Five-Year Review Report

Second Five-Year Review Report

for

Eagle Mine Superfund Site

CERCLIS ID: COD081961518

Minturn
Eagle County, Colorado

September 2005

PREPARED BY:

Colorado Department of Public Health and Environment
Denver, Colorado

Approved by:

Max H. Dodson
Assistant Regional Administrator
U. S. Environmental Protection Agency, Region 8

Date: 9/27/05

Table of Contents

List of Acronyms iii

Executive Summary ES-1

Five-Year Review Summary Form SF-1

Section 1. Introduction 1-1

Section 2. Site Chronology 2-1

Section 3. Background 3-1
3.1 Location and Setting 3-1
3.2 Site History 3-1
3.3 Regulatory History 3-3
3.4 Contaminants of Concern 3-5
3.5 Environmental Impacts 3-5

Section 4. Remedial Action 4-1
4.1 OU1 Remedy Selection 4-1
4.1.1 Remedial Activities Required Under the CD/RAP 4-1
4.1.2 Remedial Activities Required Under the CD/SOW 4-2
4.2 OU2 Remedy Selection 4-4
4.3 Remedy Implementation 4-4
4.3.1 OU1 Remedy Implementation 4-4
4.3.1.1 Waste Removal 4-4
4.3.1.2 Consolidated Tailings Pile 4-5
4.3.1.3 Town of Minturn Water Supply Wells 4-8
4.3.1.4 Revegetation 4-8
4.3.1.5 Mine Closure and Water Collection System 4-9
4.3.1.6 Rock Creek 4-11
4.3.1.7 Waste Rock 4-11
4.3.1.8 Seep Collection 4-13
4.3.1.9 Mine Water Return System 4-13
4.3.1.10 Belden Area 4-13
4.3.1.11 Water Treatment Plant 4-14
4.3.1.12 Liberty Well 4-15
4.3.1.13 Groundwater 4-16
4.3.1.14 OU1 Remedy Implementation Summary 4-16
4.3.2 OU2 Remedy Implementation 4-17
4.3.3 Additional Removal Actions at the Site 4-17
4.4 Operation, Maintenance and Monitoring 4-18
4.4.1 Operation and Maintenance at OU1 4-18
4.4.2 Operation and Maintenance at OU2 4-18
4.4.3 Monitoring and Reporting Requirements 4-18

Table of Contents (Continued)

Section 5. Progress Since the Last Five-Year Review 5-1

Section 6. Five-Year Review Process 6-1
6.1 Administrative Components 6-1
6.2 Community Notification and Involvement 6-1
6.3 Document Review 6-1
6.4 Data Review 6-2
6.4.1 Surface Water Quality Data Review 6-2
6.4.2 Biological Data Review 6-7
6.4.2.1 Macroinvertebrate Data 6-7
6.4.2.2 Brown Trout Data 6-9
6.4.3 Water Treatment Plant Data Review 6-9
6.4.4 Groundwater Data Review 6-13
6.4.4.1 Groundwater at the CTP, OTP and Rex Flats 6-13
6.4.4.2 Groundwater at Belden and Gilman 6-16
6.4.5 Observational Data Review 6-19
6.4.5.1 Settlement and Erosion Data 6-19
6.4.5.2 Revegetation Data 6-19
6.5 Site Inspection 6-19
6.6 Interviews 6-20
6.7 Current and Future Consent Decrees 6-21

Section 7. Technical Assessment 7-1
7.1 **Question A**: Is the remedy functioning as intended by the decision documents? 7-1
7.2 **Question B**: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid? 7-2
7.2.1 Exposure Assumptions 7-2
7.2.2 Toxicity Data 7-2
7.2.3 ARARs 7-3
7.2.3.1 OU1 ARARs 7-3
7.2.3.1.1 Chemical Specific ARARs for Groundwater 7-3
7.2.3.1.2 Chemical Specific ARARs for Surface Water 7-4
7.2.3.1.3 Chemical Specific ARARs for Soil 7-6
7.2.3.1.4 Action and Location Specific ARARs 7-6
7.2.3.2 OU2 ARARs 7-7
7.2.4 Environmental Covenants 7-8
7.3 **Question C**: Has any other information come to light that could call into question the protectiveness of the remedy? 7-8
7.4 Technical Assessment Summary 7-8

Section 8. Issues 8-1

Section 9. Recommendations and Follow-Up Actions 9-1

Section 10. Protectiveness Statement(s) 10-1

Section 11. Next Review 11-1

Table of Contents (Continued)

Tables

1 Chronology of Site Events 2-1
2 Design Criteria for Removal of Maloit Park Soil 4-3
3 Waste Material Quantities 4-5
4 Colorado Discharge Permit System Effluent Limits 4-15
5 Major Construction Milestones 4-17
6 Results of Unannounced Sampling of WTP Effluent 6-12
7 Worst Case Calculation of In-stream Metals Concentration Oct 2003 WTP Upset 6-13
8 Gallons of Water Pumped at the Liberty Well 6-17
9 Table Value Standards for Segment 5 of the Eagle River 7-4
10 Temporary Modifications for Segment 5 of the Eagle River 7-5
11 Issues Identified 8-1
12 Recommendations & Follow-Up Actions 9-1

Figures

1 Site Features 3-2
2 CTP Features 4-6
3 Remedial Features near Gilman 4-10
4 Site Surface Water and Biological Monitoring Locations 6-4
5 Zinc Concentration in the Eagle River Above Cross Creek 6-5
6 Zinc Loading October 2004 6-6
7 Macroinvertebrate Index Scores 6-8
8 Brown Trout Population Estimates 6-10
9 Total Zinc Concentration in Water Treatment Plant Effluent 6-12
10 Selected Monitor Well Locations at OTP and Rex Flats 6-14
11 Dissolved Zinc in Well DAP MW3/ET-1 near the CTP 6-15
12 Dissolved Zinc in Well MW2 at the OTP 6-15
13 Dissolved Zinc in Well MW2 at Rex Flats 6-16
14 Conceptual Model of Mine Pool 6-18

Attachments

A - CTP Settlement Data
B - Site Inspection Report
C - Interview Records

List of Acronyms

Ac	Acute
AGO	The Colorado Attorney General's Office
ARARs	Applicable or Relevant and Appropriate Requirements
BFPP	Bona Fide Prospective Purchaser
B-IBI	Benthic Index of Biotic Integrity
BMC	Battle Mountain Corporation
BRA	Baseline risk assessment
CAFO	Confined Animal Feeding Operation
CDPHE	Colorado Department of Public Health and Environment
CD/RAP	Consent Decree/Remedial Action Plan
CD/SOW	Consent Decree/Statement of Work
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
Ch	Chronic
COC	Contaminants of concern
CTP	Consolidated Tailings Pile
cy	Cubic yards
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
gpm	gallons per minute
HDPE	High Density Polyethylene
HMWMD	Hazardous Materials and Waste Management Division
IC	Institutional Control
IMP	Inspection & Maintenance Plan
INS	Interim Narrative Standard
MDD	Mine Draw Down
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MSL	Mean Sea Level
NC	Not Calculated
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NRD	Natural Resource Damage
NTP	New Tailings Pile
O&M	Operation & Maintenance
OM&M	Operation, Maintenance & Monitoring
OTP	Old Tailings Pile
OU1	Operable Unit 1
OU2	Operable Unit 2
PCBs	Polychlorinated Biphenyls
pH	Measure of acidity (low pH) or alkalinity (high pH)
PRP	Potentially Responsible Party
PSCOR	Preliminary Site Close Out Report
ppm	Parts per million
PVC	Polyvinyl Chloride
RAP	Remedial Action Plan
RAO	Remedial Action Objective
RBRG	Risk-based remediation goal

RD/RA	Remedial Design/ Remedial Action
RfD	Reference Dose
RI/FS	Remedial Investigation/ Feasibility Study
ROD	Record of Decision
RP	Roaster Pile
RPM	Remedial Project Manager
Site	Eagle Mine Superfund Site
TAG	Technical Assistance Grant
TCLP	Toxicity Characteristic Leaching Procedure
TVS	Table Value Standards
UGDT	Upgradient Diversion Trench
µg/L	microgram per liter
$\mu g/m^3$	micrograms per cubic meter
UAO	Unilateral Administrative Order
WQCD	Water Quality Control Division of the Colorado Department of Public Health and Environment
WQCC	Colorado Water Quality Control Commission
WRP	Waste Rock Pile
WTP	Water Treatment Plant
As	Arsenic
Pb	Lead
Cd	Cadmium
Cu	Copper
Zn	Zinc

Executive Summary

The Colorado Department of Public Health and Environment (CDPHE) has conducted a five-year review of the remedial actions implemented at the Eagle Mine Superfund Site (Site) near Minturn, Eagle County, Colorado. This review was conducted from March through August 2005. The results of the review indicate that the remedies implemented at the Site are expected to be protective of human health and environment.

Overall, the multi-component cap over the consolidated tailings pile (CTP) and the water treatment plant (WTP) are operating and functioning as designed. Contaminant levels in shallow groundwater and surface water have decreased, and the aquatic ecosystem is recovering as a result of the remedial actions. In addition, all nearby residents and businesses are connected to the local water system. Access controls are in place throughout the Site including the former Town of Gilman. A number of issues that do not immediately impact the protectiveness of the remedies were identified and must be addressed.

Redevelopment of the Site could potentially impact human health and the environment. CDPHE and the Environmental Protection Agency (EPA) will continue to work closely with the new owner/developer of the property to ensure the integrity of the existing remedy and continued protection of human health and the environment during and after redevelopment. All remedial activities must be conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

Redevelopment of the Site will also require modifications to the Site's decision documents which will trigger the requirement for environmental covenants under the Colorado Environmental Covenant Law, C.R.S. §§ 25-15-317 to 25-15-327. CDPHE and the EPA will work closely with the property owner to ensure that all necessary environmental covenants are in place to further protect the current remedy, modifications to the remedy (if any) and human health and the environment in the short and long terms. Environmental Covenants will apply to all properties within the Superfund Site where long-term institutional controls may be necessary, including Gilman.

CDPHE and EPA will continue to work with the Potentially Responsible Party (PRP), Viacom International, Inc., to resolve problems associated with the pumping of well BW-9 in Belden and the partially collapsed mine tunnel at Adit #8, to implement the recommendations from the April 2005 Site Inspection and to replace the two existing, yet outdated Consent Decrees (CDs).

The two CDs, currently in place, effectively addressed the completed remedial action activities, but do not adequately address current/future Operation, Maintenance and Monitoring activities.

CDPHE, EPA and Viacom will need to negotiate a new CD that updates terms, performance standards, current/future activities, reporting requirements, schedules, compliance and any other necessary items.

Water Quality Standards for the segments of the Eagle River associated with the Site have not been finalized. Thus far, the recovery of the Eagle River that has resulted from OU1 remedy implementation has only been measured qualitatively since appropriate performance standards for the Eagle River were not defined in the two CDs currently in place. The State and EPA will continue to pursue the establishment of appropriate surface water quality standards through the Colorado Water Quality Control Commission (WQCC). The new standards will become the performance standards for the Eagle River and will be incorporated into the upcoming CD. The protectiveness of the remedy, with respect to aquatic life, cannot be determined until the biological approach, used to develop the standards, is reviewed and accepted by the WQCC.

The next five-year review for the Eagle Mine Site is required by 2010. However, it is recommended that the next review be conducted in 2007. The reason for the change is to align the CERCLA five-year review with the similar basin-wide water quality standards review conducted by the WQCC every five years. The two reviews are similar with respect to evaluating protectiveness; therefore, their schedules should coincide to complement each other.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Eagle Mine		
EPA ID *(from WasteLAN)*: COD081961518		
Region: 8	**State: CO**	**City/County:** Minturn/Eagle County
SITE STATUS		
NPL status: X Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): Under Construction X Operating X Complete		
Multiple OUs? X YES NO	**Construction completion date:** 09 / 17 / 2001	
Has site been put into reuse? ☐ YES X NO		
REVIEW STATUS		
Reviewing agency: ☐ EPA X State ☐ Tribe ☐ Other Federal Agency		
Author name: Wendy K. Naugle		
Author title: Project Manager	**Author affiliation:** Colorado Department of Public Health and Environment	
Review period: March through August 2005		
Date(s) of site inspection: 4/21/2005		
Type of review: ☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site X NPL State/Tribe-lead ☐ Regional Discretion		
Review number: 1 (first) X 2 (second) ☐ 3 (third) ☐ Other (specify)		
Triggering action:**** ☐ Actual RA Onsite Construction at OU #___ ☐Actual RA Start ☐ Construction Completion X Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: September 2000		
Due date *(five years after triggering action date)*: September 2005		

* [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 (continued)

Issues:

1) Redevelopment of the Site could potentially impact human health and the environment during and after implementation.

2) Redevelopment of the Site will require modifications to the Site's decision documents which will trigger the requirement for environmental covenants under Colorado Environmental Covenant Law, C.R.S. §§ 25-15-317 to 25-15-327.

3) Institutional Controls through Eagle County as specified in the OU2 ROD were never implemented.

4) Viacom has not conducted pumping of BW-9 in Belden.

5) The mine tunnel at Adit #8 has partially collapsed presenting a safety hazard for personnel entering the mine.

6) The four recommended activities specified in the April 2005 Site Inspection report have not been completed.

7) Water Quality Standards for the segments of the Eagle River associated with the Site have not been finalized. Thus far, the recovery of the Eagle River that has resulted from OU1 remedy implementation has only been measured qualitatively since appropriate performance standards for the Eagle River were not defined in the two CDs currently in place.

8) The two CDs, currently in place, effectively addressed the completed remedial action activities, but do not adequately address current/future Operation, Maintenance and Monitoring activities.

9) The schedule for CERCLA five-year reviews does not coincide with the schedule for basin-wide water quality standards reviews conducted by the WQCC. The two reviews are similar with respect to evaluating protectiveness, therefore, their schedules should be re-aligned to complement each other.

Recommendations and Follow-up Actions:

1) The State and EPA will continue to closely work with the new owner of the property to ensure the integrity of the existing remedy and continued protection of human health and the environment during and after redevelopment. All remedial activities must be conducted in accordance with the NCP and CERCLA.

2) The Statute will be utilized to develop, implement and enforce all necessary environmental covenants for the properties of interest.

3) Eagle County's existing land use regulations and building permit process were determined to provide control over any new development of Gilman during the last five-year review. In addition, Viacom maintains access controls and will file charges against trespassers. In conjunction with the planned redevelopment, the State and EPA will work with the current property owner to develop, implement and enforce the necessary ICs for Gilman through an Environmental Covenant. An ESD will be prepared to document the change in ICs for OU2.

4) The State and EPA will continue to work with Viacom to address the problem - BW-9 is partially filled with gravel.

5) The State and EPA will continue to work with Viacom to address the rehabilitation of the mine tunnel to ensure continued access to the mine workings and to allow periodic confirmatory measurements of the mine pool elevation.

6) The State and EPA will continue to work with Viacom to address the recommendations in the 2005 Inspection Report to ensure that the remedy continues to operate as designed.

7) The State and EPA will continue to pursue modifications to the Water Quality Standards for the Eagle River in accordance with the ROD, CD/SOW and WQCC. The new standards will become the performance standards for the Eagle River and will be incorporated into the upcoming CD. Compliance monitoring and criteria will then be established. The protectiveness of the remedy with respect to aquatic life cannot be determined until the biological criteria are reviewed and accepted by the WQCC.

8) The State and EPA will work with Viacom to develop an agreed-upon CD that updates terms, performance standards, current/future activities, reporting requirements, schedules and any other items.

9) The next CERCLA five-year review will be conducted in 2007 to align it with the WQCC's basin-wide review.

Protectiveness Statement(s): The remedies implemented at the Eagle Mine Superfund Site are expected to be protective of human health and environment. The multi-component cap over the CTP and the WTP are operating and functioning as designed. Contaminant levels in shallow groundwater and surface water have decreased, and the aquatic ecosystem is recovering as a result of the remedial actions. All nearby residents and businesses are connected to the local water system. Access controls are in place throughout the Site including Gilman. Water Quality Standards for the segments of the Eagle River associated with the Site have not been finalized. The protectiveness of the remedy, with respect to aquatic life, cannot be determined until the biological approach, used to develop the standards, is reviewed and accepted by the WQCC.

Section 1
Introduction

The Colorado Department of Public Health and Environment (CDPHE) has conducted a five-year review of the remedial actions implemented at the Eagle Mine Superfund Site (Site), CERCLIS ID: COD081961518, near Minturn, Eagle County, Colorado. This review was conducted from March through August 2005. This report documents the results of the review.

This is the second five-year review for the Site. The U.S. Environmental Protection Agency (EPA) performed the first five-year review. The trigger action for this second review is five years after the first five-year review, which was dated September 21, 2000. The five-year review is required since hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unrestricted use and unlimited exposure. This five-year review is being conducted by CDPHE per the guidelines in the *EPA Comprehensive Five-Year Review Guidance*, June 2001.

The purpose of the five-year review was to determine whether the remedy implemented at the Site is 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 identifies issues found during the review and provides recommendations to address them.

This five-year 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, §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.*

Section 2
Site Chronology

Table 1 summarizes the important events and relevant dates in the Site's chronology.

Table 1 - Chronology of Site Events

Date	*Event*
Late 1870's	Gold & Silver deposits were discovered on Battle Mountain.
1905	Mining of lead-zinc deposits began.
1905	Roasting and magnetic separation used to process ore.
1912	Underground mill constructed that used froth-floatation to generate lead-zinc concentrate.
1942-1946	Old Tailings Pile abandoned. New Tailings Pile (now called CTP) opened.
1983	State of Colorado filed suit under CERCLA for damages to natural resources.
Summer 1984	EPA perfonned Emergency Removal of transformers containing PCBs from within the mine workings. Transformers were threatened by rising water levels in the mine after dewatering pumps were turned off.
1984	Mine workings flood.
October 15, 1984	Site proposed for listing on the NPL.
June 10, 1986	Final listing on the NPL.
1986	State of Colorado settled with Potentially Responsible Party (PRP), Consent Decree/Remedial Action Plan finalized (CD/RAP).
1988	State of Colorado completed the Remedial Investigation/Feasibility Study (RI/FS).
1988	Remediation under the CD/RAP began.
1990	As water levels in the mine rose, seepage began to reach the Eagle River.
1990	PRP installed a package Water Treatment Plant to treat water from the mine pool and seepage from the mine.
1991	PRP upgraded to a customized Water Treatment Plant.
March 29, 1993	EPA issued OU1 ROD.
1994	EPA issued Unilateral Administrative Order (UAO)
1996	Three Party Consent Decree/Statement of Work (CD/SOW) signed.
September 3, 1998	EPA issued OU2 ROD.

Table 1 - Chronology of Site Events

Date	*Event*
1999	Explanation of Significant Differences (ESD) issued for the Liberty Well.
September 2000	First five-year review conducted.
June 2001	Preliminary Site Closeout Inspection conducted.
September 17, 2001	EPA issued Preliminary Site Closeout Report/Construction Complete declared.
December 2004	Portions of the Site purchased by Ginn Entities.
March – May 2005	Community Interviews conducted for this five-year review.
April 2005	Five-Year Review Site Inspection conducted.
March – August 2005	Second five-year review conducted.

Section 3
Background

3.1 Location and Setting

The Eagle Mine is located in Eagle County, Colorado, approximately 1 mile southeast of Minturn, eight miles southwest of Vail and 110 miles west of Denver. The Site is defined as the area impacted by past mining activity along and including the Eagle River between the towns of Red Cliff and Minturn in Eagle County, Colorado. The Site is approximately 235 acres and includes the Eagle Mine workings, former Town of Gilman, former Roaster Pile areas, Waste Rock Piles, Rex Flats, Old Tailings Pile (OTP), Consolidated Tailings Pile (CTP), Maloit Park, water diversion components around the CTP, water treatment plant (WTP), a tailing slurry line and trestle, mine seepage and associated collection systems, and the Belden mill and load out area. The Site is bordered on the south and west by the White River National Forest. See Figure 1 for Site Features.

The abandoned company town of Gilman is located on the side of Battle Mountain and was once home to as many as 350 Eagle Mine employees and their families. The town was founded in 1879 and abandoned in 1985. Gilman covers approximately 50 acres and includes an estimated 90 buildings. Many of the abandoned houses in Gilman were built in the 1940s and 1950s and numerous buildings have been vandalized and are in a state of disrepair.

The Eagle River is the major surface water resource affected by the Eagle Mine. The headwaters of the Eagle River originate at elevations of 10,000 to 14,000 feet, miles from the Site. Water from the Eagle River is used for domestic, irrigation and recreational purposes. Rock Creek is a small tributary to the Eagle River in the vicinity of Gilman. Cross Creek is another tributary to the Eagle River and originates in the Holy Cross Wilderness Area.

Unconsolidated stream and glacial deposits are found throughout the Site. Groundwater flows through the unconsolidated stream and glacial deposits, mine workings and fractured bedrock.

3.2 Site History

The Eagle Mine was one of the largest zinc mines in the United States, and a major domestic source of zinc. According to statistics from the Colorado Geological Survey, the Eagle Mine produced 12,837,000 tons of ore. The average ore grade was 8.5% zinc, 1.5% lead, 0.9% copper, 228 parts per million (ppm) silver and 1.7 ppm gold. The Eagle Mine was also famous for its precious mineral specimens, especially pyrite, barite, rhodochrosite, galena and sphalerite.

Mining began in the area in the late 1870's as miners discovered the oxidized silver-lead and gold-silver ores in the Leadville Dolomite and Sawatch Quartzite. Many of the older, historical structures located in the canyon and to the south of the Belden load out area originated from the

Figure 1 – Site Features

older gold and silver mines. These mines included the Ben Butler, Tip Top, Mabel, Percy Chester, Pine Martin and the Star of the West. As the mine workings passed downward from the lead-silver ores of the oxidized zone, sulfide ores, containing lead and zinc, were encountered. The zinc ore was originally processed using a roaster and magnetic separation process.

Roaster wastes were deposited in multiple locations using a tramway system, along the banks of the Eagle River, on the steep sideslopes of the canyon and at higher elevations. The roasting process was inefficient, therefore, the roaster wastes had very high leachable metals content. In 1912, the Empire Zinc Company, later a subsidiary of the New Jersey Zinc Company, began consolidating the individual mining claims (including the Little Chief, Iron Mask, Belden and Black Iron mines) into what is now known as the Eagle Mine.

In 1929, a conventional froth-flotation mill was constructed within the mine workings due to space constraints. The mill tailings were slurried through a wood-stave pipeline/trestle system to a location down stream, known as the Old Tailings Pile (OTP). In the mid-1940s, the OTP reached capacity. At that time, tailings were deposited across the Eagle River from the OTP in an area known as Rex Flats.

In 1942, the pipeline was extended to a location near Cross Creek using an elevated wooden trestle to cross Rex Flats and the New Tailings Pile (now known as the CTP) was constructed. The New Tailings Pile also included a 15-acre water retention pond known as the Historic Pond. Rex Flats again received tailings in the 1950s apparently to kill the vegetation and reduce the fire hazard to the trestle. In December 1977, Gulf & Western closed down the mill and most mining activities ceased.

In September 1983, Colorado Businessman Glenn T. Miller purchased the Eagle Mine, the Town of Gilman and certain surrounding property. Miller then sold approximately 1,400 acres to the Battle Mountain Corporation (BMC), including the Town of Gilman, OTP and the CTP. In 1984, the property was abandoned, the pumps that were keeping the mine dry were shut off and the mine began to fill with water. Due to non-payment of property taxes, most of the Eagle Mine properties were sold at tax sales. Some of the properties were reconsolidated by Turkey Creek Limited and then sold to Ginn Battle North and Ginn Battle South (hereinafter referred to as Ginn Entities) in December 2004. Other portions of the Eagle Mine remain with the Glenn Miller bankruptcy trustee.

3.3 Regulatory History

The State of Colorado filed a Natural Resource Damages (NRD) lawsuit under CERCLA in 1983. The Site was listed on the National Priorities List (NPL) on June 10, 1986 because of the mine discharge (metals), uncontrolled mine waste piles and the close proximity of the population to the mine and associated features. In the same year, the EPA and the State of Colorado entered into an agreement designating the State as lead agency for the remediation of the Site. CDPHE

Hazardous Materials and Waste Management Division (HMWMD) represents the State and oversees all remedial activities. The State remedy was detailed in a 1988 Consent Decree with Gulf+Western and Remedial Action Plan (RAP), known as the CD/RAP.

The Potentially Responsible Party (PRP) currently implementing the clean-up project under CERCLA at the Eagle Mine Site is Viacom International, Inc. (Viacom). Viacom is the successor in interest to The New Jersey Zinc Company, a former operator of the Eagle Mine. The New Jersey Zinc Company was acquired in 1966 by Gulf & Western Industries, Inc., which later changed its name to Gulf+Western, Inc., and then to Paramount Communications Inc. (Paramount). In 1994, Viacom acquired Paramount.

In 1990, EPA became aware that there was a need to address certain issues that had arisen since the 1988 CD/RAP. EPA prepared a Feasibility Study Addendum to analyze the need for additional cleanup measures. The study was completed in 1992. As a result of the study, EPA issued the Record of Decision (ROD) for Operable Unit 1 (OU1) in March of 1993. A Unilateral Administrative Order (UAO) was issued in 1994 by EPA as an interim measure to allow the implementation of certain actions included in the ROD. A Three-Party Consent Decree and Statement of Work, known as the CD/SOW, followed the OU1 ROD and UAO.

The purpose of the OU1 remedy was to control the transport of metals from various sources to the Eagle River and to groundwater. The identified sources include the Eagle Mine, the Roaster Piles, the Waste Rock Piles, Rex Flats, the OTP, the CTP and Maloit Park. EPA issued an Explanation of Significant Differences (ESD) for OU1 on September 1, 1999. The purpose of the ESD was to modify the agreed-upon remedy to include a new feature implemented voluntarily by the PRP – a pumping well, known as the "Liberty No. 4 Well" that extracts clean groundwater from the mine workings prior to it contacting the ore body and becoming contaminated.

Operable Unit 2 (OU2) was established to evaluate potential human health risks from the soils in three areas: south of Minturn, Maloit Park, and Gilman. Arsenic, cadmium and lead levels at the Minturn Middle School and the south end of Minturn were below levels of concern for human health and required no action. The concentrations of metals in soil in parts of Maloit Park were above human health standards and the contaminated soil was removed and replaced with clean fill. Soils around the abandoned Town of Gilman contain elevated concentrations of metals, and for that reason, Gilman was the remaining area addressed under the OU2 ROD. The OU2 ROD, issued by EPA in 1998, identified Institutional Controls as the remedy for the former Town of Gilman, until such time when redevelopment occurred.

A "Preliminary Site Close Out Report" (PSCOR) was completed by EPA on September 17, 2001, to document the completion of construction activities at the Site. Operation and maintenance (O&M) of the OU1 remedy and the operation of water collection and treatment facilities is ongoing under the current CDs. OU2 currently has no O&M, other than the maintenance of access controls that curtail trespass and entry.

Glenn Miller and BMC were defendants in the State's lawsuit of 1983. As a result, two minor Consent Decrees exist with these two defendants. The Miller and BMC CDs provided access to the property for the purposes of performing the work related to the cleanup. The CDs were filed in the Office of the Clerk and Recorder of Eagle County, Colorado and all conveyances of title must contain a covenant providing the use and access described in the CDs. The Miller and BMC CDs have no remedial components and are not discussed further in this review.

3.4 Contaminants of Concern

The 1988 Endangerment Assessment lists the following metals in wastes at the Site: antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, thallium, uranium and zinc.

When the original CD was negotiated, several different types of wastes were present at the former mine and causing environmental impacts. Sources of contaminated water included the folllowing:

- **Mine Pool** - Water within the mine workings;
- **Historic Pond** – Water stored at the CTP from various sources;
- **Runoff** - Water from areas containing mine wastes;
- **Groundwater** at the OTP, CTP, Rex Flats, Rock Creek and Belden areas.

Solid mining wastes include the following:

- **Waste Rock** - Rock that was removed when mine tunnels and adits were constructed. Waste Rock has not been processed to remove metals and therefore, usually does not present as great a leaching hazard as other waste sources (e.g. roaster wastes and tailings) that were present at the site. Waste Rock was discarded on the hillside overlooking the Eagle River and Rock Creek, and is held in place by wooden cribbing in some areas.
- **Roaster Wastes** - Waste that was produced from the inefficient process of roasting and magnetic separation. Roaster wastes contained a large amount of highly leachable metals and was discarded near the river and on steep side slopes. Five distinct Roaster Piles were present at the Site.
- **Mill Tailings** - Fine-grained waste material from the milling process. Although most of the heavy metals were removed during milling, tailings still contained leachable metals and usually had a low pH, thus, generating additional acidity and further leaching.

Section 4 of this report describes in detail the remedial actions that have been undertaken to address these contaminant sources.

3.5 Environmental Impacts

The most significant environmental impact from the Site was degradation of water quality in the Eagle River due to dissolved metals, including cadmium, copper, iron, manganese and zinc, originating predominantly from the roaster wastes and tailings. At the time of the original remedy selection, waste rock piles were considered to have lower priority when compared against the need to address the significantly greater impacts from the roaster wastes and tailings piles. The water quality of the Eagle River exhibits a significant seasonal variation. An early spring

"high metals" season and a longer "low metals" season are evident. The onset of "high metals season" occurs as the snow begins to melt in early spring (typically early March). The snowmelt mobilizes metals that are still present at the former mine site. This snowmelt reaches the Eagle River during a low flow condition. As snow melts at higher elevations, upstream and tributary flows of clean water increase to the point where these flows dilute the metals loading and the metals concentrations in the river decrease. Thus, there is a spike in metals concentrations in March and April prior to spring runoff in May and June. Extensive studies at the Site have indicated that while other metals are present in surface water, zinc occurs in the highest concentrations and the other metals (with the possible exception of copper) show a high degree of correlation with dissolved zinc concentrations in surface water.

The lower half-mile of Rock Creek flows below Gilman and past waste rock piles. Rock Creek has been impacted from these contaminant sources and historically from seepage from the mine. Historical contamination from the CTP and groundwater seepage has resulted in degradation of water quality in Cross Creek.

Groundwater resources at the OTP, Rex Flats, Rock Creek and CTP were also impacted by the historic mining wastes. Groundwater within the mine workings encounters ore-bearing rock that is acid-generating. This leads to contamination of the water within the mine pool. Groundwater in the Belden area is also contaminated, most likely from a multitude of waste sources including ballast material beneath the rail lines that may contain roaster wastes, mill tailings or waste rock.

Section 4
Remedial Actions

4.1 OU1 Remedy Selection

The OU1 remedy consists of a combination of elements from the 1988 CD/RAP (and amendments), the 1994 UAO and the 1996 CD/SOW. OU1 was designed primarily to address water quality impacts to the Eagle River.

4.1.1 Remedial Activities Required Under the CD/RAP

Remedial Activities required under the CD/RAP included the following:

- Contaminated soils removal from the Roaster Piles, the OTP, Rex Flats and Pipeline/Trestle and transportation to the CTP. "Contaminated soils" were defined as "any soil that has a lead concentration over 500 mg/kg dry weight". Removal criteria were based on visual observation of the color, texture and consistency of the waste material. In addition, a nominal thickness (defined as 6 inches) of soil was removed from beneath waste material in order to assure that all waste materials had been removed. Soil remaining in areas disturbed by waste material removal operations were treated as follows:
    1) Soils with an average lead content of less than or equal to 500 mg/kg (dry weight) required no soil treatment
    2) Soils with an average lead content of more than 500 mg/kg (dry weight) and less than 1000 mg/kg (dry weight) were treated in place by the addition of such amounts of hydrated lime or similar material to raise the pH of the top 12 inches of soils to a minimum value consistent with that measured in surrounding, undisturbed areas.
    3) Soil with an average lead content of greater than 1000 mg/kg (dry weight) were to be removed or covered with 12 inches of random fill material.
    4) No soil treatment or cover was required in areas where the surface of the underlying soil was below the existing ground-water table.

- Areas disturbed by the removal were required to be revegetated using native vegetation and to meet certain quantitative revegetation criteria.
- A Mine Closure Program was established to seal known channels and pathways of flow from the mine workings and to grout fracture zones having identifiable discharge or seepage.
- Remedial activities for the waste rock piles consisted of routing storm water and other surface water flow around them. In addition, Rock Creek was routed through a culvert past the toe of Waste Rock Pile (WRP) 11 in order to prevent further erosion of the toe of WRP 11.
- Remedial activities at the New Tailings Pile (later renamed the CTP) included placement of all solid waste materials from elsewhere on the Site, re-contouring the side slopes, controlling surface water, and capping with a multi-layered engineered cap.
- A groundwater extraction system was constructed near the northern and eastern toes of the CTP to collect and pump contaminated groundwater from beneath the CTP to the water handling system.
- A groundwater diversion trench known as the Upgradient Diversion Trench (UGDT) was

constructed to the west of the CTP to direct the flow of clean groundwater away from the CTP and toward Maloit Park.

- The RAP included the construction of a "water handling system." The system included temporary runoff control system at the OTP, Rex Flats and CTP. It also included a system to pump collected water and water from the historic pond into the Eagle Mine Workings, including a surge pond (at the CTP), a pump station and a closed pipeline.
- The PRP was also required to install a stream gage at the location of the water quality monitoring station E-12A, Eagle River below Rex Flats, which met all applicable USGS requirements for such gages. The CD/RAP requires that the PRP shall "provide for operation and maintenance of the stream gage until such time as the water quality objectives for the Eagle River" are achieved.
- Permanent runon and runoff control systems (diversion ditches) at the CTP and the WRPs were designed to handle the runoff from a precipitation event having an intensity equal to that of a 500-year return period event.
- The PRP was required to connect the Pierson residence, near the mouth of Cross Creek, to the Town of Minturn's water system.

As mentioned, the RAP included a system to take water collected from the CTP, OTP and Rex Flats and pump it back into the sealed mine workings. Soon after the PRP began to implement the original remedy, as the water level in the mine rose above approximately 8500 ft MSL, contaminated water began to seep out through bedrock fractures. This mine seepage resulted in an increase in metals concentrations in the Eagle River. Under RAP Amendment 1 (May 1990), the PRP was required to cease pumping water into the mine, construct an additional surge pond at the CTP, construct a collection system to collect seeps along Rock Creek, install and operate a water treatment plant and submit a plan for constructing a system to reduce the migration of groundwater from the OTP to the Eagle River. Under RAP Amendment 2 (November 1991), the PRP was required to remove transformers, oil, grease, compressed gas and other hazardous substances from the Gilman and Belden areas. RAP Amendment 2, the UAO and the CD/SOW included redundant requirements, and are discussed in the CD/SOW section below.

4.1.2 Remedial Activities Required Under the CD/SOW

The CD/SOW describes various remedial activities requiring regular reporting and/or analysis of collected data including Quarterly Data Reports, Annual Site Monitoring and Activity Reports, Annual Surface Water Loading Reports, Data Evaluation Reports and Aquatic Biological Monitoring Reports. The CD/SOW also included:

- Storm Event/Snowmelt Surface Water Monitoring
- Roaster Pile Springs Monitoring
- Groundwater Monitoring
- Waste Rock Pile Monitoring
- Monitoring at Belden
- CTP Extraction Trench Monitoring
- Maloit Park Monitoring
- Testing of Gilman/Belden Area Waste Rock Piles
- Expedited Revegetation of OTP, Rex Flats and Roaster Drainage

- Rock Creek Seep Collection
- Rock Creek Culvert Extension
- Modification of CTP Extraction Trenches
- Evaluation, Modification, Reconstruction of Upgradient Diversion Trench
- Operation of Water Treatment Plant
- Development of Long-Term Inspection and Maintenance Plan
- Development of a "Biological Criteria Approach" for determining new surface water standards for the Eagle River
- Maloit Park Soil Removal and Restoration

Removal criteria for the Maloit Park area were based on a combination of CD/RAP removal criteria (see section 4.1.1 above), human health-based action levels and minimum phytotoxic concentrations. The required extent of soil removal was defined as the area that was visually contaminated, and areas that exceeded CD/RAP or human health-based action levels. Soils exceeding action levels were removed to a depth of one foot and covered with a minimum of one foot of fill. Additionally, in unvegetated areas where soils exceeded phytotoxic limits, existing soils were removed to a depth of two feet and covered with a minimum of one foot of fill. The removal criteria are summarized in Table 2 below.

Table 2 – Design Criteria for Removal of Maloit Park Soils

Chemical	Human Health-based Criterion (ppm)	Phytotoxic Criterion (ppm)
Arsenic	500*	
Cadmium	30,800	8.1
Chromium	153,700	
Lead	500*	200
Zinc		10,011

**Based on the precision of the x-ray fluorescence instrument, the criteria for lead and arsenic were reduced to 400 ppm for field application.*

Also, in 1992, the PRP reached agreement with the Town Of Minturn to install two new drinking water wells for the Town, located upgradient of any possible influence from the CTP. This agreement was not formally part of the CD/SOW, but is commonly regarded as part of the remedy for the site.

In 1999, the EPA issued an Explanation of Significant Differences (ESD) from the 1993 OU1 ROD. The ESD formally incorporated the Liberty Well, which intersects a 970 foot-deep tunnel that allows water to enter the mine workings, as part of the selected remedy. The well reduces the flow to and the water level in the mine pool.

4.2 OU2 Remedy Selection

EPA and CDPHE were concerned about possible exposure to elevated concentrations of metals in the soils at Gilman. Sampling of soils in 1993 revealed metal concentrations that exceeded background concentrations in soil for five metals – cadmium, chromium, manganese, lead and arsenic. In 1997, EPA completed a risk assessment for a casual user scenario because the Site was closed to public access and this was the only potential "current land use" at the time. Trespassing was considered a casual use. The document describing the results of the risk assessment was titled "Risk Assessment Summary for the Eagle Mine Site, Minturn, Colorado," dated February 11, 1997.

The overall conclusion of the risk analysis was that casual users at Gilman were not at risk from arsenic, cadmium, chromium, or manganese found in the soil and waste rock. There was a *potential, slight risk to sensitive human populations, such as pregnant women, with exposure to* lead. However, this risk only existed with an unlikely scenario of 90 days or more of exposure. The selected remedy for the Gilman Townsite under the OU2 ROD was to require any possible future developer to complete a comprehensive risk assessment based on the land use and exposure scenario planned for the Site. Any potential cleanup activities at the Gilman would then be based and dependent on the results of this risk assessment. The burden of possible cleanup activity would fall on the developer. The remedy as outlined in the OU2 ROD contained the following major components:

- Access to the former Town of Gilman was to be restricted, with trespassers subject to arrest by the Eagle County Sheriff.
- Land use controls and/or zoning restrictions were to be implemented by a local government.

4.3 Remedy Implementation

4.3.1 OU1 Remedy Implementation

The remedy for OU1 was selected to reduce heavy metal loading to the Eagle River from the former mine and associated features. Because of the degree of overlap, the following discussion on remedy implementation combines the remedial activities required by the CD/RAP and CD/SOW.

4.3.1.1 Waste Removal

Contaminated soils were removed from the Roaster Piles, the OTP, Rex Flats, and Pipeline/Trestle areas and transported to the CTP beginning in 1988. Following the clean up activities, soil samples were collected to determine the lead concentration, pH and to determine the need for hydrated lime based on the RAP criteria. Clean backfill in the remediated areas was not required under the CD/RAP. However, some clean backfill was placed in the low-lying areas of the OTP. Areas disturbed by the cleanup were required to be revegetated using native vegetation and to meet certain quantitative revegetation criteria.

In 1996, contaminated soil was removed from Maloit Park in impacted areas and replaced with clean fill. The shoulder of the road was also removed and replaced with clean fill. All soils were removed when metals were above health based or vegetation stress values, as described in Section 4.1.2. The quantities of material removed from each area are listed below in Table 3.

Table 3 – Waste Material Quantities

Waste Type	*Quantity Removed (cubic yards)*
Roaster Material	66,300
Tailings from Rex Flats	69,530
Tailings from OTP	860,000
Tailings from Pipeline/Trestle	4,000
Soil/Tailings from Maloit Park	18,000
Total	**1,017,830**

Source: CTP Final Construction Report

4.3.1.2 CTP

After the wastes were placed within the CTP, the CTP side slopes were recontoured to 5 (Horizontal) to 1 (Vertical) slopes, surface water controls were constructed, and the pile was capped with a multi-layered engineered cap. The multi-component cap described in the RAP is different for the top of the CTP versus the side slopes. The cap for the top of the cell includes (from the top down): a 12-inch growth medium layer, a 24-inch erosion layer and 12-inch low permeability zone. The low permeability zone was originally constructed of compacted tailings slimes; however, the quantity of slimes meeting the low permeability specifications was not adequate to complete the entire cap. Therefore, for those areas of the CTP that were capped last, the low permeability zone was replaced by Claymax, a geo-synthetic clay liner. For the side slopes, the cap consists of a 12-inch thick growth medium layer, a 36-inch thick erosion layer and a 6-inch thick drainage layer.

Portions of the CTP cap are covered by facilities including the WTP buildings and surrounding paved areas, upper and lower surge ponds, the sludge cell for disposal of WTP sludges, and a temporary disposal cell (Temp Cell). The portions of the CTP where these facilities are located have not been capped. A multi-component cap will be constructed over these areas when the existing facilities are no longer necessary. Stockpiles of materials to be used for this eventual cap construction are stored near the Temp Cell. Figure 2 shows the remedy features located at or near the CTP.

Permanent run-on and runoff control systems (diversion ditches) at the CTP were designed to handle the runoff from a precipitation event having an intensity equal to that of a 500-year return period event. Several rip-rapped runoff chutes convey surface runoff away from the CTP cap. The cap is instrumented with piezometers, erosion monuments, and surface settlement monuments. Access to the CTP is controlled by gates and signs that prohibit trespassing. Vehicle traffic on the CTP is restricted to authorized vehicles and confined to specific routes.

Figure 2 – CTP Features

Two groundwater extraction trenches, on the north and east sides of the CTP, were constructed in 1988 in accordance with the RAP and became operational in 1989. The groundwater extraction trenches route groundwater collected from the perimeter of the CTP to the surge ponds at the WTP. Both groundwater extraction trenches were excavated to a depth of about 15 feet. Perforated PVC pipe was placed in the bottom of each trench, bedded in and covered with screened gravel and wrapped with geo-fabric. The remaining depth of the trenches was backfilled with unclassified fill. Well vaults with pumps are located near the center of each trench. Intercepted groundwater drains by gravity to the central well vaults and submersible pumps transfer collected water to the surge ponds at the WTP through pipelines.

The North groundwater extraction trench is approximately 630 feet long constructed in an east-west direction to intercept shallow groundwater exiting the CTP to Maloit Park (see Figure 2). This trench was located to intercept northward groundwater flow moving through a natural topographic gap existing between the moraines that form the northwest and eastern embankments of the CTP. The East groundwater extraction trench is approximately 400 feet long, constructed along the terminal moraine that forms the eastern embankment of the CTP and topographically separates the CTP from the Eagle River (see Figure 2). The East trench is adjacent to a short section of the moraine that has been eroded and reworked by the river in the recent geologic past. The East trench is oriented in the north-south direction to collect groundwater from the relatively higher hydraulic conductivity sediments in this area.

The CD/SOW required modification of the CTP Extraction Trenches. These modifications were implemented in the 1995 and 1996 construction seasons. Manholes were added near each end of the trenches to provide access to the trenches for inspection and cleaning. Also, a sump was installed and equipped with a pump to drain a groundwater seep occurring near a former decant pipeline that extended from the CTP to Maloit Park. The decant sump, located about 400 feet west of the North trench, is a 2-foot diameter perforated pipe surrounded by gravel. The decant sump pump transfers the collected water via pipeline into the access manhole near the west end of the North groundwater extraction trench. Operation and maintenance of the CTP groundwater extraction system is required by the CD/SOW for a period not to exceed ten years after the effective date of the CD/SOW, or June 12, 2005, or less, if the PRP can demonstrate to the satisfaction of EPA and CDPHE that the groundwater extraction system is no longer needed to meet water quality criteria.

The UGDT was constructed in 1989 just west of the CTP runon diversion ditch, partially on a 30-foot wide easement on Minturn Middle School property, north of Maloit Park Road (see Figure 2). This system was designed to reduce recharge of groundwater below the CTP by diverting clean upgradient groundwater around the CTP to Maloit Park. The system consists of a drainage pipe buried about 15 feet deep in a gravel trench, approximately 1500 feet long. After the trench was constructed and activated, it was determined that it collected groundwater from the CTP side of the trench in addition to the clean upgradient water. Thus, some groundwater containing elevated levels of metals was routed from the CTP toward Maloit Park. Thus, the UGDT was deactivated in 1990 due to elevated concentrations of metals in the discharge.

The CD/SOW required an analysis of the need to reactivate or reconstruct the UGDT. In 1997, the PRP requested reopening the UGDT because the CTP cap was complete and water quality of the groundwater in the nearby monitor wells had improved. In September 1997, the PRP conducted a three-day test at the UGDT to evaluate discharge flow rates and water quality. Based on the results of the three-day test, the PRP obtained a Minimal Discharge Industrial Wastewater Permit from the Water Quality Control Division (WQCD) and conducted a 90-day test from April 30 to August 1, 1998. The WQCD approved a 180-day extension; however, the test was terminated on November 9, 1998 because low flow rates increased the risk of freezing which could damage the piping and valves. None of the flow or chemical limits in the permit were exceeded during the test. Water discharged during the test was used to irrigate a dry, upland portion of Maloit Park to assist plant growth. In March 1999, CDPHE and EPA agreed that operation of the UGDT benefited the reestablishment of vegetation in Maloit Park and increased the efficiency of the north groundwater extraction trench. CDPHE requested that the PRP submit an operation and monitoring plan for the UGDT containing all the substantive requirements of a discharge permit in lieu of applying for a discharge permit. The O&M Plan was approved on April 13, 1999. The UGDT typically flows during the spring of each year and dries up during the summer. The PRP operates the UGDT as a means to intercept clean groundwater that would otherwise flow under the CTP. There is no specific requirement in the CD/SOW to operate the system and there are no time limits given on the term of operation.

4.3.1.3 Town of Minturn Water Supply Wells and Pierson Water Supply Line

In 1996, two new wells were constructed for the Town of Minturn in an area upgradient from any influence from CTP groundwater. The Town of Minturn approved the technical specifications for the installation of the Pierson water supply line in September 1988, and the water line was installed thereafter.

4.3.1.4 Revegetation

Early revegetation efforts at the Site met with limited success. Thus the CD/SOW required an expedited revegetation program to provide a more aggressive approach to vegetation establishment. After the more aggressive revegetation program was implemented, by 2001, many of the areas of the Site had come into compliance with both the original revegetation requirements in the CD/RAP and those required by the CD/SOW. The two areas that remained out of compliance were the CTP cap and Maloit Park. In 2003, the CTP cap achieved compliance. Once compliance with the revegetation criteria was achieved, monitoring of that area was discontinued.

The Maloit Park area was in compliance with the percent cover requirements, but did not meet the similarity criteria. (The species present in the revegetated areas were to be similar to a natural reference area.) The reason for non-compliance with this criterion was identified as a lack of perennial forbs in the revegetated area. Rather than continue quantitative measurement in the area, the PRP agreed to an ongoing, active O&M program to correct areas that are visually bare throughout the site. In addition, an overseeding program at Maloit Park was initiated to increase the diversity of the perennial forbs. Overseeding in Maloit was conducted in early spring 2005 and will also occur in spring 2006.

4.3.1.5 Mine Closure and Water Collection System

Under the Mine Closure Program, eight concrete adit bulkheads were installed in the lower mine adits of the Eagle Mine and in the workings of the Tip Top and Ben Butler mines located upstream of Belden. The adit bulkheads were constructed to prevent the discharge of mine water from the mines and to submerge the sulfide ore bodies, thereby reducing the amount of oxygen that drives the acid rock reaction. The entrance to each of the adits is secured with a steel door and padlock. All bulkheads were constructed with stainless steel piping that allows monitoring of the water level behind the bulkhead by measuring the hydrostatic pressure and drainage of water, if necessary. Connection has been made to this piping at Adit No. 5 to allow the withdrawal of water through the bulkhead to lower the level of the mine pool and to control seepage in Rock Creek. Withdrawal of water from behind the Adit No. 5 bulkhead (mine drawdown or MDD) started in November 1992. The MDD pipeline carries mine water by gravity from Adit No. 5 to the main pipeline at the base of Rock Creek. The MDD pipeline consists of a 6-inch diameter HDPE pipeline that runs from the stainless steel Adit No. 5 piping downhill to the concrete vault at the bottom of Rock Creek. The MDD pipeline is a buried sealed line (i.e., there are no openings for air entry). An electromagnetic flow meter, to measure the flow rate through the MDD pipeline, is installed near the discharge end of the MDD line inside the concrete vault. Remedial features, including Adit 5, are shown in Figure 3.

The underground mine workings of the Ben Butler and Tip Top mines are not physically connected to the Eagle Mine workings and the mine pool in these mines is much lower. However, because of the flooding of the Eagle Mine workings, the PRP was required to collect and treat seepage from these adits as well. Withdrawal of water from behind the Tip Top bulkhead (Tip Top drawdown) started in January 1995 to lower the mine pool to a level that would eliminate flow from the Adit No. 143, on the hillside above the Tip Top adit.

The mine water collection system consists of facilities to collect, transport, and store mine water prior to its treatment at the WTP. Mine water withdrawn or collected as seeps from the Belden and Rock Creek areas is conveyed to the WTP by means of a 15,000-foot pipeline (mine water pipeline, See Figures 1, 2, and 3). The pipeline carries collected mine water by gravity flow from the mine to the surge ponds located near the WTP. This pipeline runs inside or next to the pipeline used during mine operation (the old slurry pipeline) to carry the tailings from the mill area to the CTP. The original tailings pipeline was designed for a flow rate of about 1920 gpm. The maximum flow transported in the pipeline in its current configuration is about 350 gpm.

From south Rex Flats to an area near the WTP, the mine water pipeline is supported by a wooden trestle structure. This structure, installed in about 1947, was designed to support the load of a full 16-inch diameter pipeline filled with tailings. The load currently being imposed on the structure, a 12-inch diameter pipe partially full of water is much less than the design load.

Figure 3 – Remedial Features Near Gilman

The PRP documented the load carrying capacity of the trestle structure in an October 3, 1996 letter to CDPHE. The trestle height varies from about 2 to 45 feet and is constructed mostly of wood, with a steel bridge over the Eagle River. The original structure has been repaired periodically. Broken and/or deteriorated wooden members have been replaced as needed. The walkway, running the length of the original trestle, is currently in poor condition and may not be adequate to support personnel. To limit access to the trestle structure, walkway sections at several key locations have been removed.

4.3.1.6 Rock Creek

In accordance with the CD/RAP a 48-inch diameter culvert was installed in the lower 660 feet of Rock Creek in 1989 in order to prevent further erosion of the toe of WRP 11. The culvert was designed to carry flows from a 500-year storm event. This culvert extends from just above Adit No. 5 to the base of Rock Creek where it discharges through an energy dissipation structure to the Eagle River. The energy dissipation structure is necessary to reduce the water velocity gained during the steep descent (15-20% grade) down the lower section of the culvert before it enters the Eagle River. From the energy dissipation structure, Rock Creek flows are carried through a short (approximately 30 foot) section of 72-inch diameter culvert with outfall at the Eagle River.

In 1993, the Rock Creek groundwater extraction study began to evaluate the long-term suitability of a gravity siphon system to remove groundwater from Rock Creek colluvium. Four wells were installed in lower Rock Creek canyon across a hydrologically favorable bedrock constriction in a closely spaced array that allows the interception of groundwater. The wells are shallow because Precambrian granite provides containment at approximately 15 feet below ground surface. In June 1993, a siphon was installed in well RX-3, the most productive of the four wells. It produces groundwater from bedding gravels below the 48-inch diameter buried Rock Creek culvert. The siphon discharges into the mine water pipeline at the base of Rock Creek. The siphon flow rate is adjusted to between 1 and 2 gpm to maintain the desired water level in well RX-3, usually about 13 feet below the top of casing. This level allows the siphon to operate continuously without overdrawing the well.

In 1995, the Rock Creek culvert was extended about 800 feet upstream to just above the Adit No. 8 road. The culvert extension was designed to carry a 10-year storm event and ties into the original culvert. The culvert extension is also equipped with an inlet trash rack to prevent large debris from entering the system. As part of the Rock Creek culvert system, a run-on diversion ditch was constructed immediately above the old Rock Creek access road to intercept runoff from WRP 8 and prevent it from entering the new culvert inlet. At its lower end, the run-on ditch crosses the old access road and joins the normally dry bed of Rock Creek at the Adit No. 8 road, approximately 50 feet below the new culvert inlet. These features are shown on Figure 3.

4.3.1.7 Waste Rock

Remedial activities for the waste rock piles consisted of routing storm drainage and other surface water flow around them. In accordance with the CD/RAP, a diversion channel was installed in June 1989 to conduct storm-water runoff around WRP 8. The primary purpose of this diversion was to protect WRP 8 from extensive erosion during a 500-year return period runoff event. Permanent run-on and runoff control systems (diversion ditches) at the WRP were designed to

handle the runoff from a precipitation event having an intensity equal to that of a 500-year return period event.

From 1995 to 1997, a study was implemented to assess runoff metal loading from the waste rock piles in the Gilman and Belden areas and to evaluate potential water quality impacts to the Eagle River. While all the WRPs were evaluated, the report concluded that only WRP 8 required remedial action.

The amount of clean water run-on to the WRP 8 area was measured and the results indicated that up to 80 percent of the clean water could be diverted around the waste rock pile, thereby preventing unnecessary mobilization of metals. Water quality monitoring station SR-4 was established downgradient of WRP 8 to measure flow and collect samples of runoff to Rock Creek. It was determined that WRP 8 runoff accounted for most of the dissolved metal load in Rock Creek during rainfall-runoff conditions, and subsequently increased metal concentrations in the Eagle River during large storm events. As a result, three additional run-on control ditches were installed in 1997.

In the summer of 2001, a runoff collection ditch was constructed downslope of WRP 8 at an elevation of approximately 8720 feet MSL (see Figure 3). The ditch extends laterally, approximately 500 feet from north to the south, collecting runoff from the WRP 8 area. The collection ditch ends at a culvert inlet structure where collected runoff enters a pipeline and proceeds 400 feet south to the old Fancy Shaft, a 15-foot diameter, 15-foot-deep subsidence pit. The collapsed Fancy Shaft is hydraulically connected to the Eagle mine workings and is used as a sediment trap and infiltration gallery. Since overflow from the Fancy Shaft was a possibility, an additional 600 feet of 6-inch diameter HDPE pipeline was installed to convey Fancy Shaft overflow to the Eagle mine pool via Adit No. 8. Overflow at the Fancy Shaft has not occurred.

To characterize post-construction water quality downgradient of WRP 8, sampling was conducted during the spring of 2002 using an autosampler and flows were measured in a 60-degree V-notch weir. Additional contaminated soil removal was conducted below the collection ditch at WRP 8 in 2002. In 2004, another collection system was installed near Rock Creek to collect contaminated water from the slope below WRP 8, predominantly from groundwater seeps, and route this water to the WTP.

The Gilman run-on control ditch (upper) starts at the south end of the No. 1 shaft building and runs north along a road to Rock Creek. This ditch diverts the majority of clean water away from the WRP 8 area. The primary source of flow is runoff from an approximately one half-mile stretch of U.S. Highway 24 extending to the east and south and entering several culverts above the No. 1 shaft building. Additional flow is contributed from a former Gilman residential area to the south, and to a lesser extent, from the forested hillside directly above the No. 1 shaft building. The North run-on control ditch diverts runoff from the former residential area located immediately north of WRP 8. Runoff from the former residential area is diverted via a berm and ditch to Rock Creek. The South run-on control ditch diverts runoff from the lower south former

residential area away from WRP 8. This water is conveyed to Rock Creek via three ditch road crossings.

An additional run-on collection ditch was constructed at the south end of Gilman, parallel to Highway 24. This ditch is designed to collect clean storm water prior to entry to Gilman and route it away from the waste rock piles.

4.3.1.8 Seep Collection

Seep collection basins are located in various places where mine water seepage occurs or has occurred in the Belden and Rock Creek areas. The basins are designed to collect the mine water seepage and convey it to the main pipeline. At present there are six active seep collection basins. They are designated as seep S-5, seep S-6, seep S-RF, seep S-7 (dry), S-NT (dry) and Tip Top adit. The seep collection basins consist of either an HDPE-lined basin with or without a gravel cover layer or a concrete basin constructed in conjunction with an adit entry structure. In either case, the basins drain into a pipe that connects to the main mine water pipeline.

4.3.1.9 Mine Water Return System

The mine water return system is located at the base of Rock Creek and provides the capability to pump seepage collected in Rock Creek and Belden back into the mine pool by way of a pipeline which runs into the mine through Adit No. 8. The purpose of the mine water return system is to allow the complete shutoff of flow in the mine water pipeline from Rock Creek to the surge ponds. The mine water return system consists of a cutoff valve in the 10-inch diameter mine water pipeline, a concrete sump and mine water return pump at the base of Rock Creek and a 6-inch diameter HDPE pipe which runs from the concrete sump into the Bleakhouse Mine workings inside Adit No. 8. The system is designed to run automatically once the cutoff valve in the seep transportation pipeline has been closed. The vertical turbine pump will start when the water level in the sump rises above a preset level. The pump will run until the water level in the sump is lowered to the second preset level. The capacity of the sump and the spacing between the on and off levels are designed to allow acceptable pump operation including proper cycle time. Water level probes control the pump. The mine water return system is designed to operate on a short-term basis to allow maintenance or repair of the mine water pipeline. Because the mine water return system returns water to the mine pool, its maximum time of operation depends on the amount of storage (the elevation of the mine pool surface) available at the time.

4.3.1.10 Belden Area

In 1996, remaining lead-zinc "product" from inside the mine drying house in Belden and from the soil surface in front of the drying house and loading facility was removed. All visually distinct product was removed from inside the building and an area approximately 100 meters long in front of the building was excavated to an approximate depth of one foot.

In 1995, four monitoring wells, BW-1, BW-2, BW-3 and BW-4, were installed in railroad ballast at the Belden railroad siding, between the railroad and the old loading dock. The 4-inch diameter wells were positioned to intercept groundwater moving to the Eagle River from suspected surface water recharge areas. Sample results from these wells were used to estimate metal loads from

groundwater entering the river. Results of the Belden groundwater studies suggest that the placement of wells BW-1 through BW-4 are inadequate to characterize groundwater conditions in the Belden area because the wells were not drilled deep enough to monitor groundwater fluctuations. On September 23, 1999, three new, deeper monitoring wells, BW-5, BW-6, and BW-7, were installed in the Belden area between the railroad tracks and the bank of the Eagle River. These deeper wells indicated that a shallow perched zone of contaminated groundwater is present during the spring runoff period that could potentially be pumped out.

On April 19, 2001, well BW-8 was drilled near the former zinc concentrate building, bottoming in granite at 32 feet below ground surface and well BW-9 was drilled at the base of the old tramway, also bottoming in granite at 29 feet. In both holes, 4-inch diameter PVC wells were installed to allow future groundwater extraction. The proposed plan for groundwater extraction in the Belden area was described in a letter, dated August 16, 2001, and accepted by EPA/CDPHE in a letter, dated September 13, 2001. Four photovoltaic solar panels were installed in 2002 to power the submersible pumps. BW-8 produces very little water and BW-9 was accidentally partially filled with gravel. Attempts to remove the gravel in 2003 and 2004 have been unsuccessful. Therefore, these wells have never been used to extract groundwater to date.

4.3.1.11 Water Treatment Plant

The CD/RAP included a pump back system for water removed from the historic pond at the CTP. As the water level in the mine rose above approximately 8500 ft MSL, contaminated water began to seep out through bedrock fractures. The seepage resulted in an increase in metals concentrations in the Eagle River. In 1990, under RAP Amendment 1, the PRP installed a small, package-type WTP and began treating water from the mine. In February 1991, the plant was upgraded to a full-scale custom-designed WTP.

The WTP is a "lime and settling" type plant. Lime and soda ash are added to the contaminated water to raise the pH of the water. A polymer is then added to promote the settling of the solid particles containing metals. The solids are settled out in a clarifier. In 1994, a sludge press system was installed. Acid is added to reduce the alkalinity of the treated water to acceptable discharge limits. The treated water is then discharged to the Eagle River under the provisions of a discharge permit issued by the WQCD (CDPS Permit Number CO-0042480). Effluent limits set by the CDPS permits are listed in Table 4 below.

A sludge disposal cell was constructed at the CTP. The sludge disposal cell design capacity is approximately 52,500 cubic yards (cy). Measurements taken on June 16, 2005 for this five-year review indicate that one-third of the cell is full and that approximately 17,500 cy of sludge has been placed since 1994. The treatment plant generates between 800 and 1600 cy of sludge per year. The sludge production rate has dropped markedly over the past years. The sludge averages about 60 percent moisture when it leaves the treatment plant; however a reduction in moisture content to 30 percent is assumed as a result of drying and compaction in the cell by loading/spreading equipment. Given these parameters, the empty portion of the cell (35,000 cy) will hold an additional 50 to 60 years of WTP sludge.

Table 4 - Colorado Discharge Permit System (CDPS)
Effluent Limits

Effluent Parameter	*Effluent Limitations Maximum Concentrations*	
	30-Day Average	*Daily Maximum*
Flow, million gallons per day	0.713 (design flow, not a limit)	Report
Total Suspended Solids (TSS) mg/l	20	30
pH, s.u. (min/max)	N/A	6.5/9.0
Oil and Grease, mg/l	N/A	10
Total Dissolved Solids (TDS) mg/l	Report	Report
Sulfate, mg/l	3600	Report
Cadmium, Total µg/l	50	100
Copper, Potentially Dissolved, µg/l	12/150[a]	67/300[a]
Iron, Dissolved µg/l	300	Report
Iron, Total Recoverable, µg/l	1000/Report[a]	Report
Lead, Total, µg/l	300	600
Manganese, Dissolved, µg/l	6190/2070[a]	Report
Mercury, Total, µg/l	1.0	2.0
Zinc, Total, µg/l	750	1500

[a]*Some effluent limits are seasonal. The first value is for December through April and the second value listed is the effluent limit for the period of May through November.*

4.3.1.12 Liberty Well

Since 1990, investigations have been conducted to identify means to reduce inflow to the Eagle Mine, thereby allowing better control of the mine pool level and reduce flow to the WTP. From these investigations, it was concluded that the most feasible method to reduce recharge to the mine is to stop or reduce flow entering on the 19 Level of the mine, via exploratory drift 19-5-E-3. It was estimated that 200 gpm or more flows continuously in this drift that connects the Eagle Mine workings to the Turkey Creek and Willow Creek watershed near Red Cliff. To intercept flow in the 19-5-E-3 drift, a 960-foot well (Liberty Well) was installed near the drift in July 1998.

On September 1, 1999, EPA issued an ESD describing EPA's decision regarding the mine pool component of the remedy for the Site. The ESD, which is an addition to the 1993 Record of Decision, required the PRP to install and maintain a pumping system at the Liberty Well. After installation of an above-ground power line, and resolving pump problems, the Liberty Well began pumping on October 30, 2001 and has operated more or less continuously with short interruptions due to loss of electrical power or repairs to the pump and motor.

4.3.1.13 Groundwater

Remedial activities relating to groundwater at the Site are incorporated into several elements of the remedy as discussed above. For example, the remedy for contaminated groundwater at the CTP consists of several components including:

- source removal (cleanup of Maloit Park);
- reducing infiltration (removal of the historic pond on the CTP, capping the CTP);
- diverting water away from the CTP via runon and runoff control ditches, UGDT; and
- collecting and treating groundwater from beneath the CTP via the North and East trenches.

The groundwater remedy for the OTP and Rex Flats areas was primarily source removal, along with reducing infiltration via run-on control ditches and revegetation. In addition, RAP Amendment 1 required the development of a plan to reduce the migration of groundwater from the OTP to the Eagle River. An agreement was reached on December 3, 1990, between the State and the PRP that required installation of three ground water extraction wells between the OTP and the Eagle River. Slug tests were performed on the three extraction wells and adjacent monitoring wells to estimate the hydraulic conductivity of the subsurface glacial materials in the OTP area. The hydraulic conductivity of the unconfined aquifer was determined to be on the range of 1.45×10^{-4} cm/sec. Use of this value to estimate recharge to the extraction wells resulted in a range of predicted extraction rates of between 0.74 to 1.026 gpm. The data indicated that collection of groundwater at the OTP was impractical because of the low production potential of the extraction wells. This conclusion is documented in a letter from CDPHE, dated February 12, 1991. Therefore, no active remediation of groundwater at the OTP and Rex Flats has occurred.

Water within the mine workings is also considered groundwater. The final remedy for groundwater in the mine is a combination of removal of the water for treatment through the MDD system, collection of seepage from the mine and reduction of water flowing into the mine via the Liberty Well.

A specific remedy for groundwater in the Belden area was not included in either the CD/RAP or CD/SOW requirements. Viacom voluntarily submitted a plan to remove groundwater from Belden using well BW-9, in a letter dated August 16, 2001. Due to problems with well BW-9, this plan has not yet been implemented.

4.3.1.14 OU1 Remedy Implementation Summary

A summary of the major construction milestones is presented in Table 5. All activities required by the CD/RAP have been implemented with the exception of the Compliance Monitoring Plan (CMP). The CD/RAP requires that the PRP submit the CMP to the State at the end of construction activities. However, because the final water quality standards have not yet been established and because many of the original RAP requirements were subsequently modified by the CD/SOW, the CMP must address compliance with the new water quality standards and include monitoring for CD/SOW remedy components. Therefore, the State and EPA have not yet approved the CMP.

Table 5 – Major Construction Milestones

Activity	*Date Completed*
Roaster Pile #4 removal	1989
Roaster Pile #5 removal	1988
Roaster Piles #1,2,3 removal	1989
Roaster Gulch sediment & sediment basin removal	1990,1992,1994
Rex Flats tailings removal	1988, 1996
OTP tailings removal	1991
Pipeline Trestle tailings removal	1991
CTP groundwater extraction system completed	1989
CTP cap completed	1996
Maloit Park soil removal	1995, 1996
Belden "concentrate" removal	1997
Package WTP installed	1990
Customized WTP constructed	1991
Sludge Press added to WTP operation	1994

All activities required by the CD/SOW have also been implemented. On June 28, 2001, EPA and the State conducted a final inspection and determined that the remedy had been constructed in accordance with all pertinent decision documents and CDs. The results of the inspection are documented in the Preliminary Site Close Out Report (PSCOR) dated September 17, 2001.

4.3.2 OU2 Remedy Implementation

Site-specific Institutional Controls (ICs), as envisioned by the OU2 ROD, have not been formally implemented. Instead, Eagle County's existing land use regulations and building permit process were determined to provide control over any new development of Gilman during the last five-year review.

In addition, it is important to note that the 2002 Brownfields Amendments to Superfund provide additional protection to human health and the environment in the case of redevelopment of the Site. In order for a new purchaser to maintain their status as a Bona Fide Prospective Purchaser (BFPP) they must take "reasonable steps" to stop continuing releases and prevent future releases. The Brownfields Amendments thus provide an incentive for any developer to work with EPA and State in the same manner as the new land use regulations would have required, to protect the existing remedy (run-on and run-off control features located in Gilman under OU1) and to provide protection to human health in the event of redevelopment of the Site. Otherwise, an owner could lose their status as a BFPP and become a PRP.

4.3.3 Additional Removal Actions at the Site

Several electrical transformers containing polychlorinated biphenyls (PCBs) were located inside the mine workings. In June 1984, EPA removed all but three of the transformers, under an Emergency Removal. The three remaining transformers were drained and flushed, but were left

in place because they were located behind fire seals near partially collapsed areas of the mine and could not be safely removed. PCBs have not been detected in the mine pool. The emergency removal also included the removal of other miscellaneous oil, lubricants and chemicals found in the mine below Level 16.

In 1992, under the terms of the UAO (and RAP Amendment 2), the PRP removed explosives, chemicals and electrical equipment from Gilman.

4.4 Operation, Maintenance and Monitoring

4.4.1 Operation and Maintenance at OU1

Operation and maintenance activities for OU1 are on going. Viacom maintains a daily presence at the Site because of the water collection and water treatment facilities. WTP operators are on-site a minimum of 5 days per week and, currently, the plant is shut down on weekends. Viacom also has responsibility to periodically inspect the mine bulkheads, Rock Creek Groundwater Extraction System, Rock Creek Culvert, CTP groundwater extraction systems, UGDT, Liberty Well, Seep Collection system, pipelines, water collection and conveyance structures, CTP cap and ditches, and vegetation. O&M at the Site is currently governed by the Inspection and Maintenance Plan (IMP) dated 1997.

4.4.2 Operation and Maintenance at OU2

Operation and maintenance for OU2 consists primarily of periodic inspections of Gilman for signs of trespass or vandalism of the gate. If trespassers are found on-site, the Eagle County Sheriff's Office is contacted.

4.4.3 Monitoring and Reporting Requirements

Regular reports were generated by the PRP for all phases of construction activities. Construction Complete Reports were required for all elements of the CD/RAP. A Final Construction Report was also submitted to the State and approved in 1999.

A stream gage at the location of the water quality monitoring station E-12A, Eagle River below Rex Flats, which met all applicable USGS requirements for such gages, was installed. A Memorandum of Understanding (MOU) among Eagle County, Viacom and the USGS now governs the operation of the gage.

As required by the CD/SOW, Quarterly Data Reports, Annual Site Monitoring and Activity Reports, Annual Surface Water Loading Reports, Data Evaluation Reports and Aquatic Biological Monitoring Reports have been produced and submitted to EPA and CDPHE. In recent years, these reporting requirements have been modified by the agencies because of declining activities at the Site. Currently, Semi-Annual Activity Reports and an Annual Site Monitoring Report are required.

The CD/SOW also included requirements for additional monitoring:

- Storm Event/Snowmelt Surface Water Monitoring
- Roaster Pile Springs Monitoring
- Groundwater Monitoring
- Waste Rock Pile Monitoring
- Monitoring at Belden
- CTP Extraction Trench Monitoring
- Maloit Park Monitoring

These monitoring activities are being conducted in accordance with the CD/SOW. Some of the monitoring activities have been satisfactorily completed and are no longer needed. Other monitoring activities are ongoing and the results are reported in the Annual Site Monitoring Reports produced by Viacom.

Section 5
Progress Since Last Five-Year Review

The first five-year review, dated September 2000, was written before the EPA's June 2001 "Comprehensive Five-Year Review Guidance" was issued. This is the second five-year review for the site, but the first in-depth review conducted under the more recent EPA Guidance. The first Five-Year Review states, "the remedies for OU1 and OU2 are expected to be protective of public health and the environment." It then goes on to state, "The above conclusions are, however, contingent on the protection of the CTP cap and the protection of the integrity of the soils and vegetation on the OTP. They are also contingent upon the non-use of groundwater from under the OTP, Rex Flats, or the CTP. The Question of whether Gilman can be considered for different land uses will be dependent upon further risk analysis. Gilman, as is, is not a threat, at least from metals, to the casual user." The specific activities that have taken place at the Site during the last five years are summarized below.

Rock Creek/WRP 8

1) A submersible pump was installed in the Rock Creek well in September 2000 to enhance groundwater removal in this area.
2) Construction of water collection basin at the base of WRP 8 and conveyance pipeline to the Fancy Shaft, completed July 2001.
3) WRP 8 slope soil and trash removal completed in October 2002.
4) The berm around the upper collection basin at WRP 8 was enlarged in June 2004.
5) Construction of water collection basin adjacent to Rock Creek at the base of WRP 8 and conveyance pipeline to the WTP, July 2004.

Revegetation

1) Revegetation maintenance has been performed in areas of poor vegetation establishment on the OTP and Rex Flats in 2001 and 2003.
2) Compliance with revegetation criteria achieved in 2003, and documented in the Viacom Revegetation Report
3) Overseeding of native perennial forbs in Maloit Park to improve species diversity was conducted in April 2005.

Liberty Well

1) Liberty Well was deepened, cased and screened in October 2003.
2) Liberty Well was drilled out again in September 2004 to further improve its operation.
3) During the summer of 2004, a significant effort was launched to attempt to plug the Liberty drift. This involved injecting grout and bentonite into the Liberty 19-E-3 drift. As a result of this operation, the drift was partially plugged, with flow through the plug estimated at 135 gpm. Also, as a result of the plugging activities, the production of the Liberty Well has improved. One problem did occur in that drilling foam was released for a brief time from the Liberty drilling site in August 2004 and the foam reached Willow Creek and eventually the Eagle River.

WTP and Mine Water Pipeline

1) A Computer Automation system was installed in the WTP in October 2001. The computer provides for more precise control of WTP set points and allows the WTP to continue to treat water when operators are not present, with a contingency system that provides for call-out to an operator if a malfunction occurs. Prior to implementation of the computer automation system, the plant could run without operators present, but malfunctions would not be noticed until an operator became aware of the problem by visual observation.
2) The clarifier floor was replaced in August 2002. The clarifier floor was an important component of the WTP system that limited the plant's useful life. The new floor is expected to last at least 15 years.
3) Doors were installed on the reaction tanks in August 2004 to facilitate access to the tanks for cleaning. Cleaning also occurred at this time.
4) The upper pond liner was inspected and repaired in February and May 2003.
5) The upper pond discharge pipe was replaced and reconfigured in May 2003.
6) The piping upstream of the WTP flow measurement weir and the R3 tank was modified in June and September 2004. These changes enable the WTP to be brought up to full flow (400 gpm) without discharging to the Eagle River. Once all control functions and parameters are within set points and stable, the flow is then diverted to the Eagle River by opening a manual valve. Also flow is diverted to the lower pond automatically by the plant in the event of an "upset" condition.
7) The mine water collection pipeline was upgraded to seal pipe openings and replace old or damaged pipe in November 2002.
8) An overflow line at the Tip Top adit was reconfigured in August 2000 to avoid possible pipe overflow from this adit.
9) An acid-washing process was implemented to help reduce the build-up of iron scale in the pipeline in 2002.

Other

1) New Water Quality Standards have been proposed for the Eagle River and a hearing before the WQCC has been scheduled for December 2005. (The original hearing was scheduled for February 2004, but was postponed in order to allow for additional analysis by the Colorado Division of Wildlife).

Section 6
Five-Year Review Process

6.1 Administrative Components

The Eagle Mine Superfund Site five-year review team was led by Wendy Naugle, CDPHE Project Manager, and included EPA's Remedial Project Manager Armando Saenz. Cathy Schuster (CDPHE) and Jennifer Chergo (EPA) conducted community interviews. Jason King, Assistant Attorney General with the Colorado Attorney General's Office conducted the ARARs review. Dr. Raj Goyal, Toxicologist with CDPHE conducted the toxicity review. The review was initiated in March 2005 and extended through August 2005. The review included the following:

- Community involvement
- Local interviews
- Document review
- Data review
- Site inspection and WTP effluent sampling
- ARARs review
- Five-year review report development and review

6.2 Community Notification and Involvement

CDPHE published a notice in the Vail Daily on Thursday, March 17, 2005, to notify the community that CDPHE was conducting the Eagle Mine five-year review. The notice identified Wendy Naugle, Armando Saenz, Cathy Schuster and Jennifer Chergo as points of contact if community members wished to request information or participate in an interview. Interviews were conducted with community members impacted by or involved with the Site. The interviews were completed from March through May 2005, and were conducted by the CDPHE and EPA Community Involvement Coordinators.

6.3 Document Review

In preparing this five-year review, the following documents were reviewed:

- Five Year Review Report for Eagle Mine Superfund Site (2000)
- EPA Record of Decision, Eagle Mine (OU1, 1993)
- EPA Record of Decision, Eagle Mine (OU2, 1998)
- Explanation of Significant Differences, Eagle Mine (OU1, 1999)
- Consent Decree/Remedial Action Plan (1988)
- Consent Decree/Statement of Work (1996)
- Preliminary Site Close Out Report (2001)
- Annual Reports & Water Quality Reports (Ongoing)
- Endangerment Assessment (1988)
- Risk Assessments (various years)
- Remedial Investigation (1985)

- Work Plan for Maloit Park Wetlands Removal and Restoration (July 14, 1995)
- Investigation of Hydraulic Conductivity at the Old Tailings Pond Area (January 7, 1991)
- Development and Application of a Biological Index to Assess the Influence of Heavy Metals on Stream Invertebrates in Mineralized Areas of Colorado" (March 2001)

6.3.1 ARARs

Applicable or relevant and appropriate requirements (ARARs) were reviewed to determine whether any changes to the ARARs have occurred since the signing of the RODs and ESD that could impact the protectiveness of the remedy at the Site. The results of this review are discussed in Section 7.2, "Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of the Remedy Selection Still Valid?"

6.3.2 Risk Assessment

The risk assessment for Gilman was reviewed to determine whether any changes in either the exposure assumptions or the toxicity values have occurred since the last five-year review that may impact the protectiveness of the remedy. The results of this review are included in Section 7.2, Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of the Remedy Selection Still Valid?"

6.4 Data Review

The Eagle Mine remedy was designed principally to reduce metals loading to the Eagle River. An extensive monitoring program has been conducted. Environmental monitoring data collected and evaluated during this review period include:

- Surface water quality
- Biological (macroinvertebrates and brown trout)
- Groundwater quality
- Potentiometric surface elevation
- Revegetation
- Settlement
- Erosion
- Water Treatment Plant effluent water quality
- Mine water level
- Liberty Mine Water Quality and pumping rates

6.4.1 Surface Water Quality Data Review

Surface water quality monitoring is the key component of the environmental monitoring at the Eagle Mine Site. During this five-year review period, over 300 surface water samples have been collected and analyzed. These data provide the information necessary to analyze the long-term trends in contaminant concentrations and loading to the Eagle River. One way to measure the success of the remedial actions is to review long-term trends in water quality. Surface water quality monitoring locations are shown on Figure 4. Extensive studies at the Site have indicated that while other metals are present in surface water, zinc occurs in the highest concentrations and the other metals (with the possible exception of copper) show a high degree of correlation with

dissolved zinc concentrations in surface water. Also, while surface water quality is measured at multiple locations throughout the site, the variations in water quality at each location are similar. Therefore, one monitoring location, E-13B is selected to depict the long-term water quality trend at the site for this report (see Figure 5). E-13B is located on the Eagle River, just above the confluence with Cross Creek. This location is at the downstream end of the Site, below all of the waste sources, contaminated tributaries and the WTP outfall. As shown in Figure 5, the clean up at the Eagle Mine Site has significantly improved water quality. Each remedial milestone resulted in additional improvement. Then, from about 2001 to the present, the water quality has remained fairly stable. Note also, the strong seasonal trend in the data, as explained previously, that results from early spring snow melt at the Site, prior to the high flows in the river resulting from spring runoff in the high country.

Dissolved zinc load is used to assess potential metal sources related to past mining at the Site and to measure improvements in zinc removal. Dissolved zinc load is calculated by multiplying the dissolved zinc concentration in mg/l by the flow at the time of sampling in cfs, and converting the units into pounds per day (lbs/day) using a conversion factor of 5.4. In this manner, the dissolved zinc load is calculated for each monitoring station along the river during September and October when the flow can be measured safely.

Figure 6 shows the zinc loading summary for 2004 and also includes a data table showing the changes in zinc load in recent years at each monitoring location. Note the decrease in zinc load in Rock Creek over time, and more specifically in October 2004. It is possible that this reduction is the result of remedial activities at WRP 8. However, additional monitoring is necessary before this conclusion can be fully supported. While outside the context of this five-year review (pre-2001 data), review of historical load calculations indicates large reductions in load in the OTP and CTP reaches of the Eagle River as remedial activities were completed in each of these areas.

Figure 4 – Site Surface Water and Biological Monitoring Locations

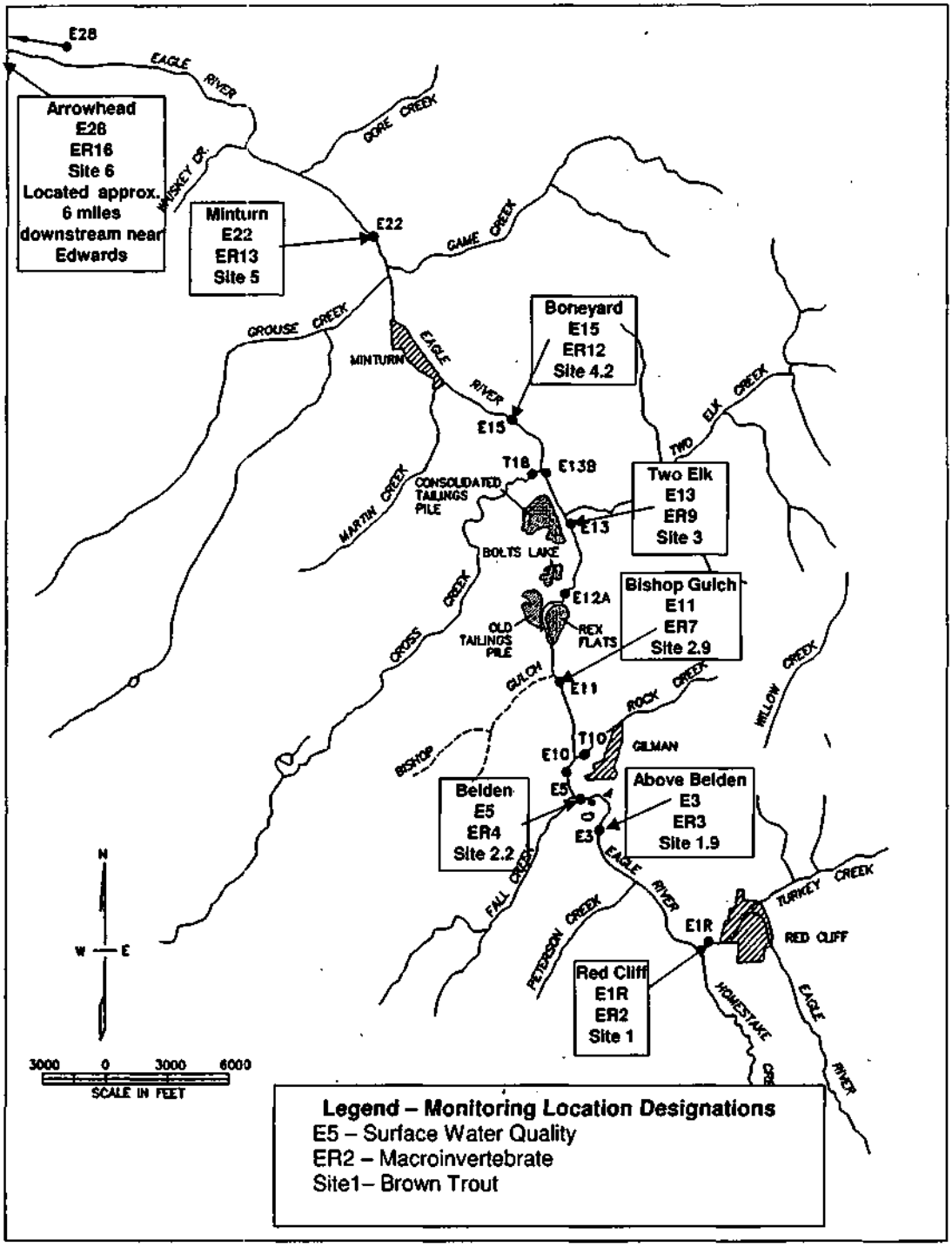


Figure 5 – Zinc Concentration in the Eagle River Above Cross Creek (E-13B)

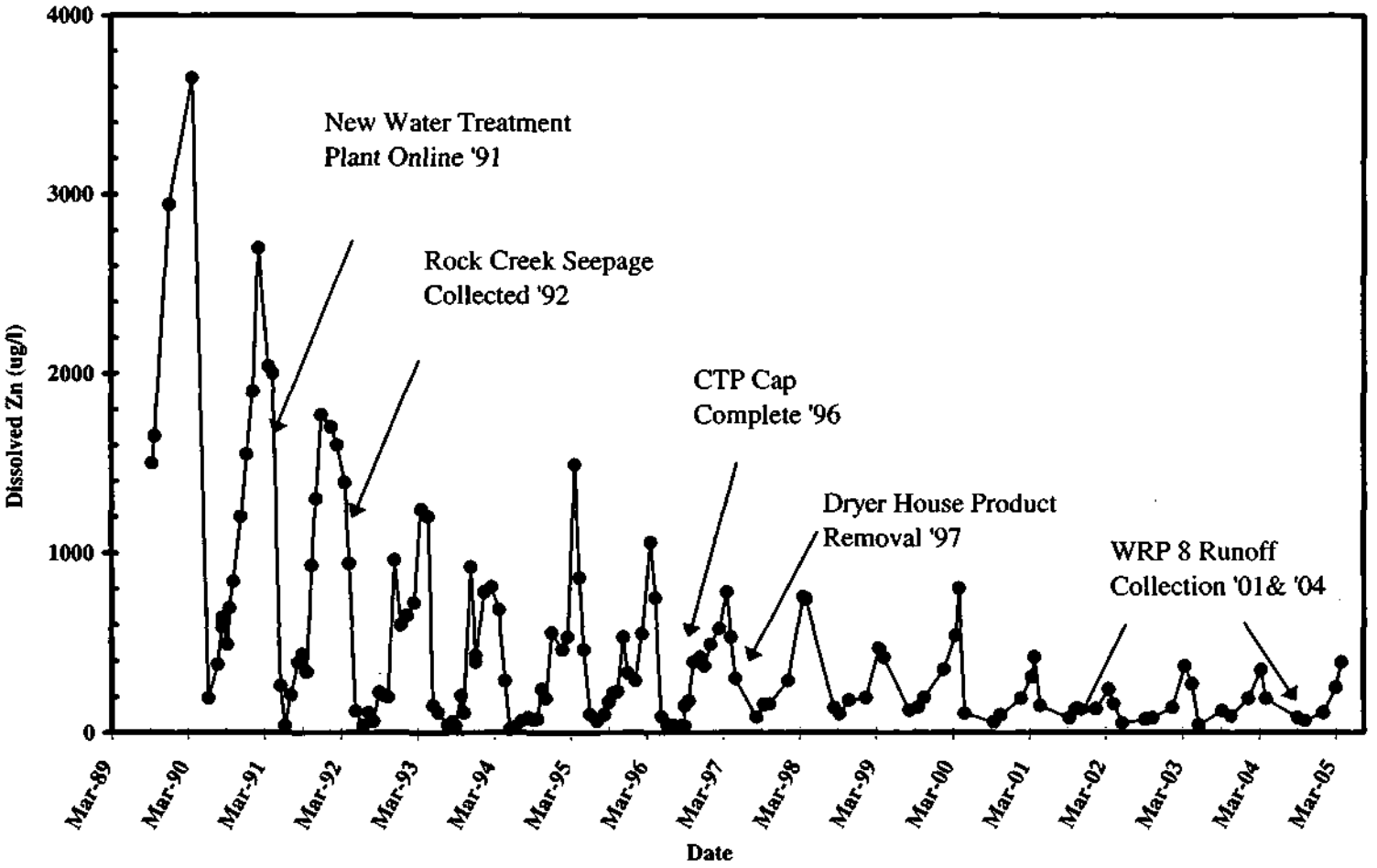
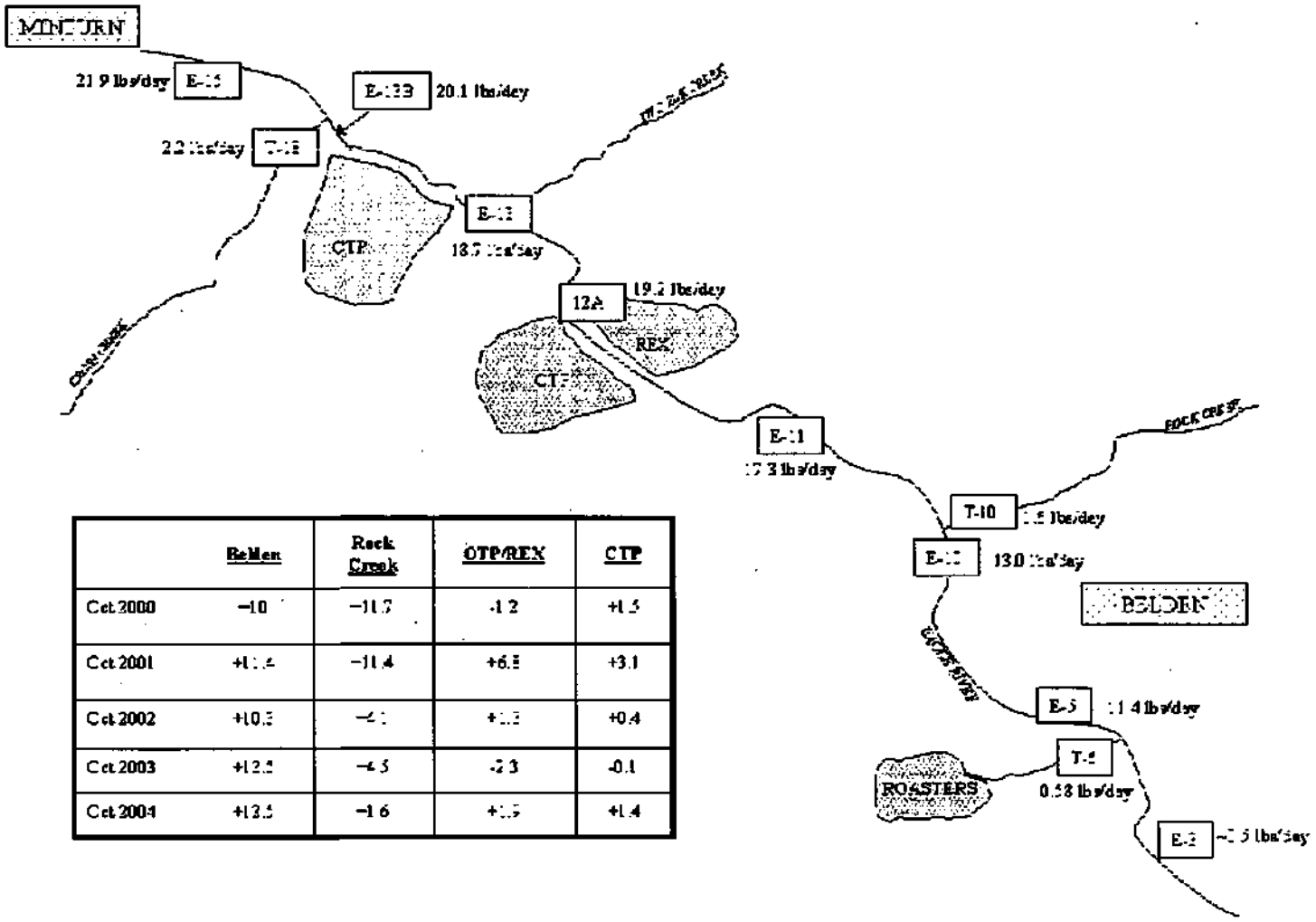


Figure 6– Zinc Loading October 2004



	Belden	Rock Creek	OTP/REX	CTP
Oct 2000	−10	−11.7	-1.2	+1.5
Oct 2001	+1.4	−11.4	+6.8	+3.1
Oct 2002	+10.8	−4.1	+1.8	+0.4
Oct 2003	+12.8	−4.5	-2.3	-0.1
Oct 2004	+13.5	−1.6	+1.5	+1.4

6.4.2 Biological Data Review

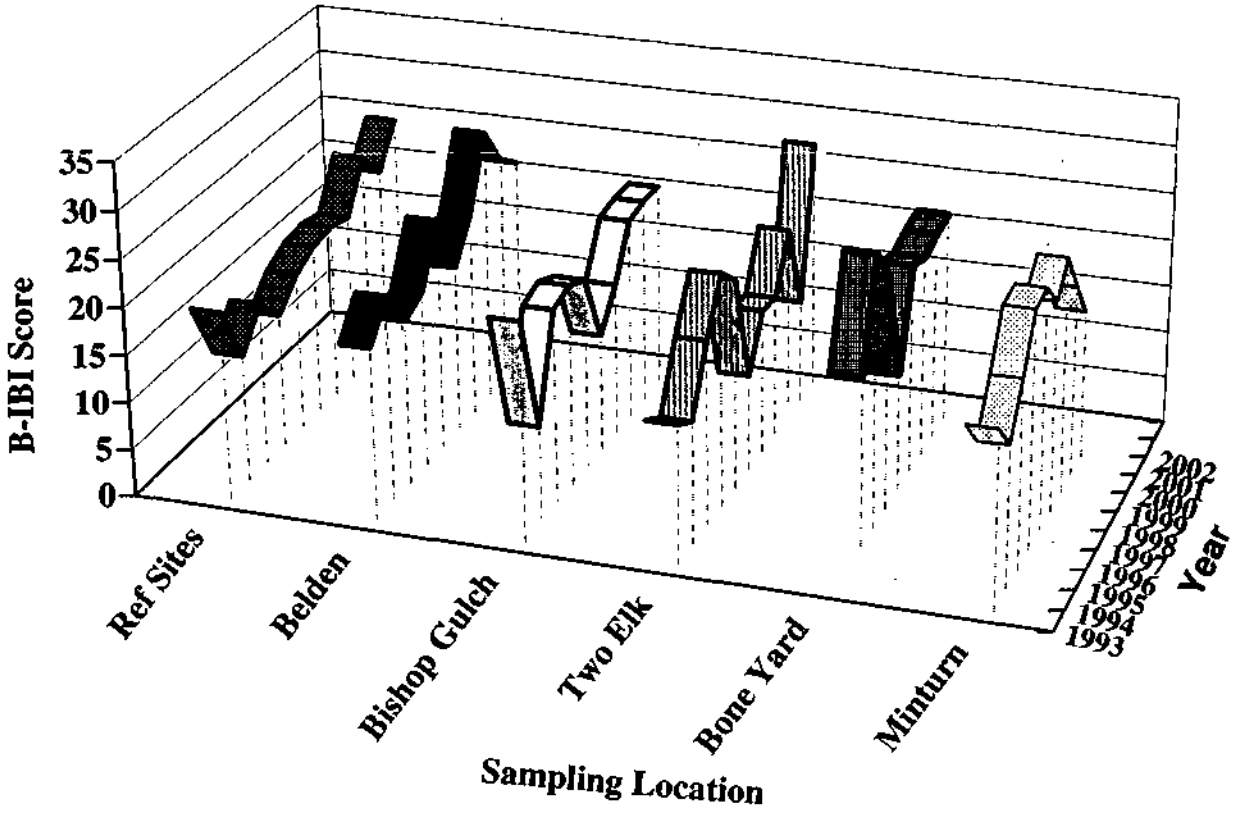
Biological investigations at the Site have been conducted since 1990 using a variety of different sampling locations and methodologies. This five-year review provides only a summary of the biological data. More detailed information about the biological monitoring data is available in both HMWMD and EPA files. In addition, the protectiveness of the remedy with respect to aquatic life cannot be addressed until the biological criteria are reviewed and accepted by the WQCC.

6.4.2.1 Macroinvertebrate Data

Macroinvertebrate samples have been collected at the Site over many years using a variety of different sampling methodologies. Interpretation of the vast array of data was difficult without a comprehensive framework for evaluating the data. Therefore, interpretation of macroinvertebrate data now follows the recommendations in EPA's report entitled "Development and Application of a Biological Index to Assess the Influence of Heavy Metals on Stream Invertebrates in Mineralized Areas of Colorado" dated March 2001. The report sets forth a methodology for determining a Benthic Index of Biotic Integrity (or B-IBI) based on fall sampling for macroinvertebrates using a Hess Sampler.

As shown in Figure 4, five locations within and downstream of the former mine site (Belden, Bishop Gulch, Two Elk, Boneyard and Minturn) have been sampled along with two upstream reference locations (Red Cliff and Above Belden). Reference locations are selected to be representative of ecologically similar conditions to the Site, but are located outside of (e.g. upstream of) environmental influences from the Site. The B-IBI values are shown in Figure 7. Figure 7 shows how the B-IBI scores have varied from year to year and how most of the locations have shown an improving trend since 1998. The improvement in B-IBI scores since 1998 indicates that the biological community at the Site has experienced a degree of recovery in a similar fashion to the improvements in water quality at the Site.

Figure 7 – Macroinvertebrate Index Scores



6.4.2.2 Brown Trout Data

Brown trout population estimates (number of fish per acre) from each mine site sampling location are compared to the average of the brown trout population estimates for three reference locations (Red Cliff, Above Belden and Arrowhead). Fish sampling locations are shown in Figure 4. Figure 8 shows brown trout population estimates for the sampling locations from 1997 to 2005. Ideally, mine sites should achieve a threshold of 95% of the average brown trout population estimates of the three reference locations. A more detailed summary of the brown trout data is available in the Annual Biological Monitoring Reports prepared by the Colorado Division of Wildlife.

Both the macroinvertebrate and brown trout data show the strong recovery of the aquatic ecosystem after the mine wastes (roaster piles and tailings) were contained, the CTP was capped and the WTP went on-line, post 1997. EPA and CDPHE are currently attempting to evaluate the degree of this biological success in the context of the WQCC standards hearing.

In 2004, brown trout populations declined at all mine locations and two of three reference locations as shown in Figure 8. The CDOW is currently conducting an evaluation of the data in order to determine if causes can be identified for the decline.

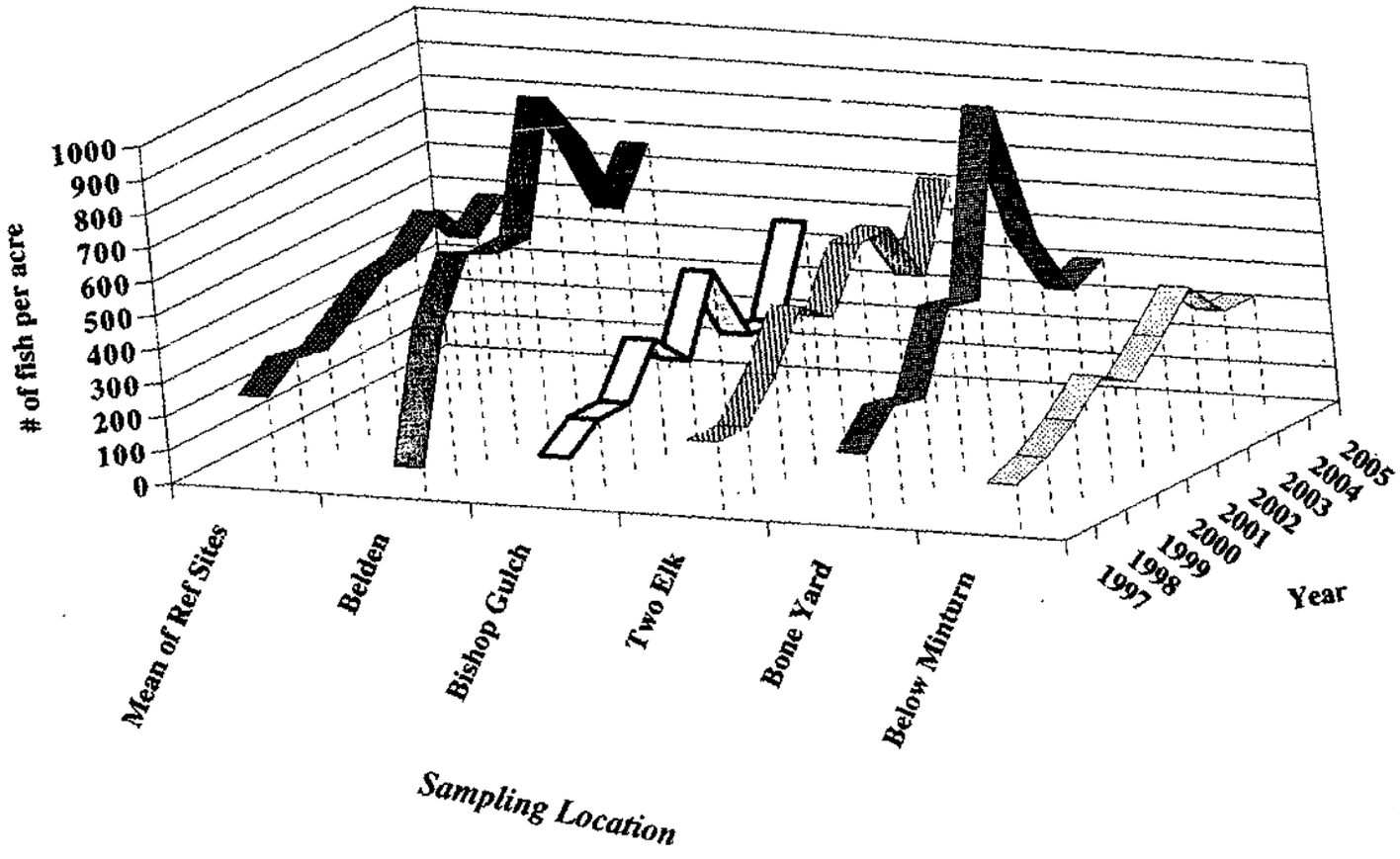
6.4.3 Water Treatment Plant Data Review

Because of the recent success in lowering the mine pool as discussed in Sections 4.3.1.5 and 4.3.1.12, the WTP can operate on a more flexible, intermittent schedule. In addition, in the evening hours, the plant is turned over to a computer-controlled system. Currently the plant is operated for 5 days per week and is shut down on the weekends. The WTP treats an average of 150 million gallons of water each year, removing between 100 and 180 pounds of zinc per day. The WQCD conducts an annual inspection of the WTP and, during this five-year review period, no violations were noted during the inspections. The discharge permit for the WTP requires periodic sampling of the treated water (effluent) at the outfall. A review of the water quality data for these effluent samples was performed as part of this five-year review for the period of October 2000 through May 2005.

Figure 9 shows the most critical water quality parameter for the treatment plant, total zinc. As shown in the figure, all effluent samples for the period were far below the corresponding effluent limits. For total zinc, the average of all 30-day average measurements for the period was 60 µg/l and the maximum daily sample was 197 µg/l. (The effluent limits in the discharge permit are 750 and 1500 µg/l respectively.)

For total cadmium, the average of all 30-day average measurements for the period was 0.07 µg/l and the maximum daily sample was 2.9 µg/l. (The effluent limits in the discharge permit are 50 and 100 µg/l respectively.) For potentially dissolved copper the average of all 30-day average measurements for the period was 1.75 µg/l and the maximum daily sample was 20 µg/l. (The effluent limits in the discharge permit are 12 and 67 µg/l respectively.)

Figure 6 – Brown Trout Population Estimates



Also, as part of this five-year review effort, an unannounced water quality sample was collected at the WTP outfall by CDPHE on June 14, 2005. The sample was analyzed for the dissolved and total metals designated in the CDPS permit. Table 6 shows that all parameters were safely within permit requirements on the date of the unannounced sample collection.

During this five-year review period, the WTP experienced one upset. On October 8, 2003, in the early morning hours, the lime feed conveyor system malfunctioned and the pH in the reaction tank began to drift downward, resulting in less than optimal treatment. At this point, the computer-controlled system should have automatically shut down the WTP, diverted the effluent to the on-site pond and called the operator for notification of the malfunction. However, because a manual switch had not been activated to turn the operation of the plant over to the computer, the operator was not notified and the plant continued to run. The WTP discharged water under this condition for approximately 5 hours at a discharge rate of 309 gpm.

In order to evaluate the possible effects that this WTP upset may have had on water quality in the Eagle River, a worst-case calculation was performed, the results of which are shown in Table 7. At the end of the period, a sample of the water was collected from inside the plant (on Table 7 "Concentration in Effluent"). More than likely, metal concentrations gradually increased to these concentrations over the 5 hour period. For the sake of analysis, it was assumed that water was discharged at these concentrations for the entire 5 hours. On October 8, 2003, the Eagle River flow at the Minturn gage (E-12A) was 38 cfs. This equates to a flow of approximately 41.42 cfs at the Two Elk location, near the WTP outfall. An approximate 40-fold dilution factor would then result as the 309 gpm flow rate (0.7 cfs) from the plant mixed with the water in the stream. Assuming ambient concentrations based on a September 2003 water quality sample (which had poorer water quality than the October 2003 sample), the resulting in-stream concentration was calculated, as shown in Table 7. Although the undiluted effluent did have concentrations high enough to impact aquatic organisms, the resulting zinc concentration in the Eagle River, under these worst-case conditions, may have increased from 120 µg/l to around 153 µg/l. As previously mentioned, the WTP is operated under a CDPS permit issued by the WQCD, which is a separate entity from the HMWMD and compliance decisions about the permit are made by the WQCD not HMWMD. In this case, after review of all applicable information, the WQCD determined that no enforcement action be taken. Under CERCLA, permits from regulatory agencies, such as the CDPS permit, are not required. Instead, the PRP is required to comply with the substantive requirements of the regulations. However, a permit is prudent in this case to adequately and feasibly oversee the WTP.

Figure 9 – Total Zinc Concentration in Water Treatment Plant Effluent

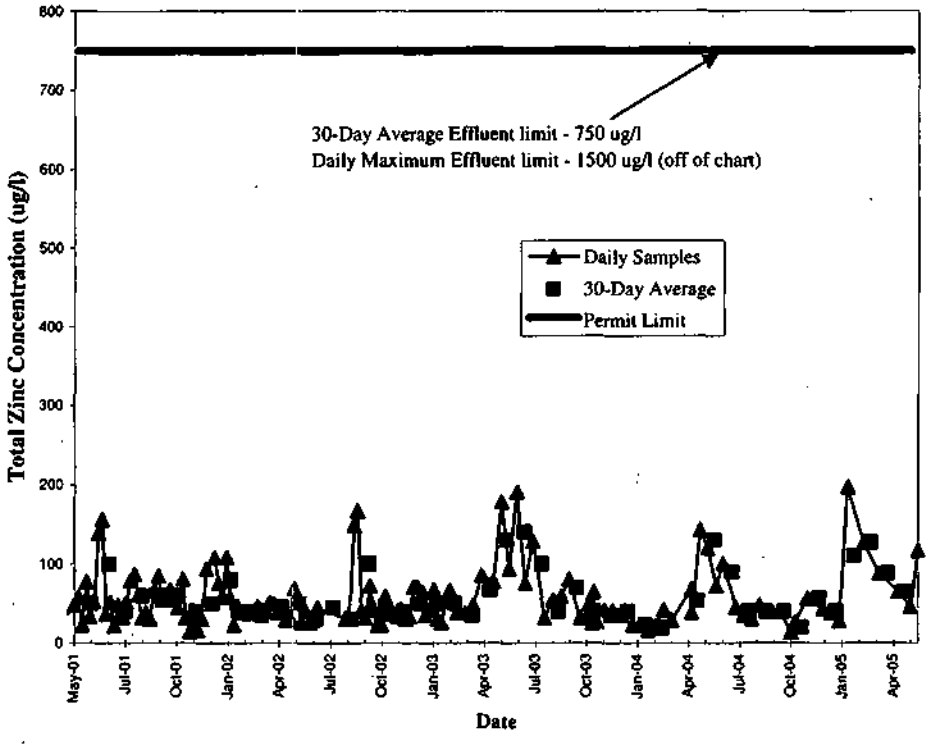


Table 6 – Results of Unannounced Sampling of WTP Effluent

Effluent Parameter	*Concentrations µg/l*	
	***Dissolved** (Effluent Limits)*	***Total** (Effluent Limits)*
pH, s.u. (min/max)	N/A	**7.36** (6.5/9.0)
Cadmium	**1.74** (100)	**1.79**
Copper	**6.31** (300)	**16.5**
Iron	**ND** (300[a])	**ND** (Report)
Lead	**ND**	**ND** (600)
Manganese	**440** (2070[a])	**490**
Mercury	**ND**	**ND**
Zinc	**60.1**	**68.6** (1500)

Note that daily maximum effluent limits from the permit are indicated in parentheses next to the measured concentration.

[a] *When the Daily Maximum is listed as "Report" 30-Day average limit is used instead.*

Table 7 - Worst Case Calculation of In-stream Metals Concentration from October 2003 WTP Upset (all concentrations in µg/l)

Chemical	**Concentration in Effluent (Effluent Limit)**	**Concentration in Eagle River**	**Resulting in-stream Concentration**
Total Cd	10.6 (100)	0.2	0.37
Total Cu	9.8 (300)	Not Detected	0.16
Total Zn	2111 (1500)	120	153

6.4.4 Groundwater Data Review

Groundwater monitoring is conducted semi-annually, during April and September, at 20 on-site wells and five wells near the UGDT. Water level data from the wells and CTP piezometers are used to construct periodic potentiometric surface maps for the CTP.

6.4.4.1 Groundwater at CTP, OTP and Rex Flats

Three monitoring wells have been selected for this report to graphically illustrate changes in water quality over time. Respectively, the wells are from the CTP, OTP and Rex Flats areas. DAP-MW3/ET-1 is located on the east side of the CTP, downgradient of the east trench, between the CTP and the Eagle River (location shown on Figure 2). OTP-MW2 is located on the east side of the OTP between the remediated tailings area and the Eagle River (location shown on Figure 10). REX MW2 is located in the northwest corner of Rex Flats between the remediated tailings area and the Eagle River (location shown on Figure 10). The dissolved zinc concentration trends in each of these three wells are shown below in Figures 11 to 13. Since the completion of the CTP cap in 1996, a measurable decrease in zinc concentration in the DAP-MW3/ET-1 area has occurred as shown in Figure 11. Zinc concentrations in groundwater, while once greater than 1000 mg/l, are now consistently below 200 mg/l. In addition, piezometer data suggest a gradual decline of the perched water table in the tailings as the CTP continues to dewater and the CTP cap limits infiltration.

As shown in Figure 12, dissolved zinc in well OTP MW2 has decreased since 1993 as a result of source removal activities at the OTP. Zinc concentrations in groundwater at this location, while once greater than 1200 mg/l, are now consistently below 150 mg/l.

At Rex Flats, zinc concentrations in groundwater have never reached the levels of either the CTP or the OTP as shown in Figure 13. During this five-year review period, zinc concentrations at REX MW2 have been consistently below 120 mg/l.

Figure 10 – Selected Monitor Well Locations at OTP and Rex Flats

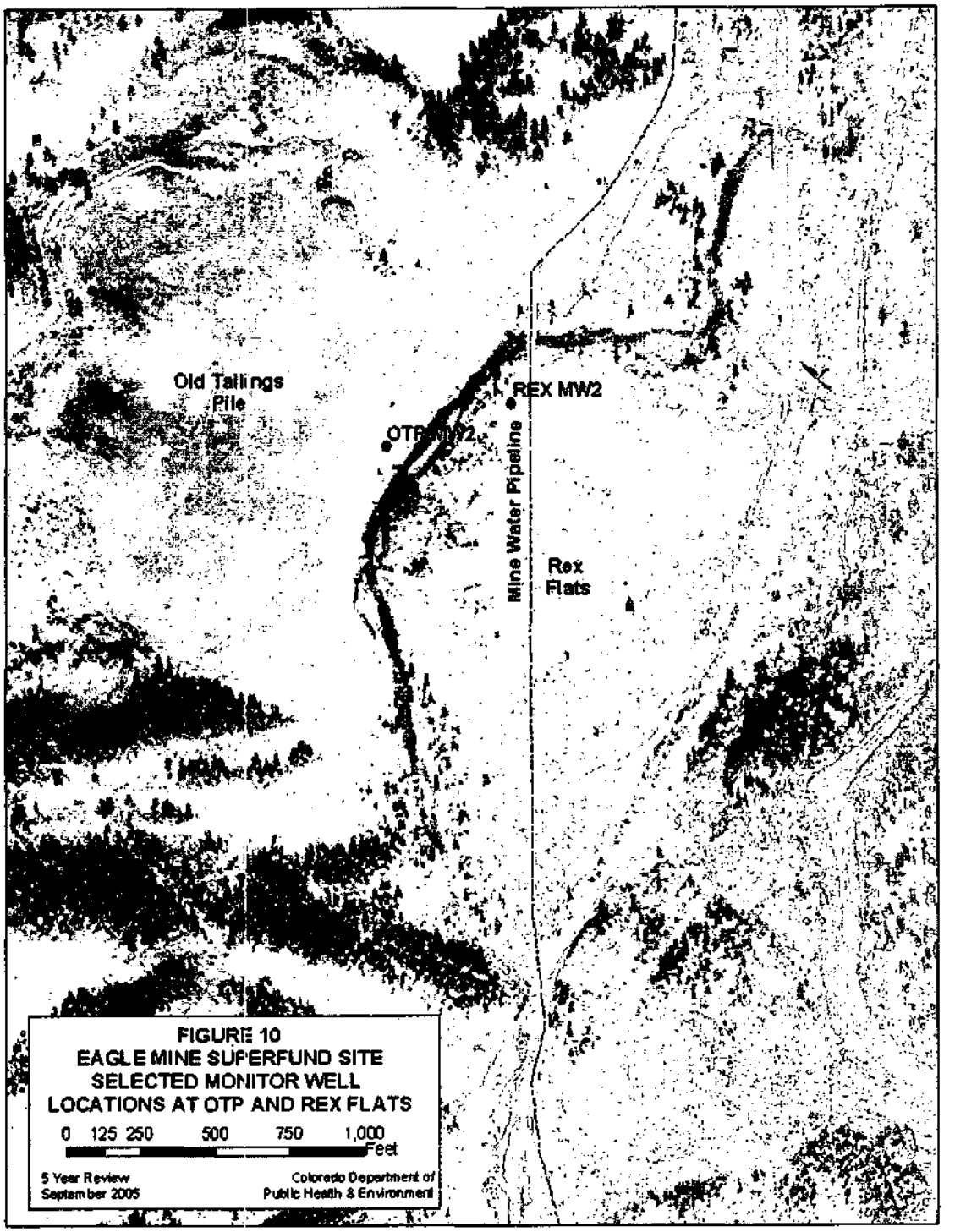


Figure 11 – Dissolved Zinc in Well DAP-MW3/ET-1 near the CTP

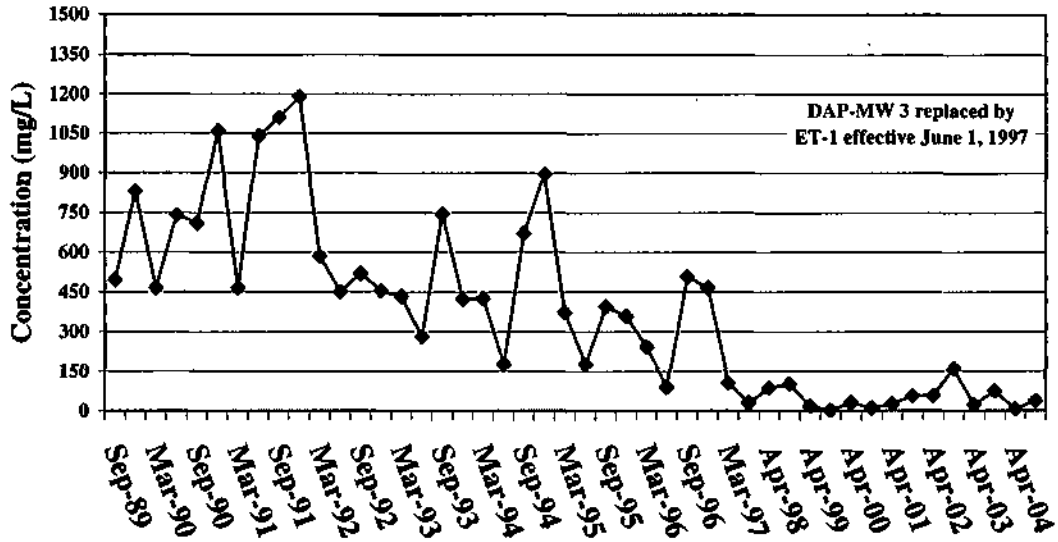


Figure 12 – Dissolved Zinc in Well MW2 at the OTP

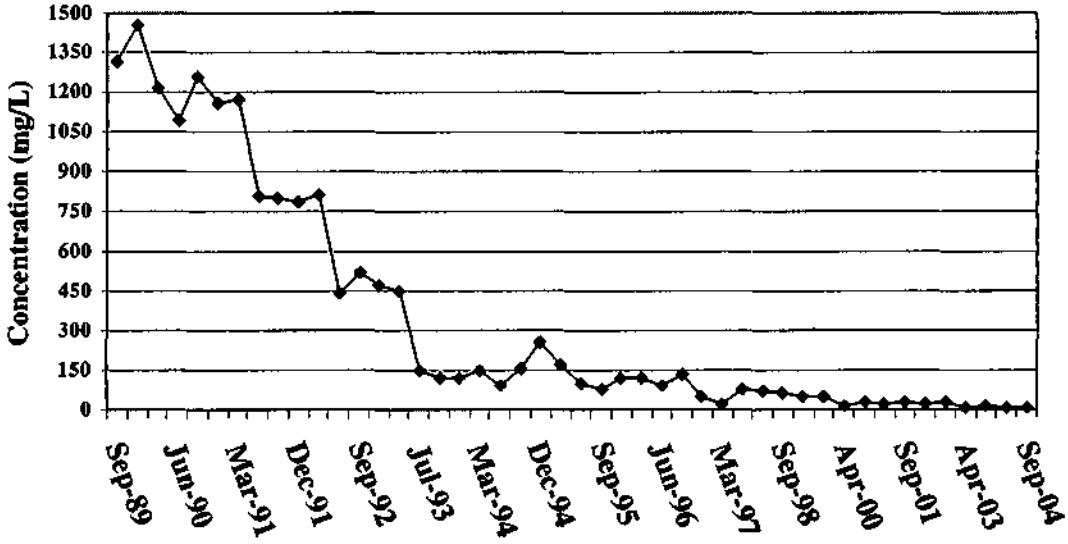
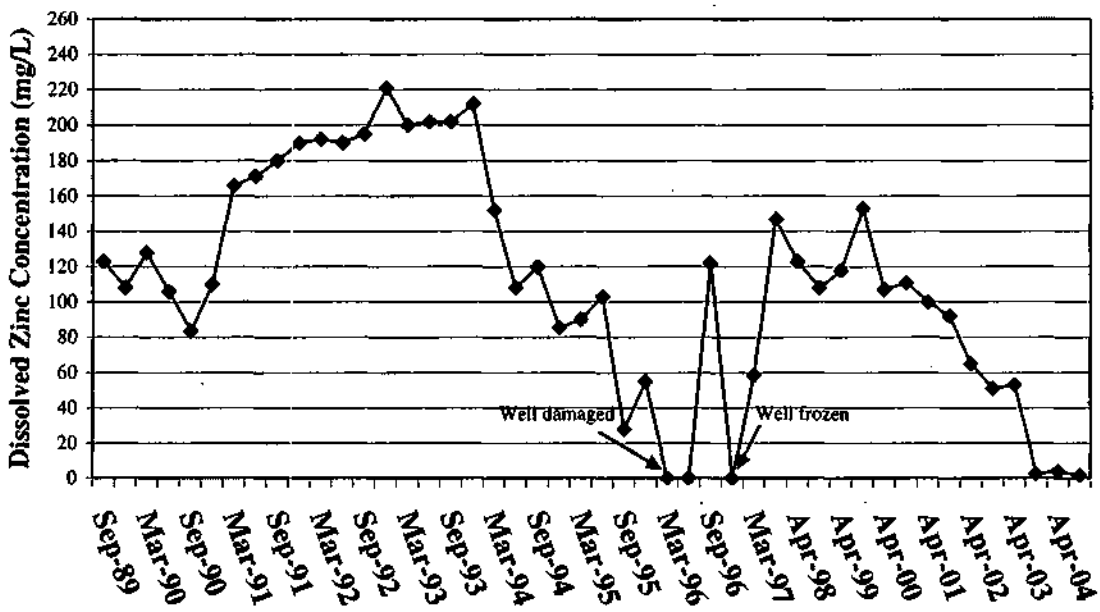


Figure 13 – Dissolved Zinc in Well MW2 at Rex Flats



6.4.4.2 Groundwater at Belden and Gilman

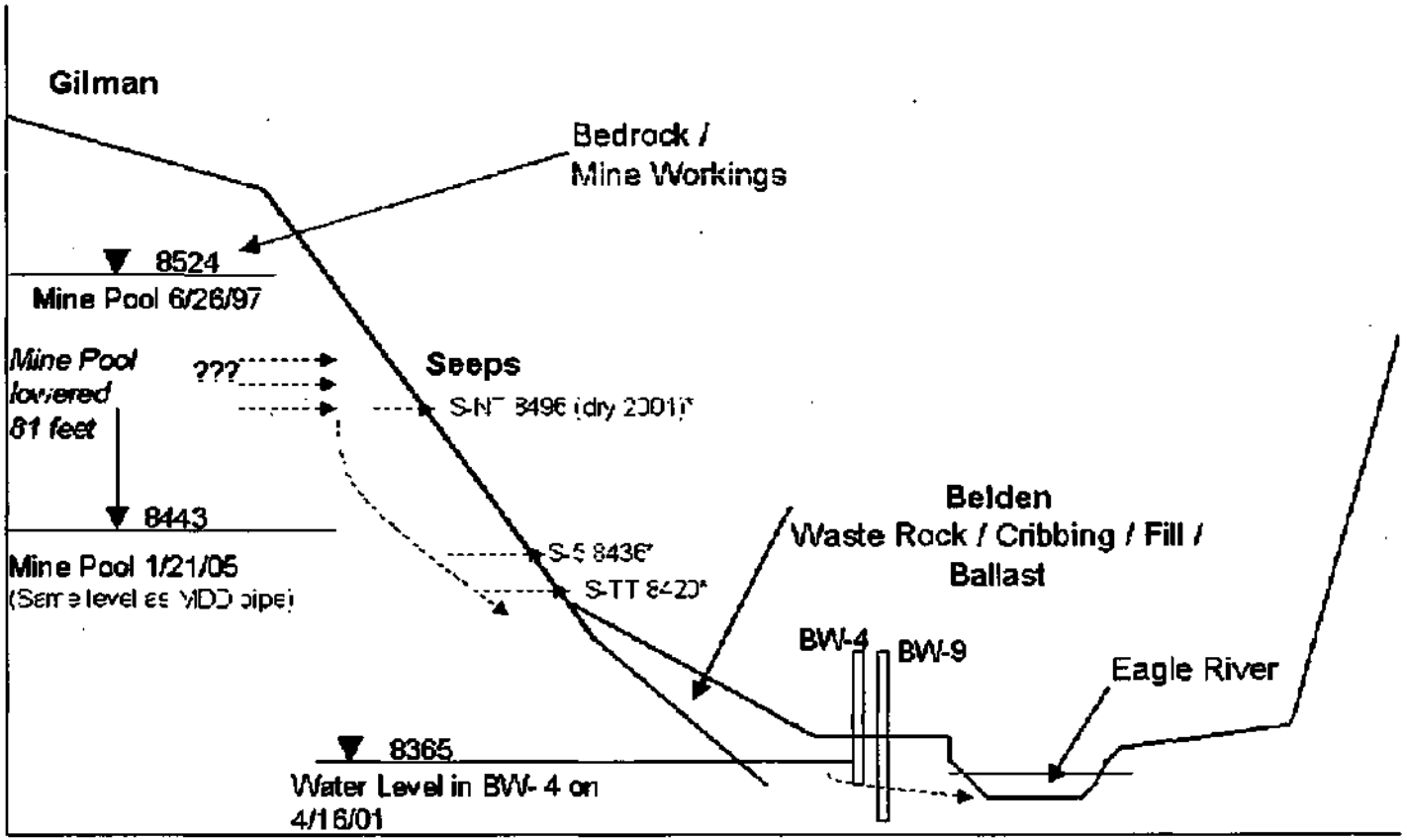
Since 1998, Viacom has put forth a concerted effort to maintain the mine pool at the lowest possible elevation. A mine pool elevation of between 8445 and 8455 feet (mean sea level or msl) is targeted. At the target level, only Adit #5, Adit #6, Ben Butler and Tip Top bulkheads back up water and many of the historical seeps near Rock Creek no longer flow. As mentioned previously, groundwater in the Belden area is also contaminated. Ongoing monitoring of the Belden wells was not required by the CD/RAP or CD/SOW. Pumping of BW-9 has been delayed until the well is repaired. A conceptual model showing the relationship between the mine pool and groundwater in the Belden area is shown in Figure 14. Maintaining a lower mine pool results in benefits to the environment including a decrease in the amount of seepage reaching Rock Creek and likely improvements in water quality in the Belden area.

The Liberty Well also has a significant impact on both the mine pool level and the volume of water requiring treatment at the WTP. The Liberty Well discharge to Willow Creek, 30 to 90 gpm, is measured by a totalizing flow meter in the pump house. Flow and water quality are monitored per a minimal discharge permit from CDPHE (CDPS Permit COG6000181.) Monthly water quality samples are collected and all permit requirements have been met. The amount of water pumped annually from the Liberty Well, representing gallons of water that do not require treatment, a significant measure of pollution prevention, is listed below in Table 8.

Table 8 – Gallons of Water Pumped at the Liberty Well

Year	*Gallons Pumped*
2001	1,028,000
2002	2,052,000
2003	1,817,155
2004	9,723,840

Figure 14 – Conceptual Model of Mine Pool



6.4.5 Observational Data Review

6.4.5.1 CTP Settlement and Erosion Data

Two factors have the potential to affect the integrity of the multi-component cap: differential settlement and erosion. Differential settlement may cause ponding of water in low areas and cracking to some or all of the layers comprising the cap. Erosion of the cap from natural causes could also potentially expose the underlying tailings to water infiltration. In turn, water infiltration could lead to further differential settlement and contamination of the groundwater in the area. Specific settlement criteria were included in the Plans and Specifications for the project. In particular, settlement within the historic pond area was of concern because of the saturated conditions. Therefore, cap construction on the CTP could not proceed until the settlement criteria had been achieved. Once the cap was completed, an additional, minor amount of settlement (e.g. less than one foot) was expected and settlement monitoring was required annually. In 2001, after no significant settlement had occurred over the previous five-year period, CDPHE and EPA approved a change in monitoring frequency to once every five years to coincide with the CERCLA five-year review process.

The CTP cap was surveyed on June 27, 2005, to determine if additional settlement had occurred since the last survey in 2001. Actual settlement data are included in Attachment A. The maximum amount of settlement over the past 8 years has occurred in the area near SS10, in the amount of 0.75 feet, or 9 inches. This degree of settlement is actually less than anticipated and is not enough to cause any damage to the CTP cap layers.

Following the completion of the CTP cap, ten erosion monuments were installed to be "visually inspected annually for signs of erosion and slope stability." The erosion monument observations are documented in the Viacom Annual Reports, which now include photo documentation of the observations. No significant problems with erosion or slope instability have been noted.

6.4.5.2 Revegetation Data

When the first five-year review was conducted for the Site, it was noted that compliance with the revegetation requirements had not yet been achieved. By 2002, the Roaster, Trestle and OTP areas were determined to have achieved compliance with the revegetation criteria. In 2003, all areas achieved compliance with the percent cover requirements. As mentioned in Section 4.3.1.4 and documented in the Viacom 2003 Vegetation Report, quantitative revegetation monitoring has been discontinued at the Site because all areas have achieved compliance with the revegetation requirements in 2003. The one exception was the species similarity criterion for Maloit Park (see Section 4.3.1.4). Revegetation data are not analyzed further as part of this review.

6.5 Site Inspection

For the past five years, site inspections have been conducted on an as-needed basis. On April 21, 2005, an inspection was conducted at the Site in conjunction with this five-year review. The purpose of this inspection was to observe the Site during the spring snowmelt/runoff period and to inspect various aspects of the remedy at the time when snowmelt was occurring. The results of the inspection are included in the report, "Eagle Mine Superfund Site, Targeted Spring Runoff Inspection Report, April 2005," included as Attachment B.

Recommendations detailed in the 2005 inspection report include:

1. Remove beaver dams on Rock Creek and ongoing beaver-related activities should be included in the Site's IMP.
2. Provide erosion protection where the Upper Gilman ditch discharges into Rock Creek.
3. Evaluate solutions for sedimentation control at the Tramway Drainage and Ben Butler culverts in Belden.
4. Place crushed limestone in the OTP borrow ditch adjacent to Tigiwon Road in the area where active seepage is occurring.

6.6 Interviews

Interviews were conducted with various representatives of the community regarding the Site. Interviews were conducted from March through May 2005 by Cathy Schuster of CDPHE and Jennifer Chergo of the EPA. The respondents included residents of Minturn, Red Cliff, Avon and other nearby towns in Eagle County. Their perspective ranged from that of past and present elected officials, local government representatives, business owners, recreation professionals, and environmentalists.

The primary concern expressed by most of those interviewed is the impact of the pending redevelopment of certain portions of the Superfund site. Many of those interviewed expressed concerns about the redevelopment and the lack of available information about the development plans. It was often stated that very few people were aware of the status of the redevelopment and the history of the Superfund process that limited the kind and number of questions people would know to ask. These concerns are outside of the scope of this five-year review, but have been relayed to the developer and owner of the property. Because characterization activities for the areas of interest have not been completed, the developer has not been able to share a definitive development plan with the community. This plan will be forthcoming once the Site conditions have been thoroughly examined and appropriate remedies identified.

A second concern expressed by those interviewed had to do with the establishment of new water quality standards for the Eagle River. There is an overall concern about permanently changing water quality standards to a level that is less stringent than the Table Value Standards established by the WQCC and further discussed in Section 7.2.3.1.2 (Chemical-Specific ARARs – Surface Water) of this report. Some interviewees felt that the remedy is not protective of aquatic life because it does not protect a native fish species, Sculpin. Another interviewee stated that trout with skinny bodies and large heads, such as those caught in the Eagle River near Minturn, indicate a problem with getting food. He reported the fish caught near Avon look normal and better each year than those caught near Minturn.

Other concerns involve mine-related areas that were not included in the remedy, and thus not slated for clean up under the original CDs. A number of the stakeholders asked why the "whole thing" wasn't done- e.g., Gilman, waste rock in Belden, and collapsed cribbing in Belden. Stakeholders believe that these other sources are a cause of contamination, as well as other mine drainages and sources of leaching that were not part of responsible party historic ownership. "Uncontrolled" orange water has been seen coming out of an adit near Belden and acidic metal

waste puddles have been observed along the railroad tracks. There is a sentiment of frustration about the lack of a provision for further clean up.

There were several comments about how the "secretive" drilling at Willow Creek for the Liberty Well has raised interest and concern among the community.

Statements about how well the water treatment operation is working were coupled with concern regarding the future of the WTP and the importance of its long term operation.

As far as the success of the remedy and protection of human health and the environment, there were no short-term concerns expressed. The site remains well maintained and vegetated with no noticeable erosion occurring over the last five years that may have disturbed the integrity of the cap on the CTP. An interviewee commented that the water ouzels (birds) have returned to the river habitat.

Interview records are provided in Attachment C. The interview records will also be used to write a revised Community Involvement Plan for the site in the near future.

6.7 Current and Future CDs

The CD/RAP and CD/SOW have served their primary purpose of mandating remedial activities to be conducted and are now out-of-date with respect to operation, maintenance, monitoring and compliance activities. The following excerpt from the CD/SOW demonstrates how outdated the CD is:

> *"The operation of the Water Treatment plant (WTP), including sludge dewatering and proper disposal, shall continue for ten (10) years after the effective date of the Consent Decree or less if Settling Defendant can demonstrate to the satisfaction of EPA and the State that use of the WTP is no longer needed to achieve Contaminant Specific Surface Water ARARs as set forth in Table VII-B of the ROD."*

This language would unrealistically allow the cessation of operations for the WTP by the end of this year assuming a 1995 effective date for the CD/SOW. Viacom is currently pursuing several options in an attempt to find alternative treatment technologies that would lessen or eliminate the need for the WTP. However, at this time, the WTP is a critical component of the remedy. An up-to-date CD will be necessary to address the continued operation of the WTP and the many other activities required for the Site in the short term and long term.

Section 7
Technical Assessment

7.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

A review of historical documents, environmental data, ARARs, and the results of the site inspections indicate that the remedy for OU1 is functioning as intended by the 1993 ROD, as modified by the 1999 ESD. Contaminated tailings and roaster wastes were consolidated within the CTP and covered by an engineered cap. Contaminated water from the mine pool and from beneath the CTP is captured and transported to the WTP where it is effectively treated to remove heavy metals. Groundwater monitoring is conducted semi-annually and indicates natural flushing is occurring that is slowly reducing contaminant concentrations in groundwater. Revegetation of areas disturbed by remediation and upon the CTP cap has been highly successful. Water quality in the Eagle River has improved significantly and brown trout and macroinvertebrate populations are recovering. The Site is slated for development and additional site characterization studies are being conducted to determine appropriate future uses and/or mitigation measures.

Site-specific Institutional Controls (ICs), as envisioned by the OU2 ROD, have never been formally implemented. Instead, Eagle County's existing land use regulations and building permit process were determined to provide control over any new development of Gilman during the last five-year review. In addition, during the time frame of this review, neither CDPHE nor EPA were aware of any occurrence of exposure to hazardous substances at Gilman due to the absence of ICs as envisioned by the OU2 ROD.

As part of this review, nine issues (slated for resolution as discussed in Section 9) were identified as summarized below:

1. Redevelopment of the Site could potentially impact human health and the environment during and after implementation.

2. Redevelopment of the Site will require modifications to the Site's decision documents which will trigger the requirement for environmental covenants under Colorado Environmental Covenant Law, C.R.S. §§ 25-15-317 to 25-15-327.

3. Institutional Controls through Eagle County as specified in the OU2 ROD were never implemented.

4. Viacom has not conducted pumping of BW-9 in Belden.

5. The mine tunnel at Adit #8 has partially collapsed presenting a safety hazard for personnel entering the mine.

6. The four recommended activities specified in the April 2005 Site Inspection report have not been completed.

7. Water Quality Standards for the segments of the Eagle River associated with the Site have not been finalized. Thus far, the recovery of the Eagle River that has resulted from OU1 remedy implementation has only been measured qualitatively since appropriate performance standards for the Eagle River were not defined in the two CDs currently in place.

8. The two CDs, currently in place, effectively addressed the completed remedial action activities, but do not adequately address current/future Operation, Maintenance and Monitoring activities.

9. The schedule for CERCLA five-year reviews does not coincide with the schedule for basin-wide water quality standards reviews conducted by the WQCC. The two reviews are similar with respect to evaluating protectiveness, therefore, their schedules should be re-aligned to complement each other.

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

7.2.1 Exposure Assumptions

EPA has updated some of the assumptions for its lead uptake model for intermittent exposure of adults and children (EPA, 2002). The updated EPA guidance for the lead uptake model accounts for cumulative exposures from a wider variety of exposure scenarios, including exposure from more than one location, varying intensities of exposure, track-in of soil from another location, and intermittent exposures. If risk at Gilman were re-assessed using the new assumptions, a more conservative (or a lower) risk-based remediation goal (RBRG) for lead in soil for Gilman would result.

In addition, the OU2 risk assessment was based on an exposure scenario of a trespasser. With the pending development of the properties owned by the Ginn Entities, trespassing in the Gilman area may be increased and what was once considered an unlikely exposure scenario (a pregnant woman trespassing for 90 days) may be more realistic, as population centers become closer to the Gilman area.

As a result of the recent purchase of Gilman and other portions of the Site by Ginn Entities, new risk assessment activities must be undertaken. Therefore, a re-assessment of risk at Gilman was not performed as part of this five-year review.

7.2.2 Toxicity Data

EPA's new acute oral reference dose (RfD) for arsenic is 0.005 mg/kg/day. This value is 20-fold

more protective than the previous value of 0.1 mg/kg/day used in the 1997 risk assessment for the Gilman Townsite. This change, however, is not likely to result in unacceptable acute risks because the acute Hazard quotient of 3E-04 for arsenic, based on the 1997 assessment, is significantly lower (i.e., more than 20-fold) than the benchmark level of 1.0.

EPA's new subchronic oral RfD for arsenic is 0.005 mg/kg/day. The impact of this value is insignificant in comparison to the previous value of 0.006 mg/kg/day used in the 1997 risk assessment for the Gilman Townsite.

Site-specific acute oral RfDs for cadmium, chromium, and manganese were derived for the Gilman in the 1997 risk assessment. In order to update these values, review of the scientific literature is necessary, an activity that will be part of the future risk assessment activities when Gilman development plans are formulated. Therefore, the site-specific acute Rfds are not being updated at this time, in light of the pending redevelopment and comprehensive risk assessment that will be undertaken by the new property owner.

7.2.3 ARARs

7.2.3.1 OU1 ARARs

The purpose of the OU1 remedy, as documented in EPA's OU1 ROD, is to control the transport of metals originating from various sources to the Eagle River and to Site groundwater. The major ARARs selected for the cleanup include: 1) groundwater quality standards; 2) water quality standards for the Eagle River; and 3) standards regulating the disposal of water treatment sludge. This ARAR review identifies where changes have occurred in the statutes during the past 5 years that may affect the protectiveness of the remedy.

7.2.3.1.1 Chemical-Specific ARARs - Groundwater

The Basic Standards for Ground Water, 5 CCR 1002-41, are listed as relevant and appropriate for Site groundwater. Groundwater standards for the contaminants of concern have not changed in the past five years. The 2000 Five Year Review noted that standards for Cadmium (OU1 ROD 10 µg/l) and Chromium (OU1 ROD 50 µg/l) had changed. The currently applicable groundwater standards are:

Arsenic	50 µg/l
Cadmium	5 µg/l
Chromium	100 µg/l
Lead	50 µg/l
Mercury	2 µg/l

The Basic Standards for Ground Water rely upon a scheme for classifying groundwater based on use. When the OU1 ROD was published in 1993, a groundwater classification was assumed for each site area based on-site-specific conditions, as follows:

Maloit Park North of Cross Creek - Class 1, Domestic Use Quality
CTP - Class 4, Potentially Usable Quality
Rex Flats - Class 3, Protection of Surface Water

OTP - Class 5, Limited Use and Quality
Groundwater standards for each area would then be applied from corresponding tables for each of the groundwater classes. For both Maloit and the CTP, the Domestic Use Quality table would apply, with the standards listed above as the applicable standards. For Rex Flats, the potential connection to surface water could allow for the application of more stringent water quality standards based on the stream classification. For the OTP, the Class 5 classification could have allowed for less stringent standards than the Domestic Use Quality table.

In 1994, after the publication of the ROD, the WQCC adopted a new method of applying groundwater standards in the absence of a site-specific classification hearing before the WQCC, called the Interim Narrative Standard (INS). The INS requires that for unclassified groundwater, the most stringent of the standards listed in Regulation 41 are applicable. Because either Domestic Use Quality standards or surface-water protective standards would have applied based on the assumed classification, the INS only affects the ARARs for the OTP. For the OTP, Class 5 standards cannot be applied unless the WQCC conducts a site-specific hearing.

7.2.3.1.2 Chemical-Specific ARARs – Surface Water
In the CD/RAP, the State and the PRP agreed to an in-stream zinc standard of 150 µg/l to be met below the mine workings and Rock Creek, and 250 µg/l zinc that was to be met at a point just above the confluence with Cross Creek (Locations E-11 And E-13B on Figure 4). EPA thought these negotiated values were not entirely protective and that standards promulgated by the State's WQCC should instead be used for ARARs.

The ROD recognized Regulation 33 of the Colorado Surface Water Quality Classification and Standards 5 CCR 1002-33, as both relevant and appropriate criteria for the Site. The surface water quality regulations include Table Value Standards (TVS) that are calculated for each metal based on the hardness of the stream. The chronic standards were adopted as the surface water quality Final Remediation Action Goals in the 1993 ROD. Contaminant-specific surface water ARARs established in the ROD were calculated using a hardness of 100 mg/l. The surface water ARARs listed in the ROD are shown in Table 9.

Table 9 – Table Value Standards listed in the OU1 ROD

	Acute	*Chronic*
Zinc	117 µg/l	106 µg/l
Cadmium	3.9 µg/l	1.1 µg/l
Copper	18 µg/l	12 µg/l
Lead	96 µg/l	4.0 µg/l
Silver	2.0 µg/l	0.08 µg/l

Note that some of the formulas used to calculate these standards have been revised in the last five years.

Colorado's surface water regulations authorize the WQCC to adopt site-specific standards to apply in lieu of the statewide standards. The WQCC established temporary standards for Segment 5 based on the stream's degraded condition as shown in Table 10.

Table 10 – Temporary Modifications for Segment 5 of the Eagle River expire 2/28/06

Chemical	*December 1 – April 30*	*May 1 – November 30*
Copper (chronic)	9.0 µg/l	9.0 µg/l
Zinc (chronic) (acute)	740 µg/l No standard	240 µg/l No standard

The EPA ROD recognized that the existing temporary modifications are not appropriate remediation targets and instead selected the TVS in Table 9 as the ARARs for surface water.

A review of the hardness data for the period 2001-2003 indicates a mean hardness value of approximately 73 mg/l for the Eagle River through the mine site, instead of the value of 100 mg/l used to calculate ARARs in the ROD. The WTP discharge adds hardness to the stream and hardness increases to around 90 mg/l downstream of the WTP outfall. Cross Creek also flows through the Superfund Site. Cross Creek is designated as Segment 7 in the WQCC regulations and TVS currently apply to Cross Creek. The mean hardness for Cross Creek is 29 mg/l.

During negotiations for the CD/SOW in 1995, it was recognized that the TVS for metals might be technically impracticable to achieve through the required remedial actions. The ROD states that the TVS are relevant and appropriate for classification as a Class 1, cold water aquatic life, "until such time that the WQCC formally redefines the nature of the aquatic community being protected and the numeric standards required to protect that redefined aquatic community." Therefore, the CD/SOW contained an exception for the contaminant-specific surface water ARARs listed in Table VII-B of the ROD. The CD/SOW provided that the parties would attempt to define what constitutes a "healthy" biological community in Segment 5 of the Eagle River. The Colorado Division of Wildlife was consulted and it was determined that the Eagle River would be managed as a brown trout fishery. Therefore, the biological goals were aimed at supporting a brown trout fishery.

The specific measurements to be used to define "healthy" were negotiated among EPA, the State and Viacom and summarized in the Biological Approach Document in March 2002. Based on public comment and technical problems with the original approach, a revised Biological Approach document was issued in March 2004. The ROD provides: "In the process of determining the definition of a viable aquatic community, this approach may also participate in the development of water quality standards for segments of the Eagle River." Once new water quality standards are established, the existing Consent Decrees will be closed out (as described in Section 6.7) and a new Consent Decree will be drafted that will deal with long-term operation,

maintenance, and monitoring activities at the Site. This new Consent Decree will include specific requirements for compliance determination and enforcement procedures for the new surface water quality standards. In order to move forward with the new Consent Decree, the water quality standards issue must be resolved. Therefore, the EPA and CPDHE have proposed to the WQCC that the water quality standards be revised to reflect values more stringent than the existing temporary modifications, but less stringent than the TVS during the months of March and April (high metals season). The proposed standards during the remainder of the year are similar to TVS. The hearing is scheduled for December 2005.

7.2.3.1.3 Chemical-Specific ARARs – Soil

The ROD included the Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites, EPA Directive #9355.4-02 (Sept. 1989). This guidance document has been superceded by Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, EPA/540/F-94/043, OSWER 9355.4-12 (August 1994).

Also included in the ROD were additional Remedial Action Goals of controlling or eliminating exposure to airborne contaminants (Total Suspended Particulates goal of 135 $\mu g/m^3$ and Lead goal of 1.5 $\mu g/m^3$), controlling or eliminating exposure to lead in soil (goal of 1000 ppm), and ensuring the long term integrity of structures and facilities associated with remedial activities at the Site.

The actual remedial criteria used at the Site are described in Sections 4.1.1 and 4.1.2 of this report. Currently, EPA uses a lead concentration of 400 ppm as a screening level and if concentrations exceed 400, a lead exposure model is used based on land use to determine appropriate remedial action objectives. In the case of the Eagle Mine Site, the use of the 500 ppm lead concentration is consistent with other cleanup projects. However, in some areas of the site, concentrations greater than 500 ppm were allowed to remain, if lime were added, or if one foot of backfill was placed over the area. Therefore, in some areas, soils with lead concentrations greater than 500 ppm may be present. It must be noted, however, that the OU1 remedy was focused on protecting the Eagle River, and was not aimed at residential re-use of the property. Because the Site is currently not being used, human health is adequately protected. If residential uses are considered, a combination of metals and different exposure scenarios must be addressed using a risk assessment. Data for a comprehensive risk assessment are currently being collected by Ginn Entities and the risk assessment is expected to be completed within the next year.

7.2.3.1.4 Action- and Location-Specific ARARs

The Colorado Waste Facility Siting Rules, 6 CCR 1007-2, and the Colorado Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, 6 CCR 1007-3 Part 264, Subpart N, are listed as the ARARs for solid and hazardous waste management. The former is listed as applicable, while the latter is listed as relevant and appropriate. The most relevant change to the statutes for the Site involves waste impoundment facilities, listed in Part 9.7.4. The part requires an operator to be on-site during open hours unless access to the Site is limited, the system is designed to contain spills, and the Department approves it. This could possibly apply to the treatment of the WTP sludge, but there could either be an operator in place

or the Site could meet the exception. Other changes deal with recycling facilities, transfer stations, scrap tire facilities, solid waste user fees, assessment monitoring charts, and trust agreements, none of which apply to the Site. Subpart N of Part 264 involves changes to the burning of hazardous waste, TCLP concentration limits, health-based limits for exclusion of waste-deemed residues, and special requirements for bulk and containerized liquids.

The Colorado Pollutant Discharge Elimination System, 5 CCR 1002-2, §§ 6.1.0 to 6.18.0, is listed as the applicable regulation for the discharge of water. The regulations have been renumbered, but the substantive changes involve (seemingly irrelevant) oil and gas construction discharge permits, CAFO effluent limitations, salinity, anti-backsliding, upsets, municipal stormwater discharge, and an emergency rule for groundwater discharge permits.

Where remediation activities affect wetlands, Dredge or Fill Requirements of Section 404 of the Clean Water Act apply, including 40 C.F.R. 230, 231, and 33 C.F.R. 323, pursuant to 33 U.S.C. § 1344. These require permits for discharge of dredged or fill material into navigable waters. No dredge and fill remedial activities have occurred at the Site over the previous 5-year period.

The Colorado Mined Land Reclamation Regulations, 2 CCR 407-1, and the Fish and Wildlife Coordination Act, 16 U.S.C. § § 661-666 and 40 C.F.R. § 6.302(g), are listed as relevant and appropriate for mine revegetation. The mining regulations were updated in 2001. Section 3.1.10 involves revegetation of a reclamation site, and gives general directives such as, "land shall be revegetated in such a way to establish a diverse, effective, and long lasting vegetative cover," and, "methods of weed control shall be employed for all prohibited noxious weed species." There do not appear to be any updates involving the Fish and Wildlife Coordination Act.

7.2.3.2 OU2 ARARs

The selected remedy for OU2 is institutional controls to limit site access and provide a long-term, local presence. Zoning regulations and/or building permit code restrictions were identified in the ROD as the controls.

Action and location specific ARARs were not identified for OU2, as there were no activities in the ROD which would trigger action or location specific requirements. Additionally, the ROD stated that there are no chemical specific ARARs for surface soils contamination. No chemical-specific ARARs were identified for air or water.

The local institutional controls remedy included a contingency strategy, which includes requirements that any future developer identify risks to human health and the environment from any land disturbance and eliminate, mitigate or control such risks during and after development. The contingency strategy also recognizes that if any land use changes, and Gilman is developed for residential use, additional remediation may be required. EPA and the State will review and must approve any developer-generated assessment and land remediation plans to assure that redevelopment is protective of human health and the environment.

7.2.4 Environmental Covenants

Enacted in 2001, the Colorado Environmental Covenant law, C.R.S. §§ 25-15-317 to 25-15-327, requires an environmental covenant for remedial decisions made subsequent to the enactment of the law that result in: 1) residual contamination levels that have been determined safe for some uses but not others; or 2) incorporation of an engineered feature or structure that requires monitoring, maintenance or operation or that will not function properly if disturbed. The environmental covenants requirement would apply to future remedial actions taken to ensure the protection of public health and the environment in association with the construction plans of the Ginn Entities. Any land owner can also voluntarily enter into an Environmental Covenant should they desire to alert future owners of any potential risks at the property, or if they seek the ability to enforce any necessary controls (e.g. controls against disturbance of a cap) at the property.

7.3 Question C: Has Any Other Information Come to Light that Could Call Into Question the Protectiveness of the Remedy?

No other information than that covered in Sections 7.1 and 7.2 has come to light during the five-year review that could call into question the protectiveness of the remedy.

7.4 Technical Assessment Summary

According to the information collected and reviewed, the remedies for OU1 and OU2 are functioning as intended by the RODs, Consent Decrees and subsequent ESD.

Section 8
Issues

Based on the information collected during this five-year report, the following issues were identified:

Table 11 - Issues Identified

Issue No.	*Issue*	*Affects Current Protectiveness of Remedy*	*Affects Future Protectiveness of Remedy*
1	Redevelopment of the Site could potentially impact human health and the environment during and after implementation.	No	Yes
2	Redevelopment of the Site will require modifications to the Site's decision documents which will trigger the requirement for environmental covenants under Colorado Environmental Covenant Law, C.R.S. §§ 25-15-317 to 25-15-327.	No	Yes
3	Institutional Controls through Eagle County as specified in the OU2 ROD were never implemented.	No	Yes
4	Viacom has not conducted pumping of BW-9 in Belden.	No	Yes
5	The mine tunnel at Adit #8 has partially collapsed presenting a safety hazard for personnel entering the mine.	No	Yes
6	The four recommended activities specified in the April 2005 Site Inspection report have not been completed.	No	Yes
7	Water Quality Standards for the segments of the Eagle River associated with the Site have not been finalized. Thus far, the recovery of the Eagle River that has resulted from OU1 remedy implementation has only been measured qualitatively since appropriate performance standards for the Eagle River were not defined in the two CDs currently in place. The protectiveness of the remedy, with respect to aquatic life, cannot be determined until the biological approach, used to develop the standards, is reviewed and accepted by the WQCC.	Not Determined	Not Determined
8	The two CDs, currently in place, effectively addressed the completed remedial action activities, but do not adequately address current/future Operation, Maintenance and Monitoring activities.	No	Yes
9	The schedule for CERCLA five-year reviews does not coincide with the schedule for basin-wide water quality standards reviews conducted by the WQCC. The two reviews are similar with respect to evaluating protectiveness, therefore, their schedules should be re-aligned to complement each other.	No	No

Section 9
Recommendations and Follow-Up Actions

The recommendations and follow-up actions for the issues identified in Table 11 are summarized below in Table 12:

Table 12- Recommendations and Follow-Up Actions

Issue No.	*Issue*	*Recommendation for Follow-Up*	*Lead*	*Schedule*
1	Redevelopment of the Site could potentially impact human health and the environment during and after implementation.	The State and EPA will continue to closely work with the new owner of the property to ensure the integrity of the existing remedy and continued protection of human health and the environment during and after redevelopment. All remedial activities must be conducted in accordance with the NCP and CERCLA.	State	Completion for project is currently estimated to take five years. Owner is currently characterizing the property– plan for completion is Summer 2006. A comprehensive risk assessment will be subsequently prepared – plan for completion is Summer 2007.
2	Redevelopment of the Site will require modifications to the Site's decision documents which will trigger the requirement for environmental covenants under Colorado Environmental Covenant Law, C.R.S. §§ 25-15-317 to 25-15-327.	The Statute will be utilized to develop, implement and enforce all necessary environmental covenants for the properties of interest.	State, Ginn Entities, Minturn	Environmental covenants will be executed as the redevelopment plan is defined and approved by Minturn – plan for completion is Summer 2007.
3	Institutional Controls through Eagle County as specified in the OU2 ROD were never implemented.	Eagle County's existing land use regulations and building permit process were determined to provide control over any new development of Gilman during the last five-year review. In addition, Viacom maintains access controls and will file charges against trespassers. In conjunction with the planned redevelopment, the State and EPA will work with the current property owner to develop, implement and enforce the necessary ICs for Gilman through an Environmental Covenant. An ESD will be prepared to document the change in ICs for OU2.	State, EPA, Ginn Entities	ICs for OU2 (Gilman) will be developed in conjunction with the development of environmental covenants for the property of interest – plan for completion is Summer 2007.
4	Viacom has not conducted pumping of BW-9 in Belden.	The State and EPA will continue to work with Viacom to address the problem - BW-9 is partially filled with gravel.	State	Resolution of this issue is planned for Spring 2006.
5	The mine tunnel at Adit #8 has partially collapsed presenting a safety hazard for personnel entering the mine.	The State and EPA will continue to work with Viacom to address the rehabilitation of the mine tunnel to ensure continued access to the mine workings and to allow periodic confirmatory measurements of the mine pool elevation.	State	Resolution of this issue is planned for Spring 2006.

Table 12- Recommendations and Follow-Up Actions (Continued)

Issue No.	*Issue*	*Recommendation for Follow-Up*	*Lead*	*Schedule*
6	The four recommended activities specified in the April 2005 Site Inspection report have not been completed.	The State and EPA will continue to work with Viacom to address the recommendations in the 2005 Inspection Report to ensure that the remedy continues to operate as designed.	State	Resolution of issue is planned for Spring 2006.
7	Water Quality Standards for the segments of the Eagle River associated with the Site have not been finalized. Thus far, the recovery of the Eagle River that has resulted from OU1 remedy implementation has only been measured qualitatively since appropriate performance standards for the Eagle River were not defined in the two CDs currently in place.	The State and EPA will continue to pursue modifications to the Water Quality Standards for the Eagle River in accordance with the ROD, CD/SOW and WQCC. The new standards will become the performance standards for the Eagle River and will be incorporated into the upcoming CD. Compliance monitoring and criteria will then be established. The protectiveness of the remedy, with respect to aquatic life, cannot be determined until the biological approach, used to develop the standards, is reviewed and accepted by the WQCC.	State	The hearing before the WQCC is scheduled for December 2005.
8	The two CDs, currently in place, effectively addressed the completed remedial action activities, but do not adequately address current/future Operation, Maintenance and Monitoring activities.	The State and EPA will work with Viacom to develop an agreed-upon CD that updates terms, performance standards, current/future activities, reporting requirements, schedules and any other items.	State & EPA	Completion of CD will be tied to resolution of water quality standards issue.
9	The schedule for CERCLA five-year reviews does not coincide with the schedule for basin-wide water quality standards reviews conducted by the WQCC. The two reviews are similar with respect to evaluating protectiveness, therefore, their schedules should be re-aligned to complement each other.	The next CERCLA five-year review will be conducted in 2007 to align it with the WQCC's basin-wide review.	State & EPA	Realignment of reviews will occur in 2007.

Section 10
Protectiveness Statement(s)

The remedies implemented at the Eagle Mine Superfund Site are expected to be protective of human health and environment. The multi-component cap over the CTP and the WTP are operating and functioning as designed. Contaminant levels in shallow groundwater and surface water have decreased, and the aquatic ecosystem is recovering as a result of the remedial actions. In addition, all nearby residents and businesses are connected to the local water system. Access controls are in place throughout the Site including Gilman. Water Quality Standards for the segments of the Eagle River associated with the Site have not been finalized. The protectiveness of the remedy, with respect to aquatic life, cannot be determined until the biological approach, used to develop the standards, is reviewed and accepted by the WQCC.

Section 11
Next Review

The next five-year review for the Eagle Mine Site is required by September 2010. However, as recommended in Section 9, the next review will be conducted by September 2007. The reason for the change is to align the CERCLA five-year review with the similar basin-wise water quality standards reviews conducted by the WQCC.

The new water quality standards planned for the Site will be based on biological data that indicate metal levels protective of aquatic organisms. It is recommended that the CERCLA five-year review process be used to evaluate the protectiveness of these new standards over the long-term by the collection and assessment of biological data (macroinvertebrate and brown trout).

The next WQCC hearing for the Upper Colorado Basin (which includes the Eagle River) will be held in June 2008. In order to provide information on the protectiveness of the new water quality standards to the WQCC in a comprehensive and timely manner, the next CERCLA five-year review will need to be completed in 2007. If the review concludes that the standards are protective, then the WQCC can use the determination and associated information in its standards review (generally called a basin-wide review). If, on the other hand, the CERCLA review concludes that the new standards are not protective, changes to the standards could be recommended in the 2007 five-year review report and considered by the WQCC at its 2008 hearing.

Attachment A
CTP Settlement Data

Eagle Mine CTP

Surface Settlement Plate Data

1997 through 2005

Station	Date	Elevation		Settlement (Ft.)	
		Top of Pipe (Ft. MSL)	Ground Surface (Ft. MSL)	Since Last Measurement	Since Installation
SS1	6/12/1997	8042.21	8041.50	NC	NC
	5/14/1998	8042.60	8041.80	0.39	0.39
	7/8/1999	8042.18	8041.30	-0.42	-0.03
	5/12/2000	8042.10	8041.20	-0.08	-0.11
	7/18/2001	8041.78	8041.90	-0.32	-0.43
	6/24/2005	8041.61	8040.71	-0.17	-0.60
SS2	6/12/1997	8044.59	8044.30	NC	NC
	5/14/1998	8044.49	8044.30	-0.10	-0.10
	7/8/1999	8044.30	8044.20	-0.19	-0.29
	5/12/2000	8044.29	8044.10	-0.01	-0.30
	7/18/2001	8044.00	8043.90	-0.29	-0.59
	6/24/2005	8043.95	8043.85	-0.05	-0.64
SS3	6/12/1997	8044.99	8043.40	NC	NC
	5/14/1998	8045.02	8043.60	0.03	0.03
	7/8/1999	8045.04	8043.40	0.02	0.05
	5/12/2000	8045.04	8043.40	0.00	0.05
	7/18/2001	8044.82	8043.20	-0.22	-0.22
	6/24/2005	8044.88	8043.28	0.06	-0.11
SS4	6/12/1997	8057.61	8057.60	NC	NC
	5/14/1998	8057.72	8057.40	0.11	0.11
	7/8/1999	8058.36	8058.00	0.64	0.75
	5/12/2000	8057.68	8057.40	-0.68	0.07
	7/18/2001	8057.41	8057.10	-0.27	-0.20
	6/24/2005	8057.50	8057.20	0.09	-0.11
SS5	6/12/1997	8055.20	8053.40	NC	NC
	5/14/1998	8055.33	8053.70	0.13	0.13
	7/8/1999	8055.29	8053.70	-0.04	0.09
	5/12/2000	8055.32	8053.70	0.03	0.12
	7/18/2001	8055.05	8053.40	-0.27	-0.15
	6/24/2005	8055.17	8053.57	0.12	-0.03

Eagle Mine CTP

Surface Settlement Plate Data

1997 through 2005

Station	Date	Elevation		Settlement (Ft.)	
		Top of Pipe (Ft. MSL)	Ground Surface (Ft. MSL)	Since Last Measurement	Since Installation
SS6	6/12/1997	8052.86	8053.30	NC	NC
	5/14/1998	8052.95	8053.10	0.09	0.09
	7/8/1999	8052.84	8053.10	-0.11	-0.02
	5/12/2000	8052.88	8053.10	0.04	0.02
	7/18/2001	8056.12	8052.90	3.24	3.26
	6/24/2005	8052.86	8052.66	-3.26	0.00
SS7	6/12/1997	8059.88	8059.30	NC	NC
	5/14/1998	8060.00	8059.30	0.12	0.12
	7/8/1999	8059.79	8059.20	-0.21	-0.09
	5/12/2000	8059.80	8059.10	0.01	-0.08
	7/18/2001	8059.77	8059.10	-0.03	-0.11
	6/24/2005	8059.83	8059.23	0.06	-0.05
SS8	6/12/1997	8077.46	8077.10	NC	NC
	5/14/1998	8077.59	8077.10	0.13	0.13
	7/8/1999	8077.31	8076.90	-0.28	-0.15
	5/12/2000	8077.38	8077.00	0.07	-0.08
	7/18/2001	8077.41	8077.40	0.03	-0.05
	6/24/2005	8077.43	8077.03	0.02	-0.03
SS9	6/12/1997	8039.59	8038.40	NC	NC
	5/14/1998	8039.57	8038.40	-0.02	-0.02
	7/8/1999	8039.43	8039.10	-0.14	-0.16
	5/12/2000	8039.43	8039.20	0.00	-0.16
	7/18/2001	8039.20	8039.40	-0.23	-0.39
	6/24/2005	8039.18	8038.98	-0.02	-0.41
SS10	6/12/1997	8040.12	8039.40	NC	NC
	5/14/1998	8039.91	8039.90	-0.21	-0.21
	7/8/1999	8040.36	8037.70	0.45	0.24
	5/12/2000	8039.74	8039.70	-0.62	-0.38
	7/18/2001	8039.44	8039.70	-0.30	-0.68
	6/24/2005	8039.37	8039.37	-0.07	-0.75

NC - Settlement not calculated, no prior survey data.

Settlement = Difference in top of pipe elevation

Attachment B
Site Inspection Report

Eagle Mine Superfund Site
Targeted Spring-Runoff Inspection Report
April 2005

On April 21, 2005 a targeted inspection was conducted at the Eagle Mine Superfund Site. The purpose of this targeted inspection was to observe the site during the spring snowmelt/runoff period and to inspect various aspects of the remedy at the time when snowmelt was occurring. This inspection will also be used during the Five-Year Review process currently underway. A similar inspection was also conducted in April 2004.

Wendy Naugle of CDPHE and Dave Hinrichs of New Fields, representing Viacom, conducted the inspection. Prior to the inspection, a checklist was prepared that listed various areas of the site and features to be observed within each area. Wendy Naugle took notes and photographs, while Dave Hinrichs operated field equipment. A YSI conductivity meter was used to compare the various sources of surface water at the site. Conductivity is a rough surrogate for metals contamination. Following is an area-by-area description of the observations during the inspection.

Gilman

In the Gilman area, considerable snow remained on the ground, making access difficult. Waste Rock Pile #8 (also referred to as WRP#8) was inspected in detail. First, the collection system at the base of the pile was operating as designed. More snow was present this year compared to last year, and the collection sump was obscured. However, the collection sump was providing flow through the pipe to the Fancy Shaft. The conductivity of water in the collection sump was 2200 umhos. As recommended following last year's inspection, the dike has been raised and the collection sump was cleaned out to provide more capacity. Discharge from the pipe into the Fancy Shaft was estimated to be approximately 11 gpm.

Figure 1 – Upper Collection sump below Waste Rock Pile #8.

Figure 2 – Discharge from WRP#8 Upper Collection system into the Fancy Shaft.

Throughout the hillside between the bottom of Waste Rock Pile #8 and Rock Creek, seepage continues to occur. This hillside appears to be a historical landslide where groundwater seepage would be expected. This seepage is collected in a concrete and rip-rap-lined channel. Following last year's inspection, a recommendation was made that seepage from below Waste Rock Pile #8, in the concrete-lined channel, be delivered to the water treatment plant to help further reduce the metals loading in Rock Creek. In July 2004, a collection sump was installed at the outlet of the concrete channel. From the collection sump, water is then piped down Rock Creek, to join the main pipeline to the water treatment plant. During this inspection, the conductivity of the water in the rip-rap channel was 1400 umhos, measured at the historical sampling location SR4. The new collection sump, hereinafter to referred to as the "Lower Waste Rock Pile #8 Collection Sump" was functioning very well.

Figure 3 – New Lower WRP#8 collection system.

Adjacent to this new collection basin, Rock Creek is diverted into a culvert after a small collection basin. The conductivity of the Rock Creek water in the basin was 130 umhos; flow in Rock Creek was too high to estimate.

An on-going problem in this area is beaver activity. Beavers continue to build dams along Rock Creek. As a result, some of the clean water flowing in Rock Creek is diverted into the concrete channel that is collecting the contaminated water from below WRP#8. During the inspection, it was estimated that 50% or less of the flow in the concrete channel was clean water diverted into the channel by the beaver dam. It is recommended that beaver control be added to the on-going Operation and Maintenance (O&M) activities at the site. Now that the flow is being diverted into the treatment plant, clean water segregation is much more important.

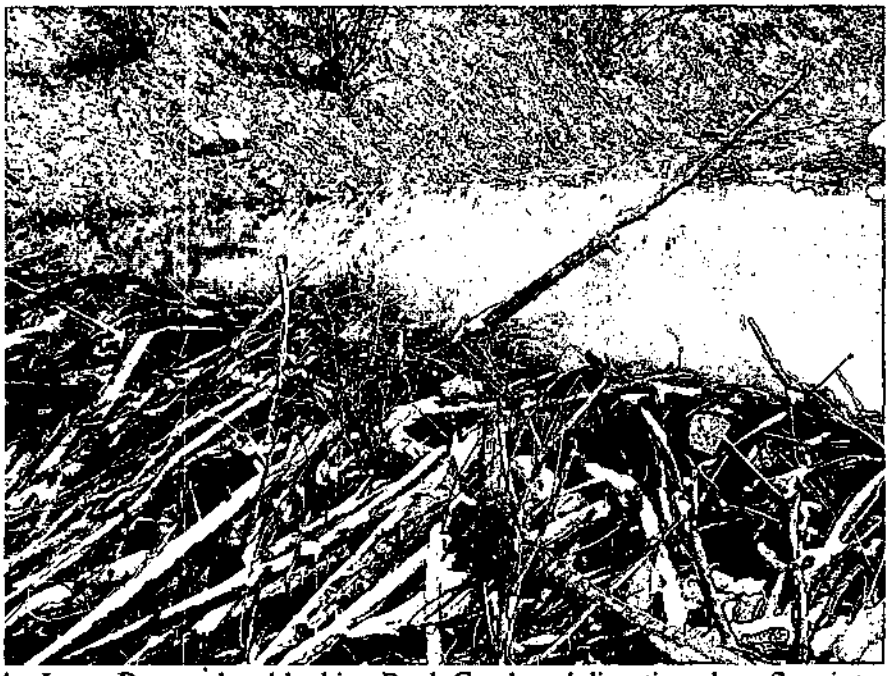


Figure 4 – Large Beaver dam blocking Rock Creek and diverting clean flow into channel collecting contaminated flow from WRP#8.

Due to snow cover, it was not possible to observe the other run-off control ditches in the Gilman area. However, as observed previously, severe erosion is occurring where the Upper Gilman ditch discharges into Rock Creek. It is recommended that the discharge point be armored with rip-rap that is already available in a pile nearby.

Figure 5 – Severe erosion occurring at the outlet of the Upper Gilman ditch as it discharges into Rock Creek.

Belden

In the Belden area, most of the snow had already melted. Flow was observed through the culvert near the Ben Butler mine. Conductivity in the Ben Butler culvert was 400 umhos.

Figure 6 – Water collected in sump at the Ben Butler culvert.

There was no flow through the culvert near the tram and the culvert is blocked by sediment and debris. These culverts are an on-going O&M issue and required periodic cleaning. However, it is recommended that Viacom consider an engineered solution – that is; designing a larger sedimentation control structure with a decant system to the culverts. In the long run this would reduce O&M and could potentially improve water quality as well.

Figure 7 – Blocked culvert at the Tramway drainage in Belden.

Figure 8 – Tramway Drainage

Old Tailings Pile (OTP)

Water was flowing at a fairly high flow rate (Dave estimated at 60+ gpm) through the diversion ditch on the north side of the OTP. The water was clear and had a conductivity reading of 140 umhos. Some standing water was observed in the mid-area of the OTP, as observed last year, most likely the result of a leaky area on the diversion ditch at the back (western edge) of the OTP and recent snowmelt.

Where the south end of the OTP meets Tigiwon road, and is bordered on the south by the concrete-lined channel, there is an area containing large boulders. Seepage emanating from beneath the boulders reaches the borrow ditch alongside Tigiwon Road. The conductivity of this undiluted seepage was 2000 umhos, with a flow rate of less than 1 gpm. This borrow ditch flows south and joins the concrete channel, then flows through a culvert under Tigiwon Road, then discharges directly into the Eagle River. The conductivity of the river was 65 umhos during this inspection.

This same feature was observed during last year's inspection. It was recommended that crushed limestone be placed in the borrow ditch to help neutralize the contaminated water. In 2004, limestone was added to a portion of the ditch, however, it did not cover the critical area, as shown below. Additional action should be taken to alleviate this problem, which is creating a point source discharge to the Eagle River.

Figure 9 – Seepage from the south end of the OTP (near the boulder pile) collecting in the borrow ditch.

The diversion ditch at the south end of the OTP was flowing at approximately 15 gpm. In the area above the OTP, where the ditch is concrete-lined, the water was clear with a conductivity of 60 umhos. Once joined by the contaminated water in the borrow ditch, the conductivity changed

to 120 umhos. Last year, a water sample of this discharge to the river was collected and the reported dissolved zinc concentration was 1.9 mg/l with a conductivity of 260 umhos.

Consolidated Tailings Pile (CTP)

Most of the snow had already melted off of the CTP. No ditches on the CTP were discharging during the inspection. There was no visible erosion, settlement or other problems observed on the CTP. The Upgradient Diversion Trench was observed and was flowing. Dave estimated the flow rate visually at around 10 gpm, with a conductivity of 320 umhos. The water was clear. A sample was collected for analysis of metals.

Rex Flats

Rex Flats was not inspected this year. Instead, an aerial view is included to illustrate the areas of standing water.

Figure 10 - Rex Flats as viewed from Highway 24.

Comparison of Conductivity Measurements

Location	Conductivity Measurement (umhos)	Approximate Flow Rate	Temp C
OTP South diversion ditch Upstream of borrow ditch	60	15 gpm	15
Eagle River adjacent to the OTP	65	Cfs	4
OTP South diversion ditch after borrow ditch confluence	120	15 gpm	8
Rock Creek in Collection Basin	130	No estimate	4
OTP North Ditch	140	60 gpm	6
Upgradient Diversion Trench	320	10 gpm	6
Ben Butler Culvert	400	20 gpm	5
Upper Gilman Ditch	400	1 gpm	10
Waste Rock Pile #8 seepage at SR4	1400	40-50 gpm	5
OTP borrow ditch	2000	<1 gpm	14
Waste Rock Pile #8 seepage in upper collection basin	2200	2 gpm	1

Summary of Recommendations

1. Beaver dams on Rock Creek need to removed and on-going beaver-related O&M activities should be included in the site's O&M plan.
2. Provide erosion protection where the Upper Gilman ditch discharges into Rock Creek.
3. Evaluate solutions for sedimentation control at the Tramway Drainage culvert and at the Ben Butler culvert in Belden.
4. Place crushed limestone in the OTP borrow ditch adjacent to Tigiwon Road in the area where active seepage is occurring.

Attachment C
Interview Records

COMMUNITY INVOLVEMENT INTERVIEW SUMMARY

Community involvement interviews were conducted during March, April and May of 2005 by community involvement staff from the Colorado Department of Public Health and Environment and the U.S. Environmental Protection Agency. A total of 19 individuals were interviewed, all but one in-person, to determine their opinion of the effectiveness of the Eagle Mine clean up. The interview questions focused on the time period since 2000. The respondents included residents of Minturn, Red Cliff, Avon and other nearby towns in Eagle County. Their perspective ranged from that of past and present elected officials, local government representatives, business owners, recreation professionals, and environmentalists.

The timing of the community interviews coincided with initial publicity, including public meetings and citizen review of development plans, of a proposal by Florida-based developer Bobby Ginn to develop certain areas of the Superfund site. Although efforts were made by community involvement staff to focus the responses on the past five years of the Superfund cleanup, some of the interview questions triggered responses/inquiries connected to the development.

The following is a list of the questions and summaries of the responses.

1. What is your overall impression of the project?
The sentiment ran the gamut from stating it is a remarkable success and meeting the objectives, to frustration that the project was too limited in scope from the beginning and continues to be. It was pointed out that the project is made complicated because some of the problems are from outside the Superfund area. The current state of the Belden tailings piles (ed.: many people interchange the terms 'tailings piles' and 'waste rock' although they are very different) and the fact they were not addressed in the ROD was a recurrent topic of concern and criticism. Some had observed symptoms of leaching mine wastes, such as in the color of the snow in spots and puddles along the railroad tracks at the mine site. However, the individuals expressing concern regarding what has not and could be done, were satisfied that the completed work has been done well. Some wondered if the project would ever be finished. Others commented there wasn't much talk about the clean up anymore, and no news must be good news. It was observed that the water treatment plant was having a positive impact and has had no violations. One respondent was skeptical about the extent of the metals cleanup in the Eagle River although admitted the project had come a long way. In regard to rehabilitation of aquatic life in the river, several respondents said too much effort had been expended on brown trout instead of other species, and more could be done. Another person said the river is much improved and recreation along the river has become enjoyable. One person remarked the project is a feather-in-the-cap for U.S. EPA and the Colorado Department of Public Health and Environment. A number of respondents remarked on the professionalism and fairness of the agency project managers.

There were requests for information on exploratory measures that have been undertaken. It was suggested making this information available would counter the impression that nothing is being done to address the ongoing problems.

2. What effects have site operations had on the surrounding community?

Respondents indicated the improved water quality has improved the water experience, from kayaking to snowmaking. There is still evidence of problems, however, such as orange rocks and decreased numbers of fish, although the fishing community has noticed an improvement. There are also still concerns about dust, but the 'orange' dust from the tailings pile is no longer a problem. Overall there have been very few noticeable effects except for occasional problems at the water treatment plant. One observer pointed out that while the Eagle Mine cleanup has been a major operation, it hasn't received a lot of attention outside of Minturn and perhaps this is due to the success of the project.

3. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.
While there is an overall sense that things are going well, it was stated that little is known about the status of existing efforts. Comments generally fall into the following categories:

What wasn't cleaned up: There are concerns about what was described as the 'uncontrolled' cribbings at Gilman and the Belden tramway area not being addressed and left out of the remedy during decades-old negotiations. It was suggested that future cleanup include other draining mines (tell tail signs in the spring) that were not a part of the historic ownership. Re-vegetated areas that aren't lush should also be reviewed. There is some confusion about what was left in the mine and what will eventually be done with it----dynamite, transformers, dioxins?

Water quality and the treatment plant: Other comments involved concerns with changes in the water standards for zinc and the possibility the changes may become permanent. It was pointed out that lowering the zinc standards because the cleanup can't meet existing standards does not inspire confidence in government. What should the standard be? The zinc being discharged may be at background levels, but that remains unknown until the sources are cleaned up. There are concerns with regard to the biological data, about how the criteria have been handled and that some of the metrics have been dropped. Continued operation of the water treatment plant (by Viacom) is essential for as long as the mine leaks. Questions were asked about the treatment pipeline: has it been maintained and would it be kept up. Is further improvement expected in the water quality or is this it?

Redevelopment: The Ginn Co. proposal to build a golf course at the Consolidated Tailings Pile area has raised questions about how the property would be rejuvenated for such use. One respondent expressed concern that residents not aware of issues of the past and are not equipped to even ask questions. It was asked how the Superfund area could be disturbed to erect housing and recreation facilities without impacting the remedy.

4. Are you aware of any events, incidents or activities at the site such as vandalism, trespassing or emergency responses from local authorities? If so, please give details.
One respondent said he'd like to know if and when any of these things occurred. Trespassing was mentioned frequently. People go in to recreate or out of curiosity about the ghost town. Other details included a discharge at Belden reported to the state health department, and strange noises heard from the site like banging in a silo and a turbo engine taking off. One person was aware of possible fish kills.

Several were aware of malfunctions at the water treatment plant and a November 2004 spill from the Liberty Mine. Notification of these incidents came from the Eagle River Watershed Council and are not common knowledge. There was some criticism regarding the lack of communication about the Liberty spill, and that the state health department shouldn't have the leisure to figure it out before reporting such incidents to the community. It was suggested that an established process for incident reporting builds trust between the agencies and the community.

5. Do you think the Eagle Mine remedy if protective of human health and the environment?

The overall consensus is the remedy has come a long way (80%, according to one person) towards protecting the environment and needs to be vigilantly maintained by the responsible party. There is a lot of concern that Viacom will walk away. The sense of success is clouded by the issues of water quality and lowering zinc standards, the visual symptoms of the unremediated Gilman and Belden waste rock and other contributing areas above the Eagle Mine. One respondent said the strategy that was taken at the site, a biological approach, has been innovative, but didn't show what was hoped for. Another person was concerned that the dearth of fish species indicates problems with the remedy, and another said the remedy should take more time to determine the causes of chronic smaller, slender fish. While some positive changes have been observed along the river, such as the return of the water oozles (bird), there are still incidences of orange icy water, grey build-up, and distressed fish, raising questions especially about the long term. There were questions about how permanent the features of the cleanup are, such as the CTP. It was asked whether everything had been done that could be done or 'just' what's in the consent decree, and is this the best it can be? A suggestion was offered to have better site security. The potential development in Gilman raised concerns about how housing construction would impact heavy metals drainage and change the environmental protectiveness standard as well as the human health standard in areas that were supposedly off-limits to development.

6. Do you have any comments, suggestions or recommendations regarding the project?

Local officials have heard positive remarks from the community about the visible improvements. There is a sense that information about the site is available, but should be easier for the public to find. The public doesn't have much input into the process and may have lost interest since the improvements. There was mention of not having an opportunity to comment when the weight metric for brown trout was dropped. Stakeholders have to rely on local groups for information. There is interest and concern among the community when they hear of things such as drilling at Willow Creek (for the Liberty Well). People would like to know more about it. The community was told the site would never be developed and needs to figure out the questions to ask when there is a proposed land use change. It doesn't look to some that the remedy was intended for the long term. Concerns were reiterated in many ways about the sections not included in the cleanup. The town would like support for their request to the Colorado Water Conservation Board for higher in-stream flow designation; would love to have designation 'golden medal waters.'

Questions:

- Why didn't the settlement ask for more?
- When will the storage cell at the water treatment plant be at capacity?
- Are there any assurances about the future of the water treatment plant?
- Are the fish tested for metals?

- Who should residents call regarding incidents/instances of environmental concern?
- What needs to be done when a Sperfund site such as this is slated for development?
- If things are disturbed (development) will aquatic life be impacted again?
- Will the environmental issues be readdressed after growth?
- Is the Eagle site similar enough to other sites (Anaconda in MT) to learn from what they have done with tailings piles?

Suggestions:

- Install sturdy roadside markers above Gilman warning of potential exposures and penalties for trespass and vandalism.
- Use EPA money to raise the river and stock it with fish.
- Belden Canyon should be made available to the public.
- The burden of proof should be with the agencies instead of stakeholder groups.
- More clean up is needed, e.g., waste rock piles, old tailings
- Aurora reservoir should take mine water; metals would be diluted.
- CDPHE should do 'surprise' water sampling.
- There should be stricter measures to achieve clean up.
- Public information should be more accessible.
- Regulators should act a watchdog so that developing on a Superfund site is done safely and appropriately.
- There should be better direct communication between the lead agency(ies) and the Forest Service and other stakeholders.

7. How have you learned about this site?

- Participation in the Eagle River Watershed Council
- Internet searches
- Toured water treatment plant
- Vail Daily
- Contacts with folks involved
- Observation
- Local watchdog groups
- CDPHE
- EPA
- Recreational users
- Direct involvement
- Eagle River Restoration Project
- Word-of-mouth, rumors
- Agency resources
- Eagle County
- Town e-mails
- Workers

8. Do you feel well informed about the site's activities and progress?

Comments included: not informed, about 7.5 on a scale of 10, informed but not well informed, information is out there for those who are interested, fairly well informed about water quality

issues but not about the overall site and requirements, not informed about mine mitigation projects, there are six-to-eight stakeholders who are well informed. There's not much put out about it anymore. There have been some discharges without any publicity. There is not enough information in a replicable format. Information provided, such as the publication on the biological method, is too technical for local readers. Information is needed about the long term. A request was made for a report on results of the 2005 fish shocking.

Other observations: If someone were new to the area, they have probably never heard about it. The only activity now is running the water treatment plant. Since it's out of site, it's out of mind.

9. The local repository for information and records about the clean up is in the Minturn Town Hall. Do you think an additional repository site should be set up in the area, for instance at the library in Eagle? Other suggested locations?
A number of respondents thought more than one repository location was a good idea and the libraries were favored (Avon, Eagle). The Eagle County Health Department was also mentioned as a location. One public official has been asked for a copy of the record.

Other comments included:

- One is probably enough.
- There's not much interest.
- No one is doing that level of research.
- Perhaps summaries could be made available.
- Redundancy could be useful in case of fire.
- Libraries are easier to access than the Minturn Town Hall.
- If the information had an internet website link, users could print out what they wanted.
- Technical language should be interpreted, made user friendly.

10. Do you want to receive future information and how?

- Mail
- E-mail
- Updates (unless of an emergency nature)
- All forms
- Calls
- Informal communications
- Memos
- Newsletters
- Fliers
- Newspaper announcements, ads
- Town e-mail
- CD's for large reports
- Paper copies on larger updates
- Studies
- Summaries
- References/articles
- Eagle River Watershed Council meetings/Waterwise Wednesdays

Comments included: everything shouldn't stem from CDPHE; others should be responsible; method of getting to right person in agencies is Byzantine. There was a request for direct documentation of any agreements and decrees.

11. What is the best way to get information to the community, for instance local radio and/or television stations, newspapers, periodic newsletters (what frequency), and/or fact sheets? What are the most popular radio stations, TV stations and newspapers? Do you regularly read the Vail Daily? Vail Trail?
It was observed that people have limited knowledge about the site because it has not been a major problem. Information should be offered in as many shapes and forms as possible. The more the merrier! Newsletters and fact sheets would be good when there is new information, or at least annually/semi-annually/quarterly, and could be posted at the county and other websites. The annual meeting of the Eagle River Watershed Council which presents the 'State of the Fish' report is a good source. Meetings of the Watershed Council are broadcast on KTUNE. It was suggested that senior lunches are a good place to share information, a 35-member captive audience, many of whom know well the local mining history. The mine tours could be hosted for specific groups of people such as the Water Board, Eagle River Watershed Council Board, County Commissioners, etc.

The Vail Daily is the most widely read source for local news and frequently covers Eagle Mine related stories. The Vail Trail writes occasional, longer in-depth stories about the site. A website could be linked to and advertised by the Vail Daily and Vail Trail, and might be more utilized by young people. Other suggestions included guest columns, e-mailing to group lists, organization's newsletters, workshops, and updates provided at the Minturn Town Council meetings (which are filmed and aired on channel 6). Television channel 16 has local news, channel 5 is local cable access, channel 8 is Vail Resorts. Listener's radio choices included KZYR, KUNC, KICK Country (Grand Junction), the Leadville country station. A new radio station is coming to Minturn in fall 2005. Access to recording and airing (free) Public Service Announcements was offered.

12. Can you suggest other community members whom we should interview?
A number of individual names and their contact information were offered in response to this question. Many of the individuals suggested were interviewed. Some were from the same categories of people who had already been interviewed, for instance, area mayors and town councilors, county commissioners and recreationalists. In order to gather a wide range of viewpoints and experiences, in most cases one representative from each category was interviewed, and for the most part it coincided with who was available when the community involvement staff planned to be in the area.

13. Is there anything else you would like to add?
The following is an attempt to group respondent's comments.

Efforts to lower water quality standards were labeled selective treatment with the State unusually willing to negotiate with Viacom. There were questions about the future and how long Viacom will be responsible; how decisions will be made in the future; how the consent decree could be amended and whether the community can offer a proposal. It was stated how fortunate in this

case that there have been relatively deep pockets to go after. If was said the change in personnel and leadership roles at the two agencies, state health department and U.S. EPA, and which agency has lead authority, has been confusing.

Regarding the prospective development, it was stated many of people's fears are misled (new structures caving into mine?). There was a statement that the whole development process seems to be fast-tracked. Questions were asked about the effects of irrigating a golf course on top of the CTP, whether the site is cleaned up enough for human habitation, and the health department was encouraged to continue its regulatory role. Many statements were made about how financial gain puts blinders on people/money talks. Newcomers have no awareness of mining or what has transpired. They think the mine is quaint. There is an emotional connection between the community, the mine and the railroad. A respondent expressed dismay with the attitude of a previous Attorney General that the community had benefited from mining and environmental contamination was the price to be paid.

With regard to the river restoration project funded by Natural Resource Damages funds, there were some comments that the river has not been helped by the project, but there were also a number of positive comments about the habitat restoration and how improved the river looks. The town sees it as a very inclusive community project with people/agencies wanting to get onboard the planning for phase II.

Additional concerns about the fish in the Eagle River were mentioned. A suggestion was offered that whether the fish are safe for human consumption was a possible criterion for the metal standards. It was pointed out that the characteristic skinny bodies and large heads on the brown trout caught near Minturn indicate a problem getting food. The brown trout caught in the Avon stretch of the river appear normal and better each year, accompanied by an increase in aquatic bugs.

There was a plea for capturing the history of the town, mine, Superfund process before it is too late. The government agencies should help develop a curriculum encompassing science, history, politics, social studies. The opportunity to capture accurate information about all this for future generations will soon be gone. Other ideas included collaborating with environmental groups and schools to offer a series of seminars on the implications of development, including the history of superfund and how sites are managed and maintained.

Several respondents expressed their gratitude to the agencies.

Summary and Recommendations:
As mentioned, due to the prospective development of areas of the Superfund site, the awareness of local residents has been heightened, and in a sense re-focused on the site after many years of relatively smooth and quiet operations. Along with residents' many questions about the process and safety of major development in such a fragile area, the alarm has been sounded locally about what hasn't been done. In almost every interview community members expressed concern about the areas near the mine historically left out of the remedy. Without a concerted effort to inform them otherwise, the community fears the loss of the watchdog agencies in the transaction.

With regard to the remedy and what has been accomplished, overall, the community was aware and very pleased with the improvements that have been brought about, e.g., the river has recovered, the aquatic life is continuing to improve, the vegetation on the CTP has reduced the dust. The Natural Resources Damages Fund project received mostly favorable reviews. Although a relatively new project, the results are already visible to those living in and passing through the town of Minturn. Concerns include skepticism about the proposal to lower the water quality standards relative to zinc in certain stretches of the river, the effects of metals exposure on the fish and local fishing industry and responsibility over the long term for operation of the water treatment plant.

The community would like to have a system for reporting environmental anomalies regarding the site, and a source for learning about any incidents in a timely fashion.
Community members are definitely interested in receiving information from the agencies "when there's something to report," and certainly with regard to the agencies interface with the developer. Some residents prefer to receive traditional mailed newsletters/fact sheets, while most others prefer e-mail. There were also offers to sponsor information on the town and county website, announcements on closed circuit TV broadcasts and suggestions to post the superfund repository information on-line, and create links from the local newspapers. Other ideas include creation of a school curriculum and professional seminar series.