignored.

4. The proposed response actions are duplicative and unnecessarily expensive. If you are going to have an alternate water supply, why not put EVERYONE on it? ARCO offered to investigate the use of Silver Lake water at one meeting. What is proposed does not discuss that. Did ARCO withdraw from that position of providing the alternate water supply? Secondly, if you do disturb the alluvial material below the water table, the odds of needing a pump back system in operation are, in my opinion, considerably greater than with the in-situ treatment approach. Finally, why removal and an alternate water supply? Covering would provide the surface exposure protection.

My usual fax source (the Montana Tech library) is closed for the weekend. I will try sending this using the two different fax programs on my computer system at home. Please accept my apology if you receive two copies of this.

## RESPONSE:

*No detailed response are provided here since the narrative above provides an overview of more detailed comments by Dr. Sonderegger to follow. Responses will be provided to the detailed comments.*

## COMMENTS OF
## JOHN SONDEREGGER

### COMMENT:

As a geologist, my first comment is that you have the choice of either an "all" or a "sort of fixed" approach. These materials are located within a floodplain. Eventually a 100, 1,000, or 10,000 year flood event will move all of this material downstream, dispersing it over a much broader area and effectively reducing the concentrations. Unfortunately, this is just one part of the bigger problem associated with past mining activities in the Butte-Anaconda area. If the materials are removed, will the new storage location be stable under the precipitation conditions that generate a 100, 1,000 or 10,000 year flooding event? Ideally, one would hydraulically "mine" all of the mining associated wastes from the headwaters of Yankee Doodle down to Warn Springs and put these materials up on the Tertiary bench in a series of well-designed impoundments. This might give you the best possible "all" case. Almost anything less constitutes a series of "fixes" that may or may not be compatible. The presence of continuing mining activity in the Butte vicinity pretty much precludes the possibility of the extreme "all" approach. Philosophically, the standards and approaches used on Superfund sites throughout the Butte-Anaconda area should be consistent. Please note that you have left the railroad related arsenic sources (which are hydraulically up gradient) in place to be dealt with under the streamside tailings action (page 11, 2nd paragraph of conclusions section). The use of multiple operable units may make management of the clean-up activities easier, but it does lead to possibility of upstream/upgradient activities re-contaminating cleaned-up areas as well as opening the door to inconsistent performance standards.

### RESPONSE:

*Comment Noted: Since it is a broad and of philosophical nature, no response is necessary.*

### COMMENT:

Having gotten the "nothing stays in place forever" diatribe off of ny chest, I'd like to comment upon technical problems with the proposed plan. The statement at the bottom of page 2:

> "The remedial investigation for Rocker concluded that arsenic could be quite mobile owing to the lack of iron to attenuate arsenic in these ground water resources."

continues to ignore the geologic setting. the travel time calculations of the RI report, the available data presented in the report. and the results of various scientific investigations. Because the proposed plan is based heavily upon the perceived risk of arsenic-contaminated groundwater and the effect upon human health, it is essential that these facts be addressed in calculating risk to the populace.

### RESPONSE:

*The proposed plan addressed the lack of iron for attenuation in the tertiary aquifer system to be available to attenuate arsenic as it moved from the well RH-6 toward the tertiary system. As you recall, there was a clear hydraulic response at RH-6 when the Town Pump well pump test was conducted.*

### COMMENT:

Starting with the calculated flow rates from the RI (p. 3-30) for the shallow alluvial aquifer, the report suggests that a geometric mean hydraulic conductivity of 6.5 feet per day and an average velocity of 0.2 feet per day (73 feet per year) are reasonable. We've had 40 to 50 years at a minimum for the arsenic plume to migrate: this would yield a plume length of 2,920 to 3,650 feet it there were no attenuation or dispersion. Yet the plume migration is only 400 to 500 feet, using the 18 ppb dissolved concentration limit (bottom of p. 7 of the proposed plan document). Neglecting dispersion, this requires a retardation factor of roughly 7.3 ( plume migration is about 10 feet per year to have reached 400 to 500 feet in 40 to 50 years). Something has been taking up (attenuating) arsenic as the water moved through the alluvial aquifer for the past 40 to 90 years. If it isn't iron, it may be feldspar, although I suspect that this problem results from your consultants not discriminating adequately between dissolved and particulate iron (especially ferric hydroxide coatings) in the alluvial aquifer.

### RESPONSE:

*EPA clearly recognizes in the RI and FS documents the past and present attenuation of arsenic V on iron* *oxyhydroxides in the oxidizing environment of the current shallow alluvial aquifer on the Rocker site.*

**COMMENT:**

Ferric hydroxide is quite insoluble as long as conditions are not reducing. The weathering of the mineralized Butte Quartz Monzonite has been occurring for far longer than mining operations in Butte. I feel fairly safe in assuming that a significant amount of the alluvial materials in the Silver Bow Creek drainage will show some minor ferric hydroxide coatings resulting from the weathering of pyrite and other iron-bearing minerals in the drainage upstream. I believe that these coatings are the reason that the plume has migrated far less rapidly than the groundwater itself.

**RESPONSE:**

*EPA agrees with the comment.*

**COMMENT:**

The absence of a plume thousands of feet long containing ppm levels of arsenic shows that natural attenuation is working at this site. The fact that the groundwater meets the new state standard (18 ppb) within 500 feet of the major source input indicates that the natural attenuation mechanisms are working quite nicely. I have included some references on ferric hydroxide and feldspar attenuation of dissolved arsenic at the end of this comment.

**RESPONSE:**

*EPA agrees with the comment.*

**COMMENT:**

On page 8, the 4th item under Remedial Action Objectives for Groundwater is impossible without immediately implementing a pump-back program. Plume migration occurs because the sediment has a limited uptake capacity for the contaminant. Nearer the source, the sediments are in approximate equilibrium with a higher concentration of the contaminant. Removal of the source (even complete removal) does not prevent continued plume migration because the sediment that has attenuated the contaminant is trying to re-equilibrate with "clean" water. While desorption of the contaminant nay be much slower than the adsorption process, it does occur at a finite rate, requiring some downgradient nitration of the plume as released contaminant is re-adsorbed by previously unimpacted sediment.

**RESPONSE:**

*On page 8 of the EPA Proposed Plan, no mention is found of the Remedial Action Objectives. It is found on page 5 however. Assuming the comment is related to the "prevent any degradation of the groundwater underlying and/or adjacent to the site" the following response is provided. EPA's intent was to preclude the exacerbation or movement of the contaminated shallow ground water from its generally defined location at the site. The remedy utilizes source removal and addition of iron to the exposed groundwater to enhance the rate of attenuation in the shallow groundwater system.*

**COMMENT:**

It would make sense to try the addition of dissolved ferric iron to try to catch' the majority of the dissolved arsenic migrating in a downgradient direction as an alternative to a pump-back system (see the conclusions of the National Research Council on the effectiveness of pump-and-treat systems: what is proposed instead is testing the feasibility of an in situ treatment).

**RESPONSE:**

*EPA agrees that the addition of iron to the groundwater will be beneficial.*

**COMMENT:**

I am concerned about excavating below the water table. Documentation of the effects of this type of removal have not been widespread in the scientific literature. I suspect that this is because the fines (which commonly carry the highest concentration of contaminants) tend to be lost and migrate down gradient. Even scientists don't like to advertise their failures, and I suspect that these types of action have generated more failures than successes. A way to approach a compromise would be to require that removal under alternative 3 be done at the time of year when the water table is at its lowest phase in the annual cycle.

**RESPONSE:**
*EPA believes that contaminated sediments can be successfully excavated 5-feet or more into the water table. Techniques are available that minimize the "breaking up" of the material which adds to the dewatering problems and drainage problems that must be considered. EPA acknowledges that the exposed groundwater will likely increase in arsenic contamination due to the removal but the impacts can be more than offset by the addition of the extra iron to better attenuate what is present and to act as an additional source of iron downgradient as the flow advances.*

**COMMENT:**
In summary, the conclusions about arsenic mobility in this environment used to reach the Proposed Plan Preferred Final Remedy are invalid. I believe that the recommended action constitutes a costly "overkill" for this problem. Alternatives 2 or 3 are the only reasonable alternatives, in my opinion.

**RESPONSE:**
*Comment noted. EPA does not agree and explains its rationale for remedy selection in the ROD itself. Specific comments relating to arsenic mobility are addressed in EPA's response to ARCO's RI Disclaimer and in EPA's response to ARCO's comments on the proposed plan.*

John L. Sonderegger, Ph.D.
Certified Ground Water Professional No. 261
Montana Monitoring Well Constructor No. 16

Selected References

Fuller, C. C., Davis, J. A., and Waychunas, G. A., 1993, Surface chemistry of ferrihydrite: Part 2. Kinetics of arsenate adsorption and coprecipitation: Geochimica et Cosmochimica Acta, v. 57, p. 2271-2282.

National Research Council, 1994, Alternatives for Ground Water Cleanup: Nat. Academy Press, Washington D.C., 314 p.

Prasad, Gur, 1994, Removal of Arsenic(V) from Aqueous Systems by Adsorption onto Some Geological Materials: in Arsenic in the Environment Part I: Cycling and Characterization, J. O. Nriagu, ed, Wiley-Interscience, NY, NY, p. 133-154.

Vircikova, E., Molnar, L., and Lech, P., 1994, The kinetics of he solubility of amorphous Fe(III)-As(V) precipitates: in Separation Processes: Heavy Metals, Ions and Minerals, The Minerals, Metals & Materials Society, p. 247-255.

Waychunas, G. A., Rea, B. A., Fuller, C. C., and Davis, J. A., 1993, Surface Chemistry of ferrihydrite: Part I. EXAFS studies of the geometry of coprecipitated and adsorbed arsenate: Geochimica et Cosmochimica Acta, v. 57, p. 2251-2269.

**RESPONSE:**
*References and credentials noted.*

# RESPONSIVENESS SUMMARY

**Local Government Comments**

# COMMENTS OF
# ROCKER SEWER AND WATER DISTRICT

## COMMENTS:

The Rocker Water & Sewer District met in special session in an attempt to get some public input before voicing the Board's position regarding groundwater contamination in our District and Arco's proposed cleanup.
EPA submitted their proposed plan on July 27, 1995 and it appears it involves extensive removal. Arco disagrees with EPA's plan involving removal of the contaminated material. Albert feels that every attempt possible should be made to protect the aquifer for our community.

Lou Eveland asked if a ban was placed on water wells would it include both shallow and deep wells. Sandy Stash informed her that it would include those wells in the very, very, shallow aquifer, close to the site. She also informed the group that she does not see any reason why people in this area should preclude drilling wells or using current wells unless the well was drilled right in the contaminated area. She feels we should do another huge pump test. Sandy Stash asked Mike Bishop (EPA representative) if EPA would be willing to do another extensive pump test. Mr. Bishop doesn't feel a pump test is necessary.

Albert asked if it would be feasible to have a community water supply and abandon the Big Hole line and, if so, would we be protected in the future for an alternate water supply. Ms. Stash said Arco would not be responsible for our community's future water supply but felt the community well would be a good, long-term, source of water. She suggested a very deep well because they are confident the current water contamination wouldn't occur in a deep well.

Larry Braunbeck informed the group that he has done some research on Arco's proposal and learned that the in situ technique (injecting iron into arsenic) Arco is proposing is new and is basically unproven. Lou Eveland asked Mike Bishop if the EPA would continue testing well water if we went with Arco's proposal. Mike informed her they EPA would. Frank Weitzel asked Sandy Stash how long the site would have to be monitored before Arco would know if the in situ technique worked. Ms. Stash said it would take from 3 to 5 years. If it didn't work after this time frame, Arco would go to removal.

Ray Palmer asked Mike Bishop if he drills a well now and in the future it is banned, does he have to incur the expense of running the water line into his house? Mr. Bishop said that he wouldn't be responsible; EPA would. Albert suggested the District take the stand that if the cleanup systems fail Arco will guarantee the funds to furnish our District with a water supply. Ms. Stash said Arco won't dig up the waste *and* guarantee funds for a future water supply because funds would be spent on digging. If they didn't do the digging then they would talk with the District regarding a guarantee.

Jack King stated that he feels the people in this area should be protected by the Big Hole water line immediately in the event Arco's plan fails we would have a water source. Gary Swanson suggested visiting with Butte Silver Bow regarding the enlargement of the line and if it is, in fact, possible. Mr. Swanson will confer with the Water Company.

Jim Manning made a motion to represent the Rocker Water and Sewer District's stand regarding the cleanup:

1. A new 12" (twelve inch) water supply line from the Big Hole River water line and a 30,000 (thirty thousand) gallon storage tank must be installed immediately by Arco to provide Rocker Water and Sewer District with a sufficient water supply.

2. The District agrees to allow Arco to attempt to cleanup the current water on the site with their innovative technology if it can meet Federal drinking water standards. The time frame to remedy the situation will be 3-5 (three to five) years. If this technology fails Arco will then institute the EPA and the State of Montana preferred alternative.

3. Every attempt possible will be made to maintain clear water and protect the present and future water supplies in our District.

4. The County Water and Sewer District of Rocker will be allowed to put in a water supply well 1/4 (one fourth) of a mile from the site and testing of the water quality for its purity will be Arco's responsibility until the site is cleaned up.

5. If all cleanup attempts fail there will be a contingency payable to the District from Arco which will supplement the District water users for the higher cost of water used from the Big Hole River water line.

6. If new water supply wells in the District become contaminated from the site, Arco agrees to reopen the whole cleanup project.

Kenny Zeller seconded the motion. The motion carried by a unanimous vote of the Board. Sandy Stash informed the group that any agreements with Arco would be done through a contract.

Kenny Zeller made a motion to allow David Myers to hook onto the water and sewer line. Glen Eveland seconded the motion. Motion carried.

Glen Eveland made a motion to adjourn the meeting. Kenny seconded the motion. Meeting adjourned at 9:50 p.m.

Sincerely,

Shirley Dunks

Secretary

**RESPONSE:**

*EPA appreciates the efforts of the Rocker Sewer and Water District. The process that this group went through to become apprised of the issues and invite public input has been commendable. EPA has made every effort to take into consideration the views of the community. Please review EPA's responses to other commentors and compare the points made above with the final remedy. It is EPA's understanding that the community leaders support the revised final remedy found in this record of decision after it was presented to them personally after the close of the public comment period.*

## COMMENTS OF
## MATT VINCENT & RICK LARSON

### COMMENT:
After reviewing the EPA's Proposed Plan, ARCO's Proposed Plan, and numerous public comments, the personnel at the Health Department have the following comments. If you have any questions or comments regarding these comments, please feel free to contact either Rick Larson or myself.

### RESPONSE:
*Comment noted - Thank You.*

### COMMENT:
The EPA's Proposed Plan for the Rocker Timber Framing and Treating Plant (Rocker OU) has many subjects which need to be addressed before a Record of Decision can be accepted. The areas of conflict that arise are mostly closely related to impracticable treatment and removal; and inconsistencies with the ARCO plan. The ARCO plan appears to have a lot more technically meritable support than does the EPA's plan. The areas of conflict are, point by point:

- Background (As) compared to MDEQ Drinking Standards (As): Rocker site data consistently shows that the natural background concentration for arsenic is ~30 ug/l. The MDEQ drinking water standard for arsenic is 18 ug/L. To comply with the MDEQ limit, arsenic concentrations at the site would have to be reduced to around half of the naturally occurring background concentration. This would mean that regardless of the removal, the 18 ug/L limit could not be met. An ARAR waiver is the solution to this inevitable problem.

### RESPONSE:
*The issue of background did not play an important part in EPA reaching a final remedy; however, it should be noted that the most recent sampling of all three aquifers identified on the Rocker OU in areas thought to be not impacted by the Rocker Plant had arsenic concentrations below 8 ug/l. This issue will receive additional attention during the remedial design and remedial action stages of the project. However, EPA will not advocate that clean up occur to levels below pre-disturbance background levels. EPA does not believe an ARAR waiver is justified at this time, but will consider this issue after remedial implementation.*

### COMMENT:
- Possible Soil Disposal in Smelter Hill Repository: Hauling up to 50,000 cubic yards of arsenic contaminated soil by rail from Rocker to Smelter Hill is a bad idea. Cheryl Beatty, Anaconda - Deer Lodge Chief Executive has stated that the residents of Anaconda-Deer Lodge do not want the Rocker waste transported to their county.

### RESPONSE:
*EPA has modified the Proposed Plan to dispose of treated excavated source soils on-site.*

### COMMENT:
- As migration within the aquifer: One of the driving factors for the EPA's proposed removal and treatment of the Rocker arsenic plume is its migration into uncontaminated aquifers used for drinking water. Since the time the Rocker Plant's operation initiated in 1909 until the present, the arsenic contamination has not migrated deeper than twenty feet into the shallow aquifer. This lack of migration is most definitely due to a tight, nonporous aquifer (nearly confined, for the most part) and natural attenuation processes. The fact that no contamination has migrated into the deeper, potable aquifer over the last eighty-five years makes it hard to believe that a potential migration risk would be more

pronounced in the future. This potential risk can be more efficiently addressed through regular monitoring and institutional controls, rather than costly removal with uncertain risks.

**RESPONSE:**

*The data suggests that contamination has clearly migrated to depths up to 40 feet and towards the tertiary aquifer near well RH-6. The tertiary aquifer has not as yet been heavily stressed, but with further development in the area increased movement could and probably would occur. Removal of the source area is necessary and justified.*

**COMMENT:**

- Impracticality of Pump-and-Treat remedy: Significant data performed by ARCO shows that the hydrogeology and geochemistry of the site aquifer incapacitates arsenic's ability to migrate. The effectiveness of the EPA's pump-and-treat contingency plan depends on the release of arsenic from the aquifer, therefore making it an impracticable technology for removing arsenic from the site.

**RESPONSE:**

*EPA is well aware of the limitations of pump-and-treat technology as it relates to this site. Long term water quality monitoring will be required to monitor the effectiveness of the final remedy. Should low probability, unanticipated plume movement occur,* the ROD identifies a contingency of containment technologies, such as capture and pump back, which are practical and implementable.

**COMMENT:**

- In-Situ Remedies for the Rocker OU: The EPA's Proposed Plan does not consider the use of an in-situ remediation at the site. An in-situ remedy would be far less costly and dangerous (short-term) than the full scale removal/pump-and-treat technology proposed by the EPA. ARCO's in-situ remedy would enhance the natural attenuation of arsenic. An experiment performed at Montana Tech's Geochemistry Department has proven the effectiveness of an in-situ iron stabilization technology for arsenic on samples from the Rocker OU. Stabilizing the arsenic in place would allow for the arsenic to attenuate to natural background levels thus reducing the long-term risks at the site.

**RESPONSE:**

*EPA has deep concerns that the ARCO proposed remedy is not implementable. If it can't be effectively implemented, it will also not be protective or effective. Please see EPA's comments to the ARCO plan.*

**COMMENT:**

- EPA/ARCO conflict of Fe content at the Rocker OU: The EPA state's in the Proposed Plan the "no iron is available (on site) to attenuate the arsenic". Whereas ARCO's Proposed Plan states "the alluvial aquifer has an abundant supply of iron which is the primary source for arsenic attenuation." Dr. Bill Chatham of the Mt Tech Chemistry Department maintains that his research indicated that there is sufficient iron present to fully adsorb the arsenic contamination. It is his position that the iron flood technology proposed by ARCO will ensure that there is sufficient iron present to immobilize the arsenic.

**RESPONSE:**

*The intent was to state that once in the tertiary aquifer, there is no iron to attenuate the arsenic. Also see EPA's comments to Dr. John Sonderegger, on this same subject.*

**COMMENT:**

- Alternate Water Supply: The primary potential human health concern for the Rocker OU is based on the potential consumption of contaminated water. Presently, no individuals are exposed to contaminated groundwater at the site. If the potential for consumption of arsenated water is the driving factor in determining the EPA Proposed Plan, it would be much easier and less costly to provide an upgrade to the current water supply line from the Butte water system to meet all current and potential expanded water needs for Rocker residents. While the Butte Water Division has the capacity to supply water to Rocker it is vital that the Butte-Silver Bow Water Utility Division be allowed to review and control banning all new wells within the contamination zone, would be the most protective solution for human health risk problems associated at the Rocker site. Any existing well users within the zone of contamination would be adequately protected from consumption of contaminants by proper monitoring of the groundwater upgradient from their wells. In the event of a detected contaminant plume, these users would then be connected to the upgraded Butte water line. A water storage tank would also be provided within the Rocker community to meet their fire suppression needs.

**RESPONSE:**

*EPA is concerned that development of additional wells without some level of control may place additional hydraulic influences on the plume and cause additional migration. Additional water supplies should be provided to the new residential and community needs for the community to alleviate this pressure, especially in light of the well ban.*

**COMMENT:**

- Institutional Controls: A Groundwater Control Area will be necessary at the Rocker OU site to prevent use of shallow, contaminated groundwater. Long-term sampling and analysis at the site could be performed by Butte Silver Bow Water Quality District personnel.

**RESPONSE:**

*Response: Comment Noted. EPA and ARCO will consider the use of Butte Silver Bow Water Quality personnel for sampling/monitoring.*

**COMMENT:**

The EPA Proposed Plan does not provide a sufficient amount of conclusive data to be considered feasible; especially when considering the $7.34 million price tag. EPA openly admits the uncertainty which is associated with the effectiveness of their plan: "None of the (EPA) alternatives reduce the intrinsic toxicity of arsenic through treatment. Even alternatives 4 and 7 (part of the Proposed Plan), which address treatment of arsenic in the plume, do not reduce the toxicity of the arsenic." This leads one to believe that, when considering the increased short-term risks associated with the EPA Proposed Plan and the uncertainty involved with its ability to achieve long-term risk reduction, it is just not a practical remedy.

**RESPONSE:**

*The site is very complex and there is no "easy" solution. ARCO's proposed plan is clearly deficient in that it is not implementable, hence it will not be effective. EPA has considered comments and have made changes to the Proposed Plan to the final remedy that are implementable and reliable, and more cost effective, without sacrificing protectiveness to human health and the environment.*

**COMMENT:**

The ARCO plan of an in-situ remedy coupled with monitoring, revegetation, preventive institutional controls, and a contingent water supply for Rocker residents seems to be the most cost-effective and reliable alternative. Also, the short-term risk associated with ARCO's idea is nil when compared to the EPA's Proposed Plan. The EPA states that removal construction may increase the mobility of the arsenic rather than decrease it—one more reason not to endorse the EPA plan.

**RESPONSE:**

*EPA disagrees. ARCO's plan is not implementable or cost effective, and is not reliable. Short-term risks associated with the selected remedy can be managed effectively. Arsenic mobility during excavation will be addressed through the addition of iron to groundwater and careful monitoring. EPA's selected remedy appropriately balances the nine selection criteria and the statutory and NCP mandates--ARCO's does not. The community of Rocker supports EPA's selected remedy and, from follow conversations, we conclude Butte/Silver Bow County does as well. See EPA's response to ARCO's comments for more detail.*

# RESPONSIVENESS SUMMARY

## ARCO Commments

## ARCO COMMENTS REGARDING
## EPA's Baseline Human Health Risk Assessment

**COMMENT:**
"SOIL WITHOUT COVER" SCENARIO

In the risk assessment, the primary approach used to evaluate risks associated with site soils is the calculation of exposures and risks for three sets of exposure point concentrations: soil concentrations in samples from the soil cover placed over much of the site during a removal action completed in 1989 (referred to as "on soil cover" in the risk assessment), soil concentrations in samples from site areas that were not covered during the removal action (referred to as "outside soil cover"), and soil concentrations in original site soils that are currently beneath the soil cover (referred to as "without soil cover" to reflect the hypothetical risk assessment scenario that these soils might be exposed at the site surface at some point in the future). (Risks associated with the concentrations observed at individual sampling locations are presented in appendices to the risk assessment.) While this approach may provide an indication of the potential risk levels associated with the specified categories of soil, these exposure point concentrations are unlikely to be representative of actual patterns and levels of exposure. Instead, potential receptors are likely to be exposed to some combination of these categories of soil, and resulting exposure levels and risks will similarly reflect a combination of the levels calculated in the risk assessment.

In particular, potential receptors are unlikely to be exposed only to the soils outside or beneath the cover, but instead will likely be exposed to these soils in conjunction with exposures to the soil in the cover. As a result, the risk estimates derived in the risk assessment for areas outside the soil cover or exposures that might occur without the soil cover overstate risks that are likely associated with either current or future exposures. For example, an individual who currently has occupational or recreational exposures at the site would be unlikely to have exposures only to covered areas or only to uncovered areas of the site. Instead, exposures are likely to occur across the site and the exposure point concentration reflecting such activity patterns would be an area weighted average of the concentrations reported in soils that are currently at the site surface.

Because a much greater proportion of the sampled site area is currently covered, concentrations that better reflect likely activity patterns would be closer to the "on soil cover" exposure point concentrations presented in the risk assessment than to the "outside soil cover" concentrations. Risk estimates would also be correspondingly lower.

Similar concerns exist regarding exposures that might occur in the future. In the risk assessment, the "without soil cover" risk calculations are presented as a means of evaluating risks and exposures that might occur if the soil cover were disturbed in the future by factors such as erosion or excavation (e.g., as a result of construction activities). As presented in the risk assessment, the exposure point concentrations reflect a scenario in which the entire soil cover is removed from the site, directly exposing all soils currently beneath the cover. In actuality, if erosion or excavation occurred, only some portion of the soils currently beneath the cover would likely be exposed. In addition, soils with higher concentrations that are currently beneath the cover would likely be mixed with the lower concentration soils present within the cover. This mixing would reduce the soil concentrations found beneath the cover. Because exposures are likely to involve only a portion of the soils beneath the cover and because mixing of soils would occur, the exposures and risks associated with hypothetical future exposures to soils currently beneath the cover are likely to be significantly less than those presented for the "without soil cover" case in the risk assessment.

At a minimum, the risk assessment should provide more explicit explanations and/or instructions to the risk managers in order for the "without soil cover" risk assessment to be used appropriately in the decision making process. For example, there is a strong likelihood of the soil cover remaining intact and that appropriate institutional controls and long-term maintenance requirements written into the Record of Decision would make a complete, or even partial, breach of the soil cover very unlikely. Without this type of qualification some risk managers and most of the public would be left with the idea the "soil without cover" scenario is likely to occur.

**RESPONSE:**

*In establishing data groupings for the risk assessment, EPA recognized that combining data from samples collected outside the soil cover with those collected on the soil cover would inappropriately bias the exposure point concentration for the combined group. As stated on page 4-5 of the risk assessment, this bias was due to the disproportionate number of samples (with respect to area) collected from each area. EPA recognizes the uncertainty associated with segregating exposure from these two areas due to potentially integrated exposures that could occur, but felt that it was more important to avoid the unnecessary bias. However, even if the areas were area-weighted with respect to exposure concentration, this would not change the conclusions of the risk assessment. Even if it were assumed that the soil cover constituted 75 percent of the potential site area (exposure unit), the aggregate risk would still substantially exceed EPA's point of departure of 1x10-4 excess cancer risk. EPA also recognizes the uncertainty associated with assuming that current soils beneath the cover could be exposure point concentrations on the surface in the future, and this is stated explicitly in the uncertainties section of the Baseline Human Health Risk Assessment. The risk analysis of this data group represents a bounding estimate that accounts for a situation where the soil cover is scraped off the surface during construction activities at certain areas, exposing concentrations equivalent to those measured beneath the cap. In addition, the soil cover was installed without any regulatory approval or oversight, the depth of the soil cover is uncertain and likely feathers out along the edges. Current or future exposures to "under cover" concentrations in these areas are not unreasonable.*

**COMMENT:**

ARSENIC CONCENTRATIONS IN INDOOR DUST

Humans are exposed to contaminants in soil not only while outside, but also by coming into contact with indoor dust that has been contaminated by soil brought into the building. Very often metal concentrations in indoor dust are found to increase more slowly than soil concentrations. Thus when soil metal concentrations are high total exposures may be overestimated if dust concentrations of metals are not accurately measured or predicted. In the baseline risk assessment for the Old Works/East Anaconda Development Area (OW/EADA) operable unit in Anaconda (ICAIR 1993), EPA relied on data from a study performed in current residential areas of Anaconda (Bornschein 1993) to model the relationship between arsenic concentrations in soil and arsenic concentrations in indoor dust. The resulting equation was used to predict indoor dust arsenic concentrations, and 50 percent of the daily intake of soil and dust by workers was assumed to be from indoor dust. The equation is:

$$C_{dust} = 0.15 \times C_{soil} + 40 \text{ ppm.}$$

This relationship should also be applied in assessing exposure of site workers or future residents to soil arsenic at the Rocker site.

**RESPONSE:**

*The relationship between indoor dust and soil concentrations of arsenic established for the Anaconda site has not been established to be applicable to the Rocker site. The relationship is site-specific, depending on arsenic source, mineralogy, meteorology, concentration versus particle size distribution, etc. ARCO provided no site specific information on this topic, which is unlike the Old Works/East Anaconda Development OU process. In lieu of this site-specific information for Rocker, no distinction is made in the risk assessment between soil and dust arsenic concentrations.*

**COMMENT:**

REDUCED BIOAVAILABILITY OF ARSENIC IN SOIL

The risk assessment discusses uncertainties that exist regarding the bioavailability of arsenic at the site; however, no quantitative adjustments were made to reflect the reduced bioavailability of arsenic in soil. Assumptions regarding bioavailability of metals in soil and dust can significantly influence risk estimates. The U.S. Environmental Protection Agency's (EPA) toxicity values for arsenic ingestion are based on exposure to arsenic dissolved in water. Because absorption of metals in soil and dust is generally less than that of metals in water or food, risk assessment calculations should account for these differences by applying a bioavailability adjustment factor to either the toxicity factor or to the intake estimate. Arsenic absorption from Anaconda soil samples has been examined in two animal models: rabbits and monkeys (Freeman et al. 1993, 1994).

In the rabbit study, the average absolute bioavailability of the arsenic in the test soil was found to be 28 percent, which, when compared with the absolute bioavailability of the dissolved soluble arsenic delivered using oral gavage (i.e., 59 percent), yields an average relative bioavailability adjustment factor of approximately 0.50 (i.e., 0.48). The monkey study included indoor dust as well as soil. In the monkeys, the average absolute bioavailability of the soluble arsenic delivered by oral gavage was 66.8 percent, that of the arsenic in soil was 13.4 percent, and that of the arsenic in dust was 19.2 percent. These data yielded average relative bioavailability adjustment factors of 0.20 for arsenic in soil and 0.28 for arsenic in dust. Monkeys are more similar physiologically to humans than are rabbits; therefore, the data obtained from the monkey study provide the most appropriate estimates of the bioavailability adjustment factor to use when evaluating risks associated with exposure to arsenic in soil and dust.

The arsenic in soil from Anaconda is derived primarily from smelter emissions, and therefore, is expected to differ in mineralogic form from the arsenic present in the soil at Rocker. Recent studies by PTI Environmental Services suggest, however, that even soluble arsenic salts mixed with soil are associated with reduced bioavailability after a period of weathering. PTI has developed an in vitro bioaccessibility test that may be used to compare the dissolution rates of arsenic from various soil samples in the gastrointestinal tract. PTI has found that arsenic in soil from several arsenical pesticide formulation facilities exhibits dissolution rates as slow or slower than those of arsenic from Anaconda soil. These data suggest that arsenic which has been in the soils at Rocker for 40 years or more is likely to be less than 50 percent as bioavailable as arsenic dissolved in water. For that reason a bioavailability adjustment of 0.5 should be made when assessing risks of exposure to arsenic in Rocker area soil.

**RESPONSE:**
*The bioavailability of arsenic is recognized in the risk assessment on page 7-2 as a source of uncertainty. The bioavailability of arsenic from soil was assumed to be equal to that in the toxicological studies from which the toxicity values for arsenic were derived, and this is the basis for EPA's use of the bioavailability factor. This was due to the lack of site-specific information quantifying the reduced availability of arsenic following soil ingestion. The information cited in the comments is site-specific information related to the very different type of mining waste found at that site. As stated on page 5-8 of the risk assessment, since the bioavailability of arsenic from soil at the site requires understanding of the chemical form, particle size, matrix type, etc., and since these data are lacking, the risk assessment made no adjustment for bioavailability. This is consistent with EPA's position in The Clark Fork Position Paper on the Bioavailability of Arsenic (1994), which states:*

> *"It is also recommended that an assumption of 100% bioavailability be applied at sites where arsenic contamination is associated with the application of pesticides/herbicides, wood treatment processes and/or fossil fuel combustion."*

*Even if a bioavailability correction factor of 50% were applied to the soil and groundwater risks for the Rocker site, the total risk estimates would still substantially exceed EPA's point of departure of 1x10-4 excess cancer risk.*

**COMMENT:**
**UNCERTAINTIES IN ARSENIC TOXICITY**

The risk assessment does not include a discussion of the uncertainties that surround EPA's standard toxicity factors for ingested arsenic. Numerous lines of evidence suggest that toxicity factors currently used in risk assessments by EPA to evaluate the toxicity of ingested arsenic overestimate toxic effects, particularly at the relatively low levels associated with exposures in the U.S. The carcinogenic slope factor (CSF) and reference dose (RFD) for ingested arsenic were derived by EPA from an ecological epidemiological study of the incidence of skin cancer and blackfoot disease in a Taiwanese population with elevated levels of arsenic in their drinking water (Tseng et al. 1968; Tseng 1977). EPA's Science Advisory Board, in commenting on EPA's draft Drinking Water Criteria Document on Inorganic Arsenic (Loehr and Ray 1993; U.S. EPA 1993), urged that the agency conduct an in-house quantitative risk assessment for cancers other than skin cancer that accounts for potential nonlinearities in the dose-response curve and the high background arsenic concentrations in the Taiwanese populations compared to U.S. populations. New epidemiological analyses of the Taiwanese populations and new data on the dietary sources of arsenic in these populations provide further evidence that the present CSF is likely to overestimate risks for U.S. populations.

Recently, Guo and coworkers conducted a large-scale ecological epidemiological study (including, but not limited to, areas studied by Tseng et al. [1968] and Tseng [1977]) evaluating the relationship between arsenic exposure and cancer in 11.4 million people living in 243 townships in Taiwan (Guo et al. a,b, in press; Guo 1994, pers. comm.). Guo et al. (a,b, in press; Guo 1994, pers. comm.) evaluated 10 exposure categories of arsenic in drinking water ('0' mg/L [undetectable], trace, 0.01 mg/L, 0.02 mg/L, 0.03-0.04 mg/L, 0.5-0.08 mg/L, 0.09-0.16 mg/L, 0.170.32 mg/L, 0.33-0.64 mg/L, and above 0.64 mg/L). Evaluation of the dose-response relationships for bladder cancer, kidney-transitional cell carcinoma, renal cell carcinoma, and skin cancer incidence per 100,000 people vs. arsenic concentrations in well water used by those populations demonstrated statistically significant increases only in the highest exposure level for bladder and skin cancer (Guo 1994, pers. comm.). Three additional studies also suggest a threshold for carcinogenic effects of ingested arsenic (Brown and Chen, in press; Chiou et al. 1993; Hsueh et al. 1993). Taken as a whole, these studies indicate that the dose-response relationship for carcinogenic effects of arsenic may reflect either a threshold or a nonlinear relationship, with exposures less than 10~225 ug/day being either noncarcinogenic or of relatively lower potency than high levels.

The strongest mechanistic evidence of nonlinearities in the dose-response curve for arsenic comes from metabolism studies that indicate that methylation of arsenic to less toxic, more rapidly excreted species provides the primary means of arsenic detoxification (Vahter 1983; U.S. EPA 1988; Thompson 1993). This metabolic pathway is located primarily in the liver. Metabolism involves sequential addition of methyl groups to yield monomethyl arsenic acid (MMA) and dimethyl arsenic acid (DMA) through enzymes known as methyl transferases. Each successive addition of a methyl group reduces toxicity by approximately an order of magnitude, as reflected in decreased acute toxicity and genotoxicity. Because the metabolism of arsenic depends upon enzymatic processes, the relationship between arsenic exposure and internal dose will be inherently nonlinear, with enzyme saturation at high arsenic levels resulting in diminished ability to detoxify (i.e., methylate) arsenic. When the capacity of this detoxification mechanism is overwhelmed, the potential for interactions of inorganic arsenic with target tissues, such as the skin, lungs, and liver, increases with increasing levels of circulating unmethylated arsenic. This means that higher exposure levels of arsenic will be relatively more efficient at inducing adverse effects than lower levels. Toxicological and epidemiological studies provide evidence of impaired arsenic detoxification at relatively high (0.4-0.6 mg/L) levels of arsenic. It should be noted that the levels at which methylation appears to be impaired are comparable to those observed by Guo to be associated with increased risk of bladder and skin cancer (Guo et al. a,b, in press; Guo 1994, pers. comm.).

Although the level of arsenic exposure in the populations studied by Tseng et. al (1968) and Tseng (1977) is poorly characterized, available evidence suggests that arsenic exposures have been underestimated. Accurately accounting for the higher arsenic exposures in evaluating the dose-response curve for arsenic would result in a reduction in the CSF and an increase in the RfD for arsenic, reflecting the reduced potency of arsenic. Two sources of data suggest that arsenic exposures have been underestimated.

First, EPA's calculations for the recently verified RFD for arsenic were based on higher consumption rates for water and higher body weights in these populations than were assumed in deriving the CSF, suggesting that arsenic intake from water may have been underestimated in the CSF calculations. When the CSF for arsenic was recalculated using the exposure assumptions used by EPA in deriving the RFD, the CSF was reduced from 1.75 (mg/kg-day)$^{-1}$ to 1.13 (mg/kg/day) ' (Valberg and Beck 1994, pers. comm.). Because it is based on more accurate estimates of arsenic intake in the exposed population, this revised CSF should be used in estimating risks from arsenic exposure.

Second, new data on arsenic concentrations in food products from Taiwanese areas studied by Tseng et. al (1968) and Tseng (1977) suggest that EPA underestimated the intake of arsenic from food in calculating the toxicity values for arsenic. To more accurately estimate arsenic concentrations in Taiwanese food, five samples of yams and three samples of rice (two samples of polished rice and one of rice grains) collected from the areas of Taiwan with historically high arsenic exposures, along with collocated soil samples, were analyzed for both Total and inorganic arsenic concentrations. The average inorganic arsenic concentration in the yams was 0.15 mg/kg, while the concentration in the two polished rice samples was 0.118 mg/kg. No organic arsenic was detected in yams, and organic arsenic concentrations in rice comprised less than 16 percent of the total arsenic concentrations. When the inorganic arsenic concentrations in rice and yams were used to calculate an alternate RFD, a 2.5-fold increase in the current RFD (from 3x10-4 to 8x10-4 mg/kg-day) was obtained. Incorporating the observed inorganic arsenic concentrations in Taiwanese yams and rice along with the new RFD assumptions yielded a CSF estimate of 0.77 (mg/kg-day)1, which is 2.3-fold lower than the current CSF. A paper presenting these data has recently been submitted for publication to the journal Environmental Health Perspectives. These data have also been submitted to EPA's Integrated Risk Information System for consideration in EPA's evaluations of revisions to the arsenic toxicity factors.

The new epidemiological evidence for nonlinearities in the dose-response curve, combined with new evaluations of dietary arsenic exposures in the Taiwanese population that formed the basis for the current toxicity values provides strong evidence that the current CSF overestimates cancer risks associated with arsenic ingestion by more than an order of magnitude. This evidence that arsenic toxicity is substantially overestimated by EPA should be considered when evaluating risks and deriving cleanup levels for arsenic in soil. Because arsenic is the primary contributor to both the cancer and noncancer risk estimates calculated for the site (accounting for more than 99 percent of the risk in some cases), using conservative assumptions to estimate arsenic intake (i.e., the risk assessment assumes that all arsenic present at the site is fully bioavailable) and toxicity is likely to yield overly conservative estimates of the overall risks posed by the site.

**RESPONSE:**

*The uncertainties associated with the human toxicology of arsenic and the application of the derived slope factor for arsenic are described in EPA's Integrated Risk Information System database (IRIS). This information is available to risk managers. These uncertainties include the possibility of nonlinear dose-response, the potential for detoxification at low dosages, the relevance of skin cancer rather than internal cancers, competing mortality from black-food disease, and lack of reliable information on alternate sources of arsenic exposure.*

*The Draft Drinking Water Criteria Document on Inorganic Arsenic (EPA 1993) states that subsequent analysis of the Taiwanese data for the potential risk of non-skin cancers from arsenic ingestion indicates that the risks for internal cancers may be as high as 10-fold higher than for skin tumors. If this is in fact the case, then the risk estimates in the Rocker risk assessment may be underestimated.*

*It is well recognized that arsenic is methylated in vivo at lower exposure concentrations, with saturation of this detoxification mechanism occurring at higher concentrations. The possible result is a nonlinear dose-response. However, according to (EPA 1993), it is unknown whether the dose-response data used to develop the cancer slope factor for arsenic was below or above the saturation point. If the doses in the Tseng et al. (1968) study were above the saturation point, then the slope factor would be overestimated at lower dose exposures. Conversely, If the exposure levels in the Tseng et al. (1968) study were below saturation, then the slope factor would be too low at high dose exposures. Considering this, the EPA Risk Assessment Forum concluded that:*

> *"While consideration of these data on the genotoxicity, metabolism, and pathology of arsenic has provided information on the possible mechanism by which arsenic may produce carcinogenic effects, a more complete understanding of these biological data in relation to carcinogenesis is needed before they can be factored with confidence into the risk assessment process"*

*An adjustment of the arsenic slope factor from 1.75 to 1.13 mg/kg-day, as ARCO suggests, would alter the conclusions of the risk assessment. However, the ROD did recalculate the cancer risk based on EPA's June 1, 1995 revised slope factor reported in EPA's Integrated Risk Information System (IRIS) data base. The revised slope factor of 1.5 mg/kg-day corresponds to 382 ug/g arsenic in soil at the 1 x $10^{-4}$ excess cancer risk level compared to 327 ug/g calculated in the EPA, Rocker Human Health Evaluation (February, 1995).*

**COMMENT:**
GROUNDWATER EXPOSURE ASSESSMENT

In the risk assessment, groundwater concentrations were calculated for shallow groundwater wells (defined as samples collected at a depth of less than 20 ft) and a combination of intermediate and deep groundwater wells (defined as samples collected a depth of greater than 20 ft). This simplistic characterization inaccurately reflects the distinction between two separate (shallow and deep) groundwater aquifers existing at the site. This characterization is also not consistent with data collected from the RI. As a result, the concentrations presented in the risk assessment for "deeper groundwater" (which is used as a drinking water supply in the region) suggest a level of contamination that is higher than is actually present in any groundwater sources that might be used for a drinking water supply.

A more accurate characterization of the groundwater at the site, which is consistent with hydraulic and chemical information from the RI's field investigation, show two separate aquifers-a shallow alluvial and deeper tertiary aquifer. The shallow aquifer is contaminated with arsenic only in a limited area around the Rocker site and is not being used as a drinking water source. Even without the arsenic contamination, the hydraulic conductivities and salt concentrations of this shallow aquifer make it extremely unlikely it will ever be used for drinking water. The deeper tertiary aquifer is currently a drinking water source, yet no drinking water wells completed in this zone have ever shown any arsenic contamination. Only one tertiary well, which is completed in the upper portion of this zone, shows any significant arsenic, and this well probably indicates an isolated condition. Geological, hydraulic, and chemical data collected provide multiple lines of evidence there is minimal connection between the two aquifers, if any. This means the real drinking water source near Rocker, which is used in the risk assessment, should be limited to the tertiary aquifer, and only data from the RI for that aquifer should be used to establish exposure point concentrations. At a minimum, the risk assessment should recognize: 1) the unlikely possibility of consumption of water directly from the shallow aquifer, 2) currently, all drinking water wells show no arsenic contamination, and 3) conditions allowing the shallow contamination to migrate into the deeper aquifer is highly unlikely.

**RESPONSE:**
*The RI recognizes that there are 3 aquifer units of importance- the shallow alluvial aquifer which is severely contaminated, the deeper alluvial aquifer which is considerably less impacted and the deeper Tertiary aquifer system that is the principal source of groundwater in the area. Risk assessment guidance and the NCP require that the most conservative assumption, (residential groundwater use) be evaluated for groundwater classified as potentially usable, which the shallow aquifer is according to State of Montana classification standards. For that reason, the mean chemistry shallow aquifer , limited to a depth of about 20-feet, was utilized for one set of calculations. The next scenario utilized the data from the intermediate and deeper wells, having much lower contaminate concentrations for the second set of risk calculations.*

*The risk assessment does recognize the lower likelihood of future consumption of shallow groundwater. However, since a hydraulic connection has been identified between the contaminated shallow alluvial system and the Tertiary aquifer near well RH-6, the shallow groundwater risk estimates represent a higher end estimate* *of potential future migration and exposure to human receptors. In addition, the State classifies the shallow aquifer as potentially usable, and the Baseline Human Health Evaluation follows this determination, in accordance with the NCP.*

**COMMENT:**

EXPOSURE POINT CONCENTRATIONS FOR SOILS

Exposure point concentrations established for soils in the risk assessment are likely not representative of the actual site conditions for several reasons. First, as reflected in Figure 4-2 of the risk assessment, soil concentration data are not available for certain portions of the site (particularly the eastern portion). If sampling was focused on the areas where contamination was suspected and, thus, concentrations are likely to be lower in the unsampled areas, then site-wide, area-weighted average concentrations (for areas outside the cover) would be lower than those presented in the risk assessment.

Secondly, Figure 4-2 also suggests that the samples from outside the cover include a disproportionate number of samples from areas located near the railroad lines. Samples and locations near the railroad have been shown to have higher concentrations than other soils located outside the cover area, therefore, the risk assessment exposure point concentrations for soils outside the cover may be inappropriately biased too high due to samples near the railroad.

Lastly, the soil exposure point concentrations used in the risk assessment do not represent the fact that a significant portion of the arsenic in the surface soil at Rocker is likely from mine tailings, not from arsenic treating operations. This is significant because the bioavailability of arsenic from mine tailings has been studied for the region and is shown to be much less than 100%, which is the general assumption used in soils assessment. Appendices to the risk assessment present the results of risk calculations performed for soil concentrations observed at individual sampling points at the site. These results indicate risks greater than EPA's target levels at most locations sampled at the site (excluding the concentrations observed in the soil cover). When making risk management decisions for the site, EPA should recognize some of the information presented in Appendix B regarding the likely influence both to mine tailings and wood-treating activities on some of the higher soil concentrations observed at the site. Otherwise, there may be some decisions regarding mine tailings at Rocker which are inconsistent with decisions made at other sites, such as Old Works and Streamside Tailings.

**RESPONSE:**

*As previously stated under "SOIL WITHOUT COVER SCENARIO", data groupings were made to avoid biasing the risk estimates resulting in overestimation. Accounting for sampling density and area-weighting the risk estimates would not likely have altered the conclusions of the risk assessment.*

*The RI designed and conducted by ARCO could not distinguish between various sources of arsenic such as sulfide mineral versus spilled wood treating fluids or arsenic trioxide. No site-specific information exists identifying arsenic form at specific locations* *on-site. As such, the assumption arsenic was 100% bioavailable, in accordance with previously cited guidance.*

*In their sampling plan, ARCO defined the frequency of samples taken. A number of samples taken near the railroad right-of-way was presumably to be of interest for the occupational scenario which ARCO believed to be an appropriate scenario for human health risk evaluation. The assessment of the risks from the former wood treating plant were recognized by EPA to be complicated by the potential influence of 1) operations of the railroad right-of-way that runs within the southern portion of the Rocker OU, 2) past mining operations in the area, and 3) a removal action formerly conducted at the site. The railroad right-of-way may contribute to the human health risk associated with this site since the ballast materials were composed of mineralized mine waste rock and arsenic containing concentrates that were reportedly spilled along the right-of-way. Although the primary focus of the risk assessment was on the wood treatment residues, any human health risk associated with contaminants within the railroad right-of-way are included in the overall site risk estimates.*

## RISK ASSESSMENT ISSUES

## Identified in ARCO's RI Disclaimer

**COMMENT:**

Presented here is an overview of ARCO's numerous concerns on EPA's Risk Assessment. As opposed to all other risk assessments performed to date in the Clark Fork Basin, EPA chose not to significantly dialogue with ARCO on the Rocker BRA. It is apparent there was little dialogue between the author's and other EPA risk assessment contractors, based on the number of inconsistencies with other recent EPA risk assessments related to arsenic. Provided here is a list of some of those inconsistencies and other concerns, which will be detailed in ARCO's comments for the BRA.

**RESPONSE:**

*Responses to the summary comments below can be found in detail in EPA's response to ARCO's <u>Comments on the Baseline Human Health Evaluation for the Rocker Timber Framing and Treating Plant,</u> Operable Unit. EPA's Rocker OU Baseline Human Health Evaluation was coordinated with other Clark Fork Basin OU risk assessments, and appropriate distinctions were made. Most notably, site specific adjustments at other OUs based on site specific data were not followed here, because of the different kind of wood treating waste present at the Rocker OU and the lack of site specific data.*

**COMMENT:**

- Available site concentration data was not utilized appropriately to represent realistic exposures.

**RESPONSE:**

*See comment addressed as response to "Spoil Without Cover" Scenario.*

**COMMENT:**

- Default indoor arsenic was used as opposed to relevant regional-specific data available and used in Anaconda.

**RESPONSE:**

*See comment addressed as response to "Arsenic Concentrations in Indoor Dust".*

**COMMENT:**

- Reduced bioavailability of arsenic in soils versus water in water, and reduced bioavailability due from arsenic in soils being partially from mine tailings was not considered.

**RESPONSE:**

*See comment addressed as response to "Reduced Bioavailability of Arsenic in Soil".*

**COMMENT:**

- Residential scenario was overstated for a site located next to an active railroad.

**RESPONSE:**

*This comment was responded to previously, and the issue is addressed in the fourth paragraph, page 1-2 of BRA.*

**COMMENT:**

- Worker protection and trespass scenarios used conservative assumptions inconsistent with other EPA risk assessments.

**RESPONSE:**

*The uncertainty expressed here was addressed on pages 4-18 and 7-1 of BRA.*

**COMMENT:**

- Uncertainties of arsenic toxicities recognized by the EPA's Science Advisory Board was not recognized in the risk assessment.

**RESPONSE:**

*This comment was addressed previously in response to "Uncertainties in Arsenic Toxicology".*

**COMMENT:**

- Risk assessment assumes groundwater consumption directly from the shallow aquifer will occur, not considering the limitation of exposure, the disconnection of shallow from deep aquifer, geochemical attenuation, and dilution factors.

**RESPONSE:**

*This comment was addressed in response to concerns regarding "Groundwater Exposure Assessment".*

# ISSUES FROM ARCO DISCLAIMER
# FINAL REMEDIAL INVESTIGATION REPORT
# ROCKER TIMBER TREATING OPERABLE UNIT

## COMMENT:

This disclaimer was prepared by ARCO in response to the Final version of Remedial Investigation (RI) that was prepared by EPA and its consultants. Since the Remedial Investigation will serve as the informational source for the development of Remedial Alternatives for the Feasibility Study (FS), it is necessary that reader of the Remedial Investigation be aware of certain controversial issues and conclusions. ARCO submits the attached disclaimer for the Final Remedial Investigation Report for Rocker Timber Framing and Treating Operable Unit due to changes made by EPA of which ARCO does not agree. Specific page and section references with an explanation and basis supported by data collected under the RI will follow after this summary.

***No Response Necessary***

## COMMENT:

Arsenic does exist in a shallow alluvial zone proximal to the previous wood treating facility and extends for a distance of a couple hundred feet. This shallow aquifer is inadequate itself as a water supply due to low conductivities (i.e., ability to pump adequate volumes) and water quality concerns not related to the Rocker plant or mining (i.e., nitrates from septic tanks, high dissolved solids and salts).

## RESPONSE:

*Arco is correct that the shallow aquifer at the Rocker site is not highly productive and is susceptible to surface contamination sources. While intuitively correct, Arco did not collect any data to allow them to make the statement about nitrate from septic tanks The shallow aquifer is productive enough to provide water to individual, properly constructed, domestic wells, and is classified as a potentially usable aquifer by the State of Montana.*

## COMMENT:

The most significant item of concern with EPA's RI is the implied connection between the shallow, low quality, arsenic impacted alluvium and the older and deeper sediments of the Tertiary aquifer. Both the chemical and hydrologic information available from the field investigation demonstrate a very poor connection between the two aquifers. There was no demonstrated response to shallower wells when the deeper, Town Pump well was tested by the Bureau of Mines. After seven days of stressing the deeper aquifer system the shallower wells that are impacted by arsenic contamination did not respond. The water chemistry likewise showed two very distinct types of water, thus indicating a poor connection.

## RESPONSE:

*The conclusion that the Tertiary aquifer and the alluvial sediments are in hydraulic communication was made on the basis of converging lines of evidence. These lines of evidence were described in the RI and were verbally provided to ARCO in numerous technical meetings and letters. The following is a summary of those lines of evidence.*

*1. The alluvial materials directly overlie the Tertiary sediments. The contact between the two formations has been described by ARCO as an "incised paleochannel"(ancient stream channel), consequently upwards of 80 feet of Tertiary sediments are in direct lateral contact with the alluvial sediments along the paleochannel sidewall.*

*2. Geologic samples, well logs, and geophysical logs all failed to identify and characterize any laterally continuous confining bed separating the Tertiary sediments from the alluvial sediments.*

*3. The Tertiary sediments are a complex deposit of volcanic tuffs and fluvial sediments. Individual beds are discontinuous and well to well correlation has proved impossible. Individual strata demonstrating high horizontal permeability have been detected in every boring that penetrated the Tertiary sediments. The high permeability strata consists of both primary permeability from coarse alluvial deposits, and secondary permeability from fractures. Laboratory tests of vertical permeability conducted on short, selected, competent pieces of cores removed from the Tertiary sediments are biased toward the parts of the section with high cementation or clay content since those materials are the only ones that would remain intact long enough for shipping and testing. This discontinuous, complex bedding containing high permeability zones and no identifiable laterally continuous confining bed indicates higher bulk, in-situ vertical permeability and consequently, more vertical communication than is implied by the discrete selected laboratory derived vertical permeabilities.*

*4. The highly productive portions of the Tertiary sediments provide industrial quantities of groundwater to local users. These fractured zones immediately underlie the Rocker Site as determined by both on-site and off site test wells installed by ARCO. These permeable zones provide a mechanism for discharging (disposing of) vertical leakage coming through the overlying sediments. Thus as observed at the Rocker Site, 1) hydraulic gradients within the alluvium are predominantly down (only 2 exceptions) and the gradients between the alluvium and the Tertiary sediments are consistently downward, 2) vertical gradients between the alluvium and the Tertiary sediments are in the same range as vertical gradients within the alluvium. This data indicates that the system is not under static equilibrium as evidenced by the gradients. The predominant source of recharge water in the Rocker hydrologic system is surface water, precipitation, and surficial groundwater. The predominant zones of discharge are lateral flow in the shallow alluvium and the underlying fractured Tertiary sediments, consequently a flow system with a significant vertical flow component is logical and is supported by RI data, including the vertical gradients and the vertical distribution of arsenic in the alluvium which shows an arsenic plume moving laterally and vertically down away from the source area(s).*

*5. The differences in water chemistry noted between strata and locales on the Rocker site are problematic to explain under any hydrologic interpretation. One interpretation consistent with EPA's conceptual model is that under <u>current</u> ambient vertical flow conditions, the potential for communication is present but the actual volume of water exchanged is limited by the combination of vertical gradients and vertical permeabilities. Under current hydrologic conditions vertical water flow is limited thus water chemistry characteristics reflect sediment geochemistry influences.*

*6. Temperature data collected by ARCO also suggests a vertically active hydrogeologic system as discussed in previous responses. Elevated nitrate concentrations in samples collected by Montana Bureau of Mines and Geology on observation wells used in the Town Pump test indicate vertical movement of surficial water into the Tertiary sediments from which these wells obtain water.*

*7. The only significant aquifer test conducted in the Rocker area was the Town Pump test performed by others and notably without support by ARCO. This test has proved invaluable in assessing the hydraulics of the Rocker groundwater systems. The results of the Town Pump test include non controversial observations of drawdown and more subtle suggestions of drawdown. ARCO has focused their objection to EPA's conclusion of vertical communication on the more subtle analyses, the limitations of which have been fairly presented by EPA in the RI and at technical meetings. The following is a summary of the interpretations made by EPA on the Town Pump aquifer test.*

*a. Drawdown within the Tertiary sediments during the test was widespread and relatively consistent over large lateral distances indicating the productive zone in the Town Pump well is prolific and laterally extensive.*

*b. Drawdown in the Tertiary sediment wells was essentially the same regardless of well completion depth providing direct evidence of vertical communication within the Tertiary sediments.*

*c. None of the RI wells installed into the tertiary sediments at the Rocker Site appeared to have encountered the productive horizon producing water at the Town Pump well yet all these wells experienced clear drawdowns. This provides additional, direct evidence of vertical communication in the Tertiary sediments.*

*d. Indications of drawdown impacts in the deep and shallow alluvial wells are not grossly obvious and the requests to ARCO to examine this data carefully have been unsuccessful. ARCO has been very vocal in objecting to EPA's interpretations of this data but have not presented any rebuttal analysis. The following is a summary of EPA's analysis and interpretations of this data.*

> *i. No drawdown could be detected in any shallow alluvial well. Pretest water levels in the shallow and deep alluvial wells indicate both sets of wells respond to precipitation and Silver Bow Creek stages.*
>
> *ii. Vertical gradients between every shallow and deep alluvial well pair changed during the test, consistent with drawdown of the deep alluvial well, i.e. downward gradients increased at all of the well pairs having downward gradients before the test and in the one well pair with upward gradients the gradient decreased.*
>
> *iii. Comparison of water levels trends (hydrographs) for deep and shallow alluvial wells prior to, during, and after the pump was shut off, show deep water levels immediately and consistently show signs of hydraulic recovery (water levels stop falling and began to increase coincidentally with the end of pumping while the shallow wells continued to decline).*
>
> *iv. A plot of all wells showing the rate of water level decline during the test versus distance from the pumped well shows an apparent relationship between distance and rate of change with the wells nearest the pumped well declining at a faster rate than those farther away.*

*It has always been EPA's position that while the hydrographs for the alluvial wells do not show the irrefutable drawdown shown by the Tertiary sediment wells, they are consistent with other lines of evidence regarding vertical communication. Individually each observation is insufficient to reach a strong conclusion, however, these interpretations were made independent of one another and as a group of observations, they converge to the same conclusion that the deep alluvial wells felt the effects of the drawdown imposed by the Town Pump well.*

*8. ARCO has often repeated the comment that after 7 days of pumping, no drawdown was observed in the alluvial wells, therefore there is no connection. In addition to the analysis presented in the previous paragraphs, it is appropriate to address the issue of the pump test duration and well responses. Under* *fractured, leaky, confined conditions like the Tertiary Aquifer, drawdown response in the aqui;·:r occurs very quickly (as observed in the Town Pump test) because water pressure (head) changes propagate rapidly. Hydraulic responses in overlying, unconfined alluvial aquifers is much slower to develop since water level changes in these aquifers requires the actual movement of water particles. The time-development and the total amount of drawdown in the overlying alluvial aquifer is a function of the horizontal and vertical permeability of the alluvial aquifer, sources of recharge, and the vertical permeability of the strata separating the pumping zone from the overlying materials. Consequently, without a detailed hydrogeologic analysis of the total hydrogeologic system, the lack of obvious drawdown in the alluvial aquifer (as interpreted by ARCO) cannot be presented as proof of no hydraulic communication. This issue has been repeatedly brought up to ARCO without response.*

*9. The elevated arsenic concentration in well RH-6 is direct evidence that the Tertiary sediments and the alluvial sediments are in hydraulic communication. While there remains some uncertainty as to the pathway the arsenic took to get into the Tertiary sediments at this location, there is no uncertainty that it came from an arsenic plume present in alluvial sediments. The two pathways are vertical migration from arsenic in the shallow groundwater immediately above the well, or laterally from the subcrop area where contaminated alluvial groundwater abuts the sidewall of the paleochannel. In either case arsenic from the alluvial system has entered the Tertiary sediments by hydraulic communication.*

*Summary. The overall assessment of the hydraulic relationships within the alluvial sediments between the alluvial sediments and the Tertiary sediments, and within the Tertiary sediments, conducted by EPA is based on a series of converging evidence and concludes that the Tertiary sediments are in hydraulic communication with the alluvial sediments. Under ambient hydraulic conditions the Tertiary sediments have been impacted only slightly. However, under potential future hydrogeologic development, vertical gradients between the contaminated alluvial aquifer and the Tertiary Aquifer will increase which, because they are hydraulically connected, will put the deeper aquifer at risk to become impacted by arsenic from the Rocker Site.*

**COMMENT:**
The second major issue is that EPA understates the fact that the arsenic has moved only several hundred feet laterally and 20 to 30 feet vertically in a period of 40 to 80 years since the plant was operated. This is important to show that the natural geochemical mechanisms already in place are effectively immobilizing the arsenic. Alluvial materials along Silver Bow Creek contain abundant iron that literally traps the arsenic in the shallow alluvium in a process known as adsorption. This is similar to additives used in conventional water treatment plants. Arsenic movement in the system could have occurred for the most part during operation of the plant some 40 to 80 years ago, and possibly has moved little since that time.

**RESPONSE:**
*There needs to be a separation between descriptions of arsenic concentrations and movement over time and the current amount of arsenic in either the sediments or the groundwater. Historical movement of groundwater was assumed to be about the same as what is measured and described by the current RI. This movement, individual groundwater flow paths, and hydraulic connections are complex (anisotropic and inhomogeneous) but the physical characteristics have probably changed little in the last few years. The amount of arsenic still in the sediments and the groundwater are the result of groundwater movement during and since the termination of wood treatment at the site. The relative mobility of the arsenic is a major concern and also complex. Problems with the data set include decreasing frequency of sediment sampling with depth, the random sampling of even the shallow sediment sampling, lack of seasonal sampling, and, probably the most important, the analytical schedule and variability in arsenic and other constituents in the two groundwater sampling rounds. These data would even more clearly document*

*processes described in the current RI but would not significantly change the conclusions carried into the FS.*

*Adsorption by iron oxyhydroxide on the sediments is one of the major "natural geochemical mechanisms" that removes and that can irreversibly immobilize a finite amount of arsenic (assuming pH remains neutral and oxidation reduction potential remains oxidizing). Laboratory data on the sediments show that a large amount of arsenic (V+) is contained on the sediments probably by adsorption to iron oxyhydroxide. This arsenic reservoir will remain largely immobile unless the pH becomes acidic or the oxidation reduction potential becomes reducing. Limited observations of acidic conditions have been observed in settings thought to be associated with sulfide materials (tailings and/or railroad fill) that are being addressed by the Streamside Tailings Operable Unit investigations. These materials are proposed to be removed from areas where they are saturated as part of the remedy for that OU and therefore are not considered a significant influence on arsenic mobility for the Rocker OU.*

*The alluvial sediments probably have sufficient iron oxyhydroxide to adsorb a part, maybe a major part, of the dissolved arsenic but not enough to adsorb the milligram per liter concentrations of arsenic currently in the groundwater plume. The amount of iron oxyhydroxide in the Tertiary sediments (volcanics) is probably both highly variable and less than what is on the alluvial sediments. Groundwater in the volcanics may also be largely flowing along fractures which would not present the same surface area that porous media provide in alluvial sediments. These data suggest that the Tertiary sediments (volcanics) do not have sufficient iron oxyhydroxides exposed to the groundwater to control even as much as the alluvial sediments. Further evidence of this is the absence of iron in groundwater taken from the Tertiary sediments aquifer.*

*The arsenic plume in the groundwater of the alluvial materials is sufficient evidence that arsenic is mobile at the site but there is more data supporting arsenic mobility in the groundwater at the site. Groundwater data indicate that there is about equal proportion of arsenic (III) and (V) in the wood treatment area and higher arsenic (III) in the downgradient periphery of the arsenic plume. These data support the conclusion that arsenic is being adsorbed but, more importantly, also indicate that arsenic is mobile because arsenic (III) is poorly adsorbed except by aluminum oxyhydroxides at an alkaline pH (pH > 8). Therefore, these data suggest that there is a reservoir of mobile arsenic within the wood treatment area and that the more mobile arsenic species indicates that the arsenic is still mobile in the downgradient part of the plume. Furthermore, it is difficult to believe arsenic is immobile when the arsenic concentrations of the two sampling rounds are compared because the arsenic concentrations (and concentrations of many other parameters) are considerably different. These differences indicate a relatively mobile groundwater system that includes arsenic as one of the parameters being mobilized at the site.*

*Finally, there is little data developed to date that indicate that the arsenic has "moved little since" the "operation of the plant some 40 to 80 years ago". The arsenic on the sediments and in the groundwater at the site today is probably a remnant of a much larger arsenic source generated by the wood treatment facility when it was operating. The high arsenic concentrations found in the RI reflect this past high source and the complex hydraulic conditions at the site.*

**COMMENT:**

The following is a brief summary of other issues discussed in this disclaimer. They will be discussed in detail following this summary, including an explanation of ARCO's alternative interpretation of the issue.

The issues identified in this disclaimer have been organized topically as pertaining to Physical Characteristics of Site, Geology, Hydrology, Groundwater Chemistry, Aquifer Disconnection, Arsenic Fate & Transport, and the Baseline Risk Assessment.

*No Response Required*

**COMMENT:**

Generally, the physical characteristics of the site are presented in a manner that ignores its historical, current, and future land use as a railroad siding on the 100-yr flood plain. To assume that there would be future residential development on the site is not realistic given the area is predominantly in a flood plain and is adjacent to an active rail line. Also, previous removal and capping actions are presented as being ineffectual without evidence to support such claims.

**RESPONSE:**

*The RI and Risk Assessment(RA) clearly explain and acknowledge the historical and present uses of the site. As regards future residential use, EPA Guidance requires that the highest possible beneficial use which can reasonably be expected to develop, which in this instance is a residential scenario, be analyzed as part of the RA. The RA couches the potential for residential development to be limited as long as the site remains as an industrial/commercial setting. In this way EPA has evaluated the potential risks of residential development (something that has occurred on abandoned rail lines nearby) and can incorporate that information about potential risk into the final remedy. In the case of the Rocker OU, the remedy includes institutional controls to limit the land use to industrial/commercial settings but does not require cleanup to full residential risk values. This is not an unrealistic evaluation or an unreasonable remedy.*

*Mapping of the floodplain provided by the Natural Resource Information GIS group, based on previous flood elevations determined by the State/CH2M Hill in 1988 for Silver Bow Creek, most of the Rocker OU is out of the 100 year flood plain. This information has been provided in the ROD and ARCO was previously aware of it from the work done for the Streamside Tailings OU.*

*As regards previous removal and capping efforts, the RI data clearly show that there are still elevated concentrations of arsenic at the surface on portions of the site. Further, the average thickness of the cover soil was about 12-inches but around the edges where the cover soil feathers in with the original topography, it is clear that the thickness is much less. The RA also considers that future land use could involve disturbances that would breach the integrity of the cap (e.g., excavation incidental to on site construction).*

**COMMENT:**

Hydrologically, all evidence points toward an effective disconnect between the shallow alluvial aquifer where arsenic is found locally and the Tertiary aquifer, the source of the Town Pump water supply. Ignored is the fact that much of the underlying alluvial aquifer has not been degraded by arsenic contamination. One Tertiary shallow well (RH-6) near the railroad load-out trench has elevated arsenic likely associated with nearby arsenic spillage, not aquifer migration There is no evidence that this monitoring well is hydraulically connected to deeper aquifer zones. The hydraulic conductivities of the alluvial aquifer is an order of magnitude less than the deep Tertiary aquifer, and preferential flow direction will be horizontal versus vertical. This means, even if the two aquifers were connected, migration into the deeper zone would be very low.

**RESPONSE:**

*This comment has numerous parts which are separated as follows.*

*See response above regarding the hydraulic relationship between the alluvial and Tertiary aquifers.*

*ARCO is correct that only one instance of arsenic contamination in the Tertiary aquifer (well RH-6) has been documented. This is also discussed in previous responses.*

*The RI conducted by ARCO and the Town Pump aquifer test conducted by the Montana Bureau of Mines and Geology (on behalf of EPA), did not collect any data at RH-6 regarding potential hydraulic communication with deeper aquifer zones, therefore it is technically accurate, but misleading, to state as ARCO does, that "There is no evidence that this well is hydraulically connected to deeper aquifer zones." There is no direct evidence because it was not investigated during the RI. Vertical communication within the Tertiary sediments, within which RH-6 is completed, is discussed at length in previous responses.*

*ARCO oversimplifies the vertical versus horizontal flow of water, and potential migration of arsenic between the alluvial aquifer and deep Tertiary aquifer. In the first place the flow or flux of water from one aquifer to the next follows Darcy's law (Q=KIA) where flow (Q) is directly proportional to the hydraulic conductivity (K), the hydraulic gradient (I) and the area (A) across which the water flows. The flux is not controlled by the contrast in hydraulic conductivities between the strata. The potential extent and subsequent impact of arsenic plume migration into the deep Tertiary aquifer is function of these parameters, plus; concentration of the invading plume, vertical versus horizontal movement of the plume within the Tertiary sediments between the alluvial aquifer and the deep Tertiary aquifer, and the vertical and horizontal zone of contribution yielding water to a deep Tertiary aquifer well. Arsenic entering at the top could be drawn deep into the Tertiary sediments by vertical flow fields imposed by a deep production well. Little is known of the lateral extent and horizontal versus vertical gradients within the numerous discontinuous permeable zones in the Tertiary sediments to allow ARCO to state as a hard conclusion that preferential flow in the horizontal direction will limit vertical migration. It is equally as likely that preferred flow paths may serve only to offset the vertical movement of a plume in a stair step fashion.*

• **COMMENT:**

The RI presentation of aquifer geochemistry has been incorrectly represented that water chemistry should directly correlate with saturated sediment chemistry. The mobilization and/or fixation of contaminates such as arsenic are largely controlled by the groundwater oxidation or reduction state in addition to the presence of iron or manganese in the system. The use of non-validated temperature data and suspect cation/anion ratios for rationalizing mixing of the upper alluvial Aquifer and the deeper Tertiary aquifer is technically insupportable.

**RESPONSE:**

*The comparison between the water chemistry and the sediment chemistry was discussed to determine if acidic conditions at the site was a major contributor of arsenic and other metals to the groundwater. When sulfuric acid attacks the sediments, and there is little to no mobilization of the dissolved parameters, the dissolved concentrations of parameters in the groundwater generally approximate their respective abundance in the sediments. It is true that with transport away from the areas of sulfuric acid attack into peripheral areas with different pH and oxidation reduction potential (ORP, redox, Eh, etc.) then other processes (primarily adsorption) will individually alter the relative concentrations of each parameter in the groundwater. Changes in each parameter's concentration generally reflect the processes occurring in the groundwater system. Unfortunately, aluminum and silica are missing from the analytical data base and this indirect method of trying to determine the relative significance of acidic conditions had to be applied at the site.*

*The comment on "invalidated temperature data and suspect cation/anion ratios for rationalizing mixing of the upper alluvial Aquifer and deeper Tertiary aquifer is technically insupportable" is not sufficiently clear to give a direct answer. However, all of the temperature data used in making interpretations and descriptions in the text are temperatures measured in the field by the ARCO engineering firm professionals during the two sampling rounds. EPA assumes that the ARCO professionals properly collected the data because there is no report or other written statement indicating otherwise. If this is not the case, EPA* *should have been notified of this and any other incorrectly collected or analyzed data generated by ARCO.*

*Without knowing what is "suspect" about the cation/anion ratios, EPA cannot respond to the "technical insupportability" part of this comment concerning the ratios. However, as stated above, if EPA has been given incorrect data without a description of the inadequacy then ARCO must submit information to EPA. The use of the ratios was prompted again by the available data and believed to be relevant. If there is a specific concern about one or more of the ratios or how they were applied then this needs to be clarified and will be subsequently answered.*

**COMMENT:**

Arsenic fate and transport discussion presented in the RI does not address the positive effect of naturally occurring attenuation of the arsenic through iron fixation. These processes have been effective in minimizing the migration of the shallow groundwater plume. The streamside tailings distributed throughout the floodplain are also a source of arsenic that may be misinterpreted as originating from the Rocker site. Understanding the role of the tailings will be important when determining the actual spread of arsenic from the Rocker plant.

**RESPONSE:**

*The "positive effect of naturally occurring attenuation of the arsenic through iron" adsorption was assumed to be operating at the site because the process is ubiquitous under near neutral pH and oxidizing groundwater conditions and this is reflected in the RI text. However, the adsorbed phase is only immobile under these groundwater conditions. In addition to this currently immobilized amount of arsenic there is a high concentration of dissolved arsenic forming a mobile phase plume in the groundwater that is of concern for the RI. If the site conditions remain stable then the adsorbed phase may remain immobilized but if the pH becomes more acidic or the groundwater becomes more reducing this adsorbed phase can released and, probably significantly increase the dissolved arsenic in the groundwater. Assuming relatively stable conditions, the fate and transport text deals primarily with the mobile groundwater phase and assumed near equilibrium adsorption conditions on the sediments. Obviously, if adsorption was totally effective in immobilizing all the available arsenic from the wood treating site there would be little to no dissolved arsenic in the groundwater.*

*The streamside tailings are known to be a source of arsenic but are not believed to be misinterpreted as arsenic originating at the site in the RI unless specifically mentioned in the text. The understanding of the role of the tailings is important (see the above responses on creating acidic groundwater conditions at the site). It is EPA's understanding that the streamside tailings will be dealt with as part of ARCO's remedial action of the streamside tailings and that the streamside tailings component will no longer contribute arsenic, metals, acidic groundwater, or change the Eh of infiltrating groundwater after their remediation. The site-related arsenic concentrations are believed to be appropriately addressed in the RI.*

**COMMENT:**

The Baseline Risk Assessment was developed using numerous overly conservative assumptions and erroneous summaries of available data. Several critical factors and analyses in the risk assessment are not even consistent with other risk assessments related to arsenic performed by EPA in Montana. Regarding risk from groundwater, EPA assumes the public would be drinking directly from the shallow aquifer. They do not recognize the limitations of the exposure scenario regarding lack of shallow aquifer usage and the disconnection with the deeper drinking water supply. To support conclusions regarding residential risk scenarios, a complete the aquifer connection was advanced by these authors. However, the lack of supporting information of an aquifer connection combined with the unlikelihood of a residential development scenario at the site makes assertions of risk factors unrealistic.

**RESPONSE:**

*As was noted in the earlier responses, EPA Guidance indicates that the highest potential beneficial land use that can reasonably be expected to develop should be examined as part of the RA so that Risk Managers (RM) have an upper range to consider in their decision-making process. The site remedy is aimed at occupational/industrial use, which ARCO admits is likely, with institutional controls to prevent residential development. Groundwater at the site is classified by the State as potentially useable, and therefore must be remediated. Significant use of groundwater exists very near the Rocker site. Risks were calculated for ingestion of groundwater from different portions of the aquifer to aid the RMs in their analyses. EPA and their consultants further believe that there is clear evidence to show the connection of the contaminated shallow alluvial aquifer with the deeper alluvium and the Tertiary system at the west end of the site, as explained previously. The risk assessment is consistent with other risk assessments for Clark Fork Basin operable units, and does not, in EPA's opinion, use overly conservative assumptions.*

**COMMENT:**

Questionable conclusions reached in the RI and risk assessment could be used incorrectly to direct a remedial alternative that could exacerbate the naturally attenuating arsenic conditions of the site.

**RESPONSE:**

*See responses to specific comments provided throughout the responsiveness summary.*

**COMMENT:**

EPA added language to the second to the last paragraph on page 1-4 that qualified the depth of the removal action of 12 inches as "nominal" and "concluded this phase of the removal action." These language changes imply that the previous action was ineffectual, and that future removal actions are imminent. The removal area has reduced the potential for a direct exposure pathway and the successful vegetation enhanced evapotranspiration reducing the potential leaching of contaminated deeper soils.

**RESPONSE:**

*EPA agrees that the removal action and subsequent cover soil has considerably reduced the short term risks of exposure to portions of the site that were highly contaminated. The interpretation that the language changes imply the removal action as ineffectual is ARCO's interpretation. The order issued by MDEQ was an emergency action, and by its very nature, implies that further work at the site is highly probable. See also EPA's response to prior issues on this topic.*

**COMMENT:**

100-yr Floodplain and Future Land Use

Figure 3-1 and the Section 3.1 narrative depict the previous wood treatment area on the NE portion of the OU as lying outside the 100-yr floodplain. The source for these boundaries were derived from its oversight contractor CH2M HILL in 1988. The Flood Boundary and Floodway Map developed under the National Flood Insurance Program in September 1979 clearly shows this entire area north of the railroad tracks to be in the 100-yr flood plain. Later in Section 6.0, there are statements made regarding the potential for railroad line abandonment and consideration of future land use for residential. Section 3.3 was modified by EPA to reflect this unlikely, residential scenario. In fact, this subsection does not indicate any such limitations to the development of the site such as the current industrial use and floodplain status.

**RESPONSE:**

*The referenced 1979 Flood Boundary Map uses a technique to develop flood plain maps that are much less rigorous than the flood modelling study conducted by CH2M HILL in 1988 which is much more precise and which was why it was used. Earlier responses defined why EPA believed it was appropriate to consider residential use for the site.*

**COMMENT:**

Exaggeration of Surface Features—Section 3.1
Nearly a half page of narrative was devoted to a six-inch diameter hole (likely animal burrow) discovered in 1992 near the carpenter's shack as a potential source of recharge waters to for transporting contamination to the subsurface. These conclusions drawn on page 3-2, last paragraph, are misleading and inappropriate for this part of the RI.

**RESPONSE:**

*The location of the hole was first raised by ARCO in its October 1994 draft RI Report. The actual discussion of the hole consists of 3 sentences describing a potentially significant field observation made by both ARCO and EPA but which ARCO did not include in their version of the RI. The observation of evidence of surface drainage entering this hole was deemed potentially significant because the drainage area was large, included potential arsenic source material from the railroad siding, and was located immediately upgradient of the highest arsenic concentrations found in the shallow groundwater. While the conclusions provided in the text regarding the hole being a possible mechanism for transport of arsenic into the shallow groundwater may not be ideally presented in this section, it is a logical mechanism that is appropriate for discussion in an RI. ARCO's pointed objection to this brief discussion is not accurate or warranted.*

**COMMENT:**

Geological Stratigraphic Relations—Section 3.4
While ARCO agrees that regional and local geology is complex, the characteri: ion of the Tertiary sequence above the Lowland Creek Volcanics as Melrose Basin equivalents (Derkey and Bartholomew, 1988) at the site discounts the actual low energy lake beds and tuffaceous sequence found at the Rocker site and Town Pump vicinity. ARCO further feels that the usage of the nomenclature, Tertiary Sediments undifferentiated (Tu) suggests a homogeneous aquifer interval from the surface rather than the vertical stratigraphic variability observed at the site. The Tertiary sediments underlying the Rocker site have been differentiated as softer silts and clays overlying denser Tertiary clays, silts and aquifer-bearing bedrock.

**RESPONSE:**

*Approximately 4 pages of the RI were devoted to describing the geologic formations in the Rocker area in an effort to properly relate the specific site stratigraphy to the regional geology as described in scientific publications by the U.S. Geologic Survey and the Montana Bureau of Mines and Geology. The stratigraphic descriptions provided in the published works were compared by EPA to the stratigraphic records of the RI test wells and the Town Pump water well. The description of the Tertiary sediments in the available literature match the stratigraphic description of the material penetrated in these wells. It is still EPA's opinion that the strata underlying the alluvial material at the Rocker Site is Tertiary Melrose Basin Sequence (most recent formal name applied) or equivalent Tertiary sediments, as discussed in the RI.*

*ARCO may be confusing the geologic connotation of "undifferentiated" with "massive". The term undifferentiated as used in the RI does not imply a single homogenous aquifer. The Tertiary sediments were clearly described as complexly bedded and the term undifferentiated was used to denote that the various strata within the formation could not be separated into definable stratum because of stratigraphic complexity and lack of data. See paragraph 3, page 3-7 of the RI which describes the Tertiary strata and provides the rational for using the term Tertiary undivided sediments or just Tertiary sediments.*

*At the Rocker site, based on ARCO's RI data, the Tertiary sediments gradationally become denser, exhibit more cementation and fewer generally fewer fluvial beds with depth. There was no specific geologic contact separating the Tertiary sediments into two units as ARCO's comment implies. This was recognized by ARCO's geologic consultants in that no such contact was identified on the lithologic logs or in geologic cross sections presented in draft RI's. Subsequent deep drilling by ARCO on the north side of Silver Bow Creek, completed after the EPA modified RI was submitted, confirms the gradational* *changes with depth in the Tertiary sediments. While always subject to different interpretations, the geologic model described by EPA in the RI is supported by RI data. ARCO's differentiation of the Tertiary sediments into 2 definable units cannot be justified with the available data.*

**COMMENT:**

The aquifer layer encountered in the Town Pump well, north of the Rocker site, cannot be confirmed to extending "to a depth of at least 155 feet" at the Town Pump site as reported in the RI on page 3-7, paragraph two. It is only likely that the more productive aquifer, extends from the upper screened interval of around 100 foot below the surface to an undetermined depth below 150 feet. Page 3-11, paragraph three indicates that geophysical logging and the driller's logs of the Town Pump wells show the first major density change associated with the bedrock aquifer at 100 feet. The deepest paleochannel sands terminate at the Rocker site at 80 feet in accordance to data from core holes along the channel axis (re: C-4 and C-10). The Tertiary aquifer lies deeper in the denser bedrock beneath the site not in the shallow Tertiary silts and clays outcropping near the surface to the west. In summary, the available evidence does not indicate a homogeneous, connected system and likely supports physically distinct geological formations under the Rocker site.

**RESPONSE:**

*This is a multi-part comment by ARCO that incorrectly draws on geologic descriptions in the RI and attempts to present a geologic and hydrogeologic model not founded in data.*

*The text on page 3-7 was describing the thickness and stratigraphy of the Tertiary sediments on the basis of available data. No where in the referenced paragraph does EPA use, or imply, the term "aquifer layer". The text states that the Tertiary sediments extend to a depth of at least 155 feet since that was the depth of first Town Pump well which, as indicated by the well drillers log and by direct personal communication with the driller by EPA, was still in what appeared to be Tertiary sediments as described previously, see comment R-12 above.*

*ARCO's second comment in this paragraph concludes that the "Tertiary aquifer" is present beneath the Tertiary silts and clays underlying the site. EPA concurs that there are (is) a discrete zone(s) of high permeability in the Tertiary sediments and that these (this) zones or zone underlies the Rocker site. ARCO goes on to state that the data "does not indicate a (hydraulically) connected system and supports physically distinct geologic formations". EPA disagrees with this statement because there is no RI data to support it and the Town Pump aquifer test clearly shows direct, and immediate response in Rocker monitoring wells completed in the Tertiary sediments, stratigraphically above what ARCO refers to as the Tertiary aquifer. Well RH-36 on the Rocker site, completed in the Tertiary sediments at a depth that places it above the bottom of the paleo-channel, also experienced drawdown during the Town Pump aquifer test. ARCO's hydrogeologic model, as summarized by this comment, is not based on the RI data and, in fact, is directly contradicted by RI data.*

**COMMENT:**

Structural Setting—Section 3.4

Multitech's (1987) Rocker Fault does not fit with the discussion presented in the text. It has been noted by the RI author's that this eastern normal fault has a downthrown western side on page 3-8. Unless this includes yet another western fault with the downthrown side to the east that would from a structural graben (re: western paleochannel border), the age relations would make the paleochannel older not younger than the Tertiary Undifferentiated (TU) sediments. Also, the Tertiary age material on the downthrown side of the fault is higher than on the up-thrown (eastern) side of the fault, which is contradictory to what would be expected in such a scenario. Other, later, investigations have not indicated that this fault exists (i.e., Purdy and Rowan, 1990 and Rowan and Segal, 1989).

While a structural answer for the western side of the paleochannel is a possibility, discussion is not presented regarding the likelihood that faults in poorly consolidated material are often clogged with fault gouge rendering low permeabilities (i.e., hydraulic barriers).

**RESPONSE:**

*EPA's use of the term "fault block basin" in the last paragraph of Section 3-4 on page 3-8 is incorrect. The correct term should be "structural basin". EPA did not mean to imply there was also a fault west of the Rocker site to form the fault block. If present as described by Multi-Tech, the Rocker fault east of the Rocker site with the west side of the fault downdropped would form a wedge shaped structural basin that could fill with alluvial sediments. The wedge of alluvial sediments would thin to the west. The eastern side of the "paleo-channel", a feature first named and introduced by ARCO, cannot be defined with the RI data. Therefore, the purpose of this discussion was to introduce a possible structural explanation for the easterly dipping contact between the Tertiary sediments and the alluvial materials at the Rocker site.*

*ARCO's comment that under the scenario described in this paragraph stratigraphic age relationships would be wrong is incorrect. In such a sediment filled structural basin, (or even if it was a fault block) stratigraphic age relationships are correctly maintained. i.e. younger sediments over older deposits.*

*There is no discussion in the text about the possible hydrologic effects of faults, either as low conductivity barriers to flow or highly permeable conduits because it wasn't relevant to the subject of the paragraph. EPA does not believe the complexities of defining and characterizing fault hydraulics is relevant to ARCO's efforts at characterizing the groundwater hydraulics at the Rocker site.*

**COMMENT:**

Number and Nature of Aquifer Units?

Page 3-17 mentions that there are three hydrostratigraphic units yet lists a fourth, unsaturated sediment and fill. While ARCO concurs that there may be distinct hydraulic characteristics of vadose material, it should not be identified in this context with aquifer units. Also the hydraulic characteristics of the Tertiary Sediments also called "Volcanic Aquifer" on page 3-23, are quite variable and appear to be more like an aquiclude in its upper 100 feet of thickness. The likely, water-bearing horizon in which the Town Pump well is screened (110-152 ft) is not listed as a hydrostratigraphic unit in the listing on page 3-17. It is concluded that the driller's preference to screen this interval was motivated by this zone being discrete and water-bearing versus the upper alluvial material or possibly separated by an aquitard clay. Installation of a later well that was screened continuously to the surface made considerably less water presumably due to the presence of clays and silts in the upper zone. This lower hydrological unit at the Town Pump is believed to underlie the Rocker site but thin at comparable depths. Overlying this older rock unit are either channel sands of the lower alluvial aquifer and the shallow alluvia aquifer unit that is associated with Silver Bow Creek and tailings deposits.

**RESPONSE:**

*This is a multi-part comment including both RI specific comments and unrelated restatements of ARCO's conclusions regarding the hydrogeology of the site.*

*ARCO is correct about the inconsistency between text and the number of hydrostratigraphic units described. The text should state there are four hydrostratigraphic units. EPA included the discussion of the vadose zone materials in this section as a matter of report structure and to provide a complete description of the hydrogeologic system at the Rocker site which includes the vadose zone.*

*The water bearing horizon at the Town Pump well was not presented as a distinct hydrostratigraphic unit because, 1) almost nothing was known about it's physical characteristics because of poor geologic logs, and 2) as described in the RI, it is one of several highly permeable zones in the Tertiary sediment hydrostratigraphic unit.*

*ARCO's discussion of the construction of the first Town Pump well suggests the well penetrated a distinct, water bearing, geologic strata that the driller chose to screen. This is not the case based on discussions* *with the driller which indicated the lower part of the geologic formation was essentially the same as the upper part, only more cemented. This is consistent with all descriptions of the Tertiary sediments presented in the RI.*

*ARCO's contention that the reason the second Town Pump well is less productive is that it tries to draw water from silts and clays in the upper Tertiary sediments is incorrect and ignores the fact the well is screened over a very long section that includes the same production interval as the first well. Why the second well does not seem to produce as much water as the first and why it was drilled so deep is open for speculation but is not relevant to the Rocker RI.*

*It is not clear what ARCO is referring to as the "lower hydrological unit at the Town Pump". It is apparent that the highly permeable zone in the Tertiary sediments that the first Town Pump well draws from is widespread, based on the large areal extent of drawdown observed during the Town Pump aquifer test. This zone apparently extends beneath the Rocker site as well. There is no RI data available to allow ARCO to make the statement that the "lower hydrogeological unit" thins at depth. The Tertiary sediments contain highly productive zones but almost nothing is known about their physical properties including extent, thickness and stratigraphy.*

**COMMENT:**

Well RH-38 Suspect in Defining Potentiometric Surfaces.

Well RH-38 is screened in both the alluvium and Tertiary sediments, thus its usefulness in determining the potentiometric surface for either formation would be misleading.

**RESPONSE:**

*Well RH-38 is screened across a thin, but permeable alluvial sand encountered near the base of the alluvium. The topmost Tertiary sediments included in the open portion of the well are much less permeable than the alluvial sands therefore EPA feels RH-38 provides valid potentiometric (water level) data for the alluvial materials in this area. Potentiometric data from this well provides evidence of complex alluvial groundwater flow patterns on the extreme southwest side of the Rocker site. RI data is not sufficient to better define this area and it has been tacitly agreed that further groundwater characterization in this area of the site is not pertinent to describing the arsenic impacted, central portion of the site.*

**COMMENT:**

Tertiary Wells RH-6, RH-48, and RH-37 Were Ignored when Mapping the Potentiometric Surface.

EPA omitted wells RH-6, RH-48, and RH-37 in defining the potentiometric surface of the Tertiary Sediment aquifer. While RH-37 may arguably be included in the alluvial aquifer system, per the EPA interpretation, the reason for omitting RH-6 and RH-48 is that they are "...too high up in the Tertiary sediments...". Since EPA maintains that there is a vertical hydraulic connection, why should the stratigraphic position be the basis for exclusion? The inclusion of these wells would lead to a potentiometric surface which trends to the northeast. This direction does not parallel the potentiometric surface of the alluvium; therefore, providing support for a hydraulic disconnection between alluvium and deep Tertiary.

**RESPONSE:**

*EPA omitted wells RH-6 and RH-48 when preparing the potentiometric map for the Tertiary sediments because they are screened in the uppermost portion of the sediments, whereas the other 4 Tertiary sediment wells are screened at comparable depths much deeper in the sediments. There is about 1.8 feet difference in water levels between the shallow Tertiary wells and deeper Tertiary wells. This difference is much larger that the water level difference between the 4 deep wells and consequently the water levels of the shallow wells dominate the shape of the potentiometric map produced when all wells are used* *together. The difference in water surface elevations between the 4 deep wells is very small and indicates a northwest flow direction, consistent with the regional flow direction.*

*When combined, the resultant potentiometric map indicates a flow direction, with very high gradients, directly towards the Town Pump well from the contaminated Tertiary sediments at well RH-6. EPA does not believe this is an accurate picture of the flow direction in the deeper Tertiary sediments and chose not to present the combined map. If ARCO believes the combined map is more accurate then they should be prepared to respond to the issues such a map and flow direction raises, namely 1) Why is the potentiometric surface and flow direction so radically different from the regional pattern?, and 2) When will the arsenic at RH-6 get to the Town Pump well?. Answering these questions would require an extensive field investigation and analysis of the stratigraphy and hydrogeology of the Tertiary sediments. EPA does not believe this is warranted and that remedy implementation is appropriate given the analysis at hand.*

**COMMENT:**

Also, the Final RI states that "The lateral extension of the permeable sand bed in well RH-6 is not known. None of the other wells drilled into the Tertiary sediments in the vicinity encountered correlative sand of the thickness and permeability of that in RH-6. Based on steady slope of the drawdown curve...it appears that the sand bed at RH-6 did not receive significant recharge during the [1987 Hydrometrics pump] test. A steepening of the drawdown curve beginning near the end of the test suggests a lateral barrier (or less permeable portion of the sand bed) was encountered." This forgoing analysis by EPA suggests a notable lack of either vertical or horizontal hydraulic conductivity in the Tertiary sediments in the vicinity of RH-6. In the Section 7.0 Summary and Conclusions, it is stated that the permeable sand in RH-6 "...is believed to subcrop at the contact between the alluvium and up sloping Tertiary sediments within the deep alluvial aquifer arsenic plume on the western side of the site." The conclusions drawn from the pump test and the forgoing statement are contradictory.

**RESPONSE:**

*Most of this comment is an accurate summary of that portion of the RI addressing the hydraulics of RH-6. ARCO's statement that EPA's analysis suggest a "notable lack of vertical or horizontal permeability in the Tertiary sediment..." is incorrect. The aquifer test at RH-6 indicates the Tertiary sediments are quite permeable in this area.*

*ARCO's last statement is not quite correct. EPA's belief that the permeable bed in RH-6 subcrops against the alluvial aquifer is consistent with the source of arsenic in RH-6 coming laterally from the east as opposed to vertically from the overlying contaminated alluvium. The fact that the shape of the drawdown curve from the pumping test did not indicate a recharge source was factually stated by EPA. The physical properties and extent of the permeable bed at RH-6 are unknown. Therefore, EPA chose not to speculate on the shape of the drawdown curve and its implications regarding connection between the Tertiary and alluvial sediments. It is entirely likely that the alluvial sediments at the subcrop area are less permeable than the water bearing zone at RH-6 and therefore the implied barrier boundary from the drawdown curve could easily reflect that hydraulic conductivity contrast. Again, if ARCO would like to pursue the hydraulics of the high flow zone at RH-6, EPA would not object.*

**COMMENT:**

Groundwater Chemistry

Temperature Data Interpretation

Certain data such as field parameters were not part of previous DSR's (re: temperature) and were procured by EPA oversight personnel directly without an opportunity for ARCO review of the data. This data was not available when requested by ARCO and may be suspect. Further, this data was procured post-stipulation and has not been validated. Assuming the temperature data is valid, EPA's use of it to conclude an indication of aquifer connection is against conventional understanding of subsurface temperature relationships. A normal temperature gradient in an area not subject to thermal activity would not produce elevated temperature data in shallow zones. If anything, elevated temperatures imply upward convection gradients versus downward flow gradients.

**RESPONSE:**

*All of the temperature data used in making interpretations and descriptions in the text are temperatures measured in the field by ARCO's engineering firm professionals during the two sampling rounds. EPA assumes that ARCO's professionals properly collected the data because there is no report indicating otherwise. If this is not the case, EPA should have been notified of this and any other incorrectly collected or analyzed data generated by ARCO.*

*Thermal gradients were used to ascertain the relative "normality" of the temperature gradient in the groundwater at the site using a "conventional understanding of subsurface temperature relationships". A homogeneous alluvial groundwater system generally shows little if any thermal changes or highly variable temperatures when sampling rounds are compared even at the shallow depths investigated at the site. Changes in temperature, therefore, was investigated to determine if there were discrete parts of the alluvial aquifer indicated by temperature differences. For example, two discretely different alluvial groundwater systems may be adjacent and their differences may not only be reflected by the chemical characteristics of the groundwater but also by physical characteristics, like temperature. Sources of recharge and potential lack of mixing was investigated by evaluating temperature differences. Elevated temperatures in this climate and shallow groundwater system could also result from localized recharge from a ponded source.*

**COMMENT:**

The Final RI report concludes that there is a wide and overlapping temperature range in the Alluvial and Tertiary sediment groundwater. However, conclusions presented from Section 4.4.1.3 that the variability in temperature range within each aquifer horizon equates to aquifer mixing is of questionable validity. The basis for EPA concluding that temperature is an indicator of groundwater mixing is developed from the narrow range of standard deviations that appear to increase with depth. This is not a reliable basis for determining groundwater mixing. The increase in standard deviation merely reflects an increase in the range of data. This increase in data range could be due to other factors not related to groundwater mixing. For instance, a small number of samples from a not normally distributed sample population could yield a higher standard deviation.

**RESPONSE:**

*The point of the temperature discussion is that: :"The increase in standard deviation" with depth "reflects an increase in the range of the " temperature "data". Variable increases in temperature ranges with depth is not a "normal" condition in groundwater systems. Groundwater temperature variability typically decreases with depth as near surface sources of recharge or mixing decrease and the geothermal gradient controls the temperature. Broad changes in groundwater temperatures measured in essentially the same season suggest considerable changes in site hydraulic conditions within the aquifer and, therefore probably considerable variability and mobility of dissolved parameters in the groundwater. Broad overlapping temperature ranges indicate that the same hydraulic conditions affect both parts of the aquifer and, thereby suggest that they are hydraulically connected. Lack of hydraulic connection would mean that, for example, perhaps only one of the two parts of the aquifer would show a broad variation in temperature while the other is relatively stable. The highly variable one is typical of localized recharge sources and/or fluctuating sources both of which indicate probable hydraulic connection and considerable groundwater movement. The stable condition is typical of confined (shallow, but particularly deep (several 100 feet), systems) or very large (stable) aquifer systems.*

**COMMENT:**

The Rocker Site is proximal to a hydrothermally altered batholithic intrusion and contains sediments and layers of volcanic origin. Thermal mixing could therefore occur irrespective of hydraulic connection.

**RESPONSE:**

*This comment is confusing. The thermal energy of the batholithic intrusive has been dissipated through the millions of years since its (and subsequent volcanic) intrusion. The temperatures used in the evaluation are measured, not calculated, temperatures from the groundwater chemistry. Therefore, the last sentence is confusing and technically incorrect.*

**COMMENT:**

REDOX Potential for PAH Derivatives

Numerous citations have been made to the reducing potential of the PAHs found at the site to alter $As^{+5}$ to $As^{+3}$, yet no references or direct evidence were provided to verify this deduction. Contrastingly, on page 4-21, under discussion presented on Eh, it is noted that the Eh measurements in TOC enriched zones did not exhibit corresponding low Eh indicative of reduced conditions. Discussion was also presented to discredit the field Eh measurements. No where at the site are Eh measurements in the range that would support $As^{+3}$ as a stable phase.

**RESPONSE:**

*The correlation between arsenic speciation, TOC, and Eh is confusing to those who have not worked with these parameters in several different sites. Arsenic speciation, i.e. the quantitative determination of the two valence states, is technically sound (USGS methodology proven by use at many different sites). Dissolved arsenic speciation indicates that the reduced state (arsenic III) occurs in about equal proportion to the oxidized state, (arsenic V) in several samples in the wood treatment area. Therefore, the reduced arsenic state (the arsenic species used in the wood treatment solution) still occurs at the site.*

*A comparison of the TOC (total organic carbon) concentrations in analyses of the two groundwater sampling rounds in essentially the same season indicates that the TOC concentrations are so highly variable that the analyses are of questionable accuracy. Alternately, the shallow groundwater systems are so hydraulically connected that the dissolved constituents are readily mobilized through intricate hydraulically connected flow paths connecting localized sources that major changes in groundwater chemistry occur with relatively minor changes in surficial activities. Other constituents show some variability but their changes show sufficient spatially correlation with one another that they are probably correct but TOC concentrations relationships appear to be random and, therefore, potentially incorrectly analyzed.*

*There are too few Eh and arsenic speciation measurement pairs to fully evaluate the relationship between the measured bulk groundwater Eh and the arsenic speciation. However, it is a well known fact that bulk water Eh values and individual dissolved ion speciation couple concentrations (arsenic, iron, manganese, etc.) can indicate oxidizing conditions instead of reducing conditions if the dissolved ion couple is not controlling the bulk water Eh. In this case, it is obvious that the arsenic is not controlling the bulk water Eh. A equilibrium calculation could be made to determine the Eh represented by the arsenic couple. The calculated Eh would probably be much lower (less oxidizing, more reducing) than the measured Eh indicates. This calculated Eh could be the Eh of the groundwater at or, at least nearer, the Eh of the arsenic source. Cherry, et al., 1979, proposed using the calculated Eh of the arsenic couple to estimate the true Eh of the groundwater because the oxidation of arsenic III to arsenic V is much slower than most other dissolved ion couples.*

*(Cherry, J.A., Shaikh, A.U., Tallman, D.E., and Nicholson, R.V., 1979, Arsenic species as an indicator of redox conditions in groundwater: Journal of Hydrology, Vol. 43, pp. 373-392)*

**COMMENT:**

Low Concentrations of Metals in Tertiary Aquifer Support a Hydraulic Connection to Alluvial Aquifers.

The final paragraph on "Other Metals" on page 4-32 states that "Zinc, copper and lead occur in low concentrations in the Tertiary sediment aquifer supporting hydraulic connection to the shallow aquifer". This statement tends to distort the reality that fill and streamside tailings material is in contact with the near surface outcrops of the undifferentiated Tertiary Sediment. The hydraulic properties of this upper zone have not been substantiated nor has the background chemistry of the Tertiary sediment been discussed. In fact, Tertiary age mineralization at the nearby Bluebird complex is a more likely explanation, but have been discounted as sources for base metals. The relationship and distribution of base metals at the site has little bearing on the distribution of the arsenic.

**RESPONSE:**

*Fill and Streamside tailings material is not in direct contact with undifferentiated tertiary sediment, only alluvial material is. If ARCO believes that the hydraulic properties of the upper zone of the Tertiary sediments needs further characterization and a background chemistry of this zone needs to be discussed, these activities should have been performed by them during the conduct of the RI. The relationship between the Tertiary sediments on the western side of the site and the Bluebird complex east of the site is an unknown. If ARCO believed this to be an issue at the site, they should have investigated and reported the results in the draft RI report.*

*EPA believes that there is adequate documentation of the Tertiary sediments at the site to continue with the FS and Proposed Plan, and stands by the cited RI statements.*

**COMMENT:**

In section 4.4.2.1 the implications that low concentrations of metals in RH-40 and RH-6 support hydraulic connection between the alluvial and Tertiary aquifers is erroneous/. The statement"Zinc decreases from a concentration of 33 ug/L in the shallowest well (RH-40, 22 feet deep) to less than 10 ug/L below a depth of about 40 feet (RH-6)" is totally incorrect. Well RH-40 is screened at a depth of approximately 100 feet below ground level or about 81 feet below the Tertiary-alluvial contact. Well RH-6 is screened at a depth of about 29 feet or 10 feet below the Tertiary-alluvial contact. Thus the apparent effort to show a decrease in zinc concentration in groundwater with depth actually shows an increase in zinc with depth. Also RH-40 is located adjacent to well RH-38, a shallow alluvial aquifer well which shows a zinc concentration of 5 ug/L. These data do not support the hydraulic connection of the alluvial and Tertiary aquifers.

**RESPONSE:**

*ARCO is correct. EPA misread the depth of well RH-40 on Table 2-4 and mistakenly used the depth of well RH-38 (adjacent to RH-40 in Table 2-4). The zinc concentration in RH-40 appears anomalously high and may not reflect actual in-situ conditions. The cited paragraph should be stricken. However, it does not effect the overall site characterization or interpretation of the geochemistry at the Rocker site, nor does it change the remedy selection presented in this ROD.*

**COMMENT:**

Low levels of metal concentrations would be expected in an area that has significant deposits of these metals. Copper, zinc, and lead occur in ores of the Butte area. Satellite occurrences of elevated concentrations of these metals would be expected to proximal to the mined deposits. Thus these metals would be expected to occur in groundwater down gradient of these naturally occurring metals concentrations.

**RESPONSE:**

*It is true that "low levels of metal concentrations would be expected in an area that has significant deposits of these metals." The problem is one of how "low" is defined and if anthropogenic activities have caused these metals to be released in concentrations higher than what could be called "natural". As described above in several responses, there is such a high level of variability of the dissolved arsenic,* *metals, and major ions that a localized anthropogenic source, not a regional background source, is responsible for the metals concentrations. Drilling log descriptions repeatedly indicate anthropogenic source materials but neither indicate nor reference any natural occurrence of copper, zinc, arsenic, or lead in the subsurface at the site.*

**COMMENT:**

Groundwater Quality Conclusions

Several of the groundwater quality conclusions lack substantiation in Subsection 4.4.4. The second bulleted item on page 4-43 states "...both calcium and sulfate increases [as TDS increases] as bicarbonate decreases..." ARCO concurs that calcium and sulfate increase with TDS, however, observations indicate that bicarbonate also increases with TDS, though not as pronounced as calcium and sulfate.

**RESPONSE:**

*There is a considerable difference in the quantitative increases in calcium sulfate over that of bicarbonate but it is true that bicarbonate slightly increases with TDS. The actual percentage of bicarbonate, however, generally decreases with increase in TDS.*

**COMMENT:**

EPA's implication that the Tertiary sediment aquifer sharing the chemistry of the alluvial aquifers lacks the perspective of the spatial relations. For instance, the chemical evolution path depicted in Figure 4-17 shows a progression from wells RH-43 to RH-40 to RH-46 to RH-6 to RH-48. Well RH-43 lies directly north (approx. 350 feet) of RH-40 and RH-46 lies approximately 200 feet west of RH-43. Wells RH-6 and RH-48 lie 10 feet south and 150 feet southwest of RH-46. With groundwater flow to the northwest, as shown in Figure 3-19, the chemical progression along a single groundwater flow is not supported.

**RESPONSE:**

*The complexity of the individual groundwater flow paths in establishing their hydraulic connection on a sand by sand or sand to fracture basis is not possible because of the complex geologic setting at the site. Individual groundwater flow paths were not evaluated because there are not sufficient monitoring wells completed in each discrete flow path across the site to do this. The RI does describe the major groundwater flow paths resulting from the combination of many of the individual flow paths.*

**COMMENT:**

Field or specific conductivity measurements clearly show a distinction between the Shallow and Lower Alluvial Aquifers and significantly different than the Tertiary aquifer.

Specific conductance is a measure of the amount of dissolved and suspended solids in the system and can be used to determine the level of mixing between aquifers. Page 4-18, paragraph three indicates that the mean value for the Upper Alluvial aquifer is 516 $\mu$mho/cm and the underlying Lower Alluvial Aquifer has a mean of 220 $\mu$mho/cm. Correspondingly the Tertiary aquifer has a mean conductance of 768 $\mu$mho/cm. This does not support a conclusion for aquifer mixing but aquifer isolation.

**RESPONSE:**

*The mean specific conductance of the three parts of the aquifer system are probably related to the number of monitoring wells completed in each unit, extreme values (both low and high) in one or a few of the total samples, localized anthropogenic sources, and mixing between aquifers. The conductance values correspond more to major ions than even the high arsenic concentrations which are present in both low to very high specific conductance values. The relevance of specific conductance to mixing is tenuous at best, and may be misleading, without evaluating the concentrations of the major, minor, and trace ions contributing to the specific conductance values. Specific conductance is really a measure of the charged ion response and, unless the suspended solids have a charge, suspended solids do not register or contribute to a specific conductance value. This is one of the major difference between specific conductance and TDS.*

*About the only conclusions that can be drawn from the above three mean specific conductance measurements is that, given the samples representing each mean, the upper alluvial aquifer and Tertiary aquifer probably contain groundwater with higher TDS and which are probably of poorer water quality for domestic use than the lower alluvial aquifer.*

**COMMENT:**

Aquifer Disconnection or Separation & Lack of Evidence for Aquifer Connection
ARCO and the EPA agree that some connection between the alluvial aquifer and the undifferentiated Tertiary aquifer may exist. However, the Agencies' qualitative discussion strongly implies an intimate connection and that extensive contamination of the Tertiary aquifer is possible. This implication is not supported by the data. In fact, the data provides multiple lines of evidence which supports only a lack of connection as summarized below:

The lack of connection between the Tertiary and alluvial sediments is demonstrated by the observed difference in static water levels in each unit and the relative response of each unit during the MBMG pump test.

Average water levels measured in the Tertiary sediments are approximately 3 to 7 feet lower than water levels measured in the alluvial sediments. (Water levels in the Tertiary sediments range from elevation 5362 to 5363, or approximately 5362.5 at the center of the Rocker Site Water levels in the alluvial sediments range from approximately 5365 to 5370, or approximately 5367.5 at the center of the site). The water levels were measured between wells with vertical screen elevation differences of 30 to 40 feet, and vertical gradients are, accordingly on the order of 0.1 to 0.2. EPA implies that this high vertical gradient is evidence of strong connection between the alluvial and tertiary sediments, when in fact, the high vertical gradients are evidence of a lack of connection. If the Alluvial Aquifers were highly connected to the Tertiary Aquifer, then the water levels in the respective aquifers would equilibrate. A strong vertical gradient could not be maintained and there would be strong seasonal variation which is not the case. Because the groundwater flow between the aquifers is impeded by lower permeability material (re: aquitard clays observed in core), water levels cannot equilibrate.

**RESPONSE:**

*EPA does not imply that high vertical gradients is evidence of vertical communication. EPA does not agree with ARCO's contention that vertical gradients are proof-positive of a hydraulic disconnect. Given the characteristics of the hydrologic systems at the Rocker site--namely, a constant surface water source, intervening alluvial sediments and a permeable water yielding zone with a lower potentiometric head in the underlying Tertiary sediments--vertical gradients consistent with overall recharge and discharge patterns. ARCO is correct that the gradients reflect, the impedance of water through the system. EPA agrees that in a natural system vertical permeabilities are generally lower than horizontal permeabilities which produces vertical gradients. EPA also agrees vertical gradients are an indication that the system is dynamic as opposed to being under static conditions and that there is a constant flux of water moving vertically through the system. Insufficient data exists to examine the seasonal trends of water levels between the hydrogeologic systems at the site.*

**COMMENT:**

The lack of connection between the Tertiary sediments and the alluvial sediments is further demonstrated by results of the MBMG pump test. The rapid development of the cone of depression over a radius of thousands of feet and the low storativity indicated a confined aquifer. Furthermore, MBMG noted that calculations of leakance resulted in very low leakance values.

As noted in the RI, the response of wells screened in the Tertiary aquifer was similar, ranging from approximately 1/2 foot to over a foot, even in wells separated 200 feet vertically. However the response of wells screened in the alluvial aquifer only a few feet above the Tertiary was, at best, very subtle. Leakance is the amount of water coming from a confining layer. A low value indicates very little water is coming from the confining layer. This could be due to either a dry confining layer or low hydraulic conductivity.

**RESPONSE:**

*EPA agrees that the rapid, areally extensive drawdown response in most observation wells is an indication of confined conditions and low storativity which is consistent with thin, fractured, water bearing zone(s) in the Tertiary sediments as the post RI deep drilling by ARCO confirmed. The similar water level drawdowns in wells vertically and laterally separated however are not consistent with the aquifer being a single, thin, discrete horizon. The MBMG report concludes that based on the range of storativity values calculated, the Tertiary sediment aquifer ranges from confined to unconfined and was therefore considered as a highly stratified unconfined or leaky confined aquifer. Much is yet to be learned about the hydraulics of the Tertiary sediments in the Rocker area.*

*The leakance analysis provided in the MBMG report apparently consisted of analyzing the test data from an observation well(s) by using the analytical routine for a leaky aquifer in a commercial software program. This routine uses an automated curve matching technique. Examination of the one leaky aquifer curve in the MBMG report shows the program produced a marginal curve match. Determination of leakage coefficients requires a strong understanding of the physical characteristics of the hydrogeologic regime being tested. Because of the poor to non-existent well logs, this degree of data was not available to MBMG. Therefore, EPA does not view the computer generated leakage coefficient as reliable.*

**COMMENT:**

EPA cite the rate of change of upward gradients in monitoring well pair RH-13/14 and the rate of change of downward gradient in monitoring well pair RH-15/16, during the MBMG pump test as evidence of hydraulic connection between the tertiary and alluvial sediments. EPA notes that the changes occur just when pumping begins and ends. However, EPA does not note that the rise and lowering of stream stage in Silver Bow creek coincided with the pump test. Stream levels rose at the start of the pump test and started falling about the time the pump was shut down. The rise and fall in stream stage clearly resulted in a corresponding rise and fall of water level in the shallow alluvial wells. However, the stream stage changes apparently did not affect the water levels in the deep alluvial wells. This would result in the observed decrease in upward gradient at the RH-13/14 well pair and the observed increase in downward gradient at the RH-15/16 well pair. Thus, at least some, if not all of the changes in gradients observed in these alluvial well pairs during the pump test must be attributed to the affects of precipitation and stream stage change and the degree of response of the alluvial aquifer to pumping of the Town Pump well is much more ambiguous than EPA implies.

**RESPONSE:**

*Stream stage in Silver Bow Creek rose abruptly about 1 day into the test and fell slowly at a constant rate until about 2 days after the pump was shut off. Gradient changes, especially the apparent recovery of the deep alluvial wells at the end of pumping, does not appear related to stream stage changes. EPA has always stated that the alluvial aquifer response during the Town Pump aquifer test was subtle and insufficient if taken by itself to indicate communication. As stated in response previously, analysis of alluvial water levels during the Town Pump aquifer test were independently consistent and fit the body of evidence indicating vertical communication between the alluvial aquifer and the Tertiary sediments.*

**COMMENT:**

Arsenic concentration in RH-6 cited by the EPA as an example of migration into the Tertiary Aquifer and a clear indication of a high potential for contamination of the entire Tertiary zone. However:

- The well is close to a source trench and at same elevation as the arsenic in the alluvial aquifer to the east. The arsenic in RH-6 may be a result of contamination from this relatively close source, not an indication of arsenic migration several hundred feet from the central plant area.

- Flow in Tertiary still primarily horizontal based upon stratified stratigraphy, pump test results, etc. Therefore, arsenic in a shallow lens of the Tertiary zone is not likely to spread into deeper zones.

- Well is shallow, near the alluvial interface, and is in laterally discontinuous sand.

**RESPONSE:**

*EPA believes the arsenic in RH-6 is due to lateral migration from the Tertiary sediment/alluvium subcrop east/northeast of RH-6. If the arsenic at RH-6 was coming vertically from the overlying alluvium the other metals (zinc, copper etc) found in RH-5 should also be in RH-6. Either way, the arsenic in RH-6 indicates either lateral (EPA's view) or vertical (ARCO's view) communication between the alluvium and the Tertiary sediments.*

*The vertical and lateral discontinuity of individual strata and the high degree of vertical communication within the Tertiary sediments as evidenced by the drawdowns observed in the Town Pump aquifer test are considered evidence of potential migration from the upper Tertiary sediments into lower zones. The lateral extent of the highly permeable water bearing zone in RH-6 is not known. It can only be said that it was apparently not encountered in wells drilled to the south, north and northwest.*

**COMMENT:**

Arsenic Fate and Transport
Issue: Arsenic Migration Rate and Tertiary Sediment Contamination
The rate of groundwater exchange and any arsenic migration is slow and limited by the stratification and anisotropy of the Tertiary aquifer.

This is supported by the statement on page 4-8, last paragraph of Subsection 4.2.1 that "in a natural phenomena with a deep subsurface source, the arsenic concentration would increase with depth." Mean values in sediment range from 11 to 16 mg/kg at 36 to 60 feet illustrating this decrease.

**RESPONSE:**

*The referenced section is describing arsenic concentration trends by depth with regard to the source of arsenic, shallow, anthropogenic or deep natural sources. The RI concludes the available soil-arsenic data indicates the arsenic is coming from the surface. This section of the RI does not evaluate the groundwater exchange and attenuation of arsenic moving through the Tertiary sediment system. At face value however, the text referenced by ARCO does indicate that vertical arsenic migration has occurred.*

**COMMENT:**

Endangerment of Town Pump Well is Not Verified
EPA implies that the Town Pump well is endangered to arsenic contamination. However, in (later) (earlier) discussion it is stated that capture zone for Town Pump is open to east. Water entering the well likely comes from east of the Town Pump not south. Further this flow is supported in the regional conceptual model (Figure 3-15 shows E-W flow).

**RESPONSE:**

*On page 5-27, paragraph 2, EPA discusses potential endangerment of the Town Pump well and the Tertiary sediment aquifer(s). EPA acknowledges the effect of capture zones on contaminant migration. However, considering the limited knowledge of the Tertiary sediment hydrologic system, the indications of vertical communication between the alluvium and Tertiary sediments under ambient flow conditions, and the possibility of increased groundwater extraction from the Tertiary system, EPA's concern with the potential for degradation of the Tertiary aquifer(s) and the Town Pump well is justified.*

**COMMENT:**

Abundance of Iron and Manganese in Tertiary Material for Attenuation of Arsenic
EPA suggests that there is deep iron and manganese in the Tertiary sediments, therefore, if arsenic migrates there, little capacity exists to attenuate it geochemically. In fact, the first paragraph of section 3.5.1 Tertiary Sediments, states "Black mottling (probably manganese) and what appeared to be iron cemented concretions or nodules attest to the mineralized nature of the

Tertiary sediments." Manganese and iron are particularly evident in the Tertiary material at RH-6 and the down gradient well RH-48. Since RH-6 is the only known well in the Tertiary material showing arsenic in groundwater above background concentrations, the presence of iron and manganese in this area, and down gradient, suggests arsenic would be attenuated. EPA presumes incorrectly that the lack of iron and manganese in groundwater equates to low concentrations in sediment. The presence of iron and manganese in sediment would attenuate arsenic.

**RESPONSE:**

*EPA suggests that there is less iron and a different form of iron in the Tertiary sediments than in the alluvial sediments, and, therefore there is less attenuation capacity in the Tertiary sediments. Iron cemented concretions are localized sources of high iron oxides. Their number and association with either sands or fractures in the Tertiary sediments part of the aquifer is more important than their general occurrence. Their occurrence suggests that dissolved iron was present during digenesis of the sediments. They do not suggest nor can they "attest to the mineralized nature of the Tertiary sediments." This conclusion could only be verified by analyzing these concretions and comparing them with analyses of iron concretions from other environments. Iron concretions are present all over the world in both "mineralized" and nonmineralized areas. Furthermore, iron in concretions is generally aged iron oxyhydroxides (iron oxides) which have a much lower adsorptive capacity than fresh iron oxyhydroxides.*

*Black mottling may be either organics or manganese in the Tertiary sediments. Without an analysis, this distinction cannot be made. There is little arsenic adsorptive capacity presented by either organics or manganese over that of other materials in the aquifer sediments. Therefore, their occurrence is of minimal importance to the fate and transport of arsenic. Both are also ubiquitous in worldwide sediments and, therefore, neither "attest to the mineralized nature of the Tertiary sediments."*

*The presence of iron and manganese in the Tertiary sediments in the vicinity of RH-6 simply means that, like other high arsenic areas at the site, dissolved iron and, particularly manganese, occur with high arsenic and this area is probably hydraulically connected to the other areas. As this comment suggests, arsenic is being attenuated by the iron oxyhydroxides which have formed in this vicinity but this adsorption capacity is not sufficient to control the transport of arsenic in the Tertiary sediments beyond the RH-6 well location.*

**COMMENT:**

Arsenic Contouring is Not Supportable

Contouring of arsenic concentrations in Figure 4-37 in vicinity of the previous Framing Mill and Former Holding Pond appears to be incorrect. The orientation of the depicted groundwater plume is north-south, however groundwater flow is to the northwest to westerly direction. This modification by EPA is believed to support the hypothesis of a northerly oriented paleochannel, which is not supported by flow indicated by the mapping of the potentiometric surface. The implication of this interpretation is that there are two separate sources: (1) southeast of RH-32 and (2) southeast of RH-26.

Also, EPA's contouring of the arsenic distribution indicates a wider spread than the data suggests. The contours suggest arsenic migrating under (or through) Silver Bow Creek, when no groundwater or surface water data is available to support it.

**RESPONSE:**

*ARCO is technically correct, to honor the potentiometric surface data the arsenic contours in this area should be extended to the west. However, the arsenic concentration contours in this area are dashed, indicating insufficient data to accurately draw them in. The 100 ug/L contour was wrapped around the two elevated points which happen to be oriented north and south. There was no intent on EPA's part to relate the orientation of this contour line to the "paleo-channel". The paleo-channel as presented by ARCO in earlier interpretations exists primarily west of these wells.*

*Regarding ARCO's comment about separate arsenic sources, it is unclear what point is being made. EPA agrees that the elevated concentrations in these two wells suggests two separate sources; the former holding pond and somewhere south and east of RH-32 in an area where no RI data exists.*

*ARCO is over reacting to the extent and implications of dashed concentration contours that happen to extend under Silver Bow Creek. ARCO's comments again seem to confuse the total lack of data with "not supported by data". At the time the RI was prepared the only data to support the extent of arsenic contour lines extending from the south to north sides of Silver Bow Creek was at DP-5. More recent groundwater analyses from the shallow alluvium, deep alluvium, and tertiary sediments, which became available during the FS, revealed concentrations of arsenic less than 8 ug/l. These data suggest the arsenic plume does not extend under Silver Bow Creek. However, this does not change the conclusions of the FS or the selection of the remedy presented in this ROD.*

**COMMENT:**

Conceptual Model Concerns

Under its summary description of the site in Section 3.7.5, EPA states that the upper alluvial and lower Tertiary aquifers are in direct connection. There is no physical evidence to support a hydraulic connection between the upper Tertiary sediments (i.e., arsenic impacted RH-6) and the lower Tertiary aquifer. The impact of the upper Tertiary sediments is a result of the spatial relationship of the westward up sloping outcrop of the Tertiary and local spillage along the load-out trench. There is no hydraulic evidence to support some deep aquifer connection with the potable r d much deeper water supply. The conceptual model also does not address the strong attenuating characteristics of the sediment to retard arsenic migration.

**RESPONSE:**

*The evidence for and line of thought leading to EPA's conclusions on the hydraulic connection between hydrostratigraphic units has been presented logically in the RI and reiterated and elaborated on in responses to previous comments. The conceptual model discussion in section 3.7.5 presents only the physical setting, it was not intended to address arsenic fate and transport which is presented in Chapter 5 and summarized in Chapter 7.*

**COMMENT:**

Health Based Risk Assessment

Estimate of Reference or Baseline Arsenic Value

Page 5-8 under Section 5.3, Review of Arsenic Geochemistry, deduces "the probable arsenic background for groundwater at the Rocker Site is between 10 and 20 μg/L." The preceding sentence cited natural values to 39 μg/L. The Streamside RI reports several values over 50 μg/L for groundwater possibly associated with tailings. ARCO believes general literature values are not relevant in an area where there is natural mineralization and sources other than the Rocker plant contributing to arsenic concentrations.

**RESPONSE:**

*The intent of this discussion in this paragraph is to acknowledge that an area with mineralized soils would have higher background concentrations of arsenic in groundwater than in areas of nonmineralized soils. The different aquifer units in the area have distinctly differing arsenic concentrations, some influenced by mineralized materials, others directly from the wood treatment arsenicals and other not impacted whatsoever. The RI for the Rocker OU also did not deal directly with the issue of background arsenic concentrations prior to anthropomorphic influences. However, it should be pointed out that the last round of groundwater analyses taken from the shallow alluvium, deep alluvium, and the tertiary groundwater systems (north of Silver Bow Creek) had concentrations less than 8 ug/l arsenic. This indicates that the contamination of concern and associated cleanup levels are not related to background conditions.*

## COMMENT:

Baseline Risk Assessment (BRA)

Presented here is an overview of ARCO's numerous concerns on EPA's Risk Assessment. As opposed to all other risk assessments performed to date in the Clark Fork Basin, EPA chose not to significantly dialogue with ARCO on the Rocker BRA. It is apparent there was little dialogue between the author's and other EPA risk assessment contractors, based on the number of inconsistencies with other recent EPA risk assessments related to arsenic. Provided here is a list of some of those inconsistencies and other concerns, which will be detailed in ARCO's comments for the BRA.

- Available site concentration data was not utilized appropriately to represent realistic exposures.
- Default indoor arsenic was used as opposed to relevant regional-specific data available and used in Anaconda.
- Reduced bioavailability of arsenic in soils versus water in water, and reduced bioavailability due from arsenic in soils being partially from mine tailings was not considered.
- Residential scenario was overstated for a site located next to an active railroad.
- Worker protection and trespass scenarios used conservative assumptions inconsistent with other EPA risk assessments.
- Uncertainties of arsenic toxicities recognized by the EPA's Science Advisory Board was not recognized in the risk assessment.
- Risk assessment assumes groundwater consumption directly from the shallow aquifer will occur, not considering the limitation of exposure, the disconnection of shallow from deep aquifer, geochemical attenuation, and dilution factors.

## RESPONSE:

***Response to the summary comments above can be found in detail in EPA's response to ARCO's Comments on the Baseline Human Health Evaluation for the Rocker Timber Framing and Treating Plant, Operable Unit.***

SUMMARY OF ISSUES FOR DISCLAIMER
FINAL FEASIBILITY STUDY REPORT
ROCKER TIMBER TREATING OPERABLE UNIT

## COMMENT:

Summary of Issues of Concern

ARCO strongly disagrees with many of the interpretations and evaluations of remedial alternatives for the Rocker Timber Treating Operable Unit (OU) in the Public Comment Feasibility Study (PCFS) to which this disclaimer is attached. ARCO and the United States Environmental Protection Agency (EPA) have entered into an Administrative Order on Consent (AOC) to perform the Remedial Investigation (RI)/Feasibility Study (FS) for the Rocker OU. This means that ARCO has agreed to carry out investigation of the impacts of mining wastes within the Rocker OU and to evaluate remediation alternatives to clean up the Rocker OU in accordance with the process and schedule defined in the AOC. This work is performed with oversight, review and control maintained by the regulatory agencies.

## RESPONSE:

*No response necessary, except to note that wastes at the Rocker OU are both wood treating wastes and mine wastes.*

## COMMENT:

Under the AOC for the Rocker OU, ARCO has the responsibility to carry out . ı investigation or FS in which an appropriate range of remedial alternatives are evaluated for cleanup of the Rocker OU. The final product of the process is the FS Report. Although this document was originally prepared by ARCO, the EPA has final review authority and any modifications to the document that are requested by the EPA must be incorporated by ARCO before the document is submitted for public review. ARCO has fully complied with modifications demanded by the EPA. However, although the PCFS is published under ARCO's name, ARCO strongly disagrees with some of the interpretations and evaluations of remedial alternatives that are discussed in the report as revised by the EPA for distribution to the public.

*No Response Necessary*

## COMMENT:

Because the document is published by ARCO but does not, in some instances, contain ARCO's technical interpretations and evaluations because of modifications mandated by the EPA, the AOC gives ARCO the right to attach a disclaimer to the PCFS which presents significant issues contained in the PCFS with which ARCO disagrees. This disclaimer is the primary record identifying the portions of the PCFS which were revised as required by the EPA but with which ARCO disagrees.

## RESPONSE:

*No response necessary. EPA has provided a detailed response to the RI Disclaimer separately.*

## COMMENT:

Site characterization information in Chapters 1 to 3 of the FS was taken from the Rocker OU Remedial Investigation (RI) prepared by the EPA and its consultants. ARCO prepared a RI disclaimer (Attachment A, RI) which described in detail ARCO's disagreement with the Agency interpretation. ARCO hereby incorporates by reference its RI Disclaimer to the extent that RI issues are raised in the FS. Since the RI interpretation is repeated in the first few chapters of the FS, a summary of issues from the previous ARCO disclaimer are discussed below.

*No Response Necessary*

## COMMENT:

Arsenic in Groundwater Presents no Real Risk

Arsenic does exist in a shallow alluvial zone proximal to the previous wood treating facility and extends for a distance of a couple hundred feet this shallow, limited impacted aquifer does not present a real risk to human health or the environment, presently or in the future. The primary basis for this conclusion is summarized here. This shallow aquifer is inadequate as a water supply due to low conductivities (i.e. inability to pump adequate volumes) and water quality concerns unrelated to the Rocker plant or mining (i.e., nitrates from septic tanks, high dissolved solids and salts).

**RESPONSE:**

*The parameters described in this comment were generally not studied during the RI, the conductivities are adequate to supply individual households, and the State of Montana considers the shallow alluvial groundwater to be a potential source of drinking water. EPA also believes that the extremely high concentrations of arsenic in this aquifer and the obvious hydraulic connections demonstrated to other aquifer units poses a threat of arsenic migration from this aquifer unit to the other aquifer units, particularly in conjunction with current and future groundwater development in the area. In this way, EPA believes there is a clear risk to human health.*

**COMMENT:**

The most significant item of concern with EPA's RI/FS is the implied connection between the shallow, arsenic impacted alluvium and the older and deeper sediments of the Tertiary aquifer. Both the chemical and hydrologic information available from the field investigation demonstrate a very limited connection, if any, between the two aquifers. There was no demonstrated response to shallower wells when the deeper, Town Pump well was tested by the Bureau of Mines. After seven days of stressing the deeper aquifer system the shallower groundwater wells impacted by arsenic contamination did not respond. The water chemistry likewise showed two very distinct types of water, thus indicating that there is little connection, if any, between the shallow and tertiary aquifers.

**RESPONSE:**

*See EPA's response to the comments in ARCO's RI disclaimer regarding the evidence for hydraulic communication between the alluvial and Tertiary sediment groundwater systems.*

**COMMENT:**

The second major issue is that EPA understates the fact that the arsenic has moved only several hundred feet laterally and 20 to 30 feet vertically in a period of 40 to 80 years since the plant was operated. Also, arsenic movement in the system could have occurred for the most part during operation of the plant some 40 to 80 years ago, and possibly has moved little since that time. This is important to show that the natural geochemical mechanisms already in place are effectively immobilizing the arsenic. Alluvial materials along Silver Bow Creek contain abundant iron that literally traps the arsenic by adsorption in the shallow alluvium. This is similar to additives used in conventional water treatment plants.

**RESPONSE:**

*There needs to be a separation between descriptions of historic arsenic concentrations and movement over time, and the current amount of arsenic in either the sediments or the groundwater. Historical movement of groundwater was assumed to be about the same as what is measured and described by the current RI. This movement, individual groundwater flow paths, and hydraulic connections are complex (anisotropic and inhomogeneous) but the physical characteristics have probably changed little in the last few years. The amount of arsenic still in the alluvium and the groundwater is the result of groundwater movement during and since the termination of wood treatment at the site. The mobility of the arsenic is a major concern to EPA that has been addressed through a complex investigation and interpretation of the data. The data set has limitations, that make the interpretation more difficult, such as: a decreasing frequency of alluvium sampling with depth, the random sampling of shallow alluvium sampling, lack of seasonal sampling, and, probably the most important, the analytical schedule and variability in arsenic and other constituents in the two groundwater sampling rounds. Additional data in these areas would more clearly document the processes described in the current RI but would not significantly change the conclusions carried into the FS. The FS appropriately interpreted the data in a manner that lead to the technology selected for the proposed* *plan and the ROD. The ROD accounted for the identified data limitations by providing for limited data collection during the remedial design phase of the project to focus the remedy on only those areas that exceed EPA's criteria: for waste removal (surface soil contamination exceeding arsenic concentrations of 1,000 ug/g), soil cover (arsenic concentrations greater than 380 ug/g) or alluvium source area removal.*

*Adsorption by iron oxyhydroxide on the saturated alluvium is one of the major "natural geochemical attenuation mechanisms" that removes and irreversibly immobilizes a finite amount of arsenic (assuming that pH remains neutral and oxidation reduction potential remains oxidizing). The alluvial sediments probably have sufficient iron oxyhydroxide to adsorb a part, maybe a major part, of the dissolved arsenic but not enough to adsorb the milligram per liter concentrations of arsenic currently in the groundwater of the plume. The amount of iron oxyhydroxide in the tertiary alluvium (volcanic origin) is probably both highly variable and less than what is on the shallow and deep alluvial sediments. Groundwater in the tertiary alluvium may also be largely flowing along fractures which would not present the same surface area that porous media provide in shallow alluvial sediments. These data suggest that the tertiary alluvium does not have sufficient iron oxyhydroxides exposed to the groundwater to control arsenic even as much as the alluvial sediments.*

*Analyses of the alluvium from the groundwater show that a large amount of arsenic (V) is present, probably resulting from adsorption to iron oxyhydroxide. This form of arsenic will probably remain largely immobile unless the pH becomes acidic or the oxidation reduction potential becomes reducing, which is not expected under ambient environmental conditions. EPA examined the potential for attenuated arsenic to remobilize and found that there are limited deposits of sulfide materials in or near the Rocker OU that have the potential to produce limited acidic conditions resulting from oxidation of sulfide materials associated with the railroad or tailings in the near stream environment. The remedy for the Streamside Tailings OU will remove sulfide tailings from the water table in areas close to the Rocker remedy. There are no circumstances known to be present within the Rocker OU that will pose a significant threat to the remedy selected in the ROD. (see also responses that follow).*

*The arsenic plume in the groundwater of the alluvial materials is sufficient evidence that arsenic is mobile at the site but there is more data supporting arsenic mobility in the groundwater at the site. Groundwater data indicate that there is about equal proportion of arsenic (III) and (V) in the wood treatment area and higher arsenic (III) in the downgradient periphery of the arsenic plume. These data support the conclusion that arsenic is being adsorbed but, more importantly, also indicate that arsenic is mobile because arsenic (III) is poorly adsorbed except by aluminum oxyhydroxides at an alkaline pH (pH > 8). Therefore, these data suggest that there is a reservoir of mobile arsenic within the wood treatment area and that the more mobile arsenic species indicates that the arsenic is still mobile in the downgradient part of the plume. Furthermore, it is difficult to believe arsenic is immobile when the arsenic concentrations of the two sampling rounds are compared because the arsenic concentrations (and concentrations of many other parameters) are considerably different. These differences indicate a relatively mobile groundwater system that includes arsenic as one of the parameters being mobilized at the site.*

*Finally, there is little data developed to date that indicate that the arsenic has "moved little since" the "operation of the plant some 40 to 80 years ago". The arsenic on the sediments and in the groundwater at the site today is probably a remnant of a much larger arsenic source generated by the wood treatment facility when it was operating. The high arsenic concentrations found in the RI reflect this past high source and the complex hydraulic conditions at the site.*

**COMMENT:**

Generally, EPA's presentation of the physical characteristics of the site ignores its historical, current, and future land use as a railroad siding on the 100-yr flood plain. EPA's assumption that there would be future residential development on the site is not realistic given the area is predominantly in a flood plain and is adjacent to an active rail line. Also, previous removal and soil cover actions are presented as being ineffectual without very competent evidence to support such claims.

**RESPONSE:**

*See responses to prior RI comments. Basically, the Rocker OU is not in the 100-year floodplain, and EPA's remedy requires institutional controls to prevent residential development and cleanup of soils to occupational/trespasser scenario levels.*

**COMMENT:**

Hydrologically, all evidence points toward an effective disconnect between shallow alluvial aquifer where arsenic is found locally and in the Tertiary aquifer, the source of the Town Pump water supply and other local well water. EPA ignores the very limited extent of arsenic in the underlying Tertiary aquifer. This disconnection is supported by the following:

1. Pump test results indicate that the tertiary aquifer behaves as a confined system;
2. Shallow alluvial wells did not drawdown during the test;
3. A pressure head differential exists between the two systems; and
4. A deep alluvial well deep not show any significant drawdown.

**RESPONSE:**

*EPA has addressed each of these points in detail in the response to ARCO's RI disclaimer. The body of evidence, supported by actual RI data indicates hydraulic communication between the alluvium and Tertiary sediments under ambient hydraulic conditions and under the minimal hydraulic stresses imposed during the Town Pump test. The evidence for communication is sufficient to warrant concerns over migration of site contaminants into the regional water supply given time and additional hydraulic gradients imposed by future groundwater development of the Tertiary aquifer.*

**COMMENT:**

One anomalous Tertiary shallow well (RH-6) near the railroad load-out trench has elevated arsenic likely associated with nearby arsenic spillage, not aquifer migration. There is no evidence that this monitoring well is hydraulically connected to deeper aquifer zones due to poor conductivities in the Shallow Tertiary Zone. The hydraulic conductivities of the alluvial aquifer are an order of magnitude less than the deep Tertiary aquifer, and preferential flow direction will be horizontal versus vertical. This means, even if the two aquifers were connected, migration into the deeper zone would be very low.

**RESPONSE:**

*It is more difficult to reconcile the arsenic concentration in groundwater from monitoring well RH-6 as coming from "arsenic spillage" than as simply part of the arsenic resulting from the wood treating facilities. The fact that the arsenic is present in these concentrations in groundwater from this well is evidence of hydraulic connection between this monitoring well and groundwater from other wells of comparable depth. This only requires horizontal, downgradient movement of the groundwater plume not vertical movement. However, potential fractures in the Tertiary sediments may hydraulically connect the plume to deeper sediments, albeit currently relatively low probably because of both relative head elevations in the different parts of the aquifers and possibly limited permeability. The argument by ARCO that downward migration of arsenic has occurred from the shallow alluvium into the tertiary sediments is also in opposition with their other arguments that the shallow alluvium and the tertiary sediments aquifers are not in communication.*

**COMMENT:**
The RI presentation of aquifer geochemistry has been incorrectly represented that water chemistry should directly correlate with saturated sediment chemistry. The mobilization and/or fixation of contaminants such as arsenic are largely controlled by the groundwater oxidation or reduction state in addition to the presence of iron or manganese in the system. The use of nonvalidated temperature data and suspect cation/anion ratios for rationalizing mixing of the upper alluvial Aquifer and the deeper Tertiary aquifer is not technically supportable and is inconsistent with several other stronger lines of evidence such as distinct differences in major cations in the various depths of the aquifers.

**RESPONSE:**
*The comparison between the water chemistry and the sediment chemistry was discussed to determine if acidic conditions at the site was a major contributor of arsenic and other metals to the groundwater. When sulfuric acid attacks the sediments, and there is little to no mobilization of the dissolved parameters, the dissolved concentrations of parameters in the groundwater generally approximate their respective abundance in the sediments. It is true that with transport away from the areas of sulfuric acid attack into peripheral areas with different pH and oxidation reduction potential (ORP, redox, Eh, etc.) then other processes (primarily adsorption) will individually alter the relative concentrations of each parameter in the groundwater. Changes in each parameter's concentration generally reflect the processes occurring in the groundwater system. Unfortunately, aluminum and silica are missing from the analytical data base and this indirect method of trying to determine the relative significance of acidic conditions had to be applied at the site.*

*The comment on "nonvalidated temperature data and suspect cation/anion ratios for rationalizing mixing of the upper alluvial Aquifer and deeper Tertiary aquifer is technically insupportable" is not sufficiently clear to give a direct answer. However, all of the temperature data used in making interpretations and descriptions in the text are temperatures measured in the field by the ARCO engineering firm professionals during the two sampling rounds. EPA assumed that ARCO's professionals properly collected the data because there is no report or other written statement indicating otherwise. If this is not the case, EPA should have been notified of this and any other incorrectly collected or analyzed data generated by ARCO. Without knowing what is "suspect" about the cation/anion ratios, EPA cannot respond to the "technical insupportability" part of this comment concerning the ratios. However, as stated above, if EPA has been given incorrect data without a description of the inadequacy then ARCO should have notified the Agency. The use of the cation/anion ratios was prompted again by the available data that was believed to be valid and relevant.*

**COMMENT:**
The arsenic fate and transport discussion presented in the RI/FS does not address the migration limiting impacts of naturally occurring attenuation of the arsenic through iron fixation. processes have been effective in minimizing the migration of the shallow groundwater plume. The streamside tailings and natural soils distributed throughout the floodplain are also a source of arsenic that may be misinterpreted as originating from the Rocker site. Understanding the role of the tailings will be important when determining the actual spread of (or lack of) arsenic from the Rocker plant.

**RESPONSE:**
*The "positive effect of naturally occurring attenuation of the arsenic through iron" adsorption was assumed to be operating at the site because the process is ubiquitous under near neutral pH and oxidizing groundwater conditions. However, the adsorbed phase is only immobile under these groundwater conditions. In addition to this currently immobilized amount of arsenic there is a high concentration of dissolved arsenic forming a mobile phase plume in the groundwater that is of concern for the RI. If the site conditions remain stable then the adsorbed phase may remain immobilized but if the pH becomes more acidic or the groundwater becomes more reducing this*

*adsorbed phase can released and, probably significantly increase the dissolved arsenic in the groundwater. Assuming relatively stable conditions, the fate and transport text deals primarily with the mobile groundwater phase and assumed near equilibrium adsorption conditions on the sediments. Obviously, if adsorption was totally effective in immobilizing all the available arsenic from the wood treating site there would be little to no dissolved arsenic in the groundwater.*

*The streamside tailings are known to be a source of arsenic but are not believed to be misinterpreted as arsenic originating at the site in the RI unless specifically mentioned in the text. The understanding of the role of the tailings is important (see the above responses on creating acidic groundwater conditions at the site). It is EPA's understanding that the streamside tailings will be dealt with as part of remedial action of the streamside tailings and that the streamside tailings component will no longer contribute arsenic, metals, acidic groundwater, or change the Eh of infiltrating groundwater after their remediation. The site-related arsenic concentrations are believed to be appropriately addressed in the RI.*

**COMMENT:**
The Baseline Risk Assessment was developed using numerous overly conservative assumptions and erroneous summaries of available data. Several critical factors and analyses in the risk assessment are inconsistent with other risk assessments related to arsenic performed by EPA in Montana. Regarding risk from groundwater, EPA assumes the public would be drinking directly from the shallow aquifer. They do not recognize the limitations of the exposure scenario regarding lack of shallow aquifer usage and the disconnection with the deeper drinking water supply. To support conclusions regarding residential risk scenarios, a complete connection of the shallow and deep aquifers was advanced by these authors. However, the lack of supporting information of an aquifer connection combined with the unlikelihood of a residential development scenario at the site makes assertions of any real risk improbably high.

**RESPONSE:**
*This same comment was responded to earlier in the response to ARCO's RI disclaimer and in EPA's response to ARCO comments on the Baseline Risk Assessment.*

**COMMENT:**
Also, exposure to and the bioavailability of arsenic were seriously overestimated. For example, arsenic distribution in the sites' surface soils was incorrectly characterized to assume all came from the Rocker Plant, where in fact, much could be attributed to less bioavailable railroad bed tailings and natural soils. Risk levels estimated for arsenic by EPA (3-300 mg/kg) are two orders of magnitude above risk levels found by the EPA at Old Works OU.

**RESPONSE:**
*The RI conducted by ARCO was not designed to distinguish between sources of arsenic (either mineral related arsenic from concentrates, ores and tailings materials versus the arsenic trioxide powders used for wood treating). EPA believes most of the arsenic at the Rocker OU is from the wood treating operation. EPA used the appropriate bioavailability factor that corresponds to wood treating forms of arsenic (such as the arsenic trioxide used on the site). For the Streamside Tailings OU, 80% bioavailability was used for sulfide forms of arsenic minerals. Even if this lower bioavailability level were applied to materials that might be sulfide minerals such as the railroad bed, the action level would be still less than 400 mg/kg arsenic, compared to the selected cleanup level of 380 mg/kg. This difference is small considering that all of the site was used for handling of oxide forms of arsenic and that for most arsenic contamination on the site the higher bioavailability is correct. However, EPA is not advocating a remedy that is over designed. If during the remedial design phase of this project ARCO would provide the appropriate bioavailability information that would allow EPA to make a bioavailability determination, EPA would consider this information with respect to the final implementation of the remedy. Reduced bioavailability assumption at the Old Works/East Anaconda*

*Development OU reflect site specific bioavailability studies relating to mine waste resent at that site and do not apply here to a very different kind of waste.*

**COMMENT:**

The narrative in Section 2.2 (page 2-1) depicts the previous wood treatment area on the NE portion of the OU as lying outside the 100-yr floodplain. The source for these boundaries was derived from its oversight contractor CH2M HILL in 1988. The Flood Boundary and Floodway Map developed under the National Flood Insurance Program in September 1979 clearly shows this entire area north of the railroad tracks to be in the 100 yr flood plain. Considering the floodplain status, its proximity adjacent to active rail lines, relatively small size, likely future land ownership (active railroad, ARCO), and no road access to the site, this area has poor development potential.

**RESPONSE:**

*This comment was answered previously in EPA's response to ARCO's RI disclaimer comments.*

**COMMENT:**

Synopsis of Remedial Investigation and Health Risk Assessment

Several RI and risk assessment items discussed in the summary at the beginning of this disclaimer were discussed in detail in the ARCO RI Disclaimer (Attachment A, RI). Since RI and risk assessment information are summarized in this FS chapter, specific responses to these issues are not discussed in detail. Please refer to the ARCO RI Disclaimer, which is incorporated by reference into this document, for a more specific response to interpretation of the RI and risk assessment. ARCO's basis is presented in the attached risk assessment comments. The issues listed below are in addition to issues discussed in the previous RI disclaimer.

**RESPONSE:**

*No response necessary -- see EPA's response to RI disclaimer and to ARCO's Health Risk Assessment comments.*

**COMMENT:**

Reduced Geochemical Conditions--Section 3.1.6.1/Section 3.1.6.2/Section 3.1.7/Section 3.18

In these sections PAHs are stated to cause the mobility of arsenic creating a reducing (oxygen deprived) condition. ARCO believes EPA's position ignores site specific conditions that limit the availability of necessary biological activity. For PAHs to create a mobilizing condition, microbes would need to digest PAHs which would consume oxygen, thus creating a reduced environment. However, the probability of biological activity capable of digesting PAHs within this environment is very low, especially given the presence of arsenic, which would impede the digestion of PAHs. Even if reducing conditions existed, iron as well as arsenic would be reduced. Mobilization would be limited because iron would precipitate out with arsenic as solution reached oxidized areas. Therefore the mobility of arsenic would be severely limited.

**RESPONSE:**

*This is a mixture of many different aspects of what determines reducing conditions and mobility of iron and arsenic. There are several abiotic sinks for dissolved oxygen in the alluvial sediments. There is a considerable amount of organic material, including wood, in addition to the PAHs in the alluvial sediments (drilling log descriptions) that are actively undergoing oxidation probably both by abiotic and biotic reactions. Sulfides occur in the surficial material and with depth in the alluvial sediments. The clay color suggests that several of them are also reduced and will be undergoing oxidation. Finally, there are the dissolved metals and arsenic which are undergoing oxidation. All of these processes are occurring abiotically and to some degree or another probably also biotically. Bacterial processes more efficient reducing agents but not a requirement for establishing a reduced environment. The point that was being made in the text is that the PAHs probably traveled along the same groundwater flow path as the arsenic and physicochemical attenuation of one may inversely influence physicochemical stability of the other. Given all of the parameters that can reduce the dissolved oxygen in the alluvial aquifer, the PAHs add to the list of reducing agents potentially capable of retaining the reduced arsenic III species used in the wood treatment process. The reduced* *state of the arsenic then allows the arsenic to be potentially less oxidizable and more mobile than if PAHs were absent.*

*Iron would likewise be more mobile where the groundwater and sediments are reduced. This is very important because if iron is dissolved it does not precipitate as the iron oxyhydroxide to form an adsorption media for arsenic. When both are transported by groundwater to more oxidizing environments, iron will precipitate first and form an adsorption media for arsenic depending on the amount of dissolved iron, the degree of oxidation encountered in the downgradient part of the system, and the arsenic speciation. Arsenic is slow to oxidize and arsenic III is poorly adsorbed by iron oxyhydroxide so it will be transported farther along groundwater flowpaths than iron. Therefore, the mobility of arsenic would not be as "severely limited" as one would suspect. The arsenic plume is an example of the above, if arsenic adsorption by iron oxyhydroxide was totally efficient and the groundwater were sufficiently oxidized, there would be little dissolved arsenic to form a plume.*

*For these reasons, the remedy is justified when considering source removal which includes not only the high arsenic contaminated materials, but also the materials that may influence a reducing condition at this OU.*

**COMMENT:**

Identification and Screening of Alternatives
Remedial Action Objectives–Groundwater/Soils–Section
Federal and State ARARs for groundwater are stated as 50 ug/L and 18 ug/L respectively. These ARARs cannot be met at the site regardless of the alternative chosen. The Agencies' and their consultants stated that groundwater ARARs would not be met at this site, but that protection of human health and the environment was achievable. ARCO is submitting a Technical Impracticability memorandum requesting a waiver from ARARs for the Rocker site, which will provide additional support for this position.

**RESPONSE:**

*The Agencies did not indicate that ARARs cannot be met at the Rocker OU. There has been recognition in the FS that clean up of the shallow alluvial groundwater system will be difficult. However, with removal of the source materials that continue to contribute to the groundwater contamination, water quality will improve over time. The question is how much time it will take for water quality to improve in the shallow alluvium to the level that it will meet the State standard of 18 ug/l arsenic. This question will be reevaluated following the implementation of the remedy and a considerable period of monitoring. In addition, the primary and secondary objectives of the remedial action is to prevent further degradation of the quality of the deep alluvial and tertiary sediments aquifers. This objective will be met in the short term.*

*In responding to ARCO's Technical Impracticability memorandum, EPA has concluded that this issue cannot be concluded until the remedy is implemented and documentation is provided that ARARs cannot be met within a reasonable time frame, as is suggested by EPA guidance.*

**COMMENT:**

Risk based soil concentrations for soils are given as 380 to 3.3 mg/kg for arsenic corresponding to a 3.3 in 10,000 to a 3.3 in 1,000,000 excess cancer risks respectively. This range is technically impracticable, as well as inconsistent with values from other Clark Fork Superfund sites (i.e., Old Works Operable Unit Risk Assessment). Also, this arsenic soil range is typical of highly mineralized sediments in the local Butte area. Removal of soils at the 3.3 mg/kg would basically encompass most of the native soils in Butte-Silver Bow County. Even soils at the 380 mg/kg would encompass an area outside of the Rocker site boundaries.

**RESPONSE:**

*The range of risk is predicated on the bioavailability of arsenic which is assumed to be 100% as described in EPA's Baseline Human Health Risk Assessment and EPA's response to ARCO's comments on the Baseline Human Health Risk Assessment. An action level of 380 mg/kg has been chosen for the remedy corresponding to an excess cancer risk of one individual in 10,000. EPA concludes that cover soils are available nearby to meet these requirements. The cover soil brought to the site from the gun club are for the removal action were less than 30 mg/kg arsenic.*

**COMMENT:**

Initial Screening of Remedial Technologies and Process Options—Section 4.5
In-situ treatment of vadose and groundwater using iron flooding was eliminated from consideration for detailed alternatives. EPA assumes that an in-situ remedy cannot be used for source control which is inconsistent with Agency resources (USEPA 1995, NRC 1994) preferences for treatment. In-situ remediation poses the least short-term risk for an active remedial scenario by not requiring worker risks to excavation operations and community risks from the off site removal operations. It also is the only remedial technology which has the potential to enhance and accelerate the ongoing natural attenuation which presently has limited arsenic migration. Conversely, physical and chemical disturbances of the arsenic in the soil by removal actions could likely exacerbate and increase arsenic mobility. In addition, in-situ iron flood remediation is an innovative technology which shows promise based on batch testing performed by Montana Tech (Chatham, 1995) and similar studies throughout the country (Groundwater Technology, 1995). A more complete treatability study would be appropriate before final remedies are selected. This would be best achieved under EPA's time schedule by building a contingency for in-situ iron treatment in the ROD.

**RESPONSE:**

*Section 4.5 of the feasibility study evaluated Process Options on the basis of technical applicability to site conditions. Appendix C, Table C-1 provided the more detailed screening analysis. The results of the screening were summarized in Table 4-1. In-situ treatment using adsorption (iron fixation) was retained for further evaluation in Section 4. Alternative S-9, described on page 4-39 of the feasibility study, includes the iron flooding technology applied to the source area (unsaturated soil and groundwater within the 10,000 ug/L arsenic in groundwater isopleth). Similarly, Alternative P-4 utilizes in-situ treatment (iron flooding) to treat groundwater in the plume area.*

*Alternative S-9 was eliminated prior to detailed analysis because of questionable effectiveness based on site conditions. The buried trench materials in the source area would make the proper application of an iron flooding technique problematic. This determination is in no way inconsistent with the National Contingency Plan (NCP) preference for treatment alternatives. Indeed treatment alternatives for the vadose soil and the groundwater were retained and evaluated in detail in Section 5. Not recognizing the unique features of the site would be inconsistent with EPA guidance on conducting feasibility studies.*

*The commentor is incorrect in stating: "It [iron flooding] is the only remedial technology which has the potential to enhance and accelerate the ongoing natural attenuation which has limited arsenic migration." On the contrary, there are ex-situ techniques for soil stabilization that will enhance and accelerate the ongoing natural attenuation that were evaluated in the feasibility study. EPA agrees that excavation of the source area will increase short-term risks to workers and potentially mobilize some arsenic, but both of these issues are manageable using proper worker protection and addition of iron salts into the excavation. Management of short-term risks is feasible enough to allow realization of reduced long-term risks through source excavation. The remedy as selected meets the Agency's preference for treatment and the use of iron as a soil and groundwater amendment is considered innovative.*

**COMMENT:**

Source Area—Section 4.6.1

Analysis of the "source" in this section, defined the base case to be the 10,000 ug/L contour line. This arsenic contour line is arbitrary and subjective and not supported by the available data. A sensitivity analysis performed by ARCO at the request of the EPA yielded a defined source based on a modified 20,000 ug/L contour which correlates well with the location of previous operation areas, including the trench area north of the carpenter shop. In the ARCO sensitivity analysis, depth and an arsenic groundwater concentration contour were selected after considering worker exposures (short-term risks), technical difficulty in removing saturated material, efficiency of arsenic removal, and economics associated with removal.

**RESPONSE:**

*Development of any of the isocontours is somewhat subjective because of changing site conditions with time. It is incorrect however to say that one isopleth is less arbitrary than another simply because the area is smaller and more well defined. All isocontours were based on the same database. EPA believes the 10,000 ug/l figure provides a strong indication of the location of arsenic "source materials."*

*The purpose of the differing contours was to compare the costs of remedial alternatives as the area comprising the "source" changed. This analysis is presented in Section 5.5 of the feasibility study. As described in the ROD, the implementation of the remedy in the source area will not strictly adhere to the 10,000 ug/L area. During source removal the source area soils will be excavated and disposed based on further remedial design work, as described in the ROD. Using a 10,000 ug/l isocontour line in the feasibility study was simply a method for getting consistent cost estimates from one alternative to another, and a reasonable attempt to define a protective "source materials" area which would cause continued groundwater contamination.*

**COMMENT:**

Development of Remedial Action Alternatives—Section 4.8

Each of the excavation alternatives identified by EPA in its rewrite of the FS require transport of contaminated soil to a RCRA Subtitle C TSD facility. EPA's position is based on its belief that soils contain the listed wastes F034 and F035. Based on this position, EPA has identified certain RCRA Subtitle C requirements as ARARs for the Rocker OU. EPA's current position on this matter is inconsistent with its earlier position that a RCRA Subtitle D facility would be suitable for contaminated soils that passed a TCLP test and stabilized soils that initially failed a TCLP test. ARCO believes that EPA should reconsider this position for several reasons. First, several potential sources of arsenic, in addition to wood treating solution residuals, have been identified at the Rocker site, e.g., tailings, railroad related materials, and arsenic trioxide powder "cold treater dust" used as a constituent of wood treating solution. These sources are outside the scope of F035. EPA has not provided any basis for determining which site soils contain F035 and which do not. Certainly, the presence of arsenic in soil is insufficient for this determination. ARCO believes that EPA should not assume that all Rocker site soils contain F035 given these other potential arsenic sources and further believes that any agency action based on this erroneous assumption would be arbitrary and capricious.

Second, the "contained in" policy is not a codified requirement and has been explicitly recognized by EPA and the courts as an interpretive statement closely related to the "mixture" rule specified in 40 C.F. R. 261.3(a)(2)(iii). See, e.g., "Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris" Final Rule, 57 Fed. Reg. 37194, 37225 where EPA recognized that the "contained in" principle has "served as an interpretive gloss on the existing mixture and derived from rules." ARCO believes that, given EPA's failure to promulgate a mixture rule by October 1, 1994 as required by the Chaffee Amendment, EPA's ability to invoke the "contained in" principle as a basis for requiring Subtitle C management of Rocker site soils is suspect and should not form a basis for EPA's remedial action decision at the Rocker site. ARCO believes that EPA cannot rely upon an uncodified principle, which, in EPA's own words, is merely an "interpretive gloss" on an invalid rule.

Third, ARCO believes that EPA's position will not provide any additional protection of human health or the environment because there are no currently promulgated treatment standards for F034 or F035 wastes.

**RESPONSE:**

*Initially, EPA has consistently identified RCRA ARARs as applicable to site contamination throughout the RI/FS process. Nevertheless, EPA has reconsidered the need for a RCRA Subtitle C repository for the Rocker OU. The rationale for heating the waste as solid waste rather than hazardous waste, and thereby disposing of Rocker wastes on site, is contained in responses to ARCO's comments on the Proposed Plan.*

**COMMENT:**

On-site Repository

Siting of an on-site repository should be considered for a location on or adjacent to the Rocker OU to minimize short-term risk to exposure from transport of materials on public roads and through Rocker. Soils not passing a TCLP test would be stabilized and placed, within this repository. Soils passing the TCLP test would be considered hazardous and replaced on site. This would eliminate short-term exposures from loading to haul trucks or rail cars which expose the community and environment to contaminated soils. This repository may need to be located in the 100 year flood plain but would be designed and constructed to withstand flood events in accordance with 40 CFR Part 257 requirements.

**RESPONSE:**

*See prior response and responses to ARCO's comments regarding the Proposed Plan for the Rocker OU. The waste will be treated to meet TCLP requirements and disposed of on site, outside of the 100-year floodplain in accordance with applicable requirem its.*

**COMMENT:**

ARCO had proposed a "contingent" water supply to be activated should the tertiary aquifer be threatened. Currently the tertiary water supply is not threatened or contaminated and monitoring will provide adequate safety for triggering design of a new alternate water supply system.

In other words, a new water supply system would be installed once monitoring of the tertiary aquifer indicated a potential migration of arsenic from the shallow alluvial aquifer. This water supply system would upgrade the current connection to the Butte Water System to enable all current and foreseeable future community water needs without relying on the uncertain productivity of the local groundwater system. In addition, an alternative water supply is shown for all alternatives except the No Action alternative. The seven alternatives are listed with respect to the rigor of treatment. This compounding effect provides no additional risk reduction but does add redundancy. For instance, Alternative 5 has plume remediation with iron sulfate in addition to an alternative water supply.

**RESPONSE:**

*EPA has concluded that the alternate water supply is a vital part of any remedy and is essential to achieve the objectives of preventing continued contamination of two valuable groundwater resources (deep alluvium and the tertiary alluvium aquifers). ARCO's comment is responded to in more detail in the section dealing with ARCO's comments on the Proposed Plan.*

**COMMENT:**

Institutional Controls

ARCO made a substantial effort to define detailed institutional controls (ICs) that were realistic for each alternative. ICs play a very important role in alternative development by supporting the technical aspects of the alternative, and cannot be assumed to be the same for each alternative. Specific ICs relating to the Rocker OU are attached.

**RESPONSE:**

*EPA has utilized ARCO's IC work to describe the general ICs necessary for the selected remedy. More specific ICs will be identified during remedial design and implemented in the remedial action.*

**COMMENT:**

**Hot Spots.** Hot Spots are defined by EPA as areas posing unacceptable risk due to direct contact with surface soils containing arsenic. ARCO does not agree with EPA's broad and unsupported characterization of hot spots. ARCO's basis is presented in the attached risk assessment comments.

Figure 1 represents the short-term relative effectiveness for surface soils or "Hot Spots" alternatives (HS-2). All alternatives, except for the No Action alternative, will provide soil cover for hot spot areas, basically providing the same measure of risk protection. Since short-term relative effectiveness is increased by exposure of workers to heavy construction equipment and contaminated materials, the risk is greater than the risk associated with the no action alternative. Conversely, the long-term risk associated with hot spots shown in Figure 2 is less than the long-term risk associated with the no action alternative.

**RESPONSE:**

*Specific responses to concerns regarding the risk assessment are included after each of ARCO's Baseline Human Health Risk Assessment comments. However, in the comment, there are no conclusions reached as to how one compares the short-term increases with the benefits of the long-term risks being reduced by the implementation of the action alternative. EPA believes the short-term risks during the remediation are quite easily managed based upon using properly trained workers with equipment and techniques that have proven to be practical and easily implementable. This risk level is preferable to the unsuspecting, long-term problems from repeated exposure to the site over time from occupational or trespass exposure.*

*Figures 1 and 2 indicate qualitative short-term and long-term risks for each alternative. There is no indication as to how these results were derived or how they relate to acceptable or unacceptable short-term or long-term risks for each of the alternatives. The comment seems to indicate during the remedial actions for the hot spots the short-term risks are greater than the No Action alternative. This is consistent with the feasibility study. Also, the commentor indicates that "action" alternatives pose a lower long-term risk than the No Action alternative. This is also consistent with the feasibility study.*

*EPA cannot respond further to this comment or the associated figures without further information.*

**COMMENT:**

**Groundwater.** Figures 3 and 4 evaluate the short and long-term risks associated with groundwater at the Rocker site. The short-term risks increase with the rigor of each alternative in numerical order in Figure 4. This is reflected by the rough number of man hours associated with each alternative which is reflective of the short-term risk associated with worker exposure. Figure 5 shows the long-term risks associated with groundwater alternatives. The no action alternative shows a greater risk potential than the other alternative. Even this risk is minimal unless the unlikely use of this poorly conductive and separated zone occurs by drilling of future well units into this zone. However, since the remaining alternatives all have institutional controls and an alternate water supply, they provide the same measure of risk protection.

**RESPONSE:**

*Again, the development and interpretation of figures 3 and 4 are similar to those mentioned earlier for figures 1 and 2 (see response to the above comments). They are non quantified, are quite subjective, and are therefore open to wide interpretation. There is no attempt to measure differences in short-term versus longer-term risks and they again ignore the risk reduction based upon using properly trained workers implementing straight forward technologies. Figure 5 does <u>not</u> show long-term risk associated with groundwater alternatives. It is a "Cartoon of Conceptual Models" non quantitatively demonstrating the theoretical decrease in arsenic concentration in the alluvial and tertiary aquifers should certain assumptions hold true. The Agencies are concerned that hydraulic connection between the contaminated shallow alluvial aquifer can be exacerbated based upon future* *development of area groundwaters and therefore recognized the need for institutional controls and alternative water supplies in the FS comments. But this cannot be the only remedy for the site, as such measures are not permanent. The NCP states that institutional controls are to be supplemental to active cleanup, not a replacement for active cleanup. The selected remedy therefore contains both components and presents a reasonable, cost-effective cleanup for the site.*

**COMMENT:**

**Arsenic Dilution/Attenuation.** EPA's FS incorrectly considers and severely underestimates the real and supportable limited arsenic fate and transport of the sites' groundwater. This is translated to an inappropriate comparative analysis of the alternatives. By incorporating the information from Figures 1 through 5, it appears that Alternative 2 would minimize short-term and long-term risk with regard to overall risk at the site. To further evaluate these alternatives, mobility of arsenic will be assessed. Relative arsenic mobility of alternatives that depend on natural attenuation processes are shown in Figure 5. This graph represents a conceptual model showing individual and combined components of arsenic dilution and attenuation, as arsenic from the source migrates through alluvial sediments to the tertiary zone. The graph is not to scale but shows a conceptual relationship of arsenic concentration versus aquifer medium with both attenuation and dilution which is supported by data and knowledge available from the remedial investigation. Attenuation alone and a combination of both attenuation and dilution decrease the concentration of arsenic dramatically at the alluvium/tertiary interface in response to strong geochemical gradients and probable geological separation. Even if attenuation stops and dilution continues the arsenic concentrations will continue to decrease.

**RESPONSE:**

*ARCO again attempts to use these same subjective figures to attempt to make their point (see responses to the two comments preceding this one). The agencies do agree that attenuation and dilution are mechanisms that will reduce arsenic concentrations in the shallow alluvial aquifer as stated in the FS comments. The problem, however, is the <u>rate</u> at which these concentrations can be reduced which is influenced by the degree of aggressiveness of various groundwater remediation technologies considered in the FS comments. EPA believes that without active remediation of the "source materials," achieving cleanup standards would not be achieved in a reasonable time frame and preventing migration would be jeopardized by the lack of permanency associated with institutional controls alone. The remedy provides an appropriate balance of the need for short-term institutional controls and long-term, effective remediation.*

**COMMENT:**

**Additional Alternative.** As discussed previously, it appears that Alternative 2 offers the best short and long-term risk protection. Considering the effects of natural attenuation and dilution, it further demonstrates the limited probability for migration of low arsenic concentrations into the tertiary zones. However, to augment this process of existing iron attenuation, an additional in-situ alternative would provide greater potential for immobilization with very little impact on short-term risk.

The EPA screened out in-situ remedies because it did not seem feasible to implement. ARCO is continuing to conduct treatability studies to evaluate an in-situ iron flood. In-situ treatment of an iron flood, or a combination of in-situ and ex-situ treatment would require very little exposure to workers while reducing short-term risks. Long-term risks would also be reduced because of the increased effect of attenuation. To examine implementation and effectiveness concerns, ARCO has conducted batch tests of this technology with promising results. ARCO will continue with column tests and a field study to further demonstrate this technology. Current EPA guidance requires the agency to seriously consider this innovative treatment technology. Specifically the NCP (Federal Register, 1990) states EPA has a preference for treatment alternative over a simple removal. Also, recently EPA (USEPA, 1995) stated source control through treatment can be considered when groundwater is determined to be impractical to restore below a given standard.

**RESPONSE:**

*Again, ARCO utilizes their interpretation of Figures 1 through 5, the limitations that have been discussed in responses to the previous three comments, to attempt to make their points to influence* *remedy selection. The agencies believe that, because of the demonstrated hydraulic connection of the shallow alluvial aquifer with the deeper units and the potential future development of future groundwater resources, controlling plume migration is important. EPA continues to believe that dilution and natural attenuation are factors that should be considered with remedy selection and that if iron salts could be added in such a way that the iron could be widely distributed in the shallow alluvial aquifer, the rate of adsorption would rapidly increase thus reducing significantly the time frame to diminish arsenic concentrations in the shallow aquifer. The problem is, that use of trenches to distribute the iron as ARCO proposed, will not lead to uniform distribution. The concern is not with the chemistry but rather the way to implement its required extensive distribution in the aquifer so it can do its job. That is why the agencies considered such thing technologies as well injection and excavation, mixing and backfill, and direct addition to the exposed groundwater system as part of their suggested alternatives. EPA's more detailed response to ARCO's proposal and the NCP issues is presented elsewhere.*

**COMMENT:**

Costs developed for the detailed alternatives were calculated for both rail and truck haul. Assumptions for rail haul are not clearly defined but a substantial cost savings by rail is shown.

**RESPONSE:**

*This is correct. Cost estimates for rail haul were based on costs provided to Mr. Jim Ford, Montana Department of Health and Environmental Sciences for the Streamside Tailings Operable Unit in a letter dated April 12, 1995.*

**COMMENT:**

Costs developed by the Agency and their contractors are stated to be within +50% to - 30%. In the draft FS, ARCO developed cost ranges based on past project experience in the local area, vendor information, established cost estimating databases (i.e., Means, MDT), and engineering judgment, and provided a detailed explanation of cost sources and assumptions. A list of cost items that seem questionable is presented below:

Institutional Controls costs have not been developed for any of the alternatives.

**RESPONSE:**

*Institutional controls costs were included in the cost estimates for each of the alternatives. These costs were included as annual operation and maintenance costs.*

**COMMENT:**

Costs developed by the EPA for a RCRA Subtitle C repository seemed very unrealistic at $6/cubic yard. Costs for a RCRA Subtitle C repository could be 2 to 5 times this amount.

**RESPONSE:**

*Cost estimates for development of a Subtitle C repository were based on a similar project in Colorado. Actual costs will vary. Costs were used consistently in all alternatives to facilitate comparison.*

**COMMENT:**

Water Supply costs were developed by EPA using Means Cost database. Based on preliminary design, costs developed by ARCO are 1/2 to 1 $M dollars more.

**RESPONSE:**

*Costs presented in the feasibility study were not based on preliminary design level calculations, thus* *the requirement for the +50% to -30% cost spread. Actual costs will vary. Costs were prepared on a consistent basis to allow comparison of alternatives.*

**COMMENT:**
Stabilization costs were not added to excavation material before going to a RCRA Subtitle C repository.

**RESPONSE:**
*This is correct. Stabilization will increase the cost of off-site disposal slightly and can likely be completed within the cost range of the estimate.*

**COMMENT:**
Transport (truck and rail) costs were compared in the sensitivity analysis by the EPA with the result of the rail being more cost effective. This seems questionable when considering such cost elements as land acquisition, railroad design/construction, and coordination with existing rail lines.

**RESPONSE:**
*Cost estimates for rail haul were based on costs provided to Mr. Jim Ford, Montana Department of Health and Environmental Sciences for the Streamside Tailings Operable Unit in a letter dated April 12, 1995. Contingencies were added to each of the alternatives to realize differing site conditions than anticipated.*

**COMMENT:**
Capital costs were not calculated for pilot/field studies for pump and treat an solidification/stabilization alternatives.

**RESPONSE:**
*This is correct. Nevertheless, the cost estimates remain within the acceptable range and are consistent among alternatives. Pilot/field studies would not add significant costs to relevant alternatives.*

**COMMENT:**
Sludge disposal volumes prepared by the EPA do not appear to assume multiple treatment trains operating simultaneously.

**RESPONSE:**
*Sludge disposal volumes were estimated based operation of similar treatment systems and a groundwater treatment rate of 1,000 gallons per day. More detailed design considerations such as the number of treatment trains is not appropriate for feasibility study level cost estimates.*

**COMMENT:**
Recognition and Use of Current EPA Guidance
In summary, major revisions made by the EPA to the FS reflect a bias toward a removal-based alternative. Most of EPA's experience in the past has been with removal-based remedies, therefore, there is often a presumptive need for removal in EPA's analysis. Experience by industry and agencies alike has shown significant problems associated with both removal and pump and treat based remedies. This has been reflected nationally and has been recognized in recent changes in EPA guidance. Major points and referenced guidance are indicated below:

- o Preference for treatment (NCP)
- o Source Control includes treatment (Luftig)
- o Phased approach (i.e. contingency ROD); Allows use of innovative technologies through testing (Luftig, NRC, TI Guidance)
- o Up front TI analysis and innovative technologies (Luftig, NRC)
- o Pump and treat performance limited (Luftig, NRC, TI Guidance)

**RESPONSE:**
*The feasibility was completed in accordance with EPA guidelines and policy. There were treatment alternatives considered and a phased approach to the implementation of the remedial actions is part of the Proposed Plan and the selected remedy for the site. Because removal of source area soil, followed by innovative treatment was selected does not indicate a bias away from treatment technologies; it indicates that removal was the best alternative based on the nine criteria required to be considered. EPA also notes that the cited NRC guidance is not EPA guidance, but is nevertheless lawful and was fully considered in selecting the Rocker OU remedy.*

**COMMENT:**
Appendices
Appendix D/E – Geochemical and Hydrogeological Factors/Pump & Treat
Both these Appendices give descriptions of potential limiting factors for a pump and treat of groundwater at the Rocker OU. Estimates for pore volumes required for pump and treat of arsenic (3 to 10 pore volumes) were obtained by EPA contractors through a review of organic contaminant literature. ARCO prepared a treatability study (Chatham, 1995) to evaluate iron flooding as a potential remedial alternative. From this study, pore volumes between 40 to 100 were estimated. These pore volume estimates are consistent with other available off site information on arsenic clean ups. The treatability study and more technically defensible pore volume estimates were part of ARCO's Draft FS but were removed by the Agencies. This estimate of pore volumes seems more reasonable since it was based on Rocker source materials and soils/alluvium.

In addition, ARCO is preparing a Technical Impracticability (TI) Memorandum, which will illustrate the inability of pump and treat systems to achieve remediation goals at the Rocker Site.

**RESPONSE:**
*The 3 to 10 pore volumes that were used in the groundwater pump and treat calculations as the lower limit of the required volumes of water to be pulled through the system. Text accompanying the pump and treat calculations clearly discuss the uncertainties of pore flushing and the effect on preferred flow paths and short-circuiting. EPA has reviewed ARCO's TI Memorandum and has responded specifically to that document.*

**References**

1. Chatham, William. 1995. Treatability Study: Iron Flood Method for In Situ Remediation of Arsenic at the Rocker Timber Framing and Treating Plant

2. Groundwater Technology, Inc. 1995. Case Study: In situ Iron Reduction Shows Results After Two Weeks

3. Federal Register. Volume 55, No. 46, March 8, 1990. National Oil and Hazardous Substances Pollution Contingency Plan: Final Rule

4. USEPA. 1995. Steve Luftig Memorandum: Consistent Implementation of the FY 1993 Guidance on Technical Impracticability of Ground-Water Restoration at Superfund Sites

5. USEPA. 1993. Guidance for Evaluating the Technical Impracticability of GroundWater Restoration

6. National Resource Council. 1994. Alternatives for Groundwater Treatment

COMMENTS OF THE ATLANTIC RICHFIELD COMPANY
ON PROPOSED PLAN FOR THE ROCKER TIMBER FRAMING &
TREATING PLANT OPERABLE UNIT ("Rocker OU")

## COMMENT:

ARCO strongly opposes the Proposed Remedy identified in the Proposed Plan (the "Proposed Remedy"). Among other things, the Proposed Remedy: 1) ignores CERCLA and EPA directives encouraging the use of innovative technologies; 2) fails to consider the propriety, availability and additional cost of offsite disposal; 3) arbitrarily imposes RCRA Subtitle C requirements on the disposal of excavated materials; 4) may have serious adverse effects on the local shallow aquifer groundwater system; 5) identifies an action of level of 380 ppm for arsenic in soils which does not reflect risks posed by exposure to arsenic at the Rocker OU and is inconsistent with action levels determined for similar sites in the UCFRB; 6) is not supported by the local community; 7) unlawfully requires an alternative water supply system as a component of the remedy under CERCLA; 8) is not cost effective and costs have not been accurately estimated; 9) arbitrarily and without authority under CERCLA proposes to use an 18 micrograms per liter (ug/l) arsenic standard for groundwater when the federal, protective drinking water standard (MCL) for arsenic is 50 ug/l and attainment of the 18 ug/l is technically impracticable through remedial action; and 10) identifies a contingency remedy which is contrary to EPA policy and directives. A decision to select the Proposed Remedy as the remedy for the Rocker OU would be arbitrary and capricious, not in accordance with law, inconsistent with the National Contingency Plan (the "NCP") and contrary to CERCLA.

## RESPONSE:

*ARCO raises several issues regarding the proposed remedy that are addressed briefly in the sequence they were presented. In some circumstances, more detailed responses follow, in reply to ARCO's more detailed comments:*

1. *EPA appropriately rejected ARCO's innovative technology proposal, which was submitted by ARCO late in the RIF process without adequate testing and which was not effective or implementable as presented. The EPA Final Remedy for the Rocker OU includes the technologies that ARCO was considering to be part of their proposal which they considered innovative. Specifically, ARCO had proposed mixing of iron with arsenic contaminated groundwater that would allow adsorption of arsenic with iron oxyhydroxides. The selected remedy includes this innovative treatment, except that, in addition to ARCO's proposal, complete mixing with groundwater in the source area is provided. Iron treatment of arsenic contaminated soils is also considered innovative by EPA. EPA believes that with this selection, the preference for innovative technologies has been satisfied.*

2. *Offsite disposal is no longer a part of the Remedy. The remedy contained in the ROD includes excavation, treatment and onsite disposal above the water table.*

3. *The Final remedy does not invoke RCRA subtitle C requirements.*

4. *The Final remedy provides for the most complete mixing of iron with the arsenic contaminated groundwater possible. This approach will provide the greatest potential for arsenic removal from the source area. In addition, iron additions to contaminated soils should provide for arsenic removal from soil solutions and placement of contaminated soils out of the water table. All of this will provide for significant reductions in arsenic concentrations in groundwater. Should conditions develop that are not anticipated, the remedy also provides contingencies for containing the plume.*

5. *Action levels for exposure to arsenic developed for this remedy are consistent with*

*guidance that has been developed for the Clark Fork Superfund sites and other EPA risk Assessment guidance. The form of arsenic at the Rocker Wood Treating Plant (six percent arsenic trioxide by weight, dissolved in a heated caustic solution) is believed to have a higher bioavailability than at other sites within the Upper Clark Fork River Basin, and ARCO provided no site specific data to refute this.*

6. *The remedy proposed by ARCO was not fully supported by the community. In comments provided during the public comment period, the Rocker Water and Sewer District conveyed an expectation that the arsenic groundwater treatment (considered risky by EPA) would meet the drinking water standard in the groundwater within a 3-5 year time frame. When ARCO clarified their position on their proposed remedy that extended the time frame to 7+ years for implementation, with no intent of meeting ARARs in the area of the plume, and that its remedy was plume containment rather than cleanup, community support for ARCO's plan, as expressed in verbal conversations from community leaders to EPA, diminished significantly.*

   *When EPA visited with the major stake holders involved with the Rocker OU, following the public comment period, the community provided their support for the remedy contained in this ROD. The proposed remedy is consistent with EPA's position regarding iron flood technologies that was conveyed originally during the development of the feasibility study.*

7. *Comments follow that respond to the issue of the legality of requiring an alternate water supply under CERCLA.*

8. *The Rocker remedy has been costed using standard engineering cost estimating procedures and is considered accurate within the +50 to -30% range required for a feasibility study. The documentation for the cost estimate is available in EPA's administrative record.*

9. *CERCLA section 121 provides that for any hazardous substance, pollutant, or contaminant that will remain on-site, remedial actions must satisfy any applicable or relevant and appropriate promulgated State standard, requirement, criterion or limitation under State environmental or facility siting law that is identified in a timely manner and is more stringent than any federal requirement.*[1] *The State's WQB-7 standard for arsenic of 18 ug/l meets these criteria. In response to the legislative directive, the State standard was duly promulgated by the Board of Environmental Quality on August 3, 1995. The forthcoming modification of the standard was timely identified to EPA by letter on May 23, 1995 and the State standard of 18 ug/l is more stringent than any federal water quality standard such as the federal drinking water standard for arsenic of 50 ug/l.*

   *ARCO incorrectly reads the water quality statute as requiring site-specific risk-based levels. The Montana legislature clearly mandated that the board promulgate one standard for each contaminant to apply on a state-wide basis. The board has determined, after proper notice and comment, that 18 ug/l represented a* $1 \times 10^{3}$ *excess cancer risk for*

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[1] The NCP also contains this requirement at 40 CFR 300.400(g)(4).

*arsenic.*[2] *As set forth above, it is that arsenic standard that is the State groundwater ARAR for arsenic.*

*The background concentrations for the site are well below the 18 ug/l for arsenic promulgated by the State. Site data from uncontaminated portions of all three aquifers identified within or near the OU indicate that arsenic concentrations are below 10 ug/l.*

*EPA has responded to ARCO regarding their request for a Technical Impracticability waiver and has found (in part) that consideration of a waiver on the basis of technical impracticability is not appropriate at this site until a well documented effort to clean up the contamination present within the OU has been conducted.*

10. *The contingency remedy identified in the ROD to further contain the arsenic plume if it spreads in an unacceptable manner is sensible, consistent with EPA guidance, and lawful.*

*In summary, the selected remedy is fully consistent with CERCLA and the NCP.*

**COMMENT:**

By these comments, ARCO also formally presents the "ARCO/ Rocker Comm ity Proposed Remedy" to EPA and MDEQ (the "ARCO/Rocker Proposal"). The ARCO/Rocker Proposal has previously been presented to the community, was favorably received in public meetings, and principle components of the remedy were adopted and approved by resolution of the Country Water and Sewer District of Rocker. The ARCO/ Rocker Proposal is fully protective of human health and the environment, consistent with the NCP and better satisfies the statutory requirements for remedial action set forth in CERCLA.

**RESPONSE:**

*EPA disagrees and demonstrates throughout the responsiveness summary that the ARCO Rocker Community proposed remedy is not protective regarding the field evaluation of arsenic source stabilization using iron flood technologies. Basically, ARCO's propose in-situ remedy would not result in uniform and adequate delivery of iron to the contamination source and plume. EPA has consistently maintained this position during the preparation of the feasibility study and the issues which EPA raised questioning ARCO's approach have not been addressed by ARCO to date. Those issues focus largely on the inability*

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[2] Section 75-5-301 was amended to read:

> Consistent with the provisions of 80-15-201 and this chapter, *the board shall:*
>
> ...
>
> (2)(A) *formulate and adopt standards of water quality*, giving consideration to the economics of waste treatment and prevention.
>
> (B) *Standards adopted by the Board must meet the following requirements:*
>
> (I) For carcinogens, the water quality standard for protection of human health must be the value associated with an excess lifetime cancer risk level, assuming continuous lifetime exposure, not to exceed $1 \times 10^{-3}$ in the case of arsenic and $1 \times 10^{-5}$ for other carcinogens. However, if a standard established at a risk level of $1 \times 10^{-3}$ for arsenic or $1 \times 10^{-5}$ for other carcinogens violates the maximum contaminant level obtained from 40 CFR, Part 141, then the maximum contaminant level must be adopted as the standard for that carcinogen.
>
> Chapter 497, Section 5, 1995 Legislature. (emphasis added).

*to force iron solutions into fine grained portions of the saturated zone where high concentrations of arsenic will continue to release to the groundwater. The extreme uncertainty of the technology, unproven in any field setting, the short time involved in the studies, and the uncertainty regarding the measure of success for the proposed field investigation, lead EPA to select a remedy that was more reliable and that could be implemented in a shorter time frame. The selected remedy does incorporate some aspects of ARCO's proposal.*

**COMMENT:**

The Proposed Remedy Does Not Use Alternative Technologies to the Maximum Extent Practicable.

CERCLA and the NCP require that the selected remedy use alternative treatment technologies to the maximum extent Practicable. See 42 U.S.C. 9621(b)(1); NCP, 40 C.F.R. 300.430(f)(1)(ii)(E). The Proposed Remedy ignores this requirement through unnecessary reliance on source area removal prior to application of iron salt to the excavation zone. This procedure is necessary to replace naturally occurring iron that is removed during excavation. In contrast to the Proposed Remedy, the ARCO/Rocker Proposal clearly meets the NCP requirement by appropriate use of alternative, innovative iron flooding treatment. Though EPA understands the potential for the iron flood treatment to effectively control arsenic migration in groundwater, the Proposed Remedy nonetheless rejects this innovative approach in favor of source removal. The Proposed Remedy is therefore inconsistent with the NCP which further provides with respect to use of innovative technologies:

> EPA expects to consider using innovative technology when such technology offers the potential for comparable or superior treatment performance or implementability, fewer or lesser adverse impacts than other available approaches, or lower costs for similar levels of perfo..nance than demonstrated technologies.

40 C.F.R. 300.430(a)(1)(iii)(E). The ARCO/Rocker Proposal fulfills EPA's expectation that use of innovative technologies be maximized. In contrast to the ARCO/Rocker Proposal, selection of the Proposed Plan as the remedial action for the Rocker OU would also be inconsistent with EPA's encouragement of the use of innovative technologies under recent Superfund administration reform initiatives. See e.g., Superfund Administrative Improvements, Initiative 9 (February 13, 1995) (encouraging the use of innovative technologies and risk sharing between PRPs and EPA on innovative technologies.

**RESPONSE:**

*As noted, the final remedy selected by EPA for the Rocker site has been modified substantially compared to the remedy denoted in the Proposed Plan and to which these comments are directed. EPA, in considering the final remedy, has considered all written comments and oral testimony, including that from ARCO. The selected remedy <u>does utilize</u> alternative treatment technologies (chemical fixation and solidification) of the removed source materials. Further, the final remedy also utilizes natural and enhanced attenuation to enhance the arsenic attenuation rate in the plume itself, which is the further use of this innovative treatment technology.*

*As to the application of CERCLA and the NCP to ARCO's proposed remedy, the provisions of CERCLA cited by ARCO do encourage EPA to select innovative treatment technologies under appropriate conditions, but not in <u>all</u> conditions. First, the NCP requires innovative technologies to be developed <u>during</u> and as part of the RI/FS evaluation (40 CFR 300.430(e)(3)(5). The Preamble to the Final NCP explains "[b]ecause innovative technologies may not have been as thoroughly demonstrated, treatability studies during the RI/FS may be necessary to provide information sufficient for an appropriate evaluation of these technologies. The goal of treatability studies is to establish through the use of good science and engineering the probable effectiveness of innovative technologies" 55 FR 8714 (March 8, 1990). Here, the commentor and proponent of the rejected innovative technology, ARCO, performed the RI/FS over a five year period and had every opportunity to perform the appropriate studies and analyses in a timely manner to demonstrate their technology. The limited bench scale testing that was done was conducted very late in the RI/FS process (approximately one month before the Feasibility Study was to be released), provided little opportunity for EPA to oversee the investigation (ARCO did not seek and did not get EPA* *input or approval of the project), and had limited application to the field setting. This did not allow sufficient time for good science and evaluation of the proposal. Second, remedies, even innovative ones, are to be selected if they meet the nine criteria for selection of a remedy only. One of those criteria is "long-term effectiveness and performance". 40 CFR 300.430 (e)(a)(iii)(c). The Preamble to the Final NCP again states that innovative technologies are appropriate where they can reliably, logically, and feasibly be protective and attain ARARs, and that the burden of presenting adequate information on such technologies would be on the promoting PRP - here ARCO. 55 FR 8748 (Mar. 8, 1990). After EPA was informed of ARCO's limited study on the innovative technology, it repeatedly stated that it had no information demonstrating that the delivery of iron salts into soil and groundwater without excavation could be accomplished in a reliable and effective manner so that protectiveness and ARAR compliance could be achieved. ARCO's response, delivered to EPA after the proposed plan was released, involved a proposal for additional laboratory (column and field studies) which were projected to take an additional two years to conduct. EPA concluded that the technology of introducing iron into the fine grained shallow alluvial aquifer was not promising and that the time involved in the proposed investigations would simply mean a delay in implementing a remedy.*

*EPA's recent Superfund Administrative Improvements, Initiative 9, does not change the need for adequate study and demonstration, and effectiveness for innovative technologies. Rather, the selection of the remedy found here, which uses innovative technology in a reliable manner, is consistent with the Administrative Improvements initiative.*

*EPA continues to believe that the remedy ARCO proposed, which is the addition of iron compounds to the groundwater system without excavation, would fail to work because of the technical difficulties in delivering the iron solutions into the fine textured portion of the aquifer. EPA believes that ARCO has failed to demonstrate how they would successfully address this concern. EPA clearly recognizes the benefits of iron oxide attenuation as an innovative treatment technology but believes that the introduction and complete mixing of these chemicals with the source materials and/or contaminated plume cannot be effectively implemented without excavation.*

**COMMENT:**

The Proposed Remedy May Have Serious Adverse Effects on the Local Shallow Groundwater System.

Unlike the ARCO/Rocker Proposal, the excavation component of the Proposed Remedy has the potential to adversely affect the local shallow groundwater system by increasing arsenic concentrations due to arsenic mobilization from soil to groundwater. Broad excavation of soils will also impair the naturally occurring attenuation capacity of the system.

By disrupting the soils, arsenic that the natural system has already stabilized through adsorption could desorb to the point of causing significant increases in arsenic concentrations within the surrounding groundwater. The ARCO/Rocker Plan minimizes this potential by first attempting to immobilize the arsenic through stabilization, or simply enhancing the existing adsorption processes. If this primary remedy is not successful, then the contingency allows for removal to be considered.

**RESPONSE:**

*EPA recognizes that during the excavation of source materials from below the water table, there will be a short-term increase in arsenic concentration in the shallow groundwater system due to the physical disturbance. After removal of the source materials, excess iron will be added to the exposed groundwater so that the arsenic concentrations will begin to attenuate on the iron oxyhydroxides as they form in the system. The excess iron will also begin to migrate down gradient below the excavated area and further reduce arsenic concentrations in the down gradient portion of the arsenic plume, and will retard arsenic migration. The concentrations in the plume itself will decrease as a result of enhanced attenuation* *associated with the extra availability of iron. EPA believes that this is effective management of possible short term effects. EPA recognizes that as iron rich groundwater from the source area treatment penetrates the down gradient undisturbed aquifer, iron precipitation will gradually coat the aquifer matrix, thereby decreasing aquifer permeability. Therefore, the most significant reductions in arsenic groundwater concentrations should occur within the first several years following remedy implementation.*

*As stated previously, the ARCO plan is not implementable because the iron cannot be reliably distributed throughout the affected fine grained portions of the aquifer.*

**COMMENT:**

Source Removal is Not Necessary to Protect Human Health and the Environment and is Not Supported by the Community

ARCO believes the results of the RI/FS for the Rocker OU demonstrate that source removal is not required to ensure protection of human health and the environment. In fact, as mentioned immediately above, the source removal advocated by EPA is likely to exacerbate conditions and might cause a threat to human health not posed by current conditions or by the ARCO/Rocker Proposal. The results of the treatability studies which have been completed examining the iron flood in-situ treatment technique are favorable and support selection of this technology for remedial action. In-situ treatment immobilizes arsenic in the subsurface, greatly enhancing the capacity of the native soils to adsorb arsenic and limit transport of arsenic through the groundwater system. Because no current water supplies are threatened by contamination, immobilization and natural attenuation of arsenic source material eliminates any need for an alternative water supply. If this approach were not successful, limited source removal to a local repository would be an available contingent remedy, again eliminating the need for provision of an alternative water supply system.

**RESPONSE:**

*The source material is an ongoing, almost infinite supply of contamination to the groundwater system. EPA believes that without removal of the source materials, there is virtually no hope in the next few hundred years of cleaning up the residual groundwater plume, which would continue to pose a risk to surrounding aquifers that are the preferred source of water for the community. As explained above, the ARCO proposed in-situ remedy remains flawed owing to delivery and implementability problems. The EPA remedy utilizes the addition of excess iron to deal with short term increases in groundwater contamination due to disturbance of the source materials, and will enhance the removal of arsenic from the existing plume. When the iron is well mixed with the arsenic residuals in an oxidizing environment at the appropriate pH, there is no question that the iron will adsorb arsenic. This is well born out by the ARCO treatability tests. Unfortunately, ARCO's plan cannot distribute the iron effectively throughout the fine grained contaminated aquifer. Also, the Town Pump well, which is in the tertiary aquifer, is hydraulically connected to the arsenic plume at well RH-6, therefore groundwater supplies are threatened by the plume. The current remedy will require a well ban during implementation of the remedy, which in turn, justifies the need for an alternative water supply. Further justification of the alternate water supply is described in subsequent responses to comment.*

**COMMENT:**

In discussions with the community regarding the technical basis for ARCO's position, ARCO was informed of the potential limitations of the current water system to provide adequate service to the community. These infrastructure limitations are unrelated to the presence of hazardous substances in groundwater at the Rocker OU. In forming a consensus opinion with the community on an appropriate approach to remedial action for the Rocker OU, ARCO has volunteered to fund certain infrastructure improvements to foster future economic development of the Rocker community.

**RESPONSE:**

*EPA disagrees that the alternate water supply can be characterized as a volunteer infrastructure improvement. Consistent with the preceding response to comment and more detailed subsequent* *responses, EPA maintains that an alternate water supply is justified based on the ongoing threat to aquifers hydraulically connected to the arsenic plume. There has been a demonstrated, although limited, excursion of the arsenic plume into the deep alluvial and tertiary sediments aquifers. Development is occurring at an increased pace in the Rocker area. Future development of deeper aquifers could alter hydraulic relationships that would accelerate the migration of the arsenic plume into these high quality aquifers. An alternate water supply therefore is an important part of this remedy to offset further reliance on groundwater resources, until the remedy is determined to be successful and the contamination is cleaned up, a process that could take many years.*

**COMMENT:**

At the public meeting held July 27, 1995, testimony presented by residents of Rocker and the surrounding area overwhelmingly rejected the approach to remedial action recommended by EPA and the State under the Proposed Plan. A description of the ARCO/Rocker Proposal supported by ARCO and the local community, as well as the additional infrastructure improvements offered by ARCO, are discussed in Section III of these comments.

**RESPONSE:**

*The community did not reject the approach to remedial action recommended by EPA and the State in the proposed plan. It appears that the community used their negotiation skills to obtain additional concessions from ARCO in exchange for their support of ARCO's innovative technology investigations. The community kept the EPA/State preferred remedy as a contingency in the event that ARCO's treatments were unsuccessful. As explained above, EPA has determined that ARCO's proposed plan is not effective or implementable, but has modified the proposed plan to include some aspects of ARCO's proposals which are workable. This approach is supported by the community.*

*EPA was disillusioned with the ARCO proposal when ARCO stated that the research time frame necessary to evaluate the technology (clarified to be a seven-year period) instead of the time period for cleanup (3 to 5 years) established by the community, and when ARCO stated its lack of intent to clean up the contamination in the shallow alluvium at all, in contrast to community expectations. ARCO's success criteria for their proposed remedy was whether the plume migrated or not during the term of their investigations, realizing that the evaluation of plume migration would occur during a period when a well ban would be in place that would eliminate additional pressure on the adjoining aquifers that would influence plume migration.*

*When EPA visited with the major stake holders involved in the Rocker remedy after the close of public comment and conveyed their continued concern over the inability of the ARCO proposal to effectively contain arsenic release from the fine grained materials within the shallow alluvial aquifer, there was apparent support from the affected communities for EPA's revised remedy contained in this ROD.*

**COMMENT:**

Health Risks as Identified in the Proposed Remedy are Overstated and Action Levels Inconsistent with EPA Decisions at Other UCFRB Sites.

By requiring remedial action for soils containing more than 380 ppm arsenic, EPA's Proposed Remedy overstates the health risks posed by exposure to arsenic in soils under a reasonable maximum exposure scenario. Furthermore, an action level of 380 ppm arsenic for the Rocker OU is inconsistent with remedial action requirements identified for other sites having similar characteristics and potential for human exposure within the Upper Clark Fork River Basin ("UCFRB").[3] As discussed in the detailed comments which follow and in ARCO's comments upon the EPA Baseline Risk Assessment for the Rocker OU, ARCO believes that action levels used for soils should be consistent with the action levels determined to be appropriate by EPA for other UCFRB sites. Furthermore, the Proposed Plan has inadequately justified EPA's selection of the remedy which would require soil removal versus placement of a soil cover on hot spots with appropriate revegetation. Soil cover and revegetation of hot spots, in combination with the institutional controls which EPA is recommending, is equally protective when compared to removal, and poses more limited potential short term risks during implementation.

**RESPONSE:**

*See EPA responses to ARCO comments on the Baseline Human Health Risk Assessment. The Rocker site is different from the other sites in the area contaminated with mining wastes in that wood treating fluids were used at Rocker that involved dissolving arsenic trioxide in a heated solution together with other caustic compounds. The Clark Fork Position Paper on Bioavailability of arsenic states that an assumption of 100% bioavailability will be applied at sites where arsenic contamination is associated with the application of pesticides/herbicides, wood treatment processes and/or fossil fuel combustion. Unlike many other UCFRB sites, ARCO has not provided site specific information to EPA for the Rocker OU that indicates that the arsenic compounds present are any less bioavailable than the assumptions used in the Baseline Human Health Risk Assessment. Given these assumptions, EPA's remedy that addresses soil contamination greater than 380 ppm arsenic is justified.*

*The EPA remedy also employs removal of arsenic contaminated soils greater than 1000 ppm (which can also be considered source materials) and combining and treating them with the other excavated soils form the source area.*

**COMMENT:**

No Legal Authority Exists Under CERCLA for Requiring Installation of an Alternate Water Supply Under the Circumstances of the Rocker Operable Unit.

Six of the seven proposed remedial alternatives evaluated in the Proposed Plan, with the exception of the "No Action" Alternative, identify the installation of an expanded capacity alternate water supply as a necessary component of the selected remedy (pg. 2, Proposed Plan). While ARCO is willing to voluntarily provide an alternate water supply as part of the ARCO/Rocker Proposal, EPA is without authority under CERCLA to require an alternative water supply as a component of the CERCLA remedy. A decision to include an alternate water supply at the Rocker Site as part of the selected remedy is inconsistent with CERCLA, the NCP and the EPA "Guidance Document for Providing Alternate Water Supplies," EPA 540/G-87/006, OSWER Directive 9355.3-03, February 1988 (the "Guidance Document"). The Guidance Document addresses the process and criteria for selection of alternate water supply remedies consistent with CERCLA and the NCP. These criteria are not met at the Rocker OU.

**RESPONSE:**

*EPA's response to this comment is provided below (see pages 26-29 of this response).*

**COMMENT:**

The Proposed Remedy is Not a Cost Effective Alternative.

Section 121 of CERCLA mandates the selection of cost effective remedies. A remedy is "cost effective" if its "costs are proportional to its overall effectiveness." NCP, 40 C.F.R. 300.430(f) (l)(ii)(D). The construction, excavation, transportation, and disposal costs of the Proposed Remedy are excessive in proportion of its effectiveness. In ARCO's opinion, the Proposed

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[3]See e.g., Old Works Record of Decision identifying an action level of 1,000 ppm for ________.

Plan substantially underestimates the cost of the Proposed Remedy. The ARCO/Rocker Proposal, in comparison: (1) meets CERCLA's requirements of protection of public health and the environment and attainment of applicable or relevant and appropriate requirements ("ARARs"); (2) out performs the Proposed Remedy under the NCP's "balancing criteria" of reduction of toxicity, mobility or volume through treatment, implementability, short term effectiveness and cost; and (3) satisfies CERCLA's and the NCP's requirements for selection of cost effective remedies.

Under the ARCO/Rocker Proposal, limited source removal is an available contingency remedy if the iron flood technology is not implemented successfully. Disposal of excavated materials in a local repository is far more cost effective than transport to Smelter Hill for disposal.

**RESPONSE:**

*EPA's final remedy is cost effective. Consideration was given to ARCO's and other's comments regarding costs and the need to classify the excavated waste as hazardous substances and transport to a suitable RCRA C facility at Smelter Hill was removed from the selected remedy at considerable financial savings compared to the Proposed Plan costs. The remedy considers excavation, chemical fixation,and onsite disposal for the source materials. As was stated earlier, ARCO's proposed remedy was not considered protective or effective due to the difficulties of implementability. Further, as proposed, it did not recognize the significance of the arsenic source to being a never ending source of contamination to the shallow alluvial aquifer. Therefore, to compare ARCO's remedy to either the earlier EPA Proposed Plan or to the current final remedy is not appropriate since the ARCO remedy is not protective.*

*In summary, EPA considered cost effectiveness carefully in selecting the remedy described in this ROD. It reduced costs where sensible and determined that the expected costs are proportional to the benefits of actual source and plume cleanup and protection of surrounding aquifers and potential industrial site users.*

**COMMENT:**

The 18 d) State Groundwater Standard for Arsenic Should Not be an ARAR. Attainment of this Concentration Level is Technically Impracticable from an Engineering Perspective and is Unnecessary to Protect Public Health.

The 18 d) groundwater arsenic concentration level does not meet the legal requirements for applicable or relevant and appropriate requirements ("ARARs") under section 121 of CERCLA or the NCP. The current MCL for public drinking water systems across the country and in Montana is 50 ug/1. It is absurd to require cleanup of groundwater not utilized for water supply to levels that are more stringent than EPA and the State have determined are appropriate to serve as protective standards for drinking water. Given that background concentrations of arsenic in groundwater in the Rocker area may occur as high as 30 ug/l there is no justification for EPA and the State to require treatment of groundwater to a condition better than existed under natural conditions. For these reasons and in light of technical information developed during the FS which demonstrates that attainment of 18 d is and will be technically impracticable from an engineering perspective using pump and treat technology, the 18 ug/l State standard should be waived pursuant to Section 121(d) of CERCLA.

**RESPONSE:**

*The response to this comment was provided in the previous introductory comments/responses. The 18 ug/l standard is a legally mandated standard and is above background. There is nothing absurd in requiring this remedy to comply with legitimate state environmental laws.*

**COMMENT:**

The Proposed Remedy Fails to Meet the NCP's Requirement of Implementability.

Implementability involves the "ease or difficulty of implementing alternatives." NCP, 40 C.F.R. 300.430(e)(9)(iii)(F). As discussed above, the Proposed Plan identifies 18 ug/l arsenic to define the source area subject to excavation. First, the Proposed Plan fails to take into account the fact that local background concentrations of arsenic range up to 30 ug/l. Therefore, it is both unreasonable and technically impracticable to impose 18 d as a performance standard for remedial action. Second, the Proposed Plan assumes the availability of a repository at Smelter Hill. While ARCO has agreed to provide a repository on its property on Smelter Hill in certain instances (such as for Flue Dust or Arbiter/Beryllium wastes), EPA does not have the authority to require as a component of the Proposed Remedy the placement of a "Subtitle C" or other repository on Smelter Hill.

**RESPONSE:**

*EPA recognizes that previous studies associated with the Rocker OU showed arsenic concentrations in shallow groundwater can range up to 30 ug/L. However, the most recent testing of all three aquifers identified during the Rocker RI showed arsenic concentrations less than 8 parts per billion. The issue of background concentrations of arsenic was not a specific aspect of studies conducted during the RI; however, it is EPA's policy to not set remedial action goals that are below natural background concentrations. Based on the most recent information available, it appears that natural background is below the State standard of 18 parts per billion arsenic.*

*While the State standard remains the standard for all aquifers within the Rocker OU, the feasibility of attaining this standard in all aquifers cannot be fully determined until the remedy has been implemented and monitoring is conducted over an extended period of time. As trends in groundwater quality improvement are developed, a determination can be made whether groundwater standard in the shallow aquifer can be met. It is clearly recognized that there was significant technical difficulty in attaining ARARS over an extended period of time for any groundwater treatment technology as noted in the FS which was why EPA considered contingency actions for the groundwater cleanup following monitoring for an extended period of time.*

*EPA, with the final remedy, does not require the construction of a repository at Smelter Hill for technical, cost, and community acceptance reasons. It is unclear why ARCO believes that EPA does not have the authority to require this in appropriate circumstances.*

**COMMENT:**

The Proposed Plan Identifies a Contingent Remedy which is Contrary to EPA Policy and Guidance.

Under limited circumstances described in EPA guidance, a contingency remedy may be identified as part of a remedial action. In short, a contingency remedy may be identified where an innovative technology is selected for remedial action. EPA has not followed that approach in the Proposed Plan. In contrast to the Proposed Plan, the identification of a contingent remedy (limited removal to a local repository) as part of the ARCO/Rocker Proposal is consistent with EPA guidance.

**RESPONSE:**

*The contingent remedy described in the Proposed Plan has been altered to better reflect EPA's level of concern with respect to the need for additional measures to be required to contain the arsenic plume and/or to meet remedial action goals within the current area of contamination. This groundwater contamination problem and the technologies available to abate the arsenic concentrations is considered by EPA to have moderate uncertainty. Under these circumstances EPA guidance encourages the inclusion of contingency measures should the remedy not meet performance criteria. EPA considers this particularly important at the Rocker OU to prevent contamination of a valuable groundwater resource.*

**COMMENT:**

**THE ARCO PROPOSED PLAN FOR REMEDIAL ACTION**

On August 2nd, the County Water and Sewer District of Rocker ("CWSDR") held a special meeting to consider taking a position on the proposed cleanup plan at the Rocker OU. The meeting was attended by local residents, property owners, and other interested parties including the EPA and ARCO. Proposed plans by the EPA and ARCO were discussed and evaluated. Afterwards, ARCO and the CWSDR agreed on a common remedy that was passed by the Board and local residents. The

ARCO/Rocker Proposal discussed below encompasses the concerns and specific objectives of the CWSDR.

## RESPONSE:

Comment Noted - No Further Response Required

## COMMENT:

The following discussion describes the problem, objectives, and ARCO/Rocker Proposal for groundwater and surface hot spots.

**GROUNDWATER**

**Problem:**
- Elevated concentrations in very shallow (20-40 ft.) groundwater

**Objective of Remedy:**
- Ensure human health is protected by not allowing arsenic from Rocker site to spread into drinking water aquifer
- Do not allow horizontal movement to affect Silver Bow Creek

**Proposed Remedy:**
- Innovative In-Situ Stabilization
- Natural Attenuation
- Groundwater Monitoring
- Limited Groundwater Ban
- Contingency Excavation/Removal only if Innovative Technology is Unsuccessful

**Remedy Description.** The groundwater area of concern would be defined by the arsenic concentration of > 50 ug/l as presented in the FS. An arsenic level of 18 ug/l would be very difficult to define and is below background levels of arsenic, according to Mike Bishop (Rocker EPA Project Manager).

The arsenic source will be immobilized by in-situ treatment stabilization. This approach to the source reduces long term risk by not allowing groundwater arsenic concentrations to spread and by reducing current levels in the arsenic plume. Short term risk due to worker and community exposure is minimized through an in-situ approach. Since this process is an innovative technology, a demonstration is being performed to measure the effectiveness and implementability of the technology. This evaluation will consist of batch tests, column tests, and field demonstrations. Results from batch tests performed by Dr. Bill Chatham at Montana Tech demonstrate that the addition of iron salt is effective in immobilizing arsenic. Column tests and field demonstrations will help determine site-specific effectiveness and implementation methods.

If, after a five year period, this innovative technology is deemed not to be protective, ARCO is willing to implement a contingency remedy where source materials will be removed to a secure repository. This repository would be located on or near the Rocker OU site if technically practicable.

Furthermore, natural attenuation will continue to immobilize arsenic. The alluvial aquifer has an abundant supply of iron which is the primary element contributing to arsenic attenuation. Removing the naturally occurring iron through excavation (as required by the Proposed Plan) would likely upset the equilibrium of the natural system. Groundwater monitoring of the shallow and deep aquifer will occur during and after remediation to monitor conditions of the plume.

## RESPONSE:

*EPA agrees that reaching 18 ug/L arsenic in the shallow groundwater will be difficult. As mentioned earlier, EPA believes ARCO's proposed remedy is not implementable. There is no detail or appropriate backup studies presented by ARCO that will assure that the iron additions will be placed in a manner to permit reaction with the contaminant source materials or the plume itself. The test work conducted at Montana Tech by Dr. Chatham utilized excavated soils and pore waters intimately mixed with the added iron compound in a physically mixed system. EPA, with its final remedy, utilizes intimate mixing of iron compounds and solidification agents to bind up the arsenic and reduce permeability of the treated mixture so that arsenic cannot be released in the future. The remedy also utilizes natural and enhanced attenuation to accelerate the rate of plume cleanup once the source materials have been removed.*

*Previous responses addressed the issue of background in relation to the 18 ppb State standard and the issue of exacerbation from excavation.*

**COMMENT:**
**SURFACE SOIL HOT SPOTS**

| | |
|---|---|
| **Problem:** | • Surface Soil "Hot Spots" are potential human health concern due to direct contact with soil |
| **Objective of Remedy:** | • Limit potential for human exposure which may cause health concern |
| **Proposed Remedy:** | • Soil Cover<br>• Revegetation<br>• Institutional Controls |

**Remedy Description.** Surface soils with arsenic concentrations above 1000 ug/l would define "Hot Spots." This concentration is protective and consistent with other UCFRB Superfund sites in Anaconda. Soil cover areas would be revegetated. Institutional controls will include private land ownership with restrictions due to the active rail lines and the 100 year floodplain. In addition, land use will be primarily industrial with limited recreational use. Current floodplain regulations will also apply.

**RESPONSE:**
*As mentioned earlier, EPA believes that the risks to workers and trespassers are significant enough to warrant removal of hot spots in excess of 1000 ppm arsenic and subsequent treatment with other source materials. It also believes 380 ppm arsenic in surface soils is an appropriate standard. This is consistent with general risk assessment guidance and with the Clark Fork Guidance. The basis for this is fully explained in the Baseline Human Health Risk Assessment, and EPA's response to ARCO comments on the Baseline Human Health Risk Assessment. The contaminated materials will be treated and solidified (as necessary to pass TCLP testing during treatment/disposal) with the source materials and disposed of on-site.*

**COMMENT:**
**VOLUNTARY INFRASTRUCTURE IMPROVEMENTS**

Infrastructure improvements are summarized below followed:

- Alternative Water Supply
- Allow for the drilling of Community Well
- As a contingency ARCO will compensate Rocker Community for use of BSB water compared with a community well.

ARCO proposes to provide the community with an alternative water supply.[4] The community is currently supplied water via a six-inch line from the Butte Silver Bow ("BSB") Big Hole Water Treatment Plant. The community wants to be less dependent on BSB water supply and construct their own supply well. The Rocker Water & Sewer District could drill a well as long as it is not within a limited well ban extending a quarter mile from the site. Use of existing wells for water supply would continue. ARCO would increase the size of the current six-inch BSB line to twelve inches and provide a 300,000 gallon storage tank. Both the community groundwater supply and the new twelve-inch line would be connected to the storage tank. Groundwater

[4]As discussed in more detail in these comments, EPA is not authorized to require development of an alternative water supply under CERCLA.

monitoring wells would provide an early warning system for water quality of the deeper tertiary aquifer which provides the current water supply for several local wells and will be the source for the community well. The risk of arsenic movement into the deeper tertiary aquifer is remote. However, if arsenic contamination occurs, the enhanced BSB water system provided by ARCO would eliminate any potential risk to the Rocker community. As a contingency, ARCO will offset the yearly costs associated with using BSB water instead of a community well water if arsenic is detected and poses a threat to the tertiary aquifer.

**RESPONSE:**

*EPA believes that once the bleeding arsenic rich source materials to the groundwater are removed and treated in conjunction with groundwater treatment in the same area, the remaining groundwater plume will begin to attenuate at a much faster rate. Even with the accelerated natural and enhanced attenuation rates, it may still take many years to meet groundwater standards in the area of the current plume. Given these facts, EPA believes it necessary to restrict additional development of the identified aquifers in the area within a 1/4-mile radius of the arsenic plume to prevent major changes in groundwater gradients that could exacerbate plume migration. An alternative water supply for the residents of Rocker will be implemented to off-set future demands for potable water and further reduce the potential for migration of contaminants. While EPA appreciates ARCO's willingness to provide an alternative water supply, there is disagreement whether this aspect of the remedy can be considered voluntary. EPA also is pleased that ARCO understands and support the need of a well ban to temporarily prevent additional groundwater development.*

**COMMENT:**

The Selection of the Proposed Remedy Would be Arbitrary and Capricious and Inconsistent with CERCLA and the NCP.

1. The Proposed Remedy Does Not Satisfy the NCP Remedy Evaluation and Selection Criteria as Well as the ARCO/Rocker Proposal.

The Proposed Remedy presented in the Proposed Plan does not satisfy the remedy evaluation and selection criteria set forth in the NCP. Specifically, the NCP requires an assessment of remedial alternatives that identifies the key tradeoffs (relative advantages and disadvantages) among alternatives with respect to the criteria. See 40 C.F.R. 300.430(e)(9) and (f); Preamble to Final NCP, 55 Fed. Reg. 8719. Under such an evaluation, the ARCO/Rocker Proposal is superior to the Proposed Remedy identified in the Proposed Plan. Specific NCP criteria are discussed below.

**RESPONSE:**

*EPA has responded to the specific issues that ARCO raises with regard to the remedy selection criteria below. Furthermore, EPA feels that the Feasibility Study, the Proposed Plan, and the ROD did evaluate the trade-offs between different technologies and alternatives before the final remedy was selected. The issue that EPA has consistently conveyed to ARCO with respect to their proposed remedy is the inability of the technology to deliver the iron solutions, that would enhance arsenic attenuation, to the fine grained portion of the shallow alluvial aquifer.*

**COMMENT:**

EPA's and MDEQ's Cursory Consideration of the NCP's Implementability Criterion in Identifying the Proposed Remedy is Inadequate.

Implementability assesses the technical and administrative feasibility of a remedy. NCP, 40 C.F.R. 300.430(e)(9)(iii)(F). The Proposed Remedy exhibits several significant implementability problems which are glossed over in the Proposed Plan. First, EPA has not provided a defensible basis for delineating the extent of the source area defined in the Proposed Plan as the 10,000 mg/l concentration line in soil down to a depth of 5 feet below the groundwater surface. This definition of the "source" of arsenic which may impact groundwater can not be technically supported. It is likely that only a small percentage of the soil media within the source area defined by EPA truly contributes to the elevated arsenic concentrations found in groundwater at the Rocker OU. If EPA persists in its present approach to define a "source," the Record of Decision should, at a minimum, recognize that the resulting area and depth is a conservative upper bound estimate which must be further refined during remedial design.

**RESPONSE:**

*EPA and ARCO, working together during the development of the FS, mutually recognized that further source term material identification would be necessary during RD/RA should source materials be removed or treated. The 10,000 ug/L isoconcentration line was mutually accepted as the estimated boundary for purposes of the FS so that comparative calculations of quantities and costs could be made to provide comparative values for analysis as the guidance requires. This volume was limited by the data available from the RI, but the estimate was considered within the accuracy range of +50/-30% required for a feasibility study. EPA can not agree that the current definition represents an upper bound. This will be determined during the RD/RA phases of the Rocker OU.*

**COMMENT:**

In contrast, the ARCO/Rocker Proposal avoids the problem of defining a discrete source by utilizing the 50 ug/l arsenic MCL to define the extent of the source area to be targeted for in-situ treatment. Thus, the ARCO/Rocker Proposal would immobilize arsenic within the "source" and "plume" by treating all affected areas with in-situ stabilization.

**RESPONSE:**

*EPA has provided comments as to why ARCO's proposed remedy is not protective, effective, or implementable in response to Summary Comments earlier.*

**COMMENT:**

Additionally, the Proposed Plan identifies several contingencies in the event that the Proposed Remedy fails to attain the State's 18 ug/l standard within a reasonable time frame. Among the contingencies listed in the Proposed Plan is the utilization of pump and treat technology to address arsenic contamination at the Rocker OU. ARCO believes that this contingency fails to satisfy the implementability criterion specified in the NCP and should not be included in the final remedy selected in the Rocker OU Record of Decision. In the Proposed Plan, EPA explicitly recognizes the limits of pump and treat systems to attain required groundwater standards. Specifically, the Proposed Plan states that:

> The US EPA Office of Solid Waste and Emergency Response is aware of the difficulty of restoring some aquifers to health based plant criteria as a result of a study conducted to evaluate the effectiveness of groundwater extraction systems in achieving specified goals. The findings indicate groundwater extraction systems were generally effective in containing the contaminant plume and the systems guaranteed significant contaminate mass removal. However, although the contaminant concentration decreased significantly after initiation of extraction, it tended to level off at concentrations above EPA's cleanup goals (i.e., MCLs). Therefore, EPA recommends identifying contingency measures for remedial actions that may not meet chemical specific standards. This information is reflected in a remedy with contingencies proposed here. (p. 6, Prcposed Plan.)

**RESPONSE:**

*As mentioned previously, EPA guidance supports the inclusion of contingencies for groundwater remedies that have a moderate level of uncertainty associated with them. In addition, EPA has moved away from the concept of a pump and treat contingency in the final remedy, because: 1.) the Agency projects that there will be a low potential need for a contingency remedy; and 2.) while a pump and treat component to the remedy might speed the early stages of arsenic concentration declines, over the long term, pump and treat would have a declining effect on arsenic concentrations as costs would continue to mount.*

**COMMENT:**

ARCO evaluated the viability of using pump and treat technologies at the Rocker OU in its Technical Impracticability Report, submitted to EPA and MDHES on June 30, 1995. The Rocker TI Report demonstrated the limitations of pump and treat technologies due to specific site hydrogeology, arsenic release rates, and technological barriers. See ARCO's Technical

Impracticability Report (TI Report), June 1995.

**RESPONSE:**

*In the FS comments, EPA clearly recognized the technical difficulties and limitations of pump and treat technologies as applied to the Rocker Site and this position is restated in the response provided previously. EPA is providing comments regarding ARCO's Technical Impracticability Report under separate cover. However, EPA's brief response is that ARCO's TI demonstration did not provide a convincing case that a TI waiver is appropriate at this time. If after implementation of the remedy, monitoring data clearly demonstrate that it will be technically impracticable to achieve and maintain remediation standards in the arsenic plume in the shallow alluvial aquifer, then a Technical Impracticability Waiver could be granted by the Agency for the smallest possible affected area.*

**COMMENT:**

Dr. Bill Chatham of Montana Tech conducted a treatability study indicating that it would take arsenic 1000 to 50,000 years to release from the site. See TI Report, Appendix C. This slow release is a result of natural attenuation or the chemistry of existing iron hydroxides at the Site. Any pump and treat technology implemented at the site would depend upon arsenic release and not be effective in reducing arsenic levels in the groundwater to 18 ug/l, as specified by EPA. See TI Report, pp. 2-23 to 24; 2-28 (finding that the presence of iron oxyhydroxides at the site inhibit the migration of arsenic by groundwater).

**RESPONSE:**

*EPA agrees that arsenic attenuation to iron oxyhydroxides, given favorable oxidizing and pH conditions, is very stable. EPA has also recognized in the FS that pumping and treatment of contaminated site groundwater is not without its problems. In the FS, EPA also acknowledges the potentially long time frames required with any technologies to meet groundwater ARARs; although with source removal/treatment this time frame is shortened considerably. Data developed following remedy implementation will allow a refined conclusion to be drawn regarding time frames required to meet the State 18 ppb standard. However, the remedy proposed is expected to protect the two most valuable aquifers in the area that are largely uncontaminated.*

**COMMENT:**

The TI Report also found that a primary reason why pump and treat technology will not achieve ARARs at the Rocker OU is the chemical nature of arsenic. Elements such as arsenic tend to strongly adsorb to soil. TI Report, p. 2-4; p. 2-28. This process decreases the rate at which the metals migrate. Id. In summary, the TI study found that it will take a minimum of 1,000 years to attain groundwater ARARs. TI Report, p. 2-33.

**RESPONSE:**

*See previous comments. EPA does not select pump and treat technology in this ROD.*

**COMMENT:**

Dr. Chatham's study and the TI Report, however, do support the ARCO/Rocker Proposal for the Rocker OU, which would utilize iron to immobilize arsenic in the site soils.

**RESPONSE:**

*See earlier comments concerning EPA's concerns regarding ARCO's proposed remedy.*

**COMMENT:**

Finally, EPA cannot assume that a repository is available at Smelter Hill as part of the Rocker remedy. While ARCO has agreed to build repositories on its property at Smelter Hill for flue dust and Arbiter/Beryllium waste materials in the past, EPA is without authority to require a repository at Smelter Hill for Rocker waste materials. The ARCO/Rocker Proposal includes limited source removal if the iron flood treatment is, following an adequate period of monitoring, not protective of human health by immobilizing arsenic in subsurface soils. If this contingency would arise, a local repository at or near the Rocker OU is supported by ARCO and the community, and would better satisfy the NCP implementability as well as the cost-effectiveness criteria.

**RESPONSE:**
*The final remedy does not require that an off-site repository be constructed.*

**COMMENT:**
The Proposed Remedy Presents Serious Short-Term Effectiveness Problems Particularly with Respect to Local Groundwater System Impacts.

Short-term effectiveness addresses the period of time necessary to complete a remedy and any adverse impacts on human health in the environment that may be posed during the construction and implementation period. NCP, 40 C.F.R. 300.430(e)(9)(iii)(e) The Proposed Remedy raises two short-term effectiveness concerns that are not raised by the ARCO/Rocker Proposal. First, the removal of source materials contemplated for the Proposed Remedy may increase arsenic groundwater concentrations by mobilizing arsenic from soils to groundwater during excavation. Further, excavation of source area materials including adjacent native soils, as defined in the Proposed Plan, will remove natural soils rich in iron and thereby significantly reduce the capacity of Site soils to adsorb arsenic at the Rocker OU. The capacity of Site soils to attenuate arsenic mobility naturally is apparent from the fact that limited groundwater contamination is present more than 70 years after wood treating operations were initiated. Thus, the Proposed Plan approach to remedial action will substantially impair the ongoing natural attenuation of arsenic concentrations.

**RESPONSE:**
*EPA has previously explained how, during and after excavation, the groundwater will be treated with additional iron which will further enhance the rate of attenuation of arsenic in the groundwater, and otherwise address the issues raised here.*

**COMMENT:**
Second, the Proposed Remedy creates greater short-term risk of exposure to workers during excavation and transport of materials from the Rocker OU to a RCRA Subtitle C repository on Smelter Hill. In particular, the Proposed Remedy contemplates several loading and unloading steps, i.e., excavation and loading to rail car, transfer from rail car to truck, and unloading from truck to repository, that increase risk of exposure and injury to workers. In addition, there are short term risks posed by exposure to arsenic bearing soils and groundwater during excavation, dewatering and backfill operations. In summary, the Agencies have not taken into account "the potential threat to human health and the environment associated with excavation, transportation and redisposal or containment" as required by section 121(b)(1)(G) of CERCLA.

**RESPONSE:**
*Excavation of soils with subsequent treatment and on-site disposal will require properly trained workers familiar with conventional excavation and material handling equipment operating practices. This type of operation utilizes standard practices and, with proper caution, should pose no unusual added risk to workers, or to nearby residents. In addition, ARCO's incomplete proposed remedy does not explain how their remedy reduces such risk compared to standard excavation because they do not explain how they intend to intimately incorporate the added iron compounds in the source and affected plume areas.*

**COMMENT:**
In contrast, the ARCO/Rocker Proposal creates none of these short-term effectiveness concerns. Furthermore, the ARCO/Rocker Proposal iron flooding component will enhance rather than eliminate the natural attenuation capacity of Site soils. Because the ARCO/Rocker Proposal contemplates an in-situ remedy, risks associated with excavation, transport and redisposal of materials in an off-site repository are eliminated.

**RESPONSE:**
*See earlier responses.*

## COMMENT:

The Cost of the Proposed Remedy is Underestimated in the Proposed Plan.

Cost evaluates the estimated capital costs and operation and maintenance costs for 30 years. NCP, 40 C.F.R. 300.430(e)(9)(iii)(G). ARCO's estimate of EPA's Proposed Plan costs range between 8.5 and 10.5 million dollars. ARCO believes that the costs estimated by EPA are inaccurate because the Proposed Plan does not include costs for stabilization of excavated soils or costs associated with contingency actions described in the Proposed Plan.[5] ARCO estimates the present worth costs for the pump and treat contingency remedy range from $17.9 to $28.3 million dollars.[6] In addition, the Proposed Plan costs for a RCRA Subtitle C repository are based on $6.00/cu. yd. Previous ARCO experience suggests a range between $30-$50/cu. yd. is more accurate is RCRA Subtitle C requirements are met. In contrast, the ARCO/Rocker Proposal would cost between 3.5-5 million dollars without contingencies and up to 15 million with the source removal contingency.

## RESPONSE:

*EPA did consider the cost of construction of a RCRA C facility and the cost of treatment utilizing barium sulfate. EPA did not cost out the pump and treatment contingency because it was in fact, just a contingency. The final selected remedy was developed based upon the public comment process and is considerably less costly due to the elimination of off-site treatment and disposal.*

## COMMENT:

EPA and MDEO's Position on ARARs is Arbitrary and Capricious and Inconsistent with CERCLA and the NCP.

The ARARs criterion assesses whether a remedy is capable of meeting ARARs identified for the operable unit. NCP 40 C.F.R. 300.430(e)(9)(iii)(C). ARCO's position on Rocker OU's ARARs issues has been set forth in several letters to EPA and MDEQ, including ARCO's May, 1993 ARARs Scoping Document for the Rocker OU, ARCO's June 30, 1995 letter to D. Henry Elsen regarding Rocker OU RCRA Subtitle C Issues, ARCO's March 14, 1995 Rocker OU RI Report disclaimer letter, and ARCO's June 26, 1995 Rocker OU FS Report disclaimer letter, all of which are incorporated herein by reference.

In particular, ARCO believes that EPA and MDEQ have identified certain requirements which do not satisfy the statutory standards for ARARs specified in CERCLA and the NCP.

EPA has identified the State of Montana standard of 18 ppb as an ARAR for arsenic in groundwater. This standard is drawn from Circular WQB-7 which was recently revised to include this and other changes mandated by recent legislation. Adoption of the 18 ug/l standard for arsenic was intended to comply with amendments to Section 75-5-301, Mont. Code Ann. as part of Senate Bill 331 passed during the last legislative session.
The revised statute requires, in pertinent part, that:

(B) Standards adopted by the Board must meet the following requirements:

(I) For carcinogens, the water quality standard for protection of human health must be the value associated with an excess lifetime cancer risk level, assuming continuous lifetime exposure, not to exceed $1 \times 10^{3}$ in the case of arsenic and $1 \times 10^{5}$ for other carcinogens. However, if a standard established at a risk level of $1 \times 10^{3}$ for arsenic or $1 \times 10^{5}$ for other carcinogens violates the maximum contaminant level obtained from 40 CFR, Part 141, then the maximum contaminant level must be adopted as the standard for that carcinogen.

To be an ARAR for this Site, EPA must demonstrate that 18 ug/l represents a risk level no more stringent than $1 \times 10^{3}$. In making this demonstration, EPA must consider risk factors and assumptions which equate to a reasonable maximum exposure scenario in light of the policy and directives provided in the recently

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[5] A number of requirements are prescribed in the Proposed Plan which were not fully analyzed in the RI/FS, and their rationale for use, benefits, and costs are clearly not understood by EPA. This would include the need for and cost of treatment to meet "universal treatment standards" for excavated soils and the cost and efficacy of a grout curtain as a hydraulic control.

[6] The pump and treat system includes pumping system, injection/Kix system, chemical treatment system, sludge drying beds, and operation and maintenance associated with treatment.

published land use guidance.[7] Given the location of the Site within the 100-year floodplain and EPA's acknowledgment that current water supplies are unaffected by Site contaminants, there is no basis upon which EPA may conclude that 18 ug/l represents an appropriate risk-based standard for arsenic in groundwater within the Site.[8] Under the current condition and a reasonable maximum future exposure scenario, 18 ug/l must represent a risk level which is more stringent than $1 \times 10^{5}$ because consumption of groundwater onsite will not occur and can be effectively precluded through implementation of appropriate institutional controls. Accordingly, State law requires that EPA adopt the MCL as the State standard for water quality at this Site.

At best, EPA could justify use of an 18 ug/l for off-site migration of arsenic where residential development may occur. However, the documented background concentration of arsenic for the Site area is 30 ug/l. Moreover, the TI Report concludes that remediation to the 18 ug/l standard is not practicable. Thus, if EPA concludes that 18 ug/l is an ARAR for this Site, this standard is appropriately waived pursuant to Section 121(d)(4) on the basis that compliance is technically impracticable from an engineering perspective. In place of the 18 ug/l standard, EPA should adopt the MCL or other, appropriate risk-based standard for arsenic to be met at a point of compliance established at the edge of the waste management unit. Within the designated waste management unit, in-situ treatment using iron flooding to immobilize arsenic would occur.

**RESPONSE:**

*Prior responses address several elements of this comment. Justification for the State standard of 18 ug/l is provided in response to ARCO's introductory comments to the proposed plan. ARARs for cleanup are determined independent of risk. Background and risk issues are also addressed in response to previous comments. The risks calculated by EPA are based on reasonable future exposure where groundwater resources connected to the arsenic plume could become contaminated, particularly with the projected future demand for these resources, and on the assumption that an aquifer classified as potential drinking water by the State could also be used. In this light, EPA views the groundwater remedy as "pollution prevention", which is an important theme to the Agency. The point of compliance for the 18 ug/l State standard in groundwater applies throughout the affected aquifers. The point of compliance for this standard is addressed in Appendix 1 of the ROD. As previously stated, EPA does not believe that a TI waiver is appropriate for the site at this time, but may consider it for the shallow aquifer in the future.*

**COMMENT:**

No basis is provided for requiring disposal of materials exceeding 1000 ug/l arsenic in a RCRA Subtitle C repository. RCRA subtitle C requirements clearly are not applicable to excavated waste materials exceeding 1000 ug/l arsenic unless such materials exceed 5.0 mg/l as measured by the toxicity characteristic leaching procedure (TCLP).[9] Based upon the results of the treatability studies which have been completed, it is highly unlikely that the 5.0 mg/l standards would be exceeded for excavated materials unless the materials exceed 5000 ug/l arsenic. ARARs only apply to onsite response actions; they do not apply to off-site disposal. See 42 U.S.C. 121(d)(2). Thus, the Agencies have no authority to determine that RCRA Subtitle C requirements are "relevant and appropriate" to an off-site disposal facility.

**RESPONSE:**

*EPA identified RCRA Subtitle C as applicable, not relevant and appropriate, to the Rocker OU waste.*

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[7] See Land Use in the CERCLA Remedy Selection Process, OSWER Directive No. 9355.7-04.

[8] A more stringent standard based upon protection of potential environmental receptors can not be justified either in light of the fact that the results of the RI did not document an impact to the sediments or surface waters of Silver Bow Creek from the Site. (p.10, Proposed Plan)

[9] The Proposed Plan does not identify the requirements for management of any listed hazardous waste as ARARs, and no basis exists for determining that excavated materials would be listed hazardous wastes under 40 C.F.R. Part 261, Subpart D.

*However, the remedy selected by EPA does not include disposal off site in a RCRA Subtitle C facility. The rationale for this change from the proposed plan has been provided previously. However, EPA does consider materials containing high levels of arsenic contamination (i.e., >1,000 ppm, arsenic) to be a threat to human health, groundwater, and surface water owing to the near stream environment and the shallow groundwater.*

**COMMENT:**

The Proposed Plan Disregards the Long-Term Effectiveness of Iron Flooding in Favor of Removal/Extraction Technology.

The long-term effectiveness criterion assesses the ability of a remedy to maintain protection of human health and the environment over time. NCP, 40 C.F.R. 300.430(e)(9)(iii)(C). In the Proposed Plan, EPA and MDEQ recognize that the natural attenuation capacity of the Rocker OU has limited the lateral and vertical extent of arsenic migration at the Site. As noted above, the ARCO/Rocker Proposal contemplates in-situ treatment with iron salt that will greatly enhance attenuation of arsenic in the natural soil media. The Proposed Remedy actually inhibits the effectiveness of natural attenuation through excavation of soils rich in iron along with source area materials for subsequent placement in a repository.

**RESPONSE:**

*EPA has previously explained how the remedy in the proposed plan and in the final remedy properly consider the enhanced attenuation of arsenic both in the affected portions of the aquifer. In addition, EPA has explained why ARCO's proposed remedy is inadequate and ineffective, and has selected a remedy which appropriately addresses all criteria, including long-term effectiveness.*

**COMMENT:**

The ARCO/Rocker Proposal Provides Overall Protection of Human Health on the Environment.

The overall protection of human health and the environment criterion assesses how a remedy, as a whole, provides and maintains protection of human health and the environment. This threshold criterion, which uses the evaluations from other criteria, must be met by a selected remedy. The ARCO/Rocker Proposal clearly meets this threshold criterion.

The ARCO/Rocker Proposal will directly address and reduce human and environmental risks posed by arsenic at the Rocker OU through the application of the iron flooding in-situ treatment technology described above. Immobilization of arsenic within the shallow alluvium will protect the deeper tertiary aquifer used for water supply. Additionally, the institutional controls to be established for lands within and adjacent to the Rocker OU by ARCO in concert with the local government will eliminate residential exposures and maintain appropriate land uses necessary for maintenance and preservation of the remedy. These measures will result in the protection of both human health and the environment.

**RESPONSE:**

*EPA has previously explained the shortcomings of the ARCO proposed remedy. It is not implementable as described and therefore cannot be as effective in protection of human health and the environment as the EPA Proposed Plan nor the final remedy.*

**COMMENT:**

The Proposed Remedy Does Not Reduce the Toxicity. Mobility and Volume of Rocker OU Materials as Well as the ARCO/Rocker Proposal.

The reduction of toxicity, mobility and volume criterion assesses the degree to which a remedy reduces the toxicity, mobility and volume of contamination. 40 C.F.R. 300.430(e)(9) (iii)(D). Through liberal introduction of iron salts using flooding techniques, source materials, and groundwater in contact with source materials, will be treated and stabilized. In contrast to the ARCO/Rocker in-situ approach, excavation, transport and partial treatment of soils media as described in the Proposed Plan will be less effective in reducing the toxicity, mobility and, in fact, will increase the volume of contaminated media. Moreover, draining of pore waters during excavation of source materials may increase the areal extent of contamination at the site. This possibility is explicitly recognized in the Proposed Plan. Accordingly, application of in-situ methods better satisfies this criterion than the Proposed Remedy.

**RESPONSE:**

*See the previous responses. The EPA remedy clearly does reduce mobility of the arsenic through treatment, and will do so in a more effective manner than ARCO's proposed remedy.*

**COMMENT:**

The Proposed Remedy Fails to Fulfill the NCP Remedy Selection Criteria.

As noted above, the NCP requires that each remedial action selected must be cost effective, provided that it satisfies threshold criteria (protective of human health and the environment in compliance with ARARs). Cost effectiveness is determined by evaluating three balancing criteria: long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness. This evaluation allows for an assessment of the overall effectiveness of the Proposed Remedy. Overall effectiveness is then compared to cost to insure that a remedy is cost effective. Under the NCP, a remedy shall be cost effective if its costs are proportional to its overall effectiveness. 40 C.F.R. 300.430(f)(1)(ii)(D).

ARCO believes that the Proposed Remedy provides significantly less overall effectiveness than the ARCO/Rocker Proposal. The ARCO/Rocker Proposal is superior in its ability to reduce the toxicity and mobility of arsenic present at the Rocker OU through treatment and because the short-term risks proposed by the ARCO/Rocker Proposal are far less than associated with the Proposed Plan. As noted above, the Proposed Remedy may potentially increase the arsenic concentrations in groundwater due to the mobilization of arsenic during excavation and will also impair the natural attenuation capacity present in soils at the Rocker OU. Moreover, the Proposed Remedy will create greater short-term risks to workers in local communities due to excavation, transport and placement activities associated with the Proposed Remedy. Thus, ARCO believes that the overall effectiveness of the Proposed Remedy is less than that of the ARCO/Rocker Proposal. Given the difference in effectiveness of the Proposed Remedy and the ARCO/Rocker Proposal and the fact that the Proposed Remedy is significantly more expensive than the ARCO/Rocker Proposal, the Proposed Remedy cannot be selected as the cost effective remedy.

**RESPONSE:**

*In previous comments EPA has clearly responded to ARCO concerns regarding cost effectiveness, long-term effectiveness and permanence, reduction of toxicity, mobility and volume through treatment, and short term effectiveness. EPA's selected final remedy clearly meets the mandate of the NCP.*

**COMMENT:**

Alternate Water Supply Issue.

Six of the seven proposed remedial alternatives evaluated in the Proposed Plan, with the exception of the "No Action" Alternative, identify the installation of an expanded capacity alternate water supply as a necessary component of the selected remedy (pg. 2, Proposed Plan). EPA's decision to include an alternate water supply at the Rocker Site as part of the selected remedy is inconsistent with the EPA "Guidance Document for Providing Alternate Water Supplied," EPA 540/G-87/006, OSWER Directive 9355.3-03, February 1988 (the "Guidance Document"), and inconsistent with the NCP and CERCLA. The Guidance Document addresses the process and criteria for selection of alternate water supply remedies consistent with CERCLA and the NCP.

EPA acknowledges in the Proposed Plan (pps. 10-11), that there are no individuals exposed to contaminated groundwater at the Rocker Site. The Guidance Document expressly provides that, under CERCLA remedial authority, no action relative to the provision of an alternate water supply should be taken if it can be documented that exposures to pollutants, as a result of consuming contaminated water, does not present a threat to public health (pg. 3-11, Guidance Document). EPA acknowledges in the Proposed Plan that the existing water supply adjacent to the Rocker Site is uncontaminated and does not present a threat to human health. Thus, the proposed alternate water supply remedy is inconsistent with the Guidance document and is not supportable as a remedial action requirement.

The primary basis stated in the Proposed Plan for the alternate water supply remedy is EPA's concern for "future potential residents who may use the groundwater (adjacent to the Site) such that an imminent and substantial endangerment may be present" (pg. 11 Proposed Plan). The Guidance Document does state that remedial actions may be taken in cases where there is a threat of future contamination, if MCL's or other ARARs are not currently exceeded. However, the Guidance document clearly provides that, in such instances, EPA must first make a determination that the water supply is actually threatened with contamination before the final remedy addressing an alternate water supply can be implemented. (pg 3-6, Guidance Document). According to the Guidance Document, EPA is required to make this determination by calculating the rate of plume movement using a form of Darcy's Law and quantifying the "threat"" to the aquifer based on the measured site characteristics. As an alternative, the Guidance Document identifies several other methods which EPA could use to quantify the actual threat of future contamination to support an alternate water supply remedy. At the Rocker Site, EPA has failed to use any of the prescribed methods of making this assessment to support its remedy that an alternate water supply remedy is appropriate.

The Proposed Plan justifies selection of an alternate water supply for the Site as a means to achieve "Plume Control" (pps. 1214, Proposed Plan). EPA presumably believes there may be a connection between a theoretical future increase in demand on the deeper aquifer for water supply and modification of the present vertical flow gradient in the aquifer system. EPA's proposed use of an alternate water supply remedy as a means to achieve "plume control" is totally inconsistent with the Guidance Document and with the NCP. There is no mention in the Guidance Document or any other EPA guidance document that supports selection an alternate water supply as a remedy component to achieve "plume control."

Additionally, the Guidance Document provides that in cases where pollutants are only detected in wells which are isolated from the water supply aquifer, an alternate water supply is likely not justified (pg. 3-11, Guidance Document). In the Proposed Plan for the Rocker Site, EPA does not assert that there is a quantified actual threat of contamination to the existing public water supply based on the existing uses and demands. Neither does EPA assert that the quantity of water in the existing water supply is inadequate to meet the community's current drinking water needs. The only current potential quantity shortage of the existing public water supply identified in the Proposed Plan is to address alleged "fire suppression" issues. In the Proposed Plan, EPA indicates it intends to address this shortage as part of the remedial action through the proposed construction of a new water storage tank. However, the Guidance Document does not identify potential shortages in public water supplies for fire suppression needs as a valid primary basis for selection of an alternate water supply remedy under CERCLA. Thus, EPA does not have justification for an alternate water supply remedy at the Rocker Site which is consistent with this remedy selection criteria specified in the Guidance Document or the NCP.

The Guidance Document also provides that the selection process for an alternate water supply remedy should include an assessment of the quantity of water which will have to be supplied to the affected area and a determination whether the available usable water supply can serve community needs without the alternate supply remedy (pg. 3-7, Guidance Document). The Guidance Document states that this analysis is "critical" to the determination whether an alternate water supply is necessary and therefore must be performed. There is no indication in the Proposed Plan that EPA has conducted any such analysis to support inclusion of an alternate water supply as a component of remedial action at the Rocker Site.

To assess the appropriateness of an alternate water supply remedy, the Guidance Document also states that the demand estimates should not include projections for future growth. The Guidance Document confirms that the decision to implement an alternate supply remedy is contingent upon a showing that the existing water supply is insufficient to meet the community's current water needs and which does not take into consideration any future development (pg. 3-11, Guidance Document). Accordingly, EPA is directed in its own guidance not to consider the possibility of such future development in determining the need for or size of an alternate water supply remedy. The rationale for this position is that the CERCLA program is not to be used to provide for the projected expansion of a community public water supply (pg. 3-7, Guidance Document). The Guidance Document states that the CERCLA remedial program is designed and should be used solely to correct problems with existing public water supply systems.

EPA's Proposed Plan at the Rocker Site includes an alternate water supply remedy at the Rocker Site which is predicated entirely on a projection of future growth and demand. Since it is not based on current needs to address existing contamination, or quantified threats of contamination to the deep aquifer based on the existing demands and uses, the proposed alternate supply remedy is unjustified and inconsistent with the EPA Guidance Document governing the selection of such remedies.

Finally, according to the Guidance Document, if an alternate water supply is demonstrated to be necessary, the feasibility study should also focus solely on the provision of that water supply and not on the complete mitigation of the contaminant source (pg. 3-11, Guidance Document). EPA's attempt to characterize the provision of an alternate water supply as a component of the remedy for "Plume Control" fails to reconcile this directive with the Proposed Plan requirements. Accepting for purposes of argument that EPA may require construction of an alternative water supply as a component of a remedy for the Rocker OU, further actions described in the Proposed Plan to mitigate arsenic contamination and comply with chemical-specific ARARs are not only unnecessary to protect human health, but clearly contrary with this aspect of the EPA Guidance Document. In this way as well, selection of the remedy described in the Proposed Plan would be arbitrary and capricious, and contrary to the requirements of CERCLA and the NCP.

**RESPONSE:**

*An alternative water supply is an appropriate and necessary component of this remedy. Section 104(a) of CERCLA, 42 U.S.C. § 9604(a), authorizes EPA to provide for remedial action relating to the release or threatened release of hazardous substances "which (EPA) deems necessary to protect the public health or welfare or the environment." Section 101(24) of CERCLA, 42 U.S.C. § 9604(24), defines remedial actions to include specifically "provision of alternative water supplies." Section 106 of CERCLA, 42 U.S.C. § 9606, gives EPA the authority to order actions as may be necessary to protect public health and welfare and the environment. EPA's determinations in these matters are to be given deference. Section 113(j)(2) of CERCLA, 42 U.S.C. § 9613(j)(2). The NCP defines remedial action as actions taken to prevent or minimize the release of hazardous substances, including the provision of alternative water supplies. 40 CFR § 300.5. Although the NCP discusses provision of alternative water supplies under removal authority generally as requiring actual exposure to contamination, 40 CFR § 300.415(d)(9), no such limitation is discussed when alternative water supplies are provided as part of a remedial action, Appendix D to Part 300, subpart(f). Appendix D also identifies restrictions on use of groundwater to eliminate the potential exposure to the contamination as appropriate (emphasis added).*

*At the Rocker OU, EPA has identified the following situation: a highly contaminated shallow alluvial aquifer; two highly productive surrounding aquifers - 'ie tertiary and the lower alluvial - which are in current use by residents of the community of Rocker and local businesses; a hydraulic connection among these aquifers demonstrating that contamination of the two aquifers has occurred and that the situation will likely lead to more contamination if additional development occurs; and imminent plans by the community and other to install groundwater wells near the Rocker site. As ARCO itself has pointed out, this situation may be aggravated by the implementation of source removal, which could temporarily increase the mobility of arsenic.*

*Faced with this situation, EPA's remedy will do two things - first, it will prevent further use of the contaminated aquifer and the surrounding, connected aquifers so that exposure does not occur and the contamination does not spread, and second, actively cleanup the source and contaminated groundwaters as described. The first part of the response involves establishing institutional controls to prevent use within a 1/4 mile area of the arsenic plume and implementation of an alternative water supply for future users of groundwater within the 1/4 mile area. Preventing exposure and use in this manner is necessary to protect public health and prevent the spread of contamination, so that cleanup can proceed. This is entirely sensible, directly related to the release or threatened release of hazardous substances at the Rocker OU, and fully consistent with CERCLA and the NCP.*

*The Guidance Document for Providing Alternative Water Supplies, OWSER Dir. 9355.3-03 (EPA 1988), cited extensively by the commentor, is explicitly not applicable to the Rocker OU remedy. The Rocker OU remedy is a Final Remedial Action to address the long term health threats at the site. The Guidance is explicitly applicable only to non-time critical removal actions, or interim remedial actions dealing with short term threats using an abbreviated RI/FS process. See guidance at iii ("This document provides guidance for those sites that do not require a time-critical removal action but do require provision of an alternative water supply as either a non-time critical removal action or a remedial action before implementation of a final remedy can be achieved... Items...four (final Remedial Actions) are outside the scope of this guidance."). Thus, the limitations from the guidance cited by the commentor relating to actual exposure or predicted exposure to contaminants, and exclusion of future growth, do not apply to this action. In, addition, the Guidance does not establish "requirements" to be rigidly followed, but is* *general guidance for use as appropriate by EPA.*

*The alternative water supply described in the ROD is tailored to the site conditions, the plans and preferences of the community, and makes good sense at the Rocker OU to prevent the spread of contamination. It is fully consistent with CERCLA and the NCP, and is necessary and appropriate for the successful remediation of the Rocker OU.*

**COMMENT:**
The Proposed Remedy's Soil Excavation Component is Not Justified Under CERCLA.

The Proposed Plan requires soils containing 1000 ug/l or greater arsenic to be removed to a depth of 18 inches. The removed soils are to be placed in a RCRA Subtitle C repository in the Smelter Hill Area.[10] EPA has further proposed that barium sulfate should be added to certain removed soils to stabilize the arsenic.

**RESPONSE:**
*The final remedy will require that the excavated soils from the hot spots will be combined with the excavated soils from the source area and will then be subsequently treated and disposed of on-site. The remedy also provides a contingency for adding solidification technologies (concrete) for materials that may fail the TCLP characteristic test after initial treatment with iron. There is no need for a RCRA C disposal site with the final remedy.*

**COMMENT:**
According to EPA's most recently published regulatory agenda, the Hazardous Waste Identification Rule (HWIR): Contaminated Media reproposal is scheduled for publication in September 1995, and final action is now anticipated to occur in September 1996. 60 Fed. Reg. 23, 981 (May 8, 1995). As such, there is currently no requirement governing the treatment or disposal of contaminated media. As discussed above, RCRA Subtitle C requirements should not be identified as ARARs for off-site actions. RCRA Subtitle C would apply to offsite disposal only if the material to be disposed is a hazardous waste. Excavated materials should not exceed TCLP regulatory limits for arsenic unless arsenic exceeds at least 5000 ug/l in the materials.

**RESPONSE:**
*See previous responses.*

**COMMENT:**
The Proposed Plan, page 15, states that "Hazardous wastes exceeding EPA's universal treatment standards (estimated to be 160 yards) will be stabilized with a barium sulfate compound prior to disposal." The Proposed Plan does not identify what the "universal treatment standard" is, whether it has been finally promulgated for contaminated media, or why such a standard would be applicable or "relevant and appropriate" to contaminated media at the Rocker Site. ARCO is unaware of any such requirement under RCRA that is applicable.[11] As previously discussed, ARARs do not apply to offsite actions. Thus, unless the universal treatment standards are applicable to disposal of waste materials off-site (i.e. all of the jurisdictional prerequisites for applicability are met for the underlying RCRA requirements), compliance with such standards as ARARs under CERCLA cannot

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[10]As noted elsewhere in these comments, ARCO believes the costs for the Proposed Plan are underestimated. The Proposed Plan costs for a RCRA C repository are based on $6.00/cu. yd. Costs based on previous ARCO experience and other sources suggest a range between $30-$50/cubic yard to be more accurate.

[11]If treatment is necessary as the Proposed Plan suggests, these costs have not been included in the EPA analysis. Cost can vary from $50 to $175/per cubic yard based on previous experience and information provided by vendors.

be required.

**RESPONSE:**

*No response is required because the selected remedy does not include stabilization to meet universal treatment standards. However, materials will be treated to below "characteristic" levels using EPA's TCLP procedure.*

**COMMENT:**

Finally, excavating and disposing the arsenic-contaminated soils off-site is contrary to CERCLA's mandates. Section 121(b) specifically requires EPA to consider, inter alia, "the potential threat to human health and the environment associated with excavation, transportation, and redisposal, or containment." 42 U.S.C. 9621(b)(1)(G). Physically removing soils from their current location to the Smelter Hill area (or a local repository) greatly increases the likelihood of airborne dispersion of the arsenic and wood-treating wastes, increasing the risk of airborne ingestion by workers and members of the surrounding community. Disturbing and removing arsenic-containing soils also increases the potential for expansion of groundwater contamination on site as arsenic in soils may form a solution during excavation of the source area. Excavating the source area may also increase groundwater concentrations of arsenic by destroying ongoing natural attenuation produced by the naturally-occurring concentrations of iron in the site soils.

**RESPONSE:**

*Previous responses have already addressed ARCO's concerns about increased groundwater concentrations. The selected remedy does not include disposal off-site making comments relative to this issue moot.*

**COMMENT:**

The ARCO/Rocker Proposal -- i.e., treating the arsenic-containing soils on-site with an iron solution -- on the other hand, meets CERCLA's mandate that "[t]he President shall select a remedial action that is protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable." 42 U.S.C. 9621(b)(1).

**RESPONSE:**

*EPA has previously explained the many shortcomings of ARCO's proposed remedy.*

**COMMENT:**

Health Risks as Identified in the Proposed Remedy are
Overstated and Action Levels Inconsistent with EPA Decisions at Other UCFRB Sites.

The Proposed Remedy for the Rocker Timber Framing and Treating Plant Operable Unit includes removing soil containing more than 1,000 ppm arsenic and covering remaining soil containing more than 380 ppm arsenic (U.S. EPA 1995). The Proposed Plan indicates that the 380 ppm arsenic cleanup level corresponds to a 1 in 10,000 excess cancer risk for site workers, based on the evaluation in the U.S. Environmental Protection Agency's ("EPA's") baseline human health risk assessment for the site (CH2M Hill 1995). ARCO has commented previously on the baseline risk assessment ("BRA") (Stilwell 1995, pers. comm.). Several issues were identified during ARCO's review of the BRA that may have contributed to substantial overestimation of site-related risks.

**RESPONSE:**

*Comment Noted - EPA has responded to these issues previously and in response to ARCO's comments regarding the Human Health Risk Assessment.*

**COMMENT:**

One issue was that the way in which site data were aggregated to calculate exposure point concentrations. In the risk assessment, the primary approach used to evaluate risks associated with site soils is the calculation of exposures and risks for three sets of exposure point concentrations: soil concentrations in samples from the soil cover placed over much of the site during a removal action completed in 1989 (referred to as "on soil cover" in the risk assessment), soil concentrations in samples from site areas that were not covered during the removal action (referred to as "outside soil cover"), and soil concentrations in original site soils that are currently beneath the soil cover (referred to as "without soil cover" to reflect the hypothetical risk assessment scenario that these soils might be exposed at the site surface at some point in the future). However, the risk estimates derived in the risk assessment for areas outside the soil cover or exposures that might occur without the soil cover overstate risks that are likely associated with either current or future exposures. This is because an individual who currently has occupational or recreational exposures at the Site would be unlikely to have exposures only to covered areas or only to uncovered areas of the Site. Instead, exposures are likely to occur across the Site, and the exposure point concentration reflecting such activity patterns would be an area-weighted average of the concentrations reported in soils that are currently at the Site surface. Because a much greater proportion of the sampled Site area is currently covered, concentrations that better reflect likely activity patterns would closer to the "on soil cover" exposure point concentrations presented in the risk assessment than to the "outside soil cover" concentrations. Risk estimates would also be correspondingly lower.

**RESPONSE:**

*This comment was a portion of the ARCO comment on EPA's Baseline Human Health Risk Assessment (HHRA) and the response to the question can be found in EPA's response on the HHRA.*

**COMMENT:**

Another source of overestimation of site risks arises from the fact that no quantitative adjustments were made to reflect the reduced bioavailability of metals in soil and dust can significantly influence risk estimates. EPA's toxicity values for arsenic ingestion are based on exposure to arsenic dissolved in water. Because absorption of metals in soil and dust is generally less than that of metals in water or food, risk assessment calculations should account for these differences by applying a bioavailability adjustment factor to either the toxicity factor or to the intake estimate. Studies of arsenic absorption from Anaconda soil samples indicate that fractional absorption of soil arsenic is between one-fifth and one-half of the fraction of dissolved arsenic that is absorbed (Freeman et al. 1993; Freeman et al., in press). The arsenic in soil from Anaconda is derived primarily from smelter emissions and, therefore, is expected to differ in mineralogic form from the arsenic present in the soil at Rocker. Recent studies by PTI Environmental Services suggest, however, that even soluble arsenic salts mixed with soil are associated with reduced bioavailability after a period of weathering. PTI has developed an in vitro bioaccessibility test that may be used to compare the dissolution rates of arsenic from various soil samples in the gastrointestinal tract. PTI has found that arsenic in soil from several arsenical pesticide formulation facilities exhibits dissolution rates as slow or slower than those of arsenic from Anaconda soil. These data suggest that arsenic that has been in the soils at Rocker for 40 years or more is likely to be less than 50 percent as bioavailable as arsenic dissolved in water. This suggests that a cleanup level twice as high as the one selected by EPA would still be associated with less than a 1 in 10,000 cancer risk.

**RESPONSE:**

*This comment has been addressed previously in the responses to the Summary Portion of this document and in EPA's responses to ARCO's comments on the HHRA.*

**COMMENT:**

Finally, ARCO noted that the risk assessment does not include a discussion of the uncertainties that surround EPA's standard toxicity factors for ingested arsenic. Numerous lines of evidence suggest that toxicity factors currently used in risk assessments by EPA to evaluate the toxicity of ingested arsenic overestimate toxic effects, particularly at the relatively low levels associated with exposures in the United States. The carcinogenic slope factor ("CSF") and reference dose ("RfD") for ingested arsenic were derived by EPA from an ecological epidemiological study of the incidence of skin cancer and blackfoot disease in a Taiwanese population with elevated levels of arsenic in their drinking water (Tseng et al. 1968; Tseng 1977). EPA's Science Advisory Board, in commenting on EPA's draft Drinking Water Criteria Document on Inorganic Arsenic (Loehr and Ray 1993; U.S. EPA 1993), urged that the agency conduct an in-house quantitative risk assessment for cancers other than skin cancer that accounts for potential nonlinearities in the dose-response curve and the high background arsenic concentrations in the Taiwanese populations compared to United States populations. New epidemiological analyses of the Taiwanese populations and new data on the dietary sources of arsenic in these populations provide further evidence that the present CSF is likely to overestimate risks for United States populations. Thus, actual risks associated with EPA's selected cleanup level are likely to be substantially less than 1 in 10,000.

**RESPONSE:**

*These comments were noted in ARCO's comments to the HHRA and have been responded to in EPA's responses.*

**COMMENT:**

Finally, the identification of a 310 ppm action level for arsenic for the Rocker OU can not be reconciled with action levels determined by EPA to be protective for the Old Works/East Anaconda Development Area OU ("OW/EADA OU"). For the OW/EADA OU, engineered covers are required where arsenic levels of 1000 ppm are found. This requirement was deemed appropriate for recreational and potential commercial/industrial areas of the OW/EADA OU. Given the potential similar land use scenarios for the Rocker OU, the same requirements would be defensible. Certainly, the Proposed Plan provides no basis upon which to conclude that more conservative remedial action requirements are appropriate for the Rocker OU.

**RESPONSE:**
*See previous responses regarding these same issues.*

**COMMENT:**
The Identification of a Contingency Remedy in the Proposed Plan is not Consistent with EPA Guidance

The Proposed Plan improperly includes a contingency remedy under which EPA would require installation of a pump and treat system in five years if excavation and removal of source materials fails to adequately reduce arsenic contamination in the groundwater. EPA guidance expressly provides that there are limited situations in which contingency remedies should be employed, and suggests only two such situations. Guidance on Preparing Superfund Decision Documents: The Proposed Plan, The Record of Decision, Explanation of Significant Differences, The Record of Decision Amendment, Interim Final, OSWER Directive No. 9355.3-02, EPA/540/G89/007, July 1989, p.9-15.

**RESPONSE:**
*As responded previously, EPA guidance recommends that contingencies be developed for groundwater remedies that have a moderate level of uncertainty associated with them. In addition, the pump and treat aspect of the proposed plan has been deleted from this remedy. The contingencies provided in this remedy address containment of the arsenic plume to prevent contamination of valuable aquifers in contact with the contaminated zone.*

**COMMENT:**
First, contingency remedies were developed to promote the use of innovative treatment technologies: "An innovative treatment technology may appear to be the most appropriate remedy for a site or operable unit during the RI/FS, but more testing is needed during remedial design to verify the technology's expected performance potential." Id. This situation contemplates trying an innovative technology, and providing a proven technology as a contingent back-up remedy. Instead, EPA has proposed a traditional remedy for the Rocker OU, excavation and removal, with another traditional remedy identified as a contingency remedy. In contrast to the Proposed Plan, the ARCO/Rocker Proposal employs an innovative remedy which, if selected by EPA, would allow inclusion of a contingency remedy. However, as described elsewhere in these comments, the TI Report has determined that a pump and treat remedy would not be successful given the hydrogeologic conditions present at the Rocker OU.[12] Thus, the proposed contingency remedy under the ARCO/Rocker Proposal which EPA should select is limited source removal to a local repository.

**RESPONSE:**
*The EPA final remedy does not specifically include pump and treat technology, as a contingency. In the EPA comment to ARCO's FS, EPA recognized the technical limitations of pump and treatment technologies as they relate to this site.*

**COMMENT:**
The second situation in which a contingency remedy may be identified is where two different technologies under consideration appear to offer comparable performance. If this is the case, a proposed plan may identify one of the two as the selected remedy and the other as a contingency remedy. Because of the demonstrated limitation of a pump and treat remedy for this Site, the remedy described in the Proposed Plan (which itself is flawed in many ways) is not comparable in terms of expected performance

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[12] To the extent EPA may believe that further testing may be necessary to determine the potential effectiveness of a pump and treat system, ARCO's Technological Impracticability Report thoroughly examined the technological practicability of using a pump and treat system to attain EPA's groundwater remediation goals and determined that such a system would be required to operate for a minimum of 1000 years to achieve those goals.

with the contingency remedy EPA has identified. Id. Thus, neither of the situations described in applicable EPA Guidance Documents apply or support selection of the contingency remedy identified in the Proposed Plan.

**RESPONSE:**
*EPA disagrees with this comment and has responded to this issue in previous responses*

**COMMENT:**
Prior Comments.

The following documents have been previously submitted to EPA and MDEQ and supplement these comments. These documents are part of the Rocker OU Administrative Record and are incorporated herein by reference:

- ARCO's "Institutional Controls Planning Document for the Rocker Timber Framing & Treating Plant Operable Unit".

**RESPONSE:**
*EPA appreciates ARCO's work in this area and believes that certain proposals in this document should be used as a supplement to the remedy, as described in the ROD.*

**COMMENT:**
ARCO's "Rocker Timber Framing & Treating Plant Operable Unit Remedial Investigation/ Feasibility Study Scoping Document; Applicable or Relevant and Appropriate Requirements under 121 ) of CERCLA (ARARs)," May, 1993.

**RESPONSE:**
*The issues raised in this document are addressed in Appendix 1 or in ARCO's specific comments on ARARs in this document.*

**COMMENT:**
Letter from Charles T. Stilwell to Mr. Michael Bishop submitting attached statement of disclaimer to Final Remedial Investigation Report, March 14, 1995.

**RESPONSE:**
*See the full EPA response to ARCO's RI disclaimer.*

**COMMENT:**
ARCO's "Rocker Timber Framing & Treating Plant Operable Unit Risk Assessment Scoping Document," March, 1992.

**RESPONSE:**
*EPA's Baseline Human Health Risk Assessment and its response to ARCO's comments on this document respond to the issues presented in this document.*

**COMMENT:**
Letter from Charles T. Stilwell to Mr. Michael Bishop referencing ARCO clarification of issues and prior correspondence submitted by ARCO, April 21, 1995.

**RESPONSE:**
*Responsive correspondence and this document address the issues raised in this letter.*

**COMMENT:**
Letter from Charles T. Stilwell to Mr. Michael Bishop transmitting ARCO's Statement of Disclaimer concerning the Final Rocker OU Feasibility Study Report, dated June 26, 1995.

**RESPONSE:**
*See EPA's response to ARCO's FS disclaimer statement.*

**COMMENT:**
Letter from Richard O. Curley, Esq. to D. Henry Elsen, Esq. regarding Rocker Timber Framing & Treating Plant Operable Unit RCRA Subtitle C issues, June 30, 1995.

**RESPONSE:**
*Appendix 1 and the ARAR specific issues addressed in this document respond to this letter.*

**COMMENT:**
ARCO's "Comments on EPA's Draft Baseline Risk Assessment," April 10, 1995.

**RESPONSE:**
*See EPA's response to ARCO's comments on the Baseline Human Health Risk Assessment and the Risk Assessment itself.*

**COMMENT:**
ARCO's Rocker Timber Framing & Treating Plant Operable Unit Technical Impracticability Waiver Report, dated June 30, 1995.

**RESPONSE:**
*EPA has responded to this document separately.*

**COMMENT:**
CONCLUSION

The preceding discussion demonstrates that selection of the Proposed Remedy as the remedy for the Rocker OU would be arbitrary and capricious, not in accordance with law, inconsistent with the NCP and contrary to CERCLA. The Proposed Remedy would have serious impacts on the local shallow groundwater system at the Rocker OU. In contrast, the ARCO/Rocker Proposal is better suited as a remedy for the Rocker OU, satisfies the statutory and regulatory requirements for remedial action specified in CERCLA and the NCP better than the Proposed Remedy and is supported by the public. For these reasons, EPA and the State should withdraw the Proposed Remedy set forth in the Proposed Plan and select the ARCO/Rocker Proposal as the remedy for the Rocker OU.

**RESPONSE:**
*EPA's final remedy has been modified in part by comments received from ARCO and others during the public comment period. EPA believes that the remedy selected is protective of human health and the environment, is implementable, cost effective, and offers the best choice of technical components given the extreme complexities of the site. EPA has clearly demonstrated why ARCO's plan is not implementable hence it cannot be protective or effective. It is our understanding that the affected communities support the final remedy selected in the ROD.*

## REFERENCES

CH2M Hill. 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. Prepared for U.S. Environmental Protection Agency, Region VIII, Helena, Mt. CH2M Hill, Inc., Helena, MT.

Freeman, G.B., J.D. Johnson, J.M. Killinger, S.C. Liao, A.O. Davis, M.V. Ruby, R.L. Chaney, S.C. Lovre, and P.D. Bergstrom. 1993. Bioavailability or arsenic in soil impacted by smelter activities following oral administration in rabbits. Fund. Appl. Toxicol. 21:83-88.

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Stilwell, C. 1995. Personal communication (letter to U.S. Environmental Protection Agency, dated March 1995, regarding comments on the Rocker baseline risk assessment). ARCO, Anaconda, MT.

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U.S. EPA. 1993. Review of the draft drinking water criteria document on inorganic arsenic. Draft. EPA-SAB-DWC-94-005. U.S. Environmental Protection Agency, Science Advisory Board, Drinking Water Committee, Washington, D.C.

U.S. EPA. 1995. Proposed plan: Rocker Timber Framing and Treating Plant operable unit. U.S. Environmental Protection Agency, Region VIII, Helena, MT.

*No Response Required*

# ARCO AMENDED PROPOSED PLAN

## COMMENTS:

The Environmental Protection Agency (EPA), in consultation with the Montana Department of Environmental Quality (MDEQ), has published a Proposed Plan for the Rocker Timber Framing and Treating Operable Unit (Rocker OU). There is a 30-day Public Comment period for comments on the EPA Proposed Plan which will end Friday, August 11th. In response to the EPA's plan, ARCO is submitting an amended proposed plan which addresses the main elements of the EPA plan, is protective of human health and the environment, and encompasses the concerns of the Community of Rocker.

### ARCO AMENDED PROPOSED PLAN BACKGROUND

On August 2nd, the County Water and Sewer District of Rocker (CWSDR) held a special meeting to consider taking a position on the proposed cleanup plan at the Rocker OU. The meeting was attended by local residents, property owners, and other interested parties including the EPA and ARCO. Proposed plans by the EPA and ARCO were discussed and evaluated. Afterwards, ARCO and the CWSDR agreed on a common remedy that was passed by the Board and local residents. The amended proposed plan discussed below encompasses the concerns and specific objectives of the CWSDR. This plan supersedes the previous ARCO plan.

### PROBLEM DEFINITION/OBJECTIVES/PROPOSED REMEDY

The following discussion describes the problem, objectives, and proposed remedy for groundwater and surface hot spots.

### GROUNDWATER

**Problem:**

- Elevated concentrations in very shallow (20-40 ft.) groundwater
- Contamination is not currently affecting any drinking water source which is in the deeper aquifer
- Contamination is not affecting Silver Bow Creek

**Objective of Remedy:**

- Ensure human health is protected by not allowing arsenic from Rocker site to spread into drinking water aquifer
- Do not allow horizontal movement to affect Silver Bow Creek

**Proposed Remedy:**

- Innovative In-Situ Stabilization
- Natural Attenuation
- Groundwater Monitoring
- Limited Groundwater Ban
- Contingency Excavation/Removal only if Innovative Technology is Unsuccessful

Remedy Description. The groundwater area of concern would be defined by the arsenic concentration of $\geq 50$ ug/L as presented in the FS. An arsenic level of 18 ug/L would be very difficult to define and is below background levels of arsenic, according to Mike Bishop (Rocker EPA Project Manager).

The arsenic source will be immobilized by in-situ treatment stabilization. This approach to the source reduces long term risk by not allowing groundwater arsenic concentrations to spread and by reducing current levels in the arsenic plume. Short term risk due to worker and community exposure is minimized though an in-situ approach. Since this process is an innovative technology, a demonstration is being performed to measure the effectiveness and implementability of the technology. This evaluation will consist of batch tests, column tests, and field demonstrations. Results from batch tests performed by Dr. Bill Chatham at Montana Tech indicate the effectiveness of iron salt addition in immobilizing arsenic. Column tests and field demonstrations will help determine site effectiveness and implementation methods.

If, after a five year period, this innovative technology is unsuccessful, ARCO is willing to implement a contingency remedy where source materials will be removed to a secure repository. This repository will be located on or near the Rocker OU site if technically practicable.

Natural attenuation will continue to immobilize arsenic. The alluvial aquifer has an abundant supply of iron which is the primary source for arsenic attenuation. Removing the iron system through excavation may upset the equilibrium of the existing natural system. Groundwater monitoring of the shallow and deep aquifer will occur during and after remediation to monitor conditions of the plume.

SURFACE SOIL HOT SPOTS

| | | |
|---|---|---|
| Problem: | • | Surface Soil "Hot Spots" are potential human health concern due to direct contact with soil |
| Objective of Remedy: | • | Limit potential for human exposure which may cause health concern |
| Proposed Remedy: | • | Soil Cover |
| | • | Revegetation |
| | • | Institutional Controls |

Remedy Description. Surface soils with arsenic concentrations above 1000 ppm would define "Hot Spots". This concentration is similar to Superfund sites in Anaconda, which are a conservative level of potential concern. Soil cover areas would be revegetated. Institutional controls will include private land ownership with restrictions due to the active rail lines and the 100 year flood plain. In addition, land use will be primarily industrial with limited recreational use. Current flood plain regulations will also apply.

INFRASTRUCTURE IMPROVEMENTS
Infrastructure improvements are summarized below followed:

- Alternative Water Supply
- Allow for the drilling of Community Well
- As a contingency ARCO will compensate Rocker Community for use of BSB water compared with a community well

ARCO proposes to provide the community with an alternative water supply. The community is currently supplied water via a six-inch line from the Butte Silver Bow (BSB) Big Hole Water Treatment Plant. The community wants to be less dependent on BSB water supply and construct their own supply well. The Rocker Water & Sewer District could drill a well as long as it is not within a limited well ban a quarter mile of the site. Production of existing wells would continue. ARCO would increase the size of the current six-inch line to twelve inches and provide a 300,000 gallon storage tank. Both the community groundwater supply and the new twelve-inch line would be connected to the storage tank. Groundwater monitoring wells would provide an early warning system for water quality of the deeper tertiary aquifer which provides the current water supply for several local wells and will be the source for the community well. The risk of arsenic movement into the deeper tertiary aquifer is remote. However, if arsenic contamination occurs, the enhanced BSB water system provided by ARCO would eliminate any risk to the Rocker community. As a contingency, ARCO will offset the yearly costs associated with using BSB water instead of a community well water if arsenic is detected and poses a threat to the tertiary aquifer.

**RESPONSE:**

***All of the above "ARCO Proposed Remedy" was contained in ARCO's written formal comments dated August 11, 1995 as Section III. Responses can be found in EPA's responses to Section III of the referenced document. They will not be repeated here.***

## ARCO PROPOSED REMEDY

### COMMENT:

The basic components of the ARCO Proposed Plan are shown below:

| | |
|---|---|
| Source: | Innovative In-Situ Stabilization; Contingency Remedy Only if Innovative Technology is Unsuccessful |
| Plume: | Contingent Water Supply; Groundwater Monitoring; Institutional Controls; Natural Attenuation |
| Hot Spots: | Clean Soil Cover; Revegetation (same as FS Alternatives 2-7); Institutional Controls |

Hot spot remediation would be similar to the alternatives developed by the EPA in the Rocker FS. Clean soil material would cover existing hot spots at a depth of 18 inches. These soils would also be revegetated.

The plume area would be defined by the arsenic concentration of 50 ug/L as presented in the FS. An arsenic level of 18 ug/L would be very difficult to define and is below background levels of arsenic. Groundwater monitoring would provide an early warning system to arsenic movement. Arsenic has been very immobile at the site for the past 40 years because of natural attenuation. The risk of arsenic movement into the deeper tertiary aquifer is very remote. However, if this occurs a contingency water system will be provided to the Rocker community to eliminate any concerns. In addition, a groundwater ban will be implemented within a half mile of the existing water supply system to prevent the use of the tertiary aquifer. Existing users of the deeper aquifer will be connected to the contingency water sup. y.

Natural attenuation will continue to immobilize arsenic. The alluvial aquifer has an abundant supply of iron which is the primary source for arsenic attenuation. Removing the iron system through excavation may upset the equilibrium of the existing natural system.

The arsenic source will be immobilized by in-situ treatment stabilization. This approach to the source reduces long term risk by allowing groundwater arsenic concentrations to approach background levels. Short term risk due to worker and community exposure is minimized though an in-situ approach. Since this process is an innovative technology, a demonstration of this technology is being performed to measure the effectiveness and implementability of this system. This evaluation will consist of batch tests, column tests, and a field demonstrations. Results from batch tests performed by Dr. Bill Chatham at Montana Tech indicate the effectiveness of iron salt addition in immobilizing arsenic. Column tests and field demonstrations will help determine site effectiveness and implementation methods. If this innovative technology is unsuccessful, ARCO is willing to implement a contingency remedy.

## ARCO'S ISSUES WITH THE EPA PROPOSED PLAN

18 ug/L Standard Cannot be Met.

- The EPA Proposed Plan defines the arsenic plume by the new Montana Department of Environmental Quality (MDEQ) arsenic drinking standards of 18 ug/L. The current EPA maximum contaminant level (MCL) for arsenic is 50 ug/L. It is impossible to meet an 18 ug/L concentration regardless of remedy with an arsenic background of approximately 30 ug/L.

- Contingencies in the EPA proposed Plan are triggered if arsenic concentrations remain above 18 ug/L after the five year review. Removal of source materials will not reduce arsenic groundwater levels below 18 ug/L or even 50 ug/L within the 18 ug/L plume. In fact, removing the source will increase arsenic groundwater concentrations by removing arsenic from soils to solution during excavation, especially in the saturated zone.

Pump and Treat is Technically Impracticable.

- The EPA Proposed Plan has pump and treat as a contingency plan. ARCO prepared an Technical Impracticability (TI) evaluation of pump and treat technologies at the Rocker OU. The TI demonstrates the limitations of pump and treat technologies because of the specific site hydrogeology, arsenic release rates, and technology barriers. A treatability study completed by Dr. Bill Chatham of Montana Tech indicated that it would take arsenic 1000 to 50,000 years to release from the site. This slow release is a result of natural attenuation or the chemistry of existing iron hydroxides at the site. As a result pump and treat would be dependent on arsenic release and not be effective in reducing groundwater to 18 ug/L. Dr. Chatham's study indicated the effectiveness of adding iron to stabilize or immobilize arsenic using Rocker OU soils.

**EPA Does Not Fully Consider an Innovative In-Situ Remedy.**

- The EPA Proposed Plan and the Rocker FS did not provide for an in-situ remedy at the site. Excavation of a non-defined source increases the risk of exposure to workers and the Rocker community. In addition, excavation will increase arsenic groundwater concentrations by mobilizing arsenic from soils to groundwater. To minimize this risk it seems more appropriate to try a in-situ approach for source soils through demonstration of an innovative technology - in-situ iron stabilization. The EPA Proposed Plan discusses the validity of this natural occurring process. This process is currently being evaluated for effectiveness through planned column testing and a field demonstration. More information regarding in-situ treatment of arsenic is attached.

**RESPONSE:**

*No response required because above plan is superseded by ARCO's Amended Proposed Plan dated 8-9-95.*