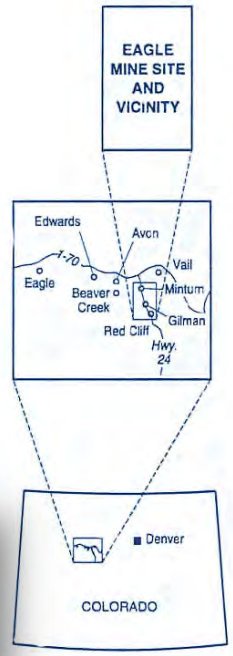
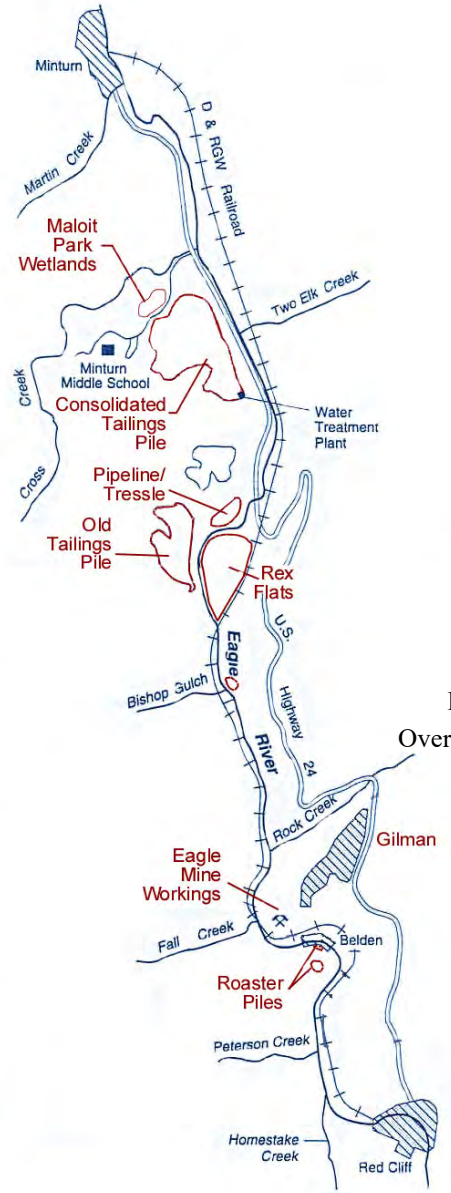
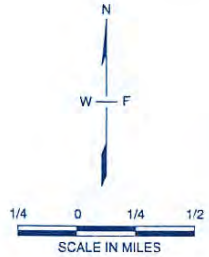
THE EAGLE MINE SUPERFUND SITE CASE STUDY

Agenda

- Site Background
- Enforcement History
- Regulatory Framework
- Robust Remedy
- Getting to Site Completion





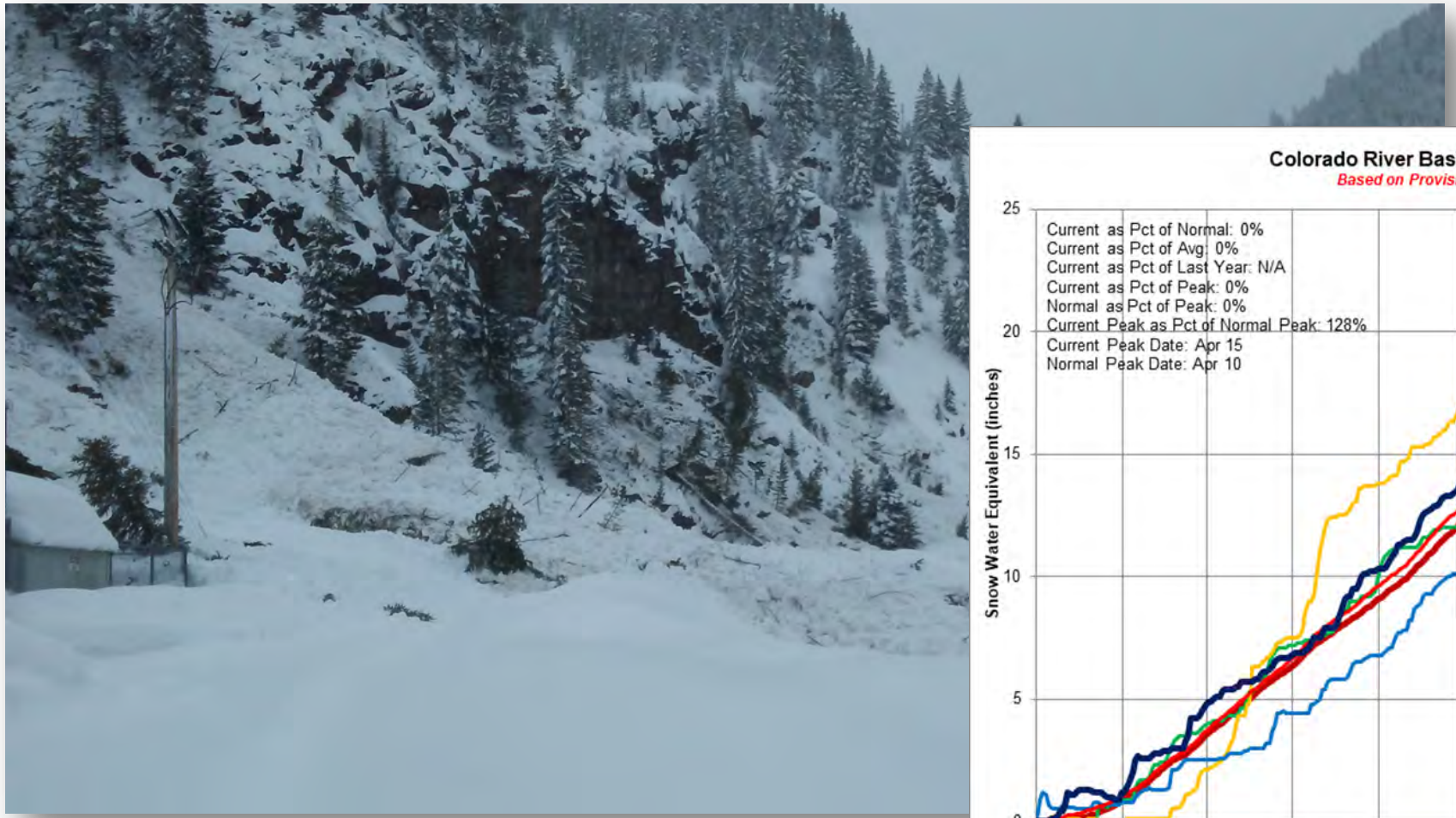


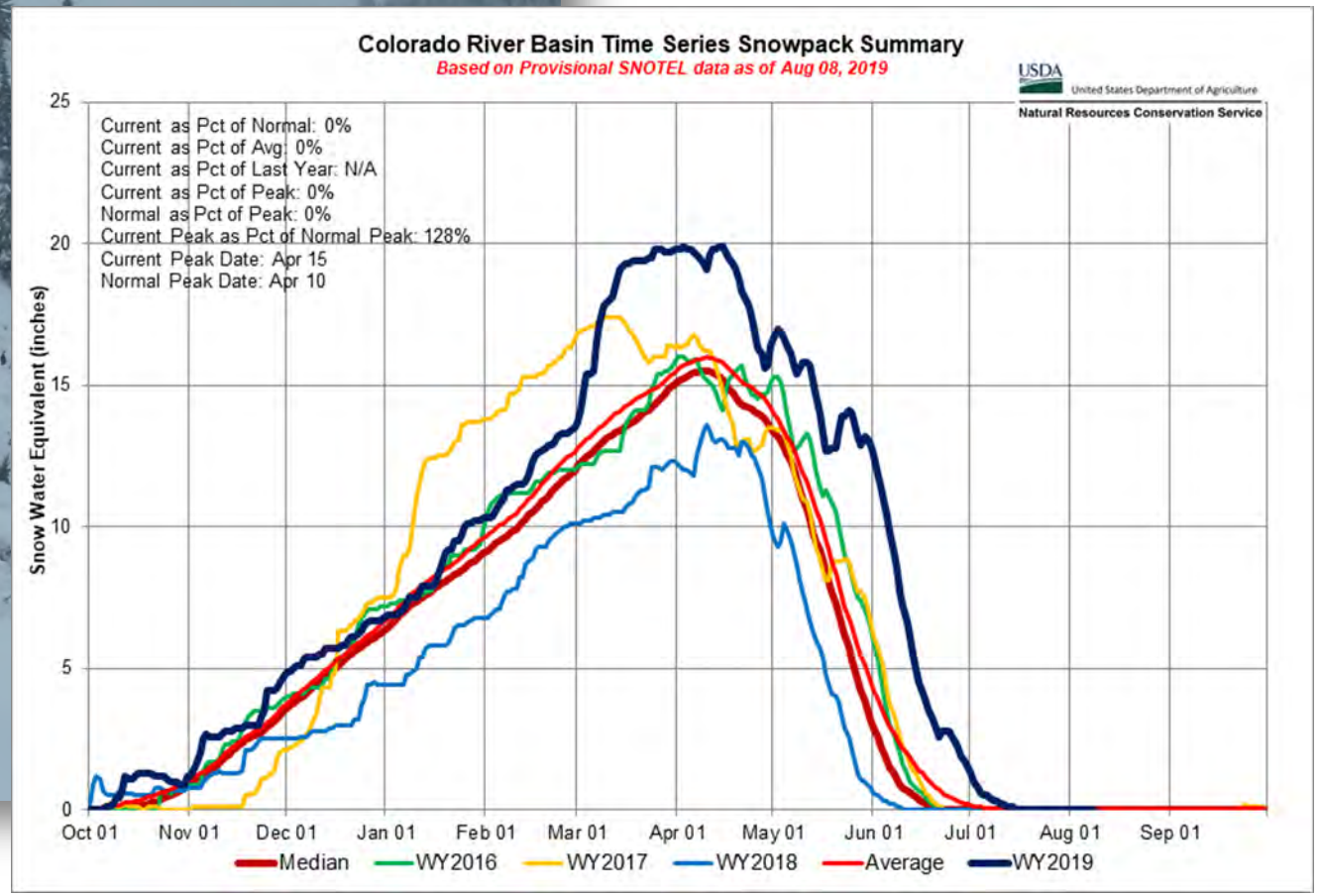
Eagle Mine Workings

Over 65 miles of tunnels located beneath Gilman

Eagle Mine Site and Vicinity Map

Site Climate





Mining History

Gilman

Shaft elevators – miners' entrance into mine

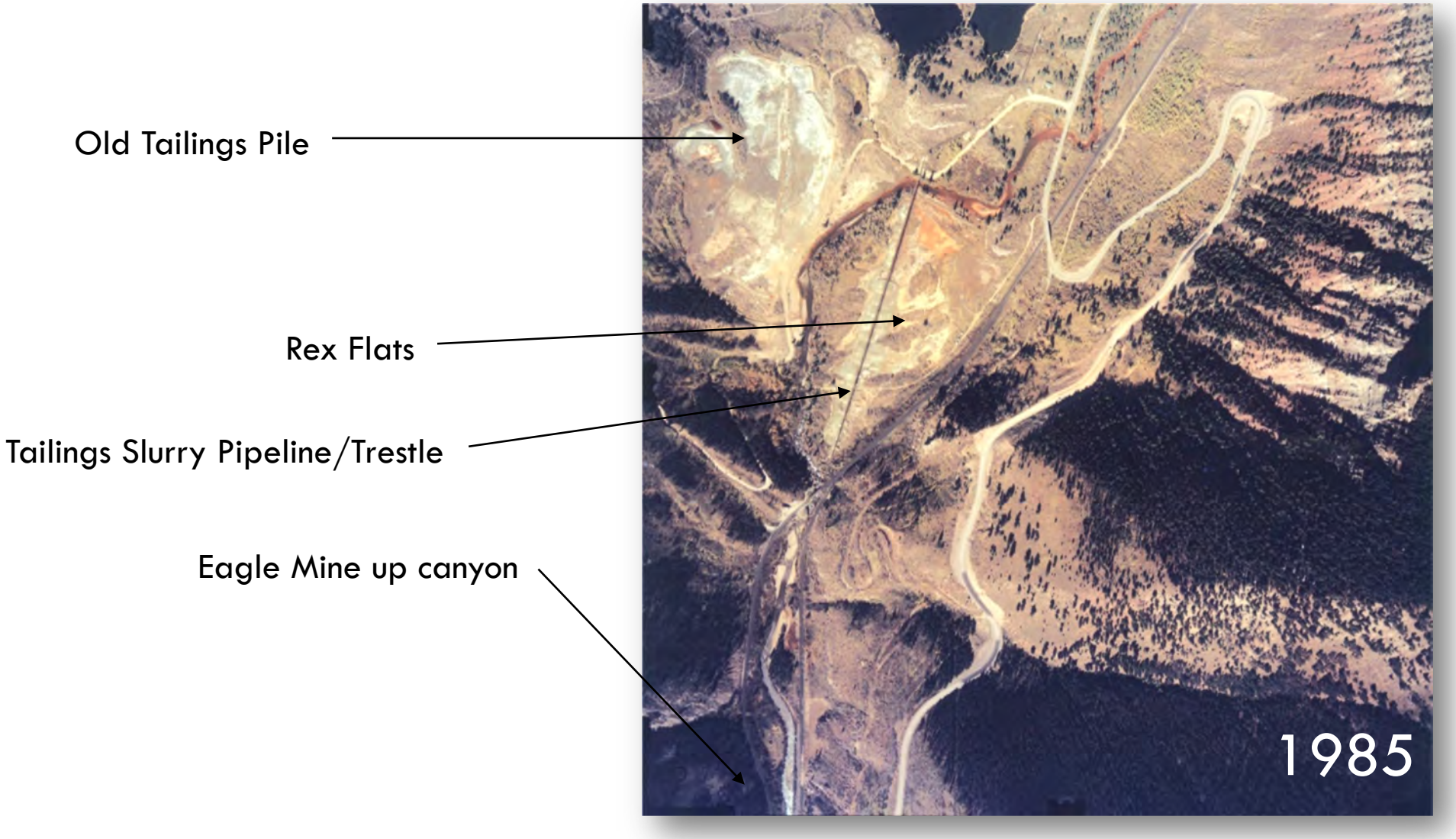
Outbuilding full of abandoned drill cores in Gilman. This one building contained multiple rooms full of cores. (2019)

Mine Waste

- Waste Rock
- Roaster Waste
- Tailings
- Acid Mine Drainage (AMD)

Roaster Pile 4 in Belden

Old Tailings Pile & Rex Flats



New Tailings Pile

New Tailings Pile
(now Consolidated Tailings Pile)

Area of Current Water
Treatment Plant

Site Management - 3 Operable Units

- OU1: Sitewide Surface Water Quality
  - All remedial components targeted at achieving surface water ARARs
  - Ecological risk based
- OU2: Town of Gilman
  - Soils in abandoned town
  - Human health risk based
- OU3: Battle North Redevelopment
  - Soils in Rex Flats, Maloit Park, Old Tailings Pile requiring additional remediation to achieve residential use standards for redevelopment
  - Human health risk based

Stained rocks along Eagle River from groundwater flow from Rex Flats.

Enforcement History

1986	Site listed on NPL

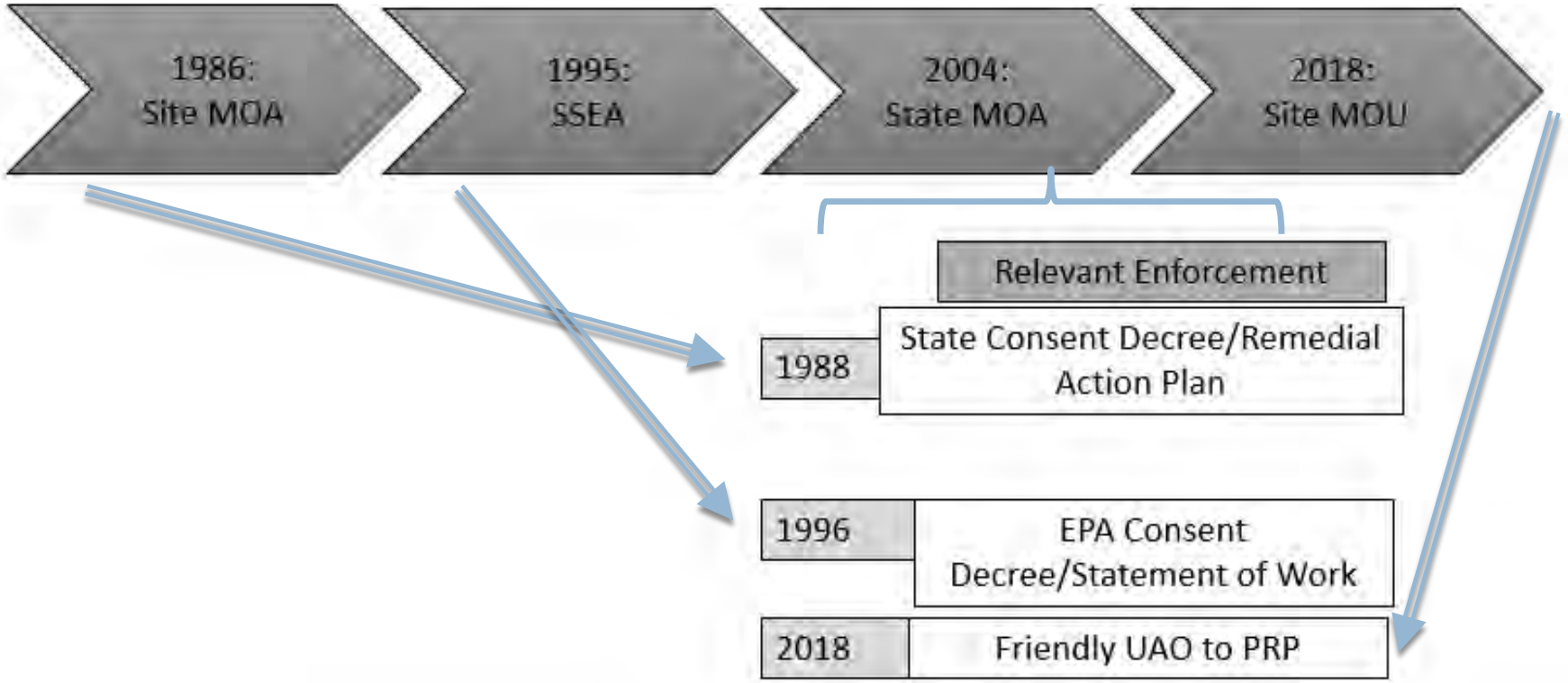
1986: Site MOA → 1995: SSEA → 2004: State MOA → 2018: Site MOU

OU1

CERCLA Process		Relevant Enforcement	
1983	State NRD & Response Cost Claim	1988	State Consent Decree/Remedial Action Plan
1993	EPA OU1 ROD	1996	EPA Consent Decree/Statement of Work
1999	EPA OU1 ESD	2018	Friendly UAO to PRP
2017	EPA OU1 RODA		

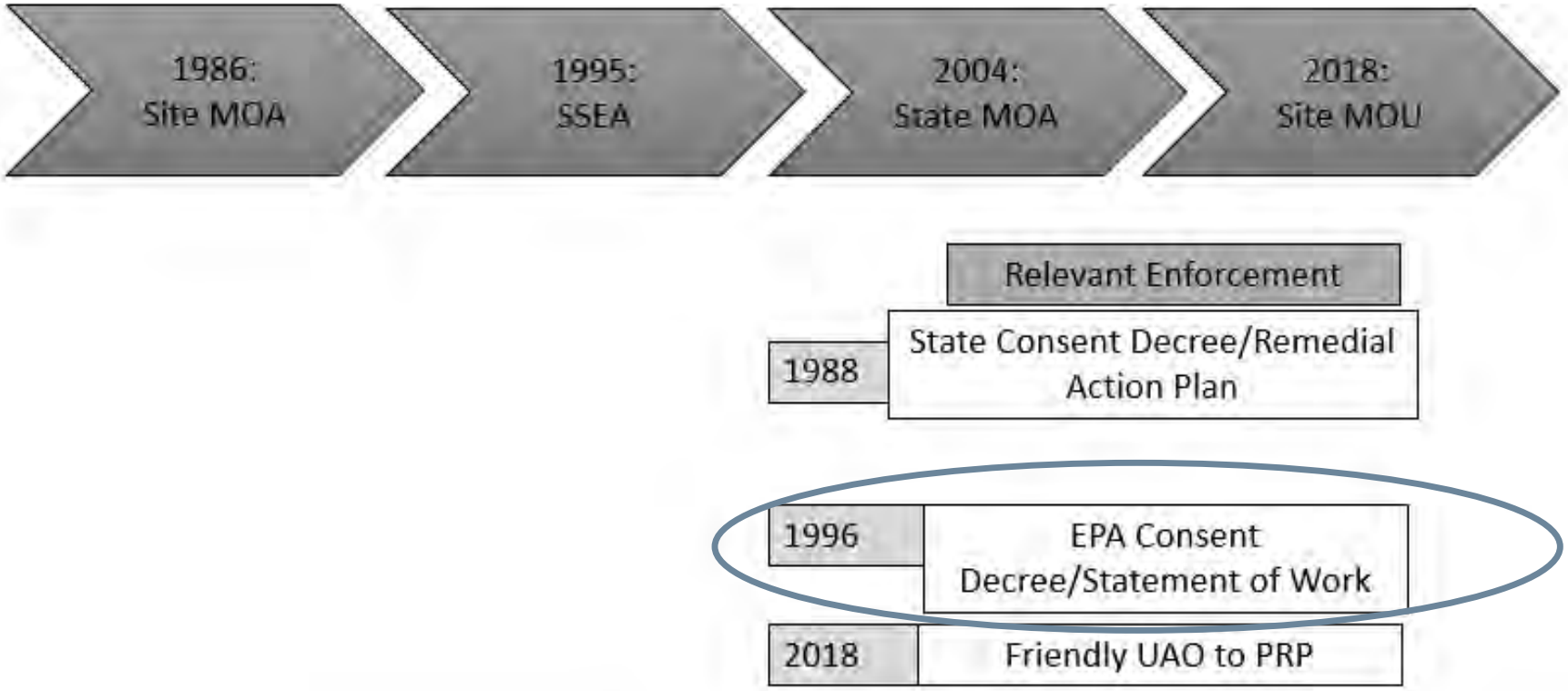
Where are we now? The obstacles.

- Patchwork enforcement strategy for OU1
  - Confusing to everyone



Where are we now? The obstacles.

- Sunsetted provisions from 1996 CD/SOW
  - Critical remedial components including water treatment plant
  - Narrow provisions



Where are we now? The obstacles.

- Regulatory Issues
  - Two State-issued discharge permits
    - Water treatment plant
    - Liberty Well
  - When CERCLA & CWA don't agree
    - TI waiver for arsenic
  - 303(d) listing
    - Segment change

Solution.

- New Consent Decree for OU1
  - Goals:
    - Consolidate all enforcement documents for OU1
    - Adopt permit equivalent documents
    - Broader and more flexible modification and additional work provisions

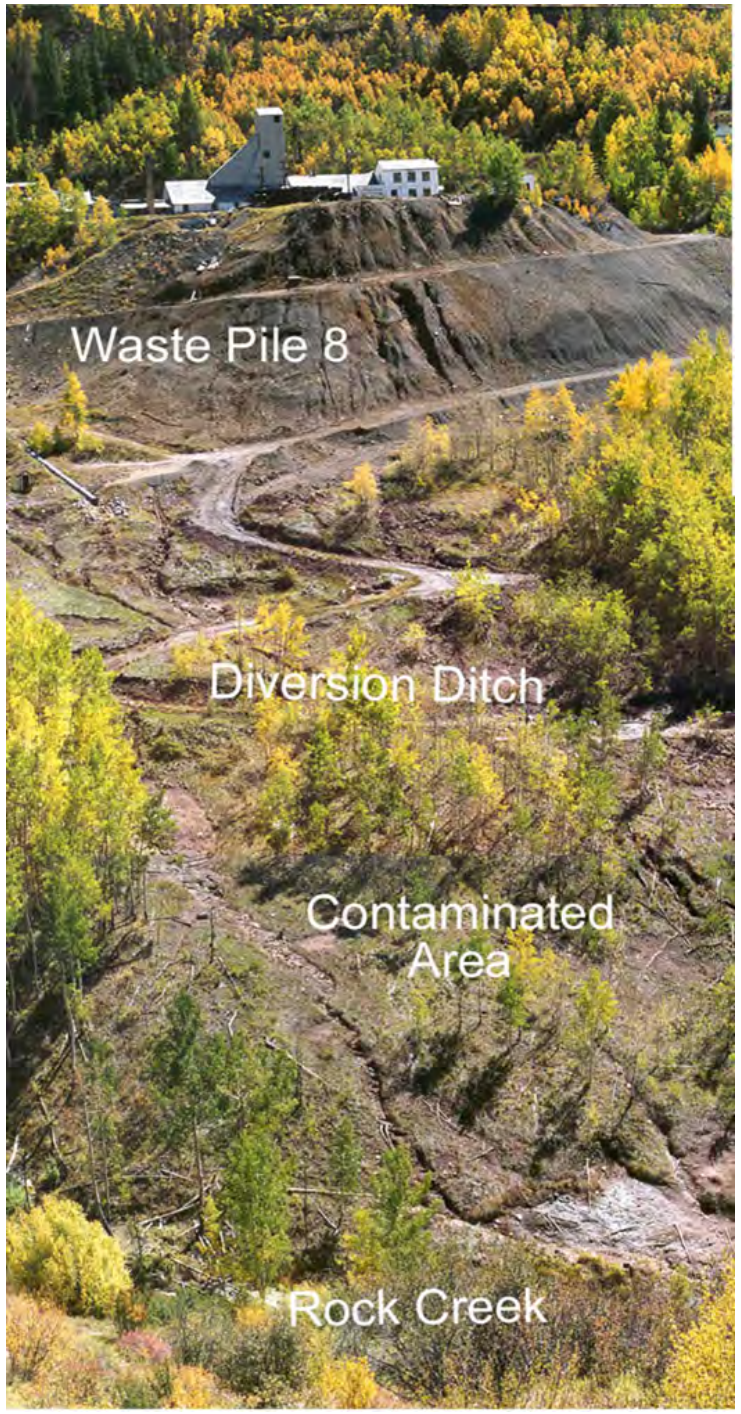
	Relevant Enforcement
1988	State Consent Decree/Remedial Action Plan
1996	EPA Consent Decree/Statement of Work
2018	Friendly UAO to PRP

Robust Remedy

- 1988 State and PRP Consent Decree/Remedial Action Plan:
- Flood workings by bulkheads and grouting
- Removal of roaster pile wastes and tailings throughout the Site
- Consolidation of roaster pile wastes and tailings into CTP
- CTP Capping
- Setting compliance objectives and long term monitoring for site

Adit Bulkhead Construction Information

Bulkhead Location	Date Constructed	Bulkhead Thickness (ft)	Bulkhead Height (ft)	Bulkhead Width (ft)	Bulkhead Gauge Elevation (ft. MSL)	Hydrostatic Head Design (ft)	Design Mine Water Elevation (ft MSL)
Adit No. 5	October 1986	6'-9"	8'-8"	7'-6"	8434	327	8761
Adit No. 6	October 1986	8'-4"	8'-0"	8'-0"	8300	500	8800
Adit No. 7	October 1988	5'-0"	varies 7' to 8'	5'±	8524	152[A]	8676[A]
Adit No. 140	October 1988	6'-9"	varies 7' to 8'	9'±	8496	208[A]	8704[A]
Ben Butler	September 1990	8'-0"	5'-10"	5'±	8426	348[A]	8774[A]
Tip Top #1	September 1990	7'-6"	6'-2"	7'±	8420	360[A]	8780[A]
Tip Top #2	September 1990	9'-2"	7'-6"	7'±	8420	360[A]	8780[A]
Tip Top #3	September 1990	3'-8"	6'-10"	7'±	8420	360[A]	8780[A]



Robust Remedy

1988 State and PRP Consent Decree/Remedial Action Plan:

- Waste rock pile diversion ditches
- CTP groundwater extraction trenches
- Up gradient diversion trench at CTP
- Diversion of lower Rock Creek around contamination
- Construction of lined surge pond at CTP

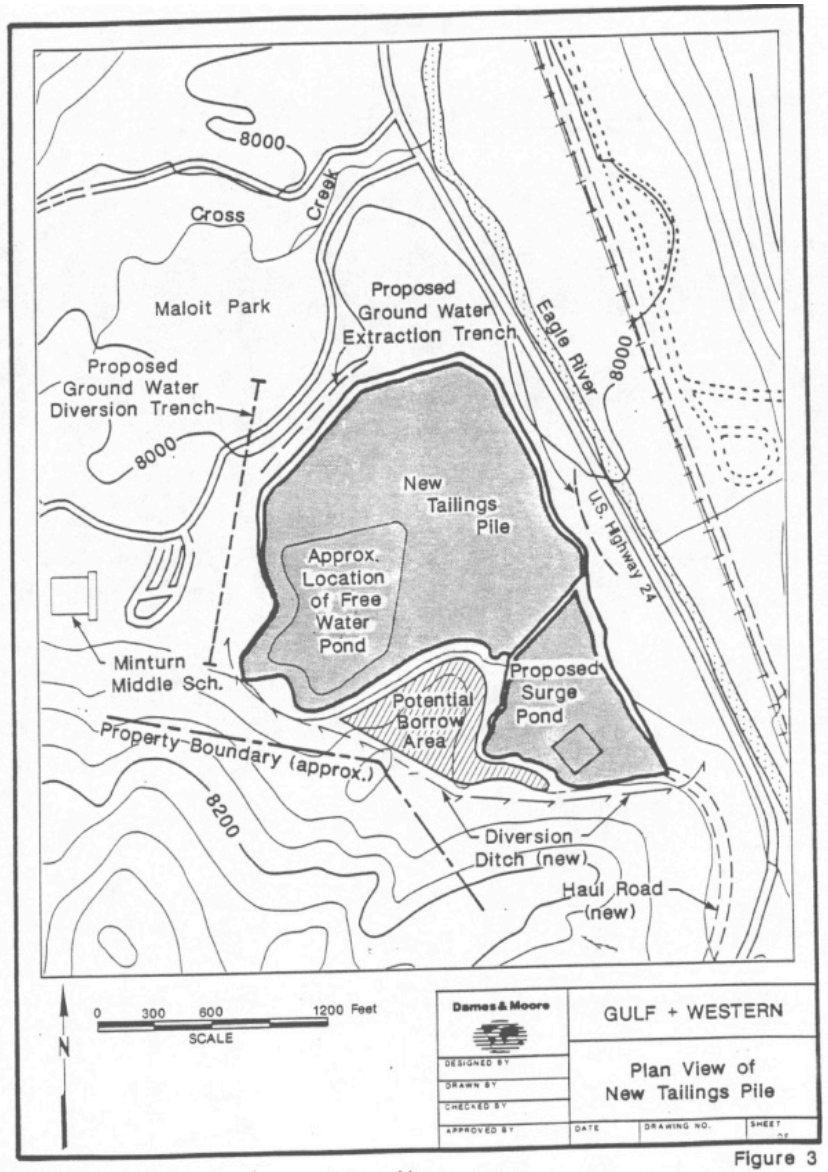
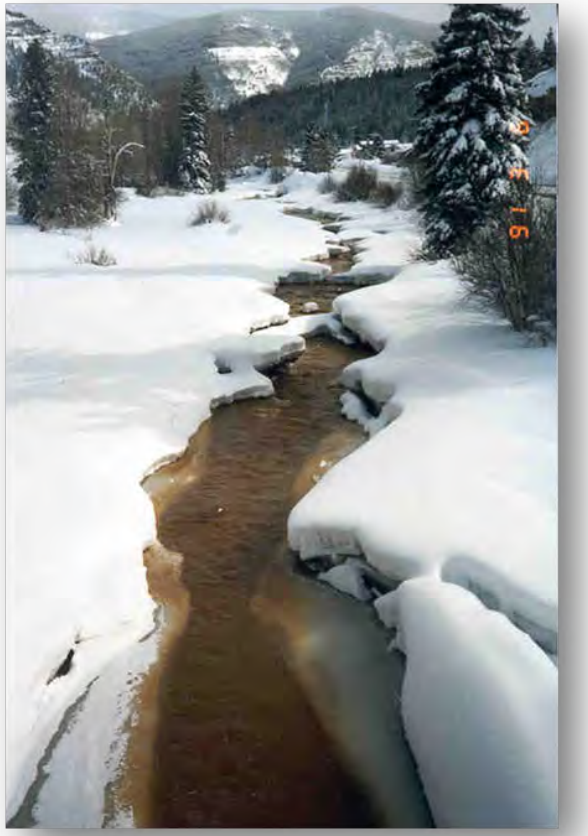


Figure 3

Robust Remedy

- 1990 Amendment to State and PRP Consent Decree/Remedial Action Plan:
  - Construction of WTP
  - Second lined surge pond
  - Mine seepage collection system
  - Expanded gw/sw monitoring
  - Temporary sludge disposal at CTP

Acid Mine Drainage from the Eagle Mine workings in 1991



Eagle River in 1991

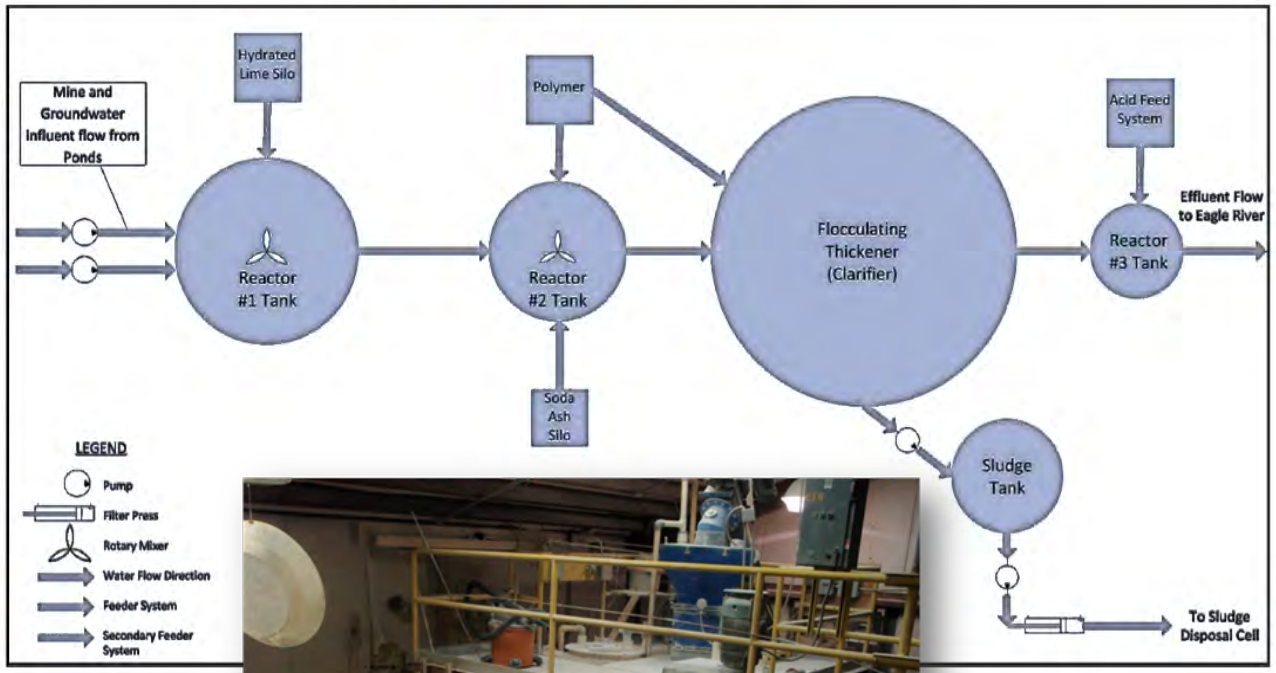
Water Treatment

WTP Influent/Effluent Concentrations

	Average Influent Concentration (µg/l)	Average Effluent Concentration (µg/l)
Arsenic	31.63	1.04
Cadmium	76.25	0.65
Copper	167.56	4.0
Zinc	33,080	48.58

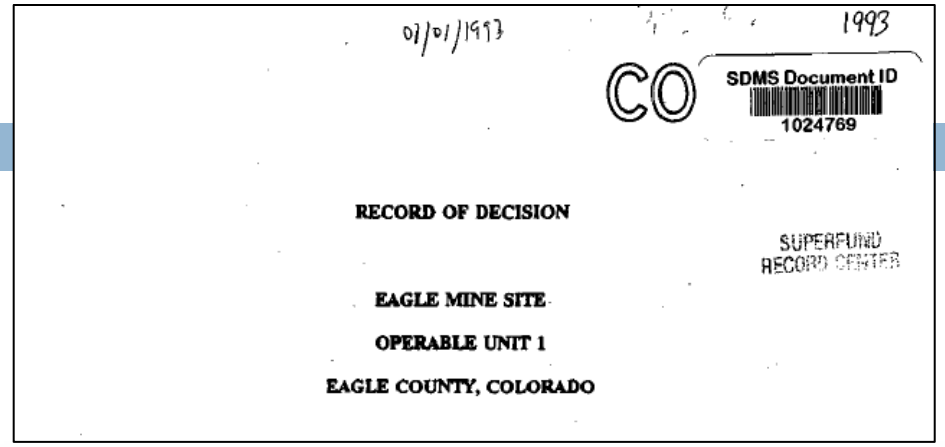
Note: Arsenic data reported from Ramboll-Environ, 2010 through 8/2014. All other contaminants based on 2014 data only. PQL for Arsenic is 1 µg/l and detection limit for copper is 4 µg/l.

Figure 5 - Eagle Mine Water Treatment Plant Schematic



Robust Remedy

- 1996 EPA and PRP Consent Decree:
  - Culvert system to divert clean Rock Creek surface flow
  - Mine draw down to maintain mine pool level
  - Waste rock pile leachability study
  - Completion of CTP cap within 2 construction seasons
  - Addition of sludge dewatering and disposal at WTP


01/01/1993

1993

CO

SDMS Document ID
1024769

RECORD OF DECISION

SUPERFUND
RECORD CENTER

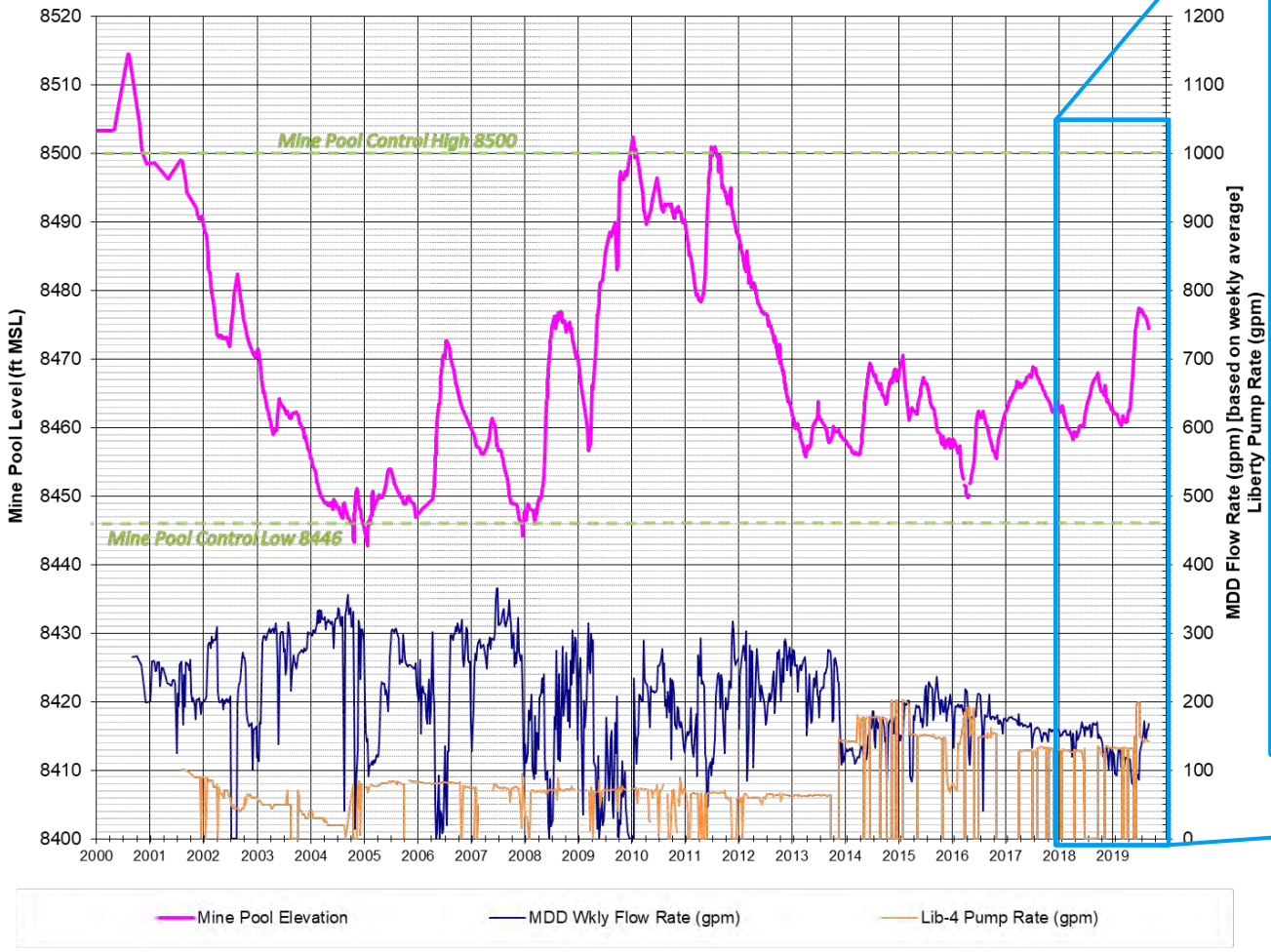
EAGLE MINE SITE

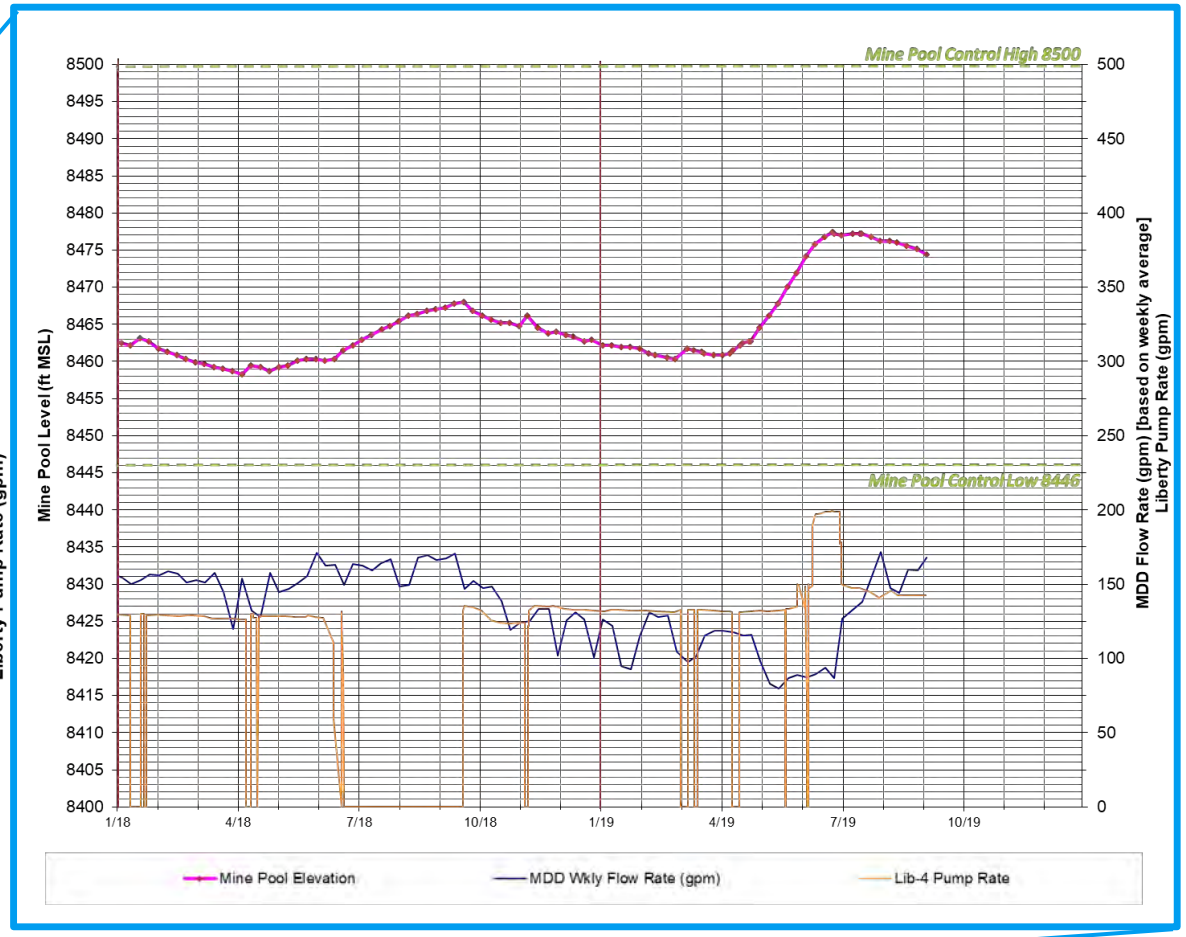
OPERABLE UNIT 1

EAGLE COUNTY, COLORADO

Mine draw down system at Adit 5

Mine Pool Elevation

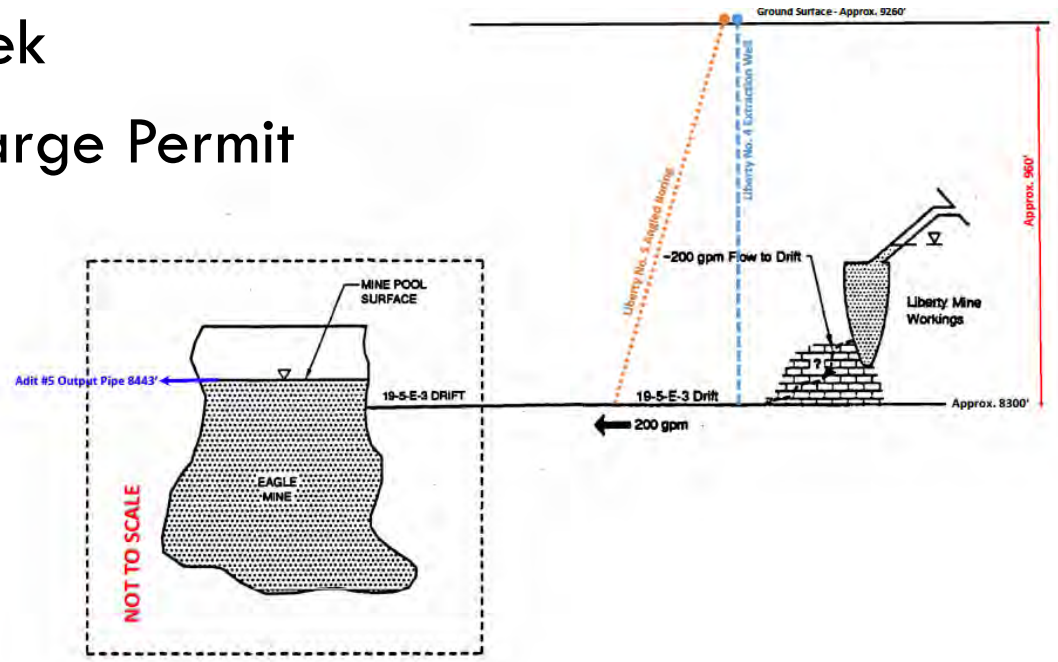




RAMBOLL

Robust Remedy

- 1998 ESD
  - Liberty Well
  - 980-foot well
  - 150 gpm direct discharge into Willow Creek
  - State Discharge Permit



Pump replacement in Liberty Well in September 2018

Robust Remedy

- 2018 Unilateral Administrative Order
  - Expansion of existing remedy
  - Collection of groundwater at Belden, at the base of Rock Creek and from the Mill Level of the mine
  - Conveyance of collected water to WTP for treatment

Iron precipitate forming in an area where groundwater enters Eagle River in Belden

Before and After. . . . . .

Roaster Pile Remediation

Roaster Pile #1
Prior to Removal
1988

Roaster Pile #1
After Restoration
1994

Before and After. . . . . .

Roaster Pile Remediation

Roaster Pile #3
Before Removal
Circa 1988

Roaster Pile #3
After Remediation
1994

66,300 cubic yards of Roaster material were removed from 5 Roaster Piles in 1988 and 1989 and placed in the CTP.

Roaster Pile #3 Remediation

Before and After. . . .

Old Tailings Pile Reclamation

The Old Tailings Pile in 1989

The Old Tailings Pile After Reclamation in 1999

Nearly 1 million cubic yards of tailings were removed from the OTP, Rex Flats and Maloit Park and placed in the CTP between 1988 and 1996.

Before and After. . .

Consolidated Tailings Pile Reclamation

The Consolidated Tailings Pile
In 1989

The Consolidated Tailings Pile
After Reclamation
1999

Before and After. . .

Consolidated Tailings Pile Reclamation

The Consolidated Tailings Pile
Prior to 1989

The Consolidated Tailings Pile
After Reclamation
1999

Before and After. . . .

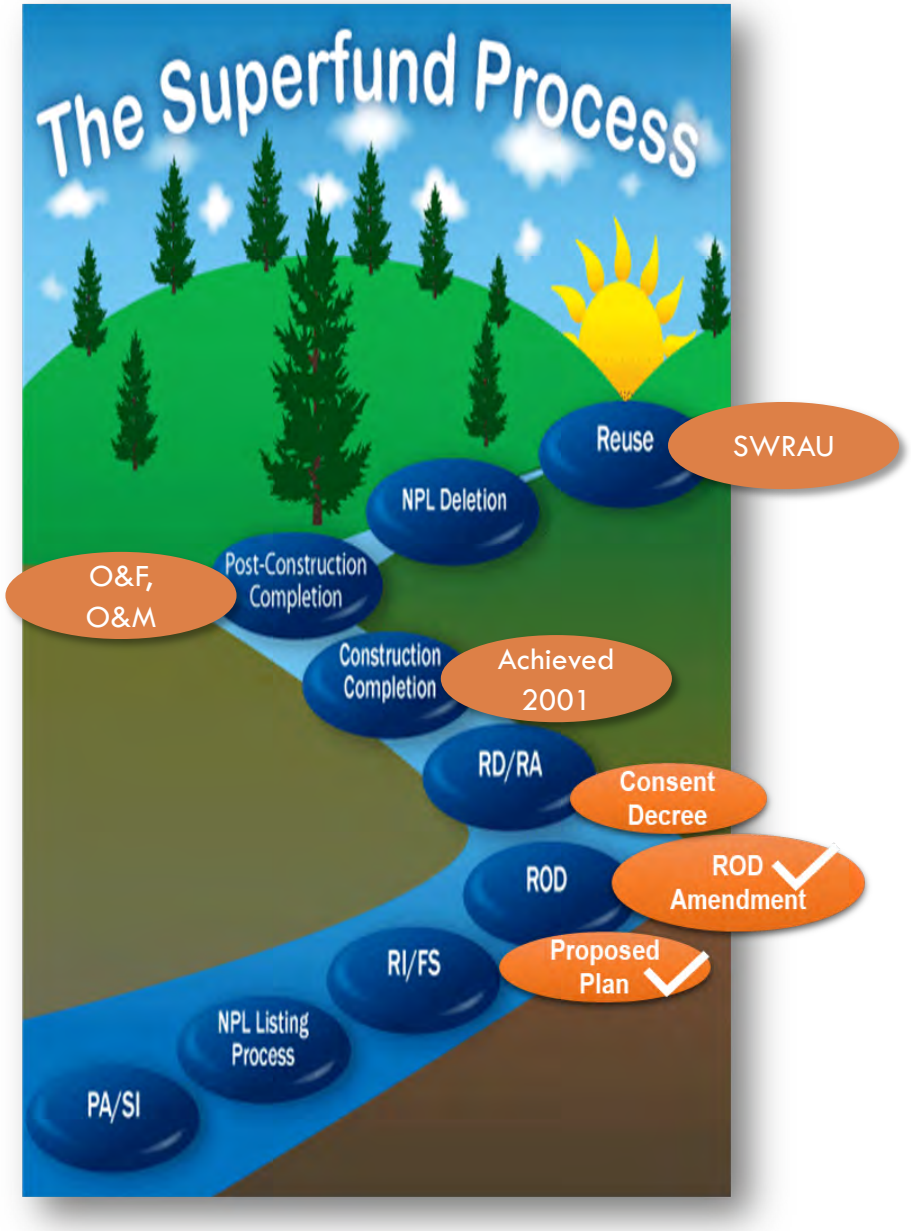
Maloit Park Wetlands

Maloit Park Wetlands
In 1993

Maloit Park Wetlands
After Remediation
1999

Getting to Site Completion

- Lodge CD
- Permits > PEDs
- GW determination
- SWRAU
- Site deletion



Questions?