Montana Department of
ENVIRONMENTAL QUALITY
Judy H. Martz, Governor

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June 29, 2001

Jim Harris
Environmental Protection Agency
Federal Building - D 10096
301 S. Park
Helena, MT 59626-0096

Subject: *First Five-Year Review Report* for the Montana Pole and Treating Plant Superfund Site

Dear Jim:

The Department of Environmental Quality has conducted a five-year review of the remedial actions implemented at the Montana Pole and Treating Plant Site in Butte, Montana. A copy of this report, signed by the Remediation Division Administrator, is enclosed. This review covers the period from April 1996 through May 2001. The purpose of the review is to determine whether the remedy at the site, as selected and implemented subsequent to the Record of Decision, is expected to be protective of human health and the environment. The methods, findings, and conclusions of the review are documented in this five-year review report. The five-year review report describes additional issues for evaluation identified during the review.

Upon review and signature of the five-year review report by John Wardell, Director of the EPA Region 8 Montana Office, please send a copy of the signed cover page to the above address. If you have any questions or comments regarding the five-year review report, please call me at (406) 444-0822.

Sincerely,

Laureen S. Kelly
Montana Pole Project Manager

Enc: *First Five-Year Review Report* for the Montana Pole and Treating Plant Site

Cc: Tom Bowler, MBMG
Ted Duaime, MBMG
Bill Kirley, DEQ
Kevin Kirley, DEQ
Darrell Stordahl, CDM

# Five-Year Review Report

## First Five-Year Review Report
## for
## Montana Pole and Treating Plant Site
## Butte
## Silver Bow County, Montana

**June 2001**

**PREPARED BY:**

**State of Montana**
**Department of Environmental Quality**
**Remediation Division**
**Helena, Montana**

Approved by:

Sandra Olsen
Remediation Division Administrator
Department of Environmental Quality

Date: June 29, 2001

Approved by:

John F. Wardell
Director, Montana Office
US E.P.A. Region 8

Date: 6/29/01

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## Executive Summary

The Department of Environmental Quality (DEQ) of the State of Montana, has conducted a five-year review of the remedial actions implemented at the Montana Pole and Treating Plant (MPTP) site in Butte, Montana. DEQ is the lead agency for this site and is therefore responsible for conducting the review. This review covers the period from April 1996 through May 2001. The purpose of this review is to determine whether the remedy at the site, as selected and implemented subsequent to the Record of Decision (ROD), is expected to be protective of human health and the environment. The methods, findings, and conclusions of the review are documented in this five-year review report. In addition, this five-year review report describes additional issues for evaluation identified during the review.

This is the first five-year review for the Montana Pole and Treating Plant site. The triggering action for this statutory review is the actual Remedial Action start date as shown in the Environmental Protection Agency's (EPA) WasteLAN database: April 18, 1996. Due to the fact that hazardous substances, pollutants, or contaminants will be left onsite above levels that allow for unlimited use and unrestricted exposure, this five-year review is required. The following items summarize the findings of this five-year review:

1. The site fence is well maintained and prevents trespassing.

2. Excavation has been demonstrated to be effective in removing soils contaminated above the cleanup levels, and enables effective removal of light non-aqueous phase liquid (LNAPL) from the surface of the groundwater. *Ex situ* biological treatment has proven effective in treating pentachlorophenol (PCP) and polynuclear aromatic hydrocarbons (PAHs) in soils to reduce contamination below cleanup levels. Operation of the *in situ* system has been minimal, so conclusions regarding its effectiveness are not available at this time.

3. Operation of the water treatment plant and associated recovery systems has been effective in capturing site groundwater and LNAPL and has provided successful treatment of plant influent.

4. State Risk Action Levels have been promulgated that are less conservative, and in some instances more conservative, than levels identified in the ROD. DEQ does not recommend increasing the discharge to surface water cleanup levels for arsenic, cadmium, copper, or zinc because the ROD cleanup levels are more conservative, and therefore more protective. DEQ and EPA will, by the end of 2001, evaluate changing the cleanup standard for dioxins in groundwater to 2 ppq (parts per quatrillion), because this standard may be more protective than the ROD cleanup level. A groundwater control area is being developed and will be implemented to prevent installation of wells that could draw groundwater from or affect groundwater flow within the plume area.

5. Due to changes in EPA-published toxicity equivalency factors (TEFs) for certain PAHs, DEQ, in consultation with EPA, will evaluate the need to lower the groundwater cleanup levels for both Benzo(a)anthracene and Indeno(1,2,3-CD)pyrene to 0.2 ppb. This evaluation will be completed by the end of 2001.

6. Storm water control capacity may be inadequate to control a 100-year flood event. Any necessary stormwater control measures will be implemented to provide for capture and discharge of water in the occurence of a 100-year flood event.

No deficiencies were identified that warrant a finding of "not protective."

## List of Acronyms

| | |
|---|---|
| ARAR | Applicable or Relevant and Appropriate Requirements |
| ARCO | Atlantic Richfield Company |
| AWQC | Ambient Water Quality Criteria |
| BRA | Baseline Risk Assessment |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| DEQ | Montana Department of Environmental Quality |
| DNAPL | Dense Non-Aqueous Phase Liquid |
| EPA | U.S. Environmental Protection Agency |
| ERA | Ecological Risk Assessment |
| FEMA | Federal Emergency Management Agency |
| FS | Feasibility Study |
| GAC | Granulated Activated Carbon |
| GPM | Gallons Per Minute |
| HDPE | High Density Polyethylene |
| HI | Hazard Index |
| LAO | Lower Area One |
| LNAPL | Light Non-Aqueous Phase Liquid |
| LTU | Land Treatment Unit |
| MCL | Maximum Contaminant Level |
| MCLG | Maximum Contaminant Level Goal |
| MDHES | Montana Department of Health and Environmental Sciences |
| MPTP | Montana Pole and Treating Plant |
| MWR | Montana Western Railroad |
| NCP | National Contingency Plan |
| NCRT | Near Creek Recovery Trench |
| NHRT | Near Highway Recovery Trench |
| NPL | National Priorities List |
| OSWER | Office of Solid Waste and Emergency Response |
| PA/SI | Preliminary Assessment/Site Inspection |
| PAH | Polynuclear Aromatic Hydrocarbon |
| PCDD | Polychlorinated dibenzo-p-dioxins |
| PCDF | Polychlorinated dibenzofurans |
| PCP | Pentachlorophenol |
| PLC | Programmable Logic Controller |
| PPB | Parts Per Billion |
| PPQ | Parts Per Quatrillion |
| PRAG | Preliminary Remedial Action Goal |
| PRP | Potentially Responsible Party |
| RA | Remedial Action |
| RCRA | Resource Conservation and Recovery Act |
| RD | Remedial Design |
| RfD | Reference Dose |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| SARA | Superfund Amendments and Reauthorization Act |

| | |
|---|---|
| SSPs | Soil Staging and Pre-Treatment Piles |
| TCDD | Tetrachlorodibenzo(p) dioxin |
| TEF | Toxicity Equivalence Factor |
| TPH | Total Petroleum Hydrocarbons |
| UV | Ultraviolet (light) |
| VOC | Volatile Organic Carbon |
| WTP | Water Treatment Plant |

# Five-Year Review Summary Form

| SITE IDENTIFICATION | | |
|---|---|---|
| **Site name** *(from WasteLAN)*: **Montana Pole and Treating Plant Site** | | |
| **EPA ID** *(from WasteLAN)*: **MTD986073583** | | |
| **Region: 8** | **State: MT** | **City/County: Butte/Silver Bow County** |

| SITE STATUS | |
|---|---|
| **NPL status:** **X** Final Deleted Other (specify) | |
| **Remediation status** (choose all that apply): **X** Under Construction Operating Complete | |
| **Multiple OUs?*** YES **X** NO | **Construction completion date:** ___ / ___ / _____ |
| **Has site been put into reuse?** YES **X** NO | |

| REVIEW STATUS | |
|---|---|
| **Reviewing agency:** EPA **X** State Tribe Other Federal Agency | |
| **Author name: Laureen S. Kelly** | |
| **Author title: Project Manager** | **Author affiliation: State of Montana, DEQ** |
| **Review period:**** 04 / 18 / 96 to 05 / 18 / 01 | |
| **Date(s) of site inspection:** 06 / 28 / 01 | |
| **Type of review:***** **X** Statutory<br>Policy ( Post-SARA Pre-SARA NPL-Removal only<br>Non-NPL Remedial Action Site NPL State/Tribe-lead<br>Regional Discretion) | |
| **Review number:** **X** 1 (first) 2 (second) 3 (third) Other (specify) | |
| **Triggering action:****** <br>Actual RA Onsite Construction at OU #___ **X** Actual RA Start<br>Construction Completion Previous Five-Year Review Report<br>Other (specify) | |
| **Triggering action date** *(from WasteLAN)*: 04 / 18 / 96 | |
| **Due date** *(five years after triggering action date)*: 05 / 18 / 01 | |

* [OU refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the five-year review in WasteLAN.]

## Five-Year Review Summary Form

**Deficiencies:**

No deficiencies in the Remedial Action implementation at the Montana Pole and Treating Plant Site were identified during the five-year review.

**Recommendations and Follow-up Actions:**

Due to changes in WQB-7 human health standards, DEQ and EPA will, by the end of 2001, evaluate changing the cleanup standards for dioxins in groundwater and in discharge to surface water to 2 pg/L and 0.13 pg/L respectively.

Due to changes in EPA-published TEFs for certain PAHs, DEQ and EPA will, by the end of 2001, evaluate the need to lower the groundwater cleanup levels for both Benzo(a)anthracene and Indeno (1,2,3-CD)pyrene to 0.2 μg/L.

DEQ has determined that the stormwater control features at the site should be evaluated for the ability to accommodate a 100-year flood event. Current stormwater control features at the site are designed to pass run-on from at least a 25-year flood event through drains or around the site without any contact with contaminated site materials.

The state floodplain management regulations prohibit the disposal of solid or hazardous wastes or the storage of toxic, flammable, hazardous, or explosive materials in the 100-year floodplain. The treated soils at the site are backfilled into the excavated areas, which lie within what was identified in the Remedial Investigation Report as the 100-year floodplain. The most recent Federal Emergency Management Agency (FEMA) map (1982) identifies portions of the site as within the floodplain due to run-on from upgradient sources. The topography at the site has since been substantially altered in a manner alleviating floodplain concerns by remedial actions at the Montana Pole site, by the relocation of Silver Bow Creek during cleanup actions at the adjacent Silver Bow Creek/Butte Area NPL site, and by activities upgradient (south) of the Montana Pole site. DEQ will evaluate the effect of all these changes on the current floodplain and determine whether any additional actions are necessary to ensure compliance with the floodplain ARARs and to ensure that none of the treated soils could be eroded or released in a 100-year flood event. If necessary to ensure ARARs compliance or protection from erosion, additional stormwater control features could be provided, either as an addition to Phase 4 activities in 2001 or during implementation of Phase 5.

**Protectiveness Statement(s):**

The remedy at the Montana Pole and Treating Plant is expected to be protective of human health and the environment upon completion, and immediate threats have been addressed. Excavation of soils and subsequent treatment is reducing concentrations of contaminants to ROD cleanup levels for PCP and B2 PAHs. ROD cleanup levels for dioxins in soils are not being met through biological treatment. In order to protect surface or groundwater contact with backfilled soils that still contain elevated levels of dioxins/furans, soils are backfilled on clean fill extending at least one foot above the historic high groundwater mark (based on 10 years of monitoring), and are covered by at least one foot of clean soil. Backfilled areas that will be

accessible for future use that might result in human exposure to these soils may be paved. Any necessary stormwater controls to provide for a 100-year flood event will be implemented as appropriate. Groundwater capture analysis will continue to make certain that adjustments are made as necessary to ensure capture of the plume. Groundwater will be captured and treated for decades until cleanup levels for groundwater are met. A groundwater control area and other institutional controls are being developed and will be implemented to prevent installation of wells that could draw groundwater from or affect groundwater flow within the plume area.

# I. Introduction

The Department of Environmental Quality of the State of Montana has conducted a five-year review of the remedial actions implemented at the Montana Pole and Treating Plant site in Butte, Montana (Figure 1). This review was conducted from April 1996 through May 2001. This report documents the results of the review. The purpose of five-year reviews is to determine whether the remedy at a site is expected to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify deficiencies found during the review, if any, and recommendations to address them.

This review is required by statute. EPA must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121(c), as amended, states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

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

This is the first five-year review for the Montana Pole and Treating Plant site. The triggering action for this statutory review is the actual Remedial Action start date as shown in EPA's WasteLAN database: April 18, 1996. Due to the fact that hazardous substances, pollutants, or contaminants will be left onsite above levels that allow for unlimited use and unrestricted exposure, this five-year review is required.

## II. Site Chronology

A chronology of events for the Montana Pole and Treating Plant follows:

### Table 1: Chronology of Site Events

| Event | Date |
|---|---|
| Initial discovery of problem or contamination | March 1983 |
| PA/SI | July 1985 |
| NPL listing | July 22, 1987 |
| Administrative Order on Consent | April 1990 |
| Cooperative Agreement | March 1988 |
| Removal actions | 1985 and 1992 |
| RI/FS complete | February 1993 |
| ROD signature | September 22, 1993 |
| ROD Amendments or ESDs | None to date |
| Phase 1 Remedial Design complete | June 1996 |
| Phase 1 Remedial Action (start - finish) | May 1996 - November 1997 |
| Phase 2 Remedial Design complete | December 1998 |
| Phase 2 Remedial Action (start - finish) | March 1999 - May 1999 |
| Phase 3 Remedial Design complete | July 1999 |
| Phase 3 Remedial Action (start - finish) | October 1999 - December 2000 |
| Phase 4 Remedial Design complete | March 2001 and ongoing |
| Phase 4 Remedial Action (start - finish) | April 2001 - ongoing |
| Phase 5 Remedial Action | Scheduled for 2004 |
| Phase 6 Remedial Action | Scheduled for 2007 |
| Construction Completion date | NA |
| Final Close Out Report | NA |
| Previous Five-Year Reviews | NA |

## III. Background

### Site Name, Location and Description

The Montana Pole and Treating Plant (MPTP) site is located at 220 West Greenwood Avenue, on the western edge of Butte, Montana, in the southeast quarter of Section 24, T3N, R8W (see Figures 1 and 2). Generally, the site is bordered on the north by Silver Bow Creek, on the south by Greenwood Avenue, on the west by a former smelter site and on the east by a railroad right-of-way. U.S. Interstate 15/90 runs across the site in an east-west direction and partitions the site into a northern and a southern section. Portions of the Site lie within the 100-year floodplain. The Lower Area One (LAO) Operable Unit of the Butte/Silver Bow Creek Superfund site overlaps the Site on the north. The Site is located in a mixed land use area. Much of the land in the vicinity of the Site has been used industrially, usually associated with past and present mining activities, though commercial and residential areas are immediately adjacent to the Site. Two neighborhoods are within a quarter mile of the site.

### Site History

The Montana Pole and Treating Plant operated as a wood treating facility from 1946 to 1984 (EPA and DEQ, 1993). During most of this period, a solution of about five percent pentachlorophenol (PCP) mixed with petroleum carrier oil similar to diesel was used to preserve poles, posts and bridge timbers. The PCP solution was applied to wood products in butt vats and pressure cylinders (retorts). Creosote was used as a wood preservative for a brief period in 1969.

The plant initially included a pole peeling machine, two butt treating vats, and related ancillary facilities. In April 1947, the first load of treated timbers was shipped off-site. Major modifications to the plant occurred between 1949 and 1951, and again around 1956. Sometime between 1949 and 1951, a 73-foot-long, 6-foot-diameter retort was installed to increase timber treatment production efficiency. A second retort, which was 66 feet long and 7 feet in diameter, was installed around 1956. The retorts were used both to dry green timber using the Boulton process, and to pressure treat timber with a petroleum/pentachlorophenol (PCP or penta) mixture. Drying timber by the Boulton process generated steam which was condensed. The condensate was discharged to two hot wells where the condensate partially separated into an oil and water phase. The water phase from the hot wells was reportedly discharged into an on-site unlined drainage ditch which flowed northward toward Silver Bow Creek. On-site sedimentation ponds were also apparently used for waste disposal purposes.

The retorts and butt treatment vats were in continuous operation until May 1969. On May 5, 1969, an explosion occurred while a charge of poles was being treated in the east butt treating vat. The explosion generated a fire which destroyed the east vat, boiler room, and retort building. Although the boiler, retorts, and auxiliary equipment were damaged, the plant was rebuilt and functional by December 1969. The west butt treatment vat was not destroyed by the

fire and was thereafter used for some timber treatment and mixing the petroleum/PCP product used in the retorts. Petroleum/PCP product reportedly spilled from the east butt treating vat as a result of the explosion and fire. Additional seepage of product occurred from both retorts as a result of broken pipes and valves damaged by the fire. Reportedly, on-site tanks were not ruptured as a result of the fire.

A small on-site sawmill was constructed in the fall of 1978 and was fully operational by the fall of 1979. Additionally, in response to implementation of the Resource Conservation and Recovery Act (RCRA), a closed-loop process water system was constructed in 1980. The primary function of this system was to eliminate overland discharges of Boultonizing water (generated from the drying of green timber). The closed-loop water recovery system operated by collecting wastewater in storage tanks, recirculating this water through the condensing system, and evaporating excess water using aeration sprays.

On May 17, 1984, the Montana Pole and Treating Plant ceased operations.

**Enforcement Actions**

In March 1983, a citizen filed a complaint concerning oil seeping into Silver Bow Creek near the Montana Pole facility. The Montana Department of Health and Environmental Services (MDHES) which is now the Department of Environmental Quality (DEQ), investigated the complaint and discovered an oil seep on the south side of Silver Bow Creek directly downgradient from the Montana Pole facility. Further investigation of the site revealed oil-saturated soils adjacent to the creek and on Montana Pole property. Subsequent sampling confirmed the presence of PCP, polycyclic aromatic hydrocarbons (PAHs), and dioxins/furans in site soils and oil samples. MDHES and EPA completed a preliminary assessment and site inspection (PA/SI) followed by a Hazard Ranking Score in July 1985. The Montana Pole facility was included on the National Priority List for Superfund sites on July 22,1987 (Fed. Reg. Vol. 52, 140 Pg. 17623).

In July 1985, the EPA Emergency Response Branch began conducting a removal action on the site to minimize impacts to Silver Bow Creek and to stabilize the site. EPA excavated approximately 6,000 cubic yards of highly contaminated soils, bagged them and placed them in storage buildings (pole barns) constructed on site. Tanks, retorts, pipes and other hardware were dismantled and stored on site in a former sawmill building. Two groundwater interception/oil recovery systems were installed to alleviate oil seepage into the creek. Contaminated areas of the site and features of the groundwater recovery system were fenced to restrict public access.

In October 1989 EPA granted MDHES the initial enforcement funding to conduct potentially responsible party (PRP) noticing and administrative order negotiations and issuance. In April 1990 MDHES signed an administrative order on consent with ARCO under which ARCO agreed to conduct a remedial investigation and feasibility study (RI/FS) at the site. In June 1990, ARCO

began the RI/FS following the MDHES and EPA approved RI/FS work plan. The remedial investigation complied with federal Superfund law, defined the nature and extent of contamination and provided information to complete the baseline human health and ecological risk assessments. The feasibility study included the development, screening and evaluation of potential site remedies.

In June 1992, the USEPA proposed an additional removal action to control and recover the light non-aqueous phase liquid (LNAPL) (floating oils) identified during the RI. The action included the installation of an 890-foot sheet piling on the south side of Silver Bow Creek. The sheet piling was approximately 50 feet south of the creek. Ten recovery wells were installed on site. Eight of the wells were located south of Silver Bow Creek in a north/south line running perpendicular to the creek. Two wells were installed parallel to the creek; one on each end of the sheet piling. The wells were approximately 25 feet deep. Each well had two pumps: one to collect free-floating oil and pump it to an on-site storage tank and the other to pump contaminated groundwater to an on-site granular activated carbon treatment facility built by EPA. The water treatment facility went into operation January 22, 1993, at which time the system installed in 1985 was shut down.

Under the terms of a consent decree, entered by the U.S. District Court on July 16, 1996, the parties responsible for the cleanup of the Montana Pole site settled their liability and provided approximately $35 million for EPA and DEQ to conduct the site cleanup. Under the EPA/DEQ Site-Specific Superfund Memorandum of Agreement, DEQ, with assistance from EPA, is conducting the cleanup at the site with funds from the MPTP Settlement Fund.

## IV. Remedial Actions

### Remedy Selection

Based upon consideration of CERCLA requirements, the detailed analysis of alternatives, and public comments, MDHES and EPA determined which alternative was the appropriate remedy for the site. The alternative selected, which is well underway, will provide maximum source reduction, remediate groundwater to the extent practicable and limit releases to Silver Bow Creek to allowable levels. All accessible contaminated soils and LNAPL will be excavated to the extent practicable and treated, preventing this material from continuing to contaminate groundwater. The long-term effectiveness and degree of permanence of the selected remedy is high. DEQ does not expect any unmanageable short-term risks associated with this alternative. This remedy will comply with all applicable or relevant and appropriate requirements. This remedy uses treatment technologies and permanent solutions to the maximum extent practicable and will be cost effective. The selected remedy will also satisfy the preference for treatment as a principal element of the remedy and for on-site remedies established in CERCLA. While certain other alternatives may better satisfy certain individual selection criteria, the selected remedy best meets the entire range of the selection criteria and achieves, in the determination of both EPA and DEQ, the appropriate balance, considering site-specific

conditions and the criteria identified in CERCLA and the NCP. The Record of Decision (ROD) which documents the remedy selection was finalized in September 1993 (EPA and MDHES, 1993).

**Components of Selected Remedy**

The contaminants of concern at the site are pentachlorophenol (PCP) and other chlorinated phenols, polynuclear aromatic hydrocarbons (PAHs), polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans. The Record of Decision established cleanup levels for contaminants of concern at the site, as well as for other compounds (Tables 2 through 5). The major components of the selected remedy as described in the ROD include:

1. Excavation of contaminated soils from accessible areas of the site, to the extent practicable. The volume of soils is estimated to be approximately 208,000 cubic yards;

2. Treatment of excavated soils (208,000 cubic yards approximately) and previously removed soils (6,000 cubic yards approximately) by above ground biological treatment;

3. In-place biological treatment of contaminated soils below the depth of excavation before backfilling;

4. Backfill of excavated and treated soils into excavated areas if possible, surface grading and revegetation;

5. Soil flushing of inaccessible soils areas (principally underlying Interstate 15/90) in order to recover hazardous substances;

6. Containment of contaminated groundwater and LNAPL using physical and/or hydraulic barriers (as determined during remedial design) in order to prevent the spread of contaminated groundwater and LNAPL and to limit releases of contamination into Silver Bow Creek;

7. Treatment of extracted groundwater using the water treatment plant (which consists of oil/water separation followed by granulated activated carbon treatment). The ultimate design of the groundwater treatment system (as determined during remedial design) may include the addition of biological means or ultraviolet oxidation (UV/oxidation) to maximize cost effectiveness of the treatment system. Treatment will meet standards for discharge or reinjection, as appropriate;

8. Discharge of extracted, treated groundwater into Silver Bow Creek and/or

reinjection of extracted, treated groundwater into the aquifer (as determined during remedial design);

9. Enhanced *in-situ* biological treatment of contaminated groundwater, inaccessible contaminated soils areas and contaminated soils not recovered by excavation;

10. Treatment of contaminated site debris and equipment by decontamination followed by disposal of these materials in a licensed off-site landfill;

11. Treatment of contaminated oils and sludges in a licensed off-site incinerator;

12. Additional institutional controls preventing access to contaminated soils and groundwater; and

13. Groundwater monitoring to determine movement of contaminants and compliance with remedial action requirements.

The ROD states:

> Once site remediation has effectively contained the contaminated groundwater and LNAPL, and releases to Silver Bow Creek have been effectively reduced or eliminated, it is expected that natural biodegradation and attenuation will effectively reduce the levels of organic contaminants in Silver Bow Creek, stream sediments and groundwater downstream of the site. These natural mechanisms will be relied upon to address the low level contamination found in this area.

**TABLE 2: SOIL CLEANUP LEVELS AND CORRESPONDING RISKS**

| Media | Contaminant | Cleanup level ($\mu g/kg$) | Basis | Cancer Risk (recreational use for soil) | Noncancer health hazard |
|---|---|---|---|---|---|
| Soils | Pentachlorophenol[a] | 34,000 | risk | $1.0 X10^{-6}$ | <1 |
| | B2 PAHs (TEF)[bc] | 4,200 | risk | $1.0 X10^{-6}$ | <1 |
| | Dioxin TCDD (TEF)[bd] | 0.20 | risk | $1.0 X10^{-6}$ | <1 |

a Levels correspond to an excess cancer risk of $1 \times 10^{-6}$ and are based on data for the dermal exposure pathway as presented in the Baseline Risk Assessment Report (CDM, 1993).

b Levels correspond to an excess cancer risk of $1 \times 10^{-6}$ and are based on data for the soil ingestion exposure pathway as presented in the Baseline Risk Assessment Report (CDM, 1993).

c Sum of individual B2 PAH (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, and indeno( 1,2,3-cd)pyrene) concentrations multiplied by their corresponding toxicity equivalence factor (TEFs).

d Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF).

## TABLE 3: GROUNDWATER CLEANUP LEVELS AND CORRESPONDING RISKS

| Media | Contaminant | Cleanup level ($\mu g/l$) | Basis | Cancer Risk (drinking use for ground water) | Noncancer health hazard quotient |
|---|---|---|---|---|---|
| Groundwater | Pentachlorophenol | 1.0 | MCL | $1.7 \times 10^{-6}$ | NA |
| | Benzo(a)pyrene | 0.2 | MCL | $2.1 \times 10^{-5}$ | NA |
| | Benzo(a)anthracene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Benzo(b)fluoranthene | 0.2 | risk | $2.1 \times 10^{-5}$ | NA |
| | Benzo(k)fluoranthene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Chrysene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Dibenzo(a,h)anthracene | 0.2 | risk | $2.1 \times 10^{-5}$ | NA |
| | Indeno(1,2,3-CD)pyrene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Benzo(g,h,i)perylene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Total D PAHs[a] | 360 | hazard quotient | NA | 0.9 |
| | Dioxin TCDD (TEF)[b] | $3.0 \times 10^{-5}$ | MCL | $6.2 \times 10^{-5}$ | <1 |
| | 2,4,6-trichiorophenol | 6.5 | risk | $1.0 \times 10^{-6}$ | NA |
| | 2-chlorophenol | 45 | hazard quotient | NA | 0.9 |
| | 2,4-dichiorophenol | 27 | hazard quotient | NA | 0.9 |
| | 2,3,5,6-tetrachlorophenol | 267 | hazard quotient | NA | 0.9 |

NA - Not applicable

A Sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations.

B Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF).

## TABLE 4: SURFACE WATER CLEANUP LEVELS AND CORRESPONDING RISKS

| Media | Contaminant | Cleanup level ($\mu g/l$) | Basis | Cancer Risk (drinking use for ground water) | Noncancer health hazard quotient |
|---|---|---|---|---|---|
| Surface Water | Pentachlorophenol | 1.0 | MCL | $1.7 \times 10^{-6}$ | <1 |
| | Benzo(a)pyrene | 0.2 | MCL | $2.1 \times 10^{-5}$ | NA |
| | Benzo(a)anthracene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Benzo(b)fluoranthene | 0.2 | risk | $2.1 \times 10^{-5}$ | NA |
| | Benzo(k)fluoranthene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Chrysene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Dibenzo(a,h)anthracene | 0.2 | risk | $2.1 \times 10^{-5}$ | NA |
| | Indeno(1,2,3-CD)pyrene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Benzo(g,h,i)perylene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Total D PAHs[a] | 360 | hazard quotient | NA | 0.9 |
| | Dioxin TCDD (TEF)[b] | $1.0 \times 10^{-5}$ | aquatic criteria | $2.0 \times 10^{-5}$ | <1 |
| | 2,4,6-trichiorophenol | 6.5 | risk | $1.0 \times 10^{-6}$ | NA |
| | 2-chlorophenol | 45 | hazard quotient | NA | 0.9 |
| | 2,4-dichiorophenol | 27 | hazard quotient | NA | 0.9 |
| | 2,3,5,6-tetrachlorophenol | 267 | hazard quotient | NA | 0.9 |

NA - Not applicable

a Sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations.

b Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF).

## TABLE 5: DISCHARGE TO SURFACE WATER CLEANUP LEVELS AND CORRESPONDING RISKS

| Media | Contaminant | Cleanup level ($\mu$g/l) | Basis | Cancer Risk (drinking use for surface water) | Noncancer health hazard quotient |
|---|---|---|---|---|---|
| Discharge to Surface Water | Pentachlorophenol | 1.0 | MCL | $1.7 \times 10^{-6}$ | <1 |
| | Benzo(a)pyrene | 0.2 | MCL | $2.1 \times 10^{-5}$ | NA |
| | Benzo(a)anthracene | 1.0 | risk | $1.0 \times 10^{-7}$ | NA |
| | Benzo(b)fluoranthene | 0.2 | risk | $2.1 \times 10^{-5}$ | NA |
| | Benzo(k)fluoranthene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Chrysene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Dibenzo(a,h)anthracene | 0.2 | risk | $2.1 \times 10^{-5}$ | NA |
| | Indeno(1,2,3-CD)pyrene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Benzo(g,h,i)perylene | 1.0 | risk | $1.0 \times 10^{-6}$ | NA |
| | Total D PAHs[a] | 360 | hazard quotient | NA | 0.9 |
| | Dioxin TCDD (TEF)[b] | $1.0 \times 10^{-5}$ | aquatic criteria | $2.0 \times 10^{-5}$ | <1 |
| | 2,4,6-trichlorophenol | 6.5 | risk | $1.0 \times 10^{-6}$ | NA |
| | 2-chlorophenol | 45 | hazard quotient | NA | 0.9 |
| | 2,4-dichloropheno1 | 27 | hazard quotient | NA | 0.9 |
| | 2,3,5,6-tetrachlorophenol | 267 | hazard quotient | NA | 0.9 |
| | Arsenic | 48 | aquatic criteria | NA | NA |
| | Cadmium | 1.1 | aquatic criteria | NA | NA |
| | Chromium | 11 | aquatic criteria | NA | NA |
| | Copper | 12 | aquatic criteria | NA | NA |
| | Lead | 3.2 | aquatic criteria | NA | NA |
| | Zinc | 110 | aquatic criteria | NA | NA |

NA - Not applicable

a Sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations.

b Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF).

### Remedy Implementation

The MPTP cleanup is being implemented in a number of phases. These phases are further decribed below. Camp Dresser & McKee (CDM) is under contract with DEQ to conduct engineering design, construction oversight, and technical support at Montana Pole.

The design for Phase 1 of the Remedial Action was finalized in June 1996 (CDM, 1996). Construction occurred from May 1996 to November 1997. The primary activities completed during Phase 1 of the remedial action consisted of construction of the land treatment unit, building an addition to the water treatment plant, construction of two contaminated groundwater recovery trenches, and removal of the north-side contaminated soils. Phase 1 required detailed coordination of numerous remedy components including:

- Excavation of approximately 46,000 cubic yards of contaminated north-side soils and construction of aboveground biological treatment units. These units consist of 13 soil staging and pretreatment piles (SSPs) and a nine-acre biological land treatment unit. Air is added to the SSPs through a high volume vacuum system. Water and nutrients are also added through a drip irrigation system. The land treatment unit is tilled by conventional farming techniques and watered with a center pivot irrigation system. Nutrients can be applied while tilling or via liquid fertilization with the center pivot unit.
- Bioremediation to enhance the breakdown of contaminants by microorganisms through aeration and nutrient addition. The SSPs and the land treatment unit both utilize soil bioremediation practices.
- Processing and placing approximately 10,000 cubic yards of previously excavated contaminated soils onto the SSPs along with approximately 16,000 cubic yards of north-side contaminated soils. The land treatment unit was loaded with 30,000 cubic yards of contaminated soils.
- Removal and replacement of the active railroad track located adjacent to Silver Bow Creek in order to excavate contaminated soils below the tracks.
- LNAPL recovery and biological treatment of contaminated soils below the depth of excavation before backfilling.
- Construction of two recovery trenches. The Near Highway Recovery Trench is approximately 700 feet long and 22 feet deep. It was constructed just north of Interstate 15/90 and was designed to recover LNAPL and groundwater. The Near Creek Recovery Trench was constructed at the north end of the site, just south of Silver Bow Creek. This trench is designed to intercept all contaminated groundwater prior to leaving the site and is approximately 880 feet long and 20 feet deep.
- Installation of a new oil/water separator to complement the existing activated carbon treatment system in the water treatment plant addition. The water treatment plant is used for above-ground treatment of extracted groundwater. The treated water is either used for watering the SSPs or is discharged to Silver Bow Creek.
- Treatment of contaminated oils and sludges in a licensed offsite hazardous waste incinerator.
- Installation of infiltration basins in the north side clean backfill to further enhance microbial degradation of groundwater and any residual soil contamination.

The design for Phase 2 of the Remedial Action was finalized in December 1998 (CDM, 1998). Construction occurred from March 1999 to May 1999. Phase 2 of the remedial action consisted of the removal and disposal of hazardous and non-hazardous waste debris remaining on site. Off-site disposal methods included incineration and/or placement in hazardous and non-hazardous waste landfills. Metal debris was pressure washed and recycled. Phase 2 activities included the following:

- Characterization of the site debris to determine disposal requirements. Debris was segregated into non-contaminated debris that could be placed in a non-hazardous waste landfill, hazardous debris that could be placed in a licensed hazardous waste landfill, asbestos containing debris, metal that could be pressure washed and recycled, and solid and liquid wastes that required off-site incineration.
- Demolition of storage tanks. Sludges from the tanks were placed in drums and shipped to an incinerator. Tanks were cut up and pressure washed for off-site recycling.
- Asbestos containing materials were tested to determine whether they were friable. Non-friable asbestos-containing wastes were shipped to a licensed hazardous waste landfill and friable asbestos-containing wastes were double-bagged and disposed of at the same hazardous-waste landfill.
- Debris that could not be stabilized for hazardous-waste land disposal was incinerated off site along with the recovered sludges and oils.
- Construction of a temporary pressure wash pad for cleaning metal prior to recycling.

Waste disposal volumes for Phase 2 activities included:

- 1,036 cubic yards of uncontaminated debris disposed of in a non-hazardous waste landfill in Missoula, MT.
- 3,224 tons of hazardous debris disposed of at an approved hazardous waste landfill in Idaho.
- 300 tons of metals sent to a recycler.
- 18 tons of hazardous sludges, solids, and oils treated at a licensed hazardous waste incinerator in Utah.

The design for Phase 3 of the Remedial Action was finalized in July 1999 (CDM, 1999). Construction occurred from October 1999 to December 2000. Phase 3 of the remedial action consisted of the south-side contaminated soils excavation, off-loading Phase 1-treated soils from the land treatment unit, placing contaminated soil on the land treatment unit, installing the north and south *in situ* treatment systems, and the relocation of sewer and potable water lines. Phase 3 activities included the following:

- Excavation of approximately 148,000 cubic yards of contaminated soils and non-contaminated overburden from the south-side of the site and from accessible areas below the Interstate 15/90 bridges.
- Screening and loading approximately 132,000 cubic yards of contaminated soil on the land treatment unit for treatment of soils.
- Recovery of light non-aqueous phase liquids during all excavation activities. This was accomplished with the use of booms, a vacuum system and a rotating-drum skimmer. Approximately 20,700 gallons of LNAPL were collected during Phase 3.

- Construction of *in situ* cells at the north and south end of the site to enhance bioremediation of contaminated groundwater and non-accessible contaminated soils. A gravel layer and perforated piping were installed to inject nutrients and oxygenated water back into the groundwater to enhance the biodegradation of any residual contamination.
- Off-loading approximately 25,000 cubic yards of treated soils from the land treatment unit and backfilling these soils in the north side excavation.
- Placement of approximately 64,000 cubic yards of clean soils as backfill above the south-side *in situ* treatment systems.
- Off-loading 27,000 cubic yards of Phase 3 soils from the land treatment unit. After 3 months of treatment on the LTU, the top 28-inch lift of soils was remediated to below the treatment criteria for pentachlorophenol and polynuclear aromatic hydrocarbons and was backfilled in the south excavation area.
- Relocation of an existing community sewer line and construction of new sewer and potable water lines.

To date, more than 52,000 cubic yards of soil have been successfully treated in the land treatment unit. Treatment of each of the first 2 lifts of these soils was obtained in one treatment season. Soil PCP concentrations in the heavily contaminated soils that were placed in the SSPs have been significantly reduced since being placed in the piles during Phase 1 activities (i.e. PCP concentration of 712 ppm (parts per million) in SSP #13 has been reduced to 264 ppm).

Phase 4 of this project is a continuation of Phase 3 activities, and will primarily consist of off-loading the land treatment unit over the next few years as surface soil lifts are remediated to below the action limits set for the site. These treated soils will be placed over the south-side *in situ* system. SSPs meeting the cleanup criteria will also be dismantled and the treated soils backfilled on-site. Phase 4 Remedial Action construction began in April 2001 and is ongoing.

Phase 5 will address the contaminated soils beneath Interstate 15/90 that divides the site. Currently, a preliminary remedial alternatives report is being generated that evaluates various potential remediation methods including surfactant flushing, soil vapor extraction, hydraulic manipulation, and excavation of the contaminated soils beneath the existing bridges in the event of bridge replacement by the Montana Department of Transportation. Phase 5 construction activities are anticipated to begin in 2003.

Phase 6 will consist of removal and disposal of the soil treatment facilities on the south side of the site and final revegetation of all disturbed areas. At that time, DEQ expects to turn the site over to Butte/Silver Bow City/County government. Final land use at the site will be determined by Butte/Silver Bow with certain constraints on land use specified by EPA and DEQ consistent with the Montana Pole and Treating Plant Record of Decision.

**System Operations/O&M**

The Montana Bureau of Mines and Geology (MBMG) is under contract with DEQ to provide site services. Site services work is being conducted in accordance with the approved Operations and Maintenance (O&M) Plan (CDM, 2000). MBMG also assists with Remedial Action construction activities as requested by DEQ.

Site Services Support activities include such things as: operation and maintenance of the water treatment facility, including carbon changes; maintenance of groundwater and soil treatment facilities; drilling and installation of additional monitoring wells as determined necessary for monitoring and determination of groundwater capture; operation of bioremediation units (LTU and SSP's); operation and monitoring of both the north side and south side in-situ bioremediation systems; input and management of data; utilization of a database compatible with the Clark Fork Data Management System; maintenance of the former Oaas residence and other site facilities; provision of site security, site health and safety; escorting contractors and visitors; providing site information when requested by DEQ; management of the decontamination facility; management of on-site oily waste and off-site disposal; and control of weeds.

Water, soil, and air monitoring are conducted as required in the *Site-Wide Operations and Maintenance Manual.* Monitoring requires regular collection of samples of groundwater, surface water, water treatment plant discharge, soil (from LTU and SSPs), and air. Samples are collected as needed to ensure compliance with the ROD and the cleanup levels stipulated in the ROD. The current frequency and methods for collecting samples is specified in Table 6 below and in the *Site-Wide Operations and Maintenance Manual* and may be altered by DEQ depending upon results and site-specific conditions. Groundwater elevation monitoring and determination of NAPL thickness are conducted as well. Groundwater flow and capture at the site are evaluated on a weekly basis.

Table 6 below lists the current data collection requirements for the site. DEQ may choose to alter the requirements at any time. DEQ and MBMG will review this table on an annual or more frequent basis to determine if sampling points, sampling frequency, or required analyses should be altered.

The water treatment plant has treated approximately 600 million gallons of contaminated water and has removed approximately two tons of PCP from the groundwater since the facility went into operation January 22, 1993. The water treatment plant and *in situ* bioremediation system will continue to operate for decades until ROD cleanup levels are met in the groundwater below the site.

## Table 6: Data Collection Requirements at the Montana Pole Site

| Frequency | Data Type | Data Logged |
|---|---|---|
| Weekly | All monitoring wells, Piezometers | Groundwater elevations & NAPL thickness (weekly during in situ system operation; may move to biweekly over time) |
| | 8-12 monitoring wells each side, Cell Piezometers No. side (MW-A,E,H,I,J,K,L,M,O-01&MW-K,M-96) So. Side (MW-Q,R,S,T,U,V,W,X-01&MW-14,E-96,B-95,GW-10) | Downhole monitoring (pH, EC, Temp, Redox) during in situ system operation |
| | WTP influent/between carbon tanks/effluent, NHRT, NCRT | PCP |
| | In situ system injection water | Nutrients (anions & ammonia), pH, EC, Temp, Redox |
| | Air samples | BTEX, Naphthalene, PCP, PM-10 (frequency will decrease during winter months) |
| | WTP Flow Rates and Totals | Flow rates |
| | LTU and SSP Field Meter Parameters | Oxygen, carbon dioxide, moisture, and temp during treatment season |
| | Three air monitoring stations, 2 immediately downwind of LTU and excavation areas and 1 upwind | PM-10 (during construction and LTU operations) |
| Biweekly | All monitoring wells, Piezometers | Groundwater elevations & NAPL thickness (when not operating in-situ system) |
| | Stream Gauge Levels | Levels |
| | Two air monitoring stations immediately downwind of LTU and excavation areas, and 1 upwind | PCP, Naphthalene, BTEX (during LTU operations) |
| Monthly | Surface water samples (1 upstream, 1 immediately downstream, 3 downstream) | PCP |
| | Monitoring wells GS-22, GW-10, GW-12, GW-13, GW-14R-98, GW-17, MW-01, MW-14, MW-87-03, MW-A-95, MW-B-95, MW-I-96, MW-J-96, MW-K-96, MW-L-96, MW-M-96, MW-A-98, MW-B-98, MW-A-99; All INF Series Wells, 4 to 6 south side piezometers; and MW-A through X-01 | PCP, Anions, Ammonia |
| | Meteorological Stations | Weather conditions |
| | NHRT, NCRT | PCP (during steady state conditions) |
| | Two air monitoring stations (one upwind and one downwind of LTU and excavation areas) | PM-10 |
| Bimonthly | LTU Soils | PCP, TPH, Nutrients, Chloride |
| | SSP Soils | PCP, TPH, Nutrients, Chloride |
| Quarterly | WTP influent | PCP, Metals, Anions, Cations |
| | Discharge to surface water, Surface water samples SW-01 and SW-02, NCRT, NHRT and wells MW-L-96&MW-H,J,K,L,M-01&MW-B-98 | Metals, Anions |
| Semi-Annually | WTP Effluent | PAH, dioxins/furans, metals, chlorophenols |
| | Discharge to surface water, Surface water samples, Monitoring wells MW-96K, GW-12, MW-D-96, MW-B-98, MW-L-96, INF-04, INF-05, INF-06 | PAH, dioxins/furans, chlorophenols |
| | All domestic wells within 1/4 mi. | PCP, Metals, Anions, Cations |
| Annually | All monitoring wells (except S-01, CT-01, and CT-02) | PCP |
| | Air monitoring stations | TSP and Pb during summer |
| End of Treatment/ Final Compliance | LTU Soils | PCP, PAH, dioxins/furans |
| | SSP Soils | PCP, PAH, dioxins/furans |
| As-Needed Basis | Debris wipe samples | PCP |
| | Various soils | PCP Quick Tests |
| | Level loggers | Groundwater elevations |
| | Retention pond and sumps | PCP |
| | Site Buildings | PCP, noise, and dust |
| | Site employees | PCP |
| | Confirmation sampling | PCP, PAH, dioxins/furans |

Notes:

1. Semiannual sampling occurs in May and November.
2. Anions include the following: bicarbonate, carbonate, nitrate, sulfate, fluoride, chloride, nitrite, and orthophosphate.
3. Metals include the following: As, Cd, Cr, Cu, Pb, Zn, and in some instances Mn.

## V. Five-Year Review Process

The Montana Pole and Treating Plant Site five-year review was led by Laureen Kelly, Project Manager for the MPTP site. The following team members assisted in the review:

- Tom Bowler, Field Remediation Engineer, MBMG
- Ted Duaime, Hydrogeologist, Project Manager, MBMG
- Kristen Edelmann, Human Health Risk Assessor, CDM Federal Programs
- Kevin Kirley, MDEQ Federal Superfund Section Manager
- Bill Kirley, MDEQ Legal Counsel
- Jim Harris, P.E., EPA Remedial Project Manager
- Darrell Stordahl, P.E., Project Manager, CDM Inc.

This five-year review consisted of the following activities: document review; site inspection; review of changes in standards; review of changes in exposure pathways, toxicity, and other contaminant characteristics; risk assessment; and data review.

## VI. Five-Year Review Findings

### Interviews

Interviews were not specifically conducted for the five-year review. DEQ is actively involved on the site on a daily basis and is therefore already aware of site issues and views of nearby residents.

### Site Inspection

DEQ last inspected the Site on June 28, 2001. DEQ's presence at the site varies from as little as one day per week to as many as five days per week, and DEQ is therefore continually aware of the Site's status.

Site Security

The fence around the site is maintained by the Site Services Contractor. Frequently, cars travelling on Greenwood have impacted the fence, which has then been immediately repaired. DEQ also installed security systems on the water treatment plant and Oaas house in 2000. Site Security procedures are described in the site Health & Safety Plan (MBMG, 2001). These three measures together have been effective in preventing access of unauthorized visitors onto the site.

Land Treatment Unit

The Land Treatment Unit is functioning well, enabling effective and timely treatment of soils loaded on the LTU. Soils loaded on the LTU during Phase 1 met treatment standards for PCP and B2 PAHs within one treatment season, and an 18-inch lift of soils was offloaded (a 24-inch lift had been placed on the LTU; however, only 18 inches were removed to prevent damage to the LTU liner and drainage system). During Phase 3, 8 feet of soils were loaded on the LTU.

Treatment goals for PCP and B2 PAHs were reached within one treatment season for the top 30-inch lift of soils. Note that cleanup levels for B2 PAHs were reached by the first sampling event of the season. DEQ anticipates that at a minimum, at least 18 inches of soil can be treated each treatment season, and potentially a thicker lift. The ROD cleanup level for dioxins (Total TCDD Equivalents) have not been met by biological treatment on the LTU nor by the inadvertant mixing of more highly contaminated soils with less contaminated soils.

Because the cleanup level for dioxins has not been met on the LTU by biological treatment nor by mixing of more highly contaminated soils with less highly contaminated soils, DEQ has determined that the best way to handle treated soils is to backfill them within the excavated area (as contemplated in the ROD) on top of clean fill extending at least one foot above the historical high groundwater mark, and to cover treated backfilled soils with at least one foot of clean fill. DEQ is conducting both an analytical solution and modeling to evaluate the potential for dioxins to leach to groundwater (CDM, 2000). Preliminary results indicate that for a 100-year timeframe, dioxins would not significantly leach, thus groundwater dioxin concentrations would not be above the ROD cleanup level for dioxins in groundwater. This is not surprising given the immobile, hydrophobic nature of dioxins. Also, water treatment plant influent concentrations in December 1999 showed that although LNAPL remains on the groundwater underneath the I-15/90 portion of the site, the dioxin concentration in water treatment plant influent is below the ROD cleanup level.

Operation of the Center Pivot Unit (CPU) to control dust on the LTU is adequate in most cases. On occasion, during very hot weather and high wind conditions, dust has blown up from the LTU as the surface layer of the LTU can dry out extremely quickly. In these cases, additional water cannot necessarily be added, because it would make tilling of the LTU impossible and would reduce treatment of the soils by reducing soil aeration. DEQ is currently evaluating other possible dust control measures, such as the use of magnesium chloride ($MgCl_2$), lignin or soy oil amendments which do not evaporate as readily as water, as well as additional barrier-type fencing or snow fencing to reduce the erosive force of the wind. Evaluation of the potential for air-borne particulate phase contaminants (calculated using the highest PM-10 level detected near the LTU and the highest concentrations of the contaminants on the LTU) show that levels have not exceeded EPA Region 9 Preliminary Remediation Goals for ambient air.

Odors emanating from the LTU have also been of concern to DEQ and a few of the nearby residents. Air monitoring to date has indicated that the concentrations of volatile and semi-volatiles in the air are below EPA Region 9 Preliminary Remediation Goals. DEQ is currently conducting an odor study to determine if the peak level of odor at the site can be reduced by modifying the tilling frequency or through the addition of an amendment such as $MgCl_2$.

Soil Staging/Pretreatment Piles

Operation of the soil staging and pretreatment piles has resulted in significant biodegradation of contaminants, however, it is unclear as to how much longer the SSPs will need to be operated before ROD cleanup levels for PCP are reached. B2 PAH cleanup levels have already been reached in the SSPs. DEQ does not anticipate, based on the results seen on the LTU, that dioxin cleanup levels will be reached. In 2000, composite sampling indicated that cleanup levels for PCP had been reached in the SSPs. Intensive confirmation sampling indicated that this was

not the case. In fact, in most instances, concentrations of PCP in the confirmation samples were higher than in the previous sampling event. This was likely due to variability within the SSPs and perhaps laboratory processes. In the event that soils do not meet cleanup levels for PCP by the time all Phase 3 excavated soils are treated on the LTU and backfilled, DEQ anticipates dismantling of the SSPs and placing any soils still above the PCP cleanup level onto the LTU.

Groundwater Treatment System

The Water Treatment Plant has been effective in treating captured water to ROD cleanup levels for discharge into Silver Bow Creek. In March 2000, breakthrough of the secondary GAC bed occurred resulting in a discharge in exceedence of the ROD cleanup level for PCP. DEQ ordered an emergency carbon change of all four carbon beds, and has experienced no problems since that time. The Site Services Contractor has prepared a report which discusses potential causes of the breakthrough (MBMG, 2001). Potential causes may include coating of the carbon by free product adsorbed to fine solid matter, coating of the carbon by a polymer used in construction of the Near Creek Recovery Trench, or some other unknown cause. To prevent a future similar recurrence, DEQ installed a belt skimmer at the west end of the Near Highway Recovery Trench which has been very effective in removing product, reducing the load to the OWS. MBMG has also begun careful monitoring of metal speciation and concentrations in plant influent and effluent, to determine any potential impacts of precipitates on the carbon. DEQ is considering pre-treatment technologies for groundwater prior to its entry into the GAC beds; pre-treatment would not only extend the life of the carbon beds but would also reduce the chance of any future discharge exceedence.

Testing of the *in situ* treatment system has just begun. Currently, there is insufficient data to evaluate whether the system is effective in enhancing bioremediation of residual contaminants in the groundwater and soils within the saturated zone. The *in situ* treatment system is installed and complete on both the north and south sides of the site.

The Near Highway Recovery Trench and Near Creek Recovery Trench along with their associated pumps have been effective in capturing site groundwater. Historically, capture has been evaluated using both SURFER plots and verifying gradients from guard wells toward the trenches. However, starting in May of 2001, the Site Services Contractor began using MODFLOW to evaluate capture (Figure 3). Results from groundwater contour maps developed with Surfer indicate that capture is being maintained. However, MODPATH (a particle tracking program), shows that pumping rates from the NCRT may need to be increased (Figure 4). This is currently being evaluated. The Near Highway Recovery Trench has been effective in preventing downgradient migration of LNAPL that still remains below I-15/90.

Groundwater contaminant plume maps (Figures 5, 6, and 7) show the reduction in size of the groundwater plume from 1997 and 1998 to 2000. Note that the area north of the Near Creek Recovery Trench overlapped with Lower Area One (an adjacent mine-waste Superfund site). Soils were excavated in this area, but residual contamination can result in elevated levels of PCP in this area. It is believed that naturally occurring biodegradation will be effective in reducing these levels to below ROD groundwater cleanup levels.

Integral to the evaluation of hydraulic capture is a clear knowledge of the extent of the contaminant plume. In 2000, DEQ evaluated all site well construction details, and has determined that a number of wells are screened too deeply. Monitoring of an LNAPL plume with wells whose screen interval is lower than the low groundwater level will likely result in collection of samples from a lower, less contaminated part of the aquifer. Because of this, and also due to the fact that additional wells are needed to more definitely define capture (several were removed during excavation activities), 26 new wells will be installed.

As mentioned numerous places above, concentrations of contaminants in groundwater remain above ROD cleanup levels. It is expected to take several decades of operation of the water treatment plant and *in situ* system, after removal of the remaining contaminated soils and LNAPL, for groundwater to meet treatment goals.

Excavations and LNAPL Recovery from Excavations

The remedy calls for excavation to remove all accessible soils contaminated above the cleanup goals. Excavation has been effective in removing all contaminated soils to a depth of 18 inches below the groundwater surface. The remedy also called for recovery of LNAPL off the surface of the groundwater after excavation. The use of vacuum skimmers, drum skimmers, and air injection into soils below the groundwater has enabled removal of LNAPL from all excavation areas, such that only a sheen remains on the groundwater. The remedy called for soil washing of inaccessible soils (i.e. beneath I-15/90). However, MDT has slated the I-15/90 bridge which transects the site for removal and replacement. DEQ is coordinating with MDT so that when the bridge is removed, DEQ will be able to excavate all contaminated soils and recover the remaining LNAPL beneath I-15/90.

**Risk Information Review**

All ARARs listed in the ROD were reviewed for changes that could affect protectiveness. Upon review of the ARARs, DEQ does not believe there have been any changes in location-specific or action-specific ARARs that would bear on protectiveness and that would thus require analysis in this five-year review report. While there have been some recodifications and revisions of ARARs, these would not fall within the "protectiveness" standard which would bring the change into application in the five-year review process.

DEQ has determined that the stormwater control features at the site should be evaluated for the ability to accommodate a 100-year flood event. Current stormwater control features at the site are designed to pass run-on from at least a 25-year flood event through drains or around the site without any contact with contaminated site materials.

The state floodplain management regulations prohibit the disposal of solid or hazardous wastes or the storage of toxic, flammable, hazardous, or explosive materials in the 100-year floodplain. The treated soils at the site are backfilled into the excavated areas, which lie within what was identified in the Remedial Investigation Report as the 100-year floodplain. The most recent Federal Emergency Management Agency (FEMA) map (1982) identifies portions of the site as within the floodplain due to run-on from upgradient sources. The topography at the site has since been substantially altered in a manner alleviating floodplain concerns by remedial actions

at the Montana Pole site, by the relocation of Silver Bow Creek during cleanup actions at the adjacent Silver Bow Creek/Butte Area NPL site, and by activities upgradient (south) of the Montana Pole site. DEQ will evaluate the effect of all these changes on the current floodplain and determine whether any additional actions are necessary to ensure compliance with the floodplain ARARs and to ensure that none of the treated soils could be eroded or released in a 100-year flood event. If necessary to ensure ARARs compliance or protection from erosion, additional stormwater control features could be provided, either as an addition to Phase 4 activities in 2001 or during implementation of Phase 5.

A review of the Montana Numeric Water Quality Standards Circular WQB-7 reveals that the State of Montana has promulgated standards that are different from the respective human health standards or aquatic life standards which were used as remediation levels in the 1993 ROD as shown in Table 7. The current WQB-7 aquatic life standards for arsenic and cadmium are higher than the WQB-7 aquatic life standards for these elements in 1993. The cleanup levels for arsenic and cadmium must be met in discharge to surface water from the water treatment plant. The ROD is therefore protective of aquatic life, since the ROD cleanup levels are more stringent. The current WQB-7 aquatic criteria for copper and zinc are 5.2 and 67 ppb respectively at 50 mg/L hardness; however, water at Montana Pole exceeds 400 mg/L hardness, bringing the WQB-7 aquatic criteria to 51 ppb and 387 ppb for copper and zinc respectively. ROD cleanup levels for copper and zinc are 12 and 110 ppb respectively, and are therefore more protective that current WQB-7 levels. Therefore, DEQ does not recommend changing cleanup levels for arsenic, cadmium, copper, or zinc. Samples collected by MBMG from the discharge have had concentrations below ROD cleanup levels (MBMG, 2001).

**Table 7: Changes in Chemical-Specific Standards**

| Contaminant | Media | Cleanup Level | Standard (µg/L) | | Source/Year |
|---|---|---|---|---|---|
| Arsenic | Discharge to Surface Water | 48 | Previous | 48 | WQB-7 1993 |
| | | | New | 150* | WQB-7 1999 |
| Cadmium | Discharge to Surface Water | 1.1 | Previous | 1.1 | WQB-7 1993 |
| | | | New | 1.4* | WQB-7 1999 |
| Copper | Discharge to Surface Water | 12 | Previous | 12 | WQB-7 1993 |
| | | | New | 5.2* | WQB-7 1999 |
| Zinc | Discharge to Surface Water | 110 | Previous | 110 | WQB-7 1993 |
| | | | New | 67* | WQB-7 1999 |
| Total TCDD Equiv. | Groundwater | $3x10^{-5}$ | Previous | $3x10^{-5}$ | WQB-7 1993 |
| | | | New | $2x10^{-6}$ | WQB-7 1999 |

*Based on 50 mg/L hardness. Montana Pole groundwater harness exceeds 400 mg/L.

WQB-7 standards for dioxins have also changed since the ROD was written. The ROD cleanup criteria for Total TCDD Equivalents in discharge to surface water is 10 pg/L (picograms per liter); the most recent plant effluent concentration was taken in December 1999. The concentration in the plant discharge was 0.27 pg/L, well below the ROD aquatic criteria cleanup level. Currently, there are no aquatic criteria for Total TCDD Equivalents in WQB-7, but there is a human health surface water standard of 0.13 pg/L due to a high bioconcentration factor for

dioxins. The ROD cleanup criterion for Total TCDD Equivalents in groundwater based on the 1993 MCL is 30 pg/L ($3x10^{-5}$ µg/L); the most recent plant influent concentration taken in December 1999 had a Total TCDD Equivalents concentration of 2.4 pg/L, well below the ROD cleanup level. The current WQB-7 human health standard is 2 pg/L ($2x10^{-6}$ µg/L). The plant influent concentration is just above this level which is not surprising given that LNAPL still exists under the interstate. However, treatment by the GAC beds reduced this concentration to well below 2 pg/L as described above. DEQ and EPA will evaluate the need to lower the cleanup level for Total TCDD Equivalents in groundwater and in discharge to surface water. This evaluation will be completed by the end of calendar year 2001.

The assumptions used to estimate health risks and cleanup levels for the Montana Pole ROD were compared to assumptions that would currently be used. Most of the exposure parameters and toxicity values have not changed. Two key changes that could impact the cleanup levels are the Toxicity Equivalency Factors (TEFs) for carcinogenic PAHs and the dermal adherence factor used to estimate risk from dermal contact with soil.

For PAHs in groundwater, Table 8 below compares the previous TEFs with those currently recommended by EPA, and provides the corresponding groundwater cleanup levels. As shown, using the current TEFs, the cleanup levels would increase for chrysene and decrease for benzo(a)anthracene and indeno(1,2,3-cd)pyrene. By the end of 2001, DEQ and EPA will evaluate the need for lowering the cleanup levels for both Benzo(a)anthracene and Indeno(1,2,3-CD)pyrene to 0.2 ppb as the revised risk-based levels may be more protective.

**Table 8: Potential Changes to Groundwater Cleanup Levels Based on PAH Toxicity Equivalency Factors**

| Carcinogenic PAHs | TEFs used in 1993 Risk Assessment | Current TEFs (a) | 1993 Cleanup Levels (µg/L) | Cleanup Levels using current TEFs (µg/L) |
|---|---|---|---|---|
| Benzo(a)anthracene | 0.01 | **0.1** | 1 | 0.2 b |
| Benzo(b)fluoranthene | 1 | **0.1** | 0.2 | 0.2 b |
| Benzo(k)fluoranthene | 0.01 | 0.01 | 1 | 1 |
| Benzo(a)pyrene | 1 | 1 | 0.2 | 0.2 b |
| Benzo(g,h,i)perylene | 0.01 | NA | 1 | NA c |
| Chrysene | 0.01 | **0.001** | 1 | 10 |
| Dibenzo(a,h)anthracene | 1 | 1 | 0.2 | 0.2b |
| Indeno(1,2,3-cd)pyrene | 0.01 | **0.1** | 1 | 0.2 b |

(a) Current Toxic Equivalency Factors (TEFs) for carcinogenic PAHs are from: USEPA. 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EPA/600/R-93/089

(b) The cleanup level associated with a $10^{-6}$ cancer risk from drinking water would be lower than the value shown. The cleanup level of 0.2 ug/L is based on the MCL for benzo(a)pyrene.

(c) NA = Not applicable. Benzo(g,h,i)perylene is a Group D PAH, not classifiable as to carcinogenicity.

For pentachlorophenol in soil, the risk assessment assumed that the dermal adherence factor was 1.45 mg of soil per cm of exposed skin ($mg/cm^2$) (CDM 1993). The value currently recommended by EPA (e.g., Region 9 PRG tables) is 0.2 $mg/cm^2$. The only chemical with cleanup levels based on dermal exposure was pentachlorophenol. These cleanup levels increase significantly (by a factor of 7.25) when the new dermal adherence factor is used.

Table 9 summarizes the soil cleanup levels for pentachlorophenol based on the previous assumptions and based on the new adherence factor. As shown, for residential and industrial receptors, the new cleanup levels for pentachlorophenol would be based on ingestion exposure rather than dermal exposure (i.e., the estimated risks from ingestion are now higher than the estimated risks from dermal exposure). Note: If the site has been cleaned up to 34 mg/kg for recreational land use, that level might also be acceptable for industrial land use. The cleanup level for industrial land use, based on ingestion exposures, is 40 mg/kg. DEQ does not recommend increasing the cleanup level for PCP as the ROD cleanup level is more protective and drives much of the cleanup at Montana Pole.

**Table 9: Estimated Soil Cleanup Levels for Pentachlorophenol (mg/kg)**

| | Residential Land Use | Industrial Land Use | Trespasser or Recreational Land Use |
|---|---|---|---|
| **1993 Assumptions** | | | |
| Dermal Exposure | **3** | **9** | **34** |
| Ingestion Exposure | 14 | 40 | 255 |
| | | | |
| **Current Assumptions (a)** | | | |
| Dermal Exposure | 22 | 65 | **247** |
| Ingestion Exposure | **14** | **40** | 255 |

**Bold** values indicate the soil cleanup level for pentachlorophenol for each land use.

(a) The only exposure assumption that changed is the dermal adherence factor
1993 dermal adherence factor: 1.45 $mg/cm^2$
Current dermal adherence factor: 0.2 $mg/cm^2$

Using current assumptions, ingestion exposures would result in higher risks than dermal exposures for residential and industrial land use. Dermal exposure would still result in higher risks for recreational land use.

In March 2000, DEQ published a Tier 1 Risk-Based Corrective Action Guidance Document. This document provides risk-based screening levels for petroleum compounds in soils and groundwater. EPA has not developed screening levels for diesel (which is very similar in composition to the fuel oil used to dissolve the PCP at Montana Pole) in soil or groundwater. However, MBMG has sampled soils and plant influent and effluent for Total Petroleum Hydrocarbons (TPH by EPA Method 418.1). In no case have levels of TPH in soil backfilled after treatment exceeded the RBCA ceiling concentration of 5,000 ppm for Total Extractable Hydrocarbons (EPA Method 8015 mod.). Some soils removed during the 1985 EPA Removal Action exceeded this value initially; however, these soils are still undergoing treatment in the biopiles and TPH concentrations are now well below 5,000 ppm. In no case since March 1998 (earliest data reviewed) have levels of TPH in plant effluent to Silver Bow Creek exceeded the RBCA ceiling concentration of 1,000 ppb for Total Petroleum Hydrocarbons (MBMG 2001). Influent TPH concentrations (which in some cases have exceeded 1,000 ppb) appear to be effectively reduced to acceptable concentrations by GAC treatment.

### Data Review

A review of records and monitoring reports through January 1, 2001, indicates that the water treatment plant has treated approximately 600 million gallons of contaminated water and has removed approximately two tons of PCP from the groundwater since the facility went into operation January 22, 1993 (CDM, 2001). A total of 192,000 cubic yards of contaminated soils have been excavated, while 52,000 cubic yards of these soils have been treated on the Land Treatment Unit and backfilled. Over 5,000 tons of debris have been removed and over 50,000 gallons of LNAPL have been recovered off the surface of the groundwater.

Weekly sampling of plant effluent has shown the GAC treatment of the groundwater prior to discharge into Silver Bow Creek is effective in reducing contaminant concentrations to below ROD cleanup levels for discharge to surface water. Plant influent concentrations for PCP have fluctuated between 354 ppb and 2,210 ppb over the past year. Effluent from the Near Creek Recovery Trench has averaged 80 ppb while effluent from the Near Highway Recovery Trench was 2,356 ppb. Concentrations in plant influent were highest during Phase 3 Remedial Action Construction Activities. Typical flow rates through the plant have been 235 gpm. Due to the fact that LNAPL persists beneath the interstate and remedial action construction is not complete, this five year review report will not include a detailed comparison of post-construction, groundwater contaminant concentrations with pre-construction groundwater contaminant concentrations. It is apparent from the difference in concentrations between the NCRT and NHRT that high groundwater contaminant concentrations will continue until LNAPL and contaminated soils below the interstate are removed.

## VII. Assessment

The following conclusions support the determination that the remedy at the Montana Pole and Treating Plant site is expected to be protective of human health and the environment upon completion.

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

- Health and Safety Plan (HASP)/Contingency Plan: The HASP and Contingency Plan are in place, and are sufficient to control risks.
- Implementation of Institutional Controls and Other Measures: The site fence is well maintained and prevents trespassing. DEQ is in the process of preparing a revised draft Groundwater Control Area technical memorandum and implementing other institutional controls in accordance with requirements of the 1996 consent decree.
- Remedial Action Performance: Excavation has been demonstrated to be effective in removing soils contaminated above the cleanup levels, and has enabled effective removal of LNAPL from the surface of the groundwater. Biological treatment has proven effective in treating PCP and B2 PAHs in soils to below cleanup levels. ROD cleanup levels for dioxins in soils are not being met. In order to protect surface or groundwater contact with backfilled soils that still contain elevated levels of dioxins/furans, soils are backfilled on clean fill extending at least one foot above the historic high groundwater mark (based on 10 years of monitoring), and are covered by at least one foot of clean soil. Operation of the *in situ*

system has been minimal, so a review of its effectiveness is not available at this time.

- System Operations/O&M: Operation of the water treatment plant and associated recovery systems has been effective in capturing site groundwater and LNAPL and has provided successful treatment of plant influent.
- Cost of System Operations/O&M: A review of O&M costs has not been completed in this five year review due to the fact that remedial action construction is still ongoing, and the site is not in an O&M phase.
- Opportunities for Optimization: In early 2001, DEQ identified monitoring data gaps and a task order is in place to fill these data gaps. The current monitoring schedule was shown above in Table 6. Upon completion of one year of monitoring under this revised schedule, monitoring frequency will be reduced as appropriate.
- Early Indicators of Potential Remedy Failure: No early indicators of potential remedy failure were noted during the review. Review of the budget indicates that adequate monies remain to take this site through to final cleanup.

***Question B: Are the assumptions used at the time of remedy selection still valid?***

- Changes in Standards: This five-year review identified State Risk Action Levels that have been changed since the ROD was signed. These parameters were identified in Table 7 above. DEQ does not recommend increasing cleanup levels for the discharge to surface water for arsenic, cadmium, copper, or zinc because the ROD cleanup levels are more conservative, and therefore more protective.

  DEQ and EPA will, by the end of 2001, evaluate changing the cleanup standard for dioxins in groundwater and in discharge to surface water to 2 pg/L and 0.13 pg/L respectively. A groundwater control area is being developed and will be implemented to prevent installation of wells that could draw groundwater from or affect groundwater flow within the plume area.

- Changes in Exposure Pathways: No changes in the site conditions that affect exposure pathways were identified as part of the five year review.

- Changes in Risk Assessment Methodologies: Due to changes in EPA-published TEFs for certain PAHs, DEQ and EPA will, by the end of 2001, evaluate the need to lower the groundwater cleanup levels for both Benzo(a)anthracene and Indeno(1,2,3-CD)pyrene to 0.2 μg/L.

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

No additional information has been identified that would call into question the protectiveness of the remedy.

## VIII. Deficiencies

As noted and documented above, there were no deficiencies; however, changes to the remediation levels will be evaluated to reflect state standards and current EPA-published TEFs, and stormwater control features at the site will be evaluated for the ability to accommodate a 100-year flood event

## IX. Recommendations and Follow-up Actions

There are three recommendations relating to this five-year review:

1) Due to changes in WQB-7 human health standards, DEQ and EPA will, by the end of 2001, evaluate changing the cleanup standards for dioxins in groundwater and in discharge to surface water to 2 pg/L and 0.13 pg/L respectively.

2) Due to changes in EPA-published TEFs for certain PAHs, DEQ and EPA will, by the end of 2001, evaluate the need to lower the groundwater cleanup levels for both Benzo(a)anthracene and Indeno (1,2,3-CD)pyrene to 0.2 μg/L.

3) DEQ is currently evaluating the need for design and construction of 100-year stormwater control structures. If necessary to ensure ARARs compliance or protection from erosion, additional stormwater control features could be provided, either as an addition to Phase 4 activities in 2001 or during implementation of Phase 5.

## X. Protectiveness Statement(s)

The remedy at the Montana Pole and Treating Plant is expected to be protective of human health and the environment upon completion, and immediate threats have been addressed. Excavation of soils and subsequent treatment is reducing concentrations of contaminants to ROD cleanup levels for PCP and B2 PAHs. In order to protect surface or groundwater contact with backfilled soils that still contain elevated levels of dioxins/furans, soils are backfilled on clean fill extending at least one foot above the historic high groundwater mark (based on 10 years of monitoring), and are covered by at least one foot of clean soil. Where access to backfilled areas might result in human exposure to these contaminated soils, the soils may be paved. Any necessary stormwater controls to provide for a 100-year flood event will be implemented as appropriate. Groundwater capture analysis will continue to make certain that adjustments are made as necessary to ensure capture of the plume. Groundwater will be captured and treated for decades until cleanup levels for groundwater are met. A groundwater control area and other institutional controls are being developed and will be implemented to prevent installation of wells that could draw water from or affect groundwater flow within the plume area.

## XI. Next Review

This is a statutory site that requires ongoing five-year reviews. The next review will be conducted within five years of the completion of this five-year review report. The completion date is the date of the signature shown on the cover attached to the front of this report.

## References


Camp Dresser and McKee. 1993. *Baseline Risk Assessment for the Montana Pole NPL Site.*

Camp Dresser and McKee. 1996. *Phase 1 Remedial Action Final Design Report.*

Camp Dresser and McKee. 1998. *Phase 2 Remedial Action Bidding Documents.*

Camp Dresser and McKee. 1999. *Phase 3 Remedial Action Bidding Documents.*

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Environmental Protection Agency and Montana Department of Health and Environmental Sciences. 1993. *Record of Decision, Montana Pole and Treating Plant National Priorities List Site.*

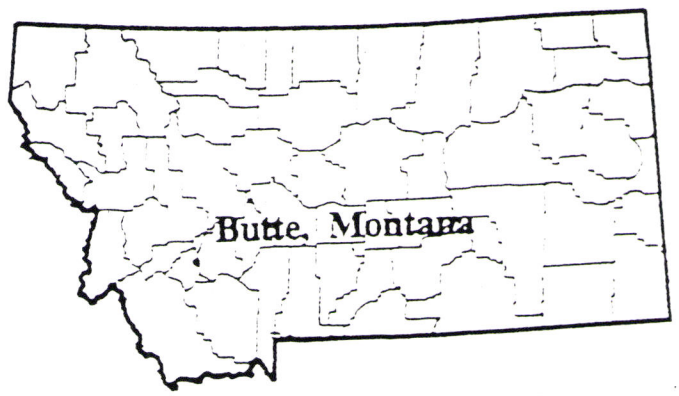
Montana Bureau of Mines and Geology. 2001. *Montana Pole Monthly Report for March 2001.*

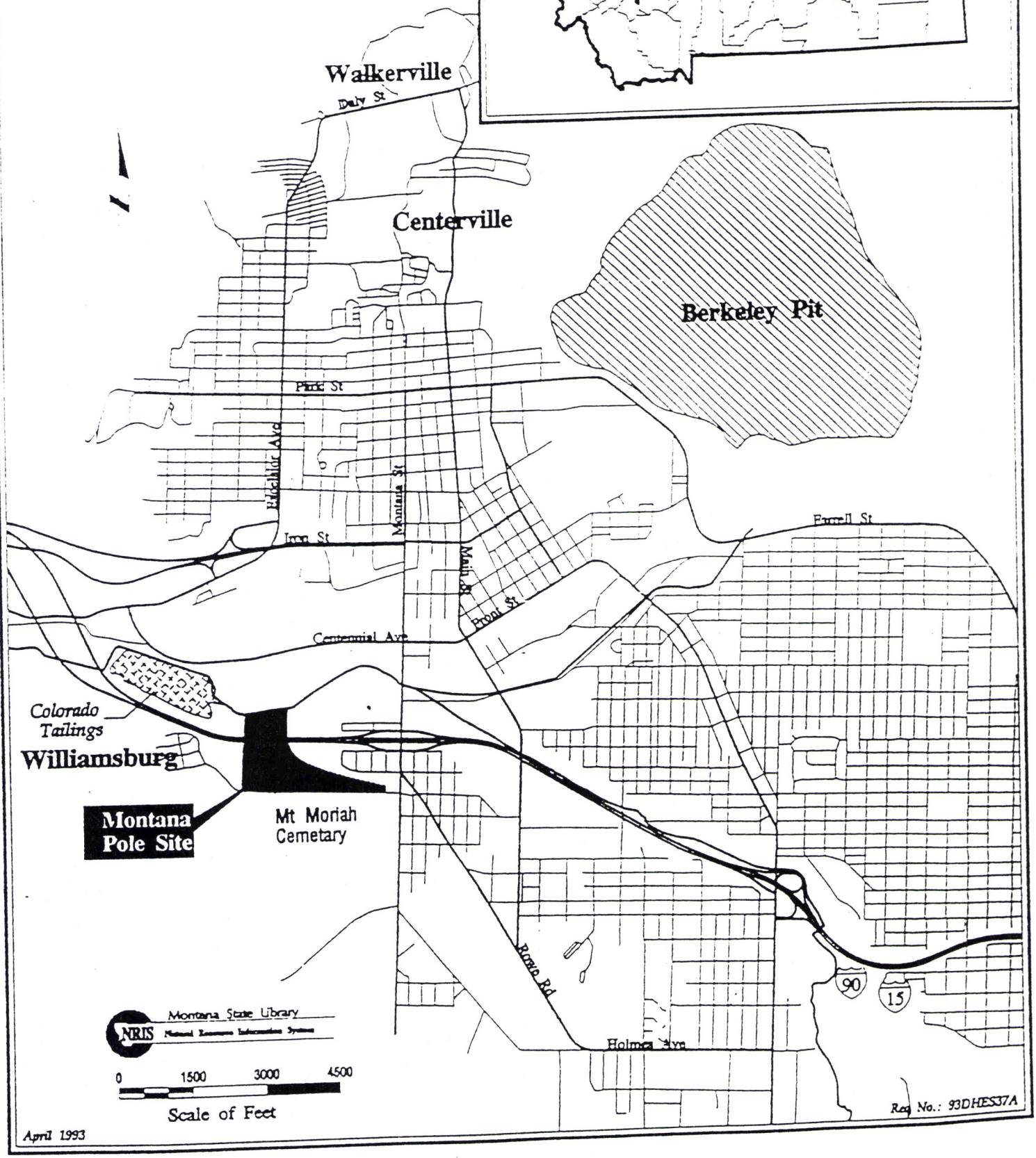
Montana Bureau of Mines and Geology. 2001. *Montana Pole and Treating Plant Site Health and Safety Plan.*

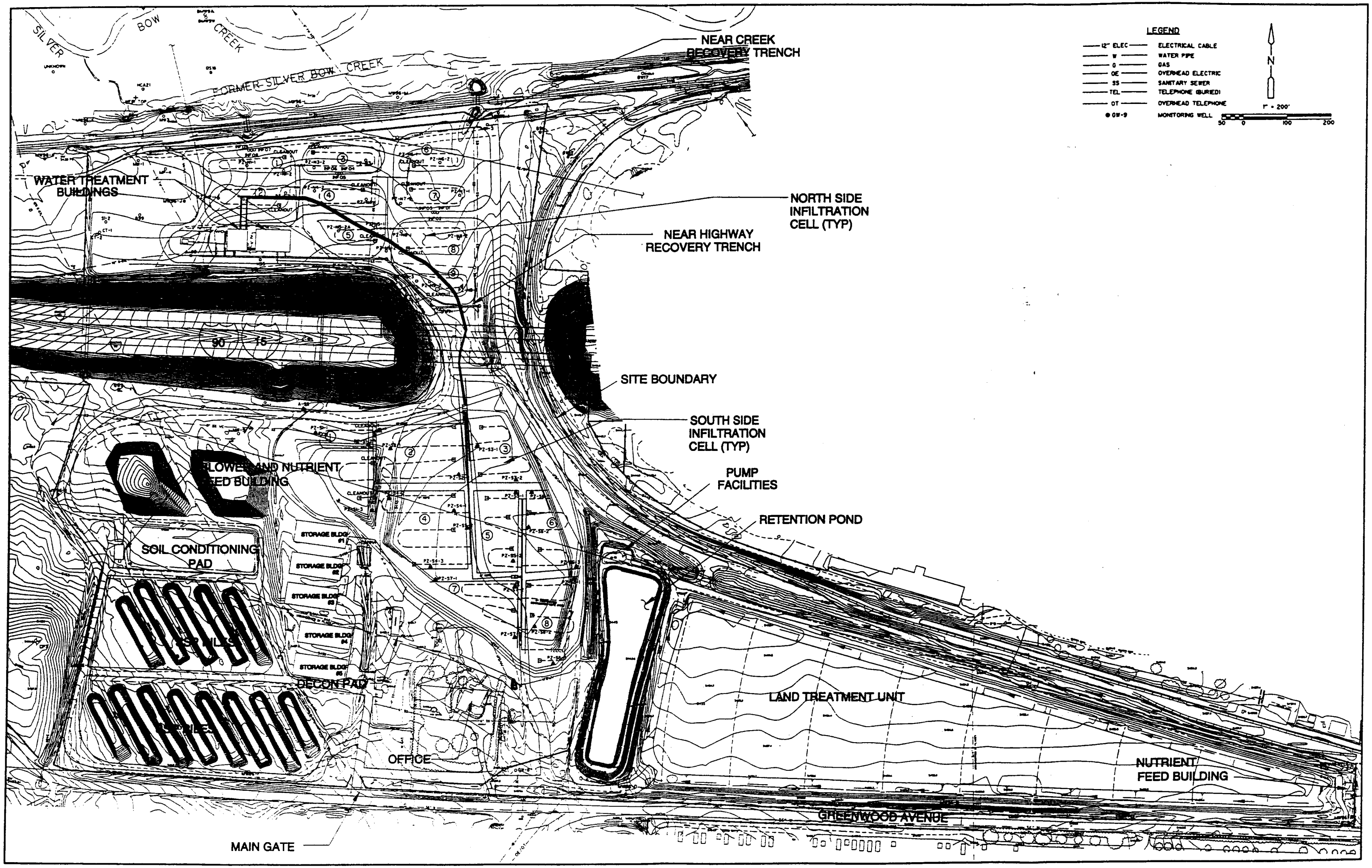
Montana Bureau of Mines and Geology. 2001. *Premature Carbon Bed Replacement Report.*

Montana Department of Environmental Quality. 2000. *Tier 1 Risk-Based Corrective Action Guidance Document.*

# Figure 1:
# Montana Pole Superfund Site
# Butte, Montana






D:\land_projects\MIP\INSITU\dwg\FIG1-1.DWG 12/11/00

**CDM** Camp Dresser & McKee

Figure 2

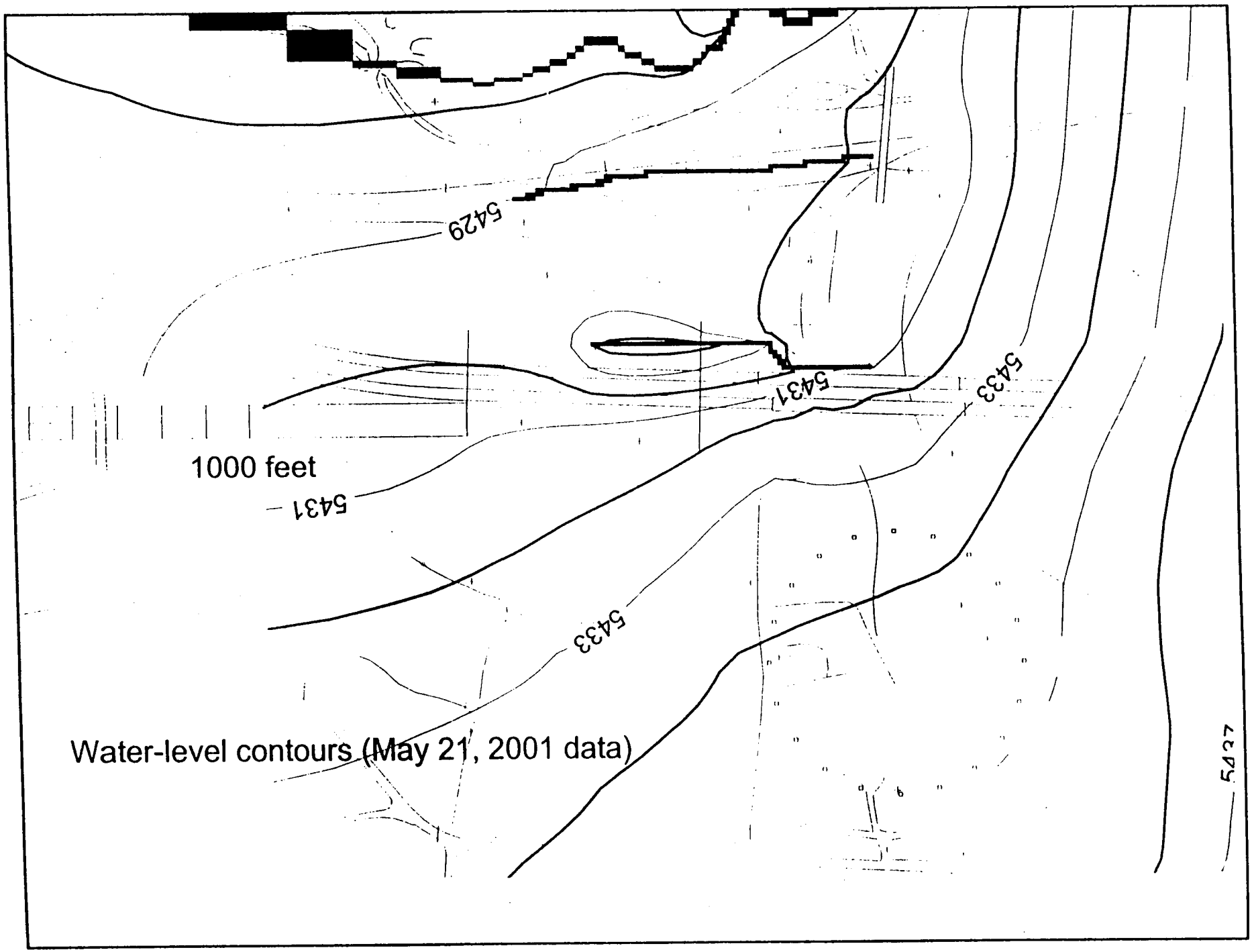

5429
5431
5433
1000 feet
5431
5433
Water-level contours (May 21, 2001 data)

Figure 3

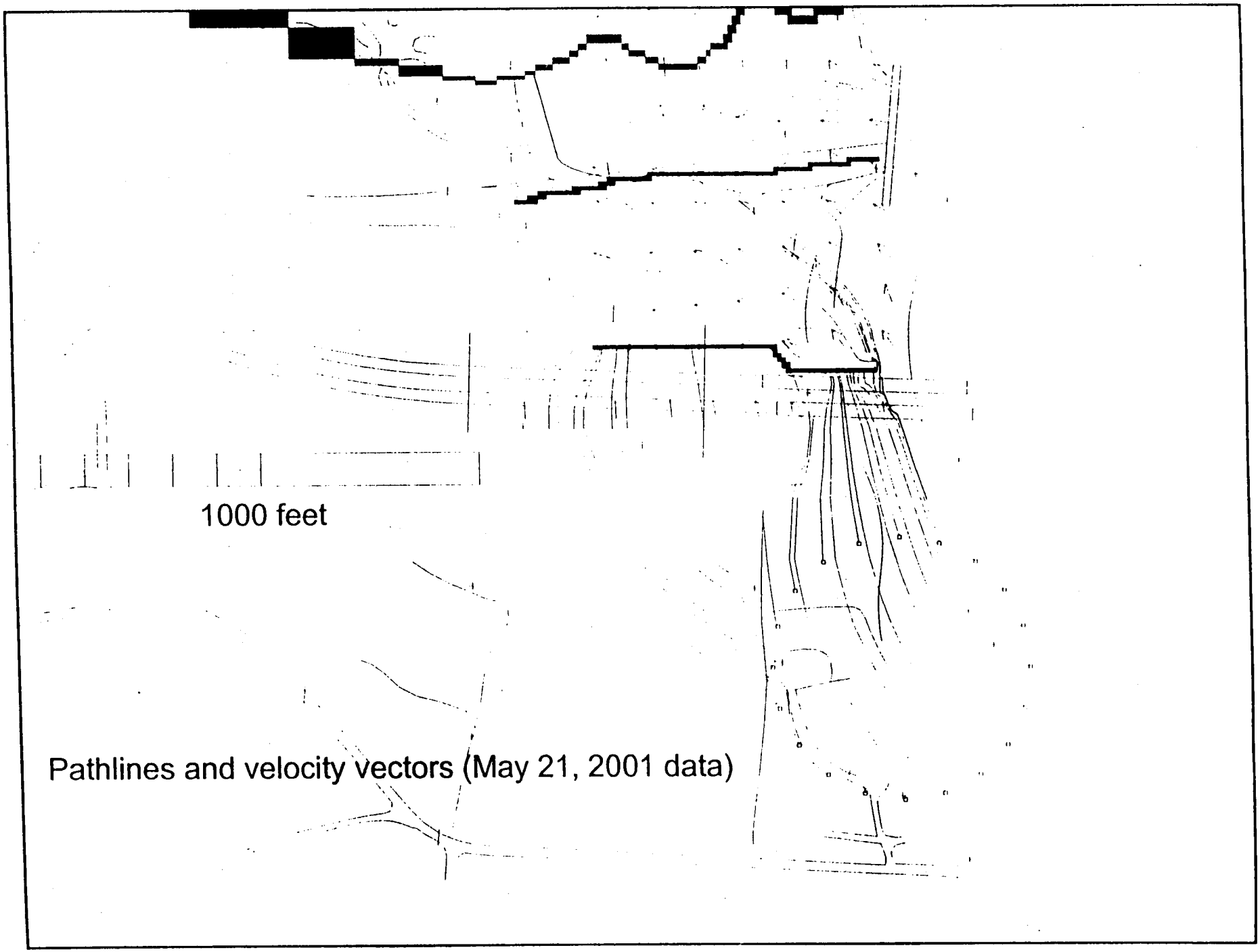



Figure 4

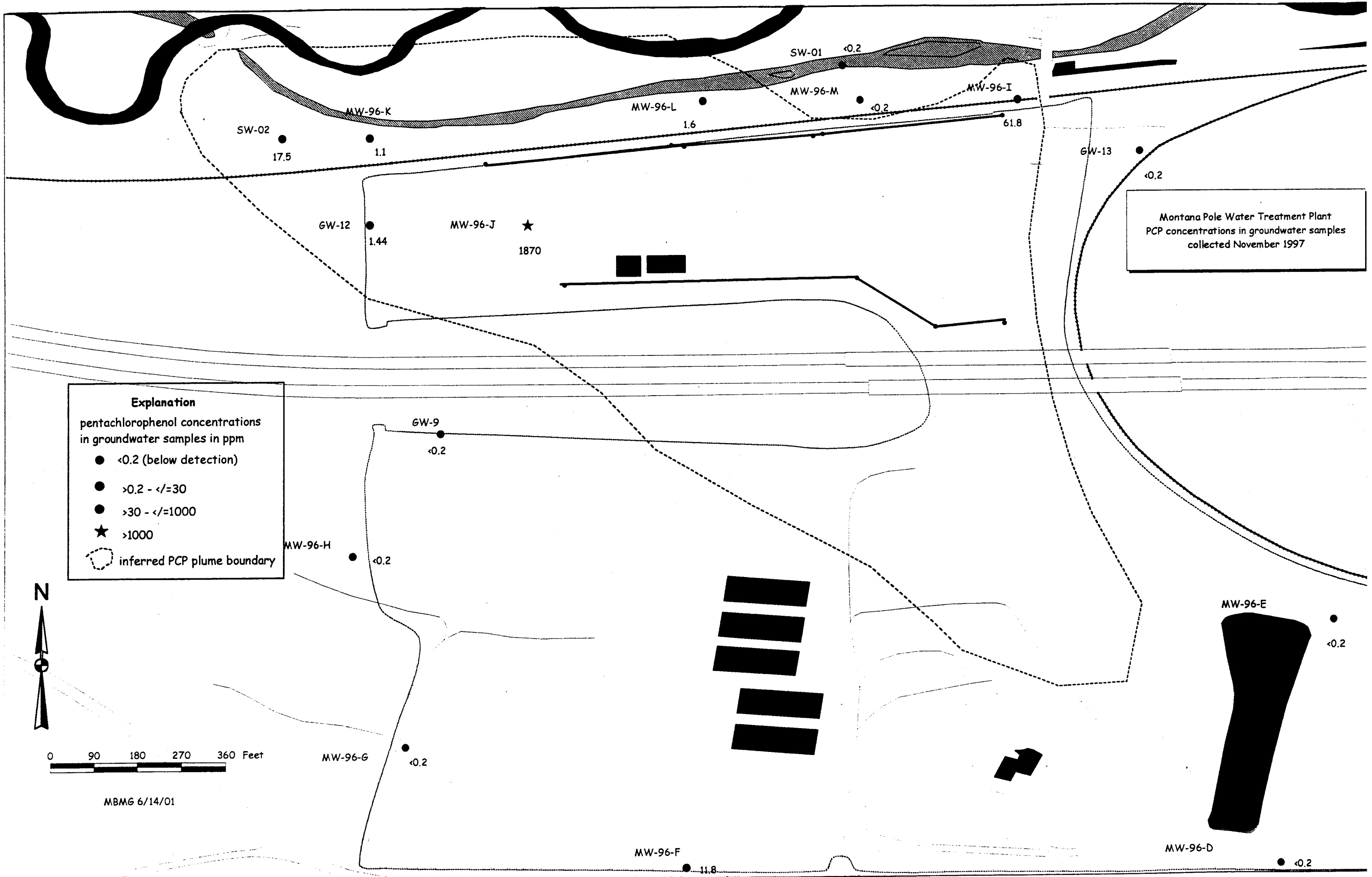

SW-01 <0.2
MW-96-M
MW-96-I
MW-96-K
MW-96-L
<0.2
1.6
61.8
SW-02
17.5
1.1
GW-13
<0.2
GW-12
1.44
MW-96-J
1870
Montana Pole Water Treatment Plant
PCP concentrations in groundwater samples
collected November 1997
Explanation
pentachlorophenol concentrations
in groundwater samples in ppm
<0.2 (below detection)
>0.2 - </=30
>30 - </=1000
>1000
inferred PCP plume boundary
GW-9
<0.2
MW-96-H
<0.2
N
0 90 180 270 360 Feet
MBMG 6/14/01
MW-96-G
<0.2
MW-96-E
<0.2
MW-96-F
11.8
MW-96-D
<0.2

Figure 5

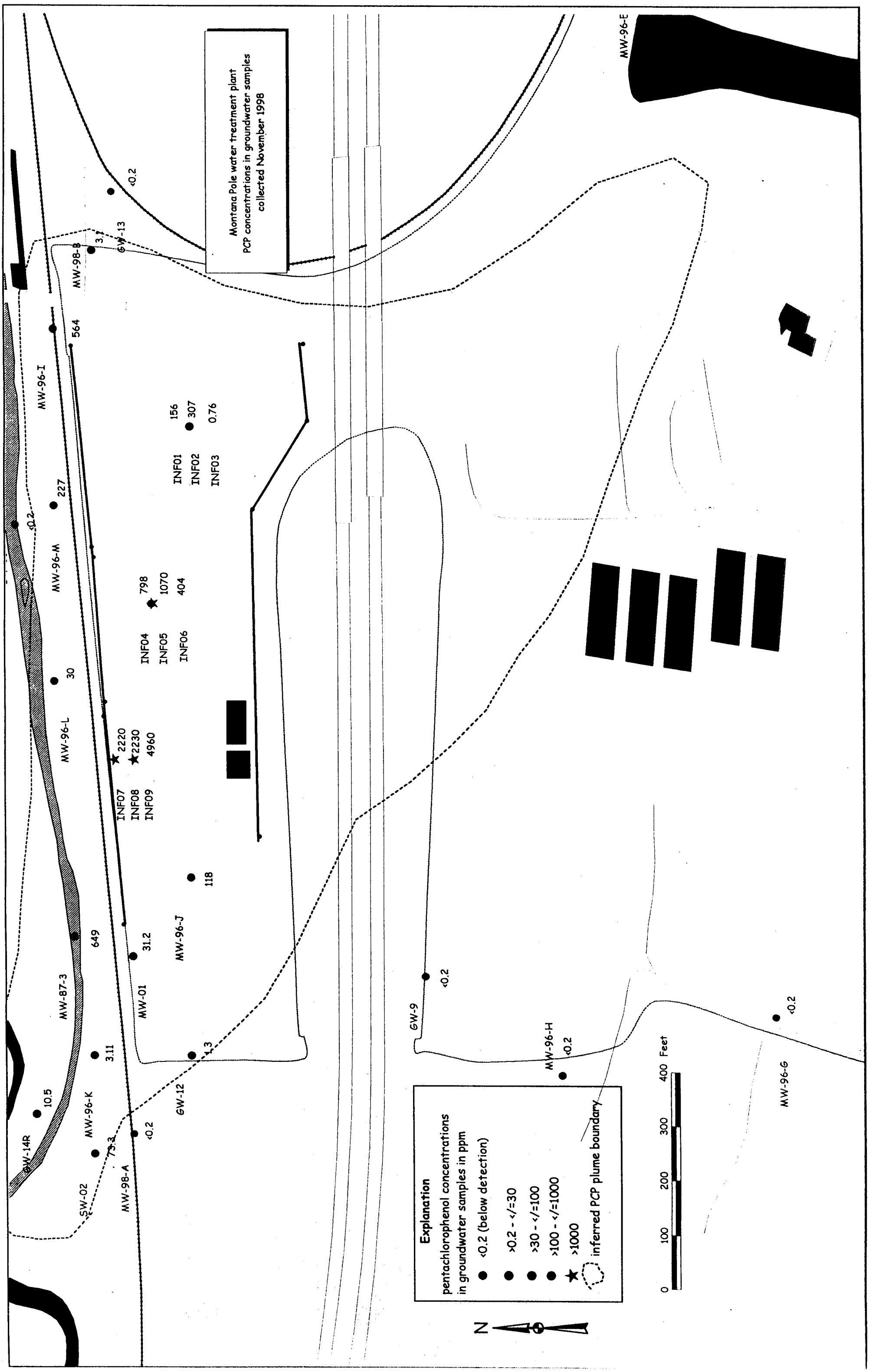

Montana Pole water treatment plant
PCP concentrations in groundwater samples
collected November 1998
MW-96-I
564
MW-98-B
3.1
GW-13
<0.2
MW-96-E
MW-96-M
227
<0.2
INF01
INF02
INF03
156
307
0.76
INF04
INF05
INF06
798
1070
404
MW-96-L
30
INF07
INF08
INF09
2220
2230
4960
MW-96-J
118
649
31.2
MW-87-3
MW-01
10.5
3.11
1.3
GW-14R
MW-96-K
SW-02
MW-98-A
<0.2
GW-12
GW-9
<0.2
MW-96-H
<0.2
MW-96-G
<0.2
Explanation
pentachlorophenol concentrations
in groundwater samples in ppm
<0.2 (below detection)
>0.2 - </=30
>30 - </=100
>100 - </=1000
>1000
inferred PCP plume boundary
N
0
100
200
300
400 Feet

Figure 6

Montana Bureau of Mines and Geology
Montana Pole Plant
Product plume at end of year 2000
based on samples collected November 13, 2000

Explanation
- ★ water samples with PCP concentrations >1000 ppb
- ● water samples with PCP concentrations >100 - <1000 ppb
- ● water samples with PCP concentrations 30-100 ppb
- ● water samples with PCP concentrations >0 - <30 ppb
- ● monitor well not sampled
- fenceline
- exsiting buildings
- locations of removed buildings
- surface water
- former channel of Silver Bow Creek
- railroad
- roads
- Contour around wells with detected concentrations of PCP
- 2 PCP concentration in ppb

100 0 100 200 Feet

N

GW-14R 35
HCA-21
GS-18
MW-96-L 0
MW-96-M 11
MW-96-I
MW-98-B 1
MW-96-K 0
MW-87-3 108
NCRTPZ04
NCRTPZ03
NCRTPZ02
NCRTPZ01 41
116
GW-18 0
MW-98-A 0
MW-01 1
MP-4 7
INF07 902
INF08 606
INF09 5056
INF04 1318
INF05 236
INF06 248
GS-22
GW-12 0
MW-96-J 6
B-99 2
INF01 114
INF02 99
INF03 58
NHRTPZ04
NHRTMH02
A-99 2
H-95
1616
NHRTPZ01
NHRTMH01
AW-2
B-95
GW-9 0
A-25 398
UNK-43
GW-10 0
MW-9
MW-11 (abandoned)
MW-96-H
MW-4 2
GW-21
GW-05
MW-96-G

MBMG 1/4/00

Figure 7