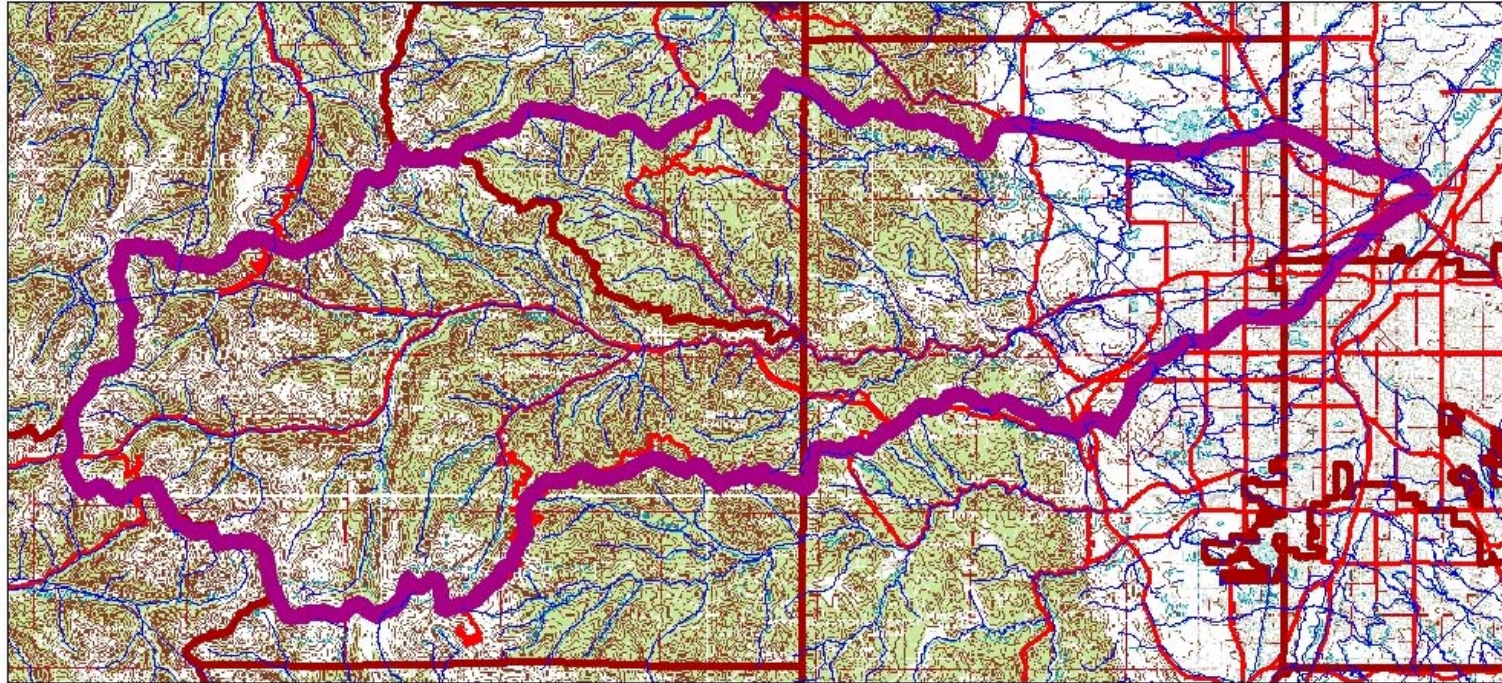


Clear Creek / North Clear Creek Overview

- Highlight Past Improvements
- Discuss Feasibility Study & Record of Decision North Clear Creek
- Metals of Concern
Zinc, Copper,
Manganese
Cadmium, Aluminum, Iron

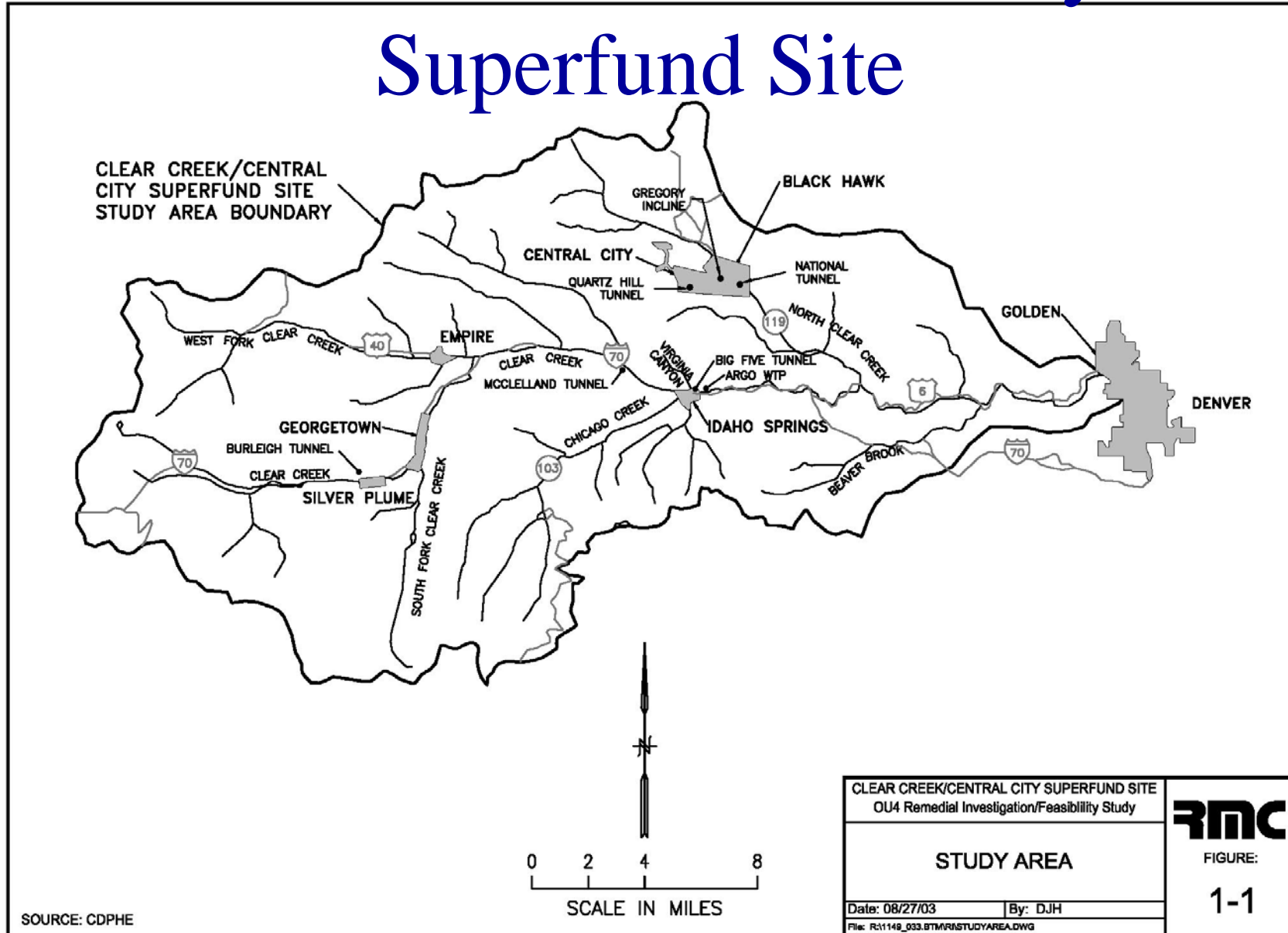


The Upper Clear Creek Watershed and Superfund Study Area



Clear Creek / Central City

Superfund Site



Completed Remediation Efforts on Main Stem of Clear Creek

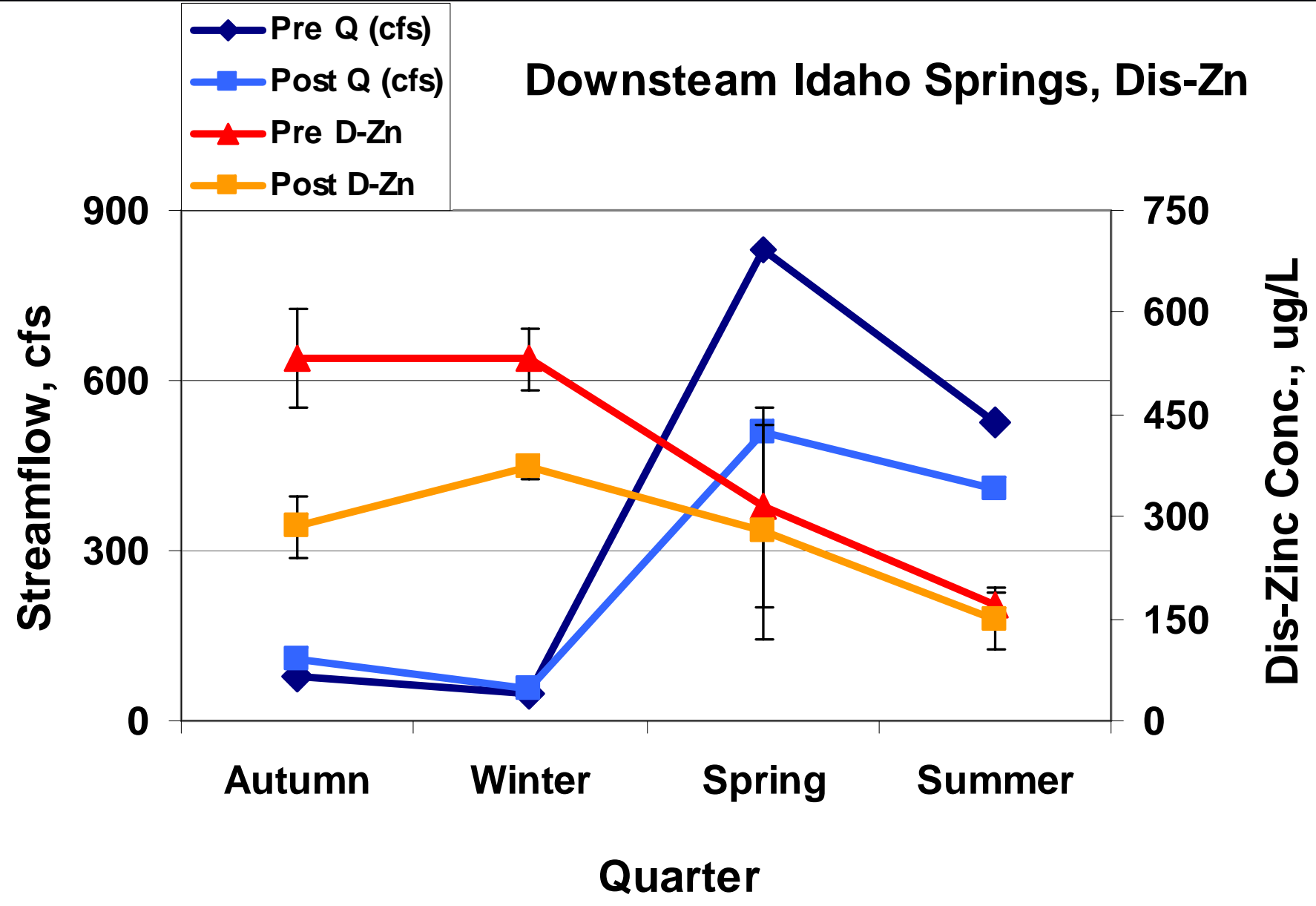
- **1994 - Present**
Mine Waste Pile Cleanups
- **1998 - Argo Water Treatment Plant**



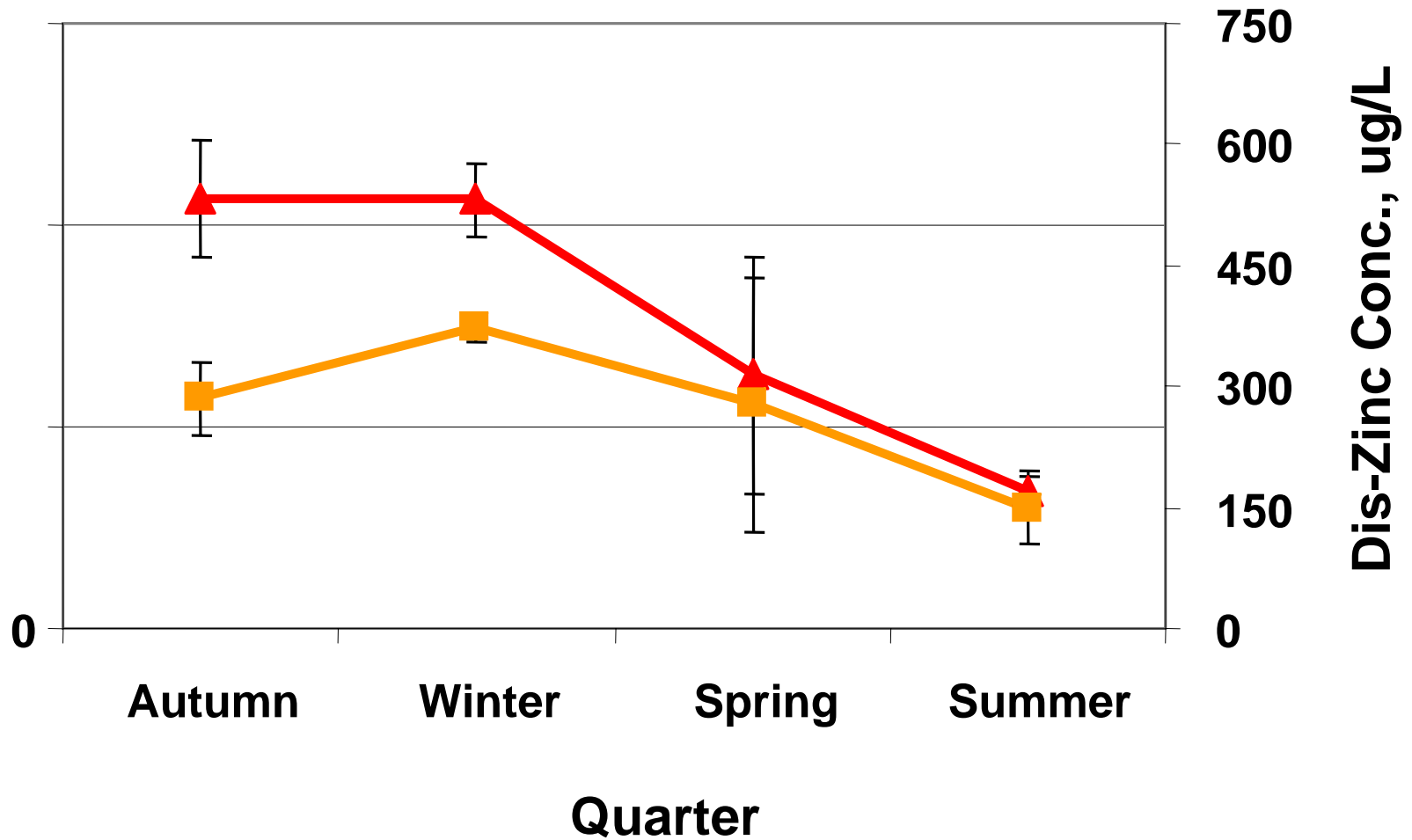
Argo Tunnel

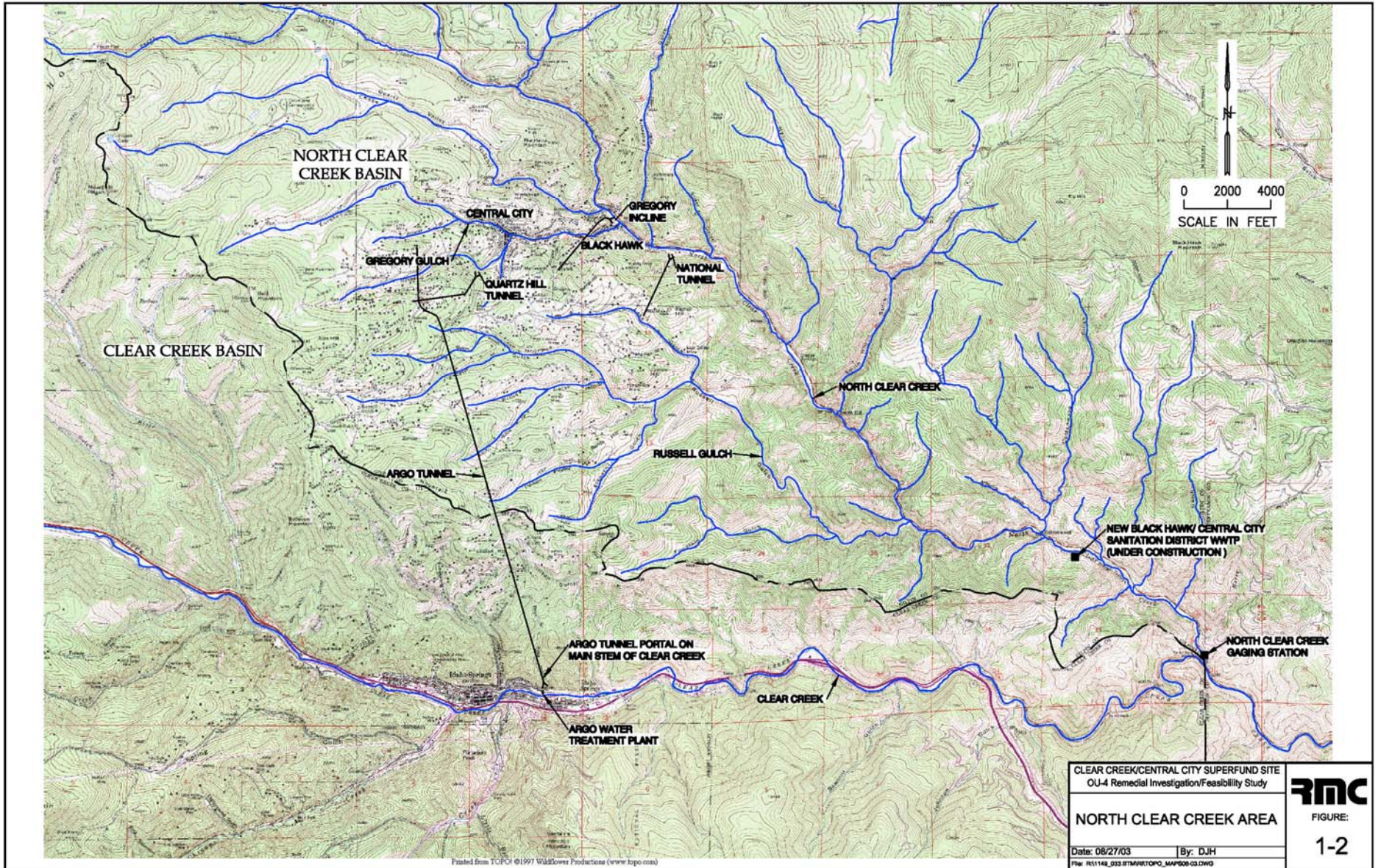


Downsteam Idaho Springs, Dis-Zn



Downstream Idaho Springs, Dis-Zn





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CLEAR CREEK/CENTRAL CITY SUPERFUND SITE
OU-4 Remedial Investigation/Feasibility Study

NORTH CLEAR CREEK AREA

Date: 08/27/03 By: DJH

File: R51148_003.01M/R51TPO21_MAP006-03.DWG



FIGURE:

1-2

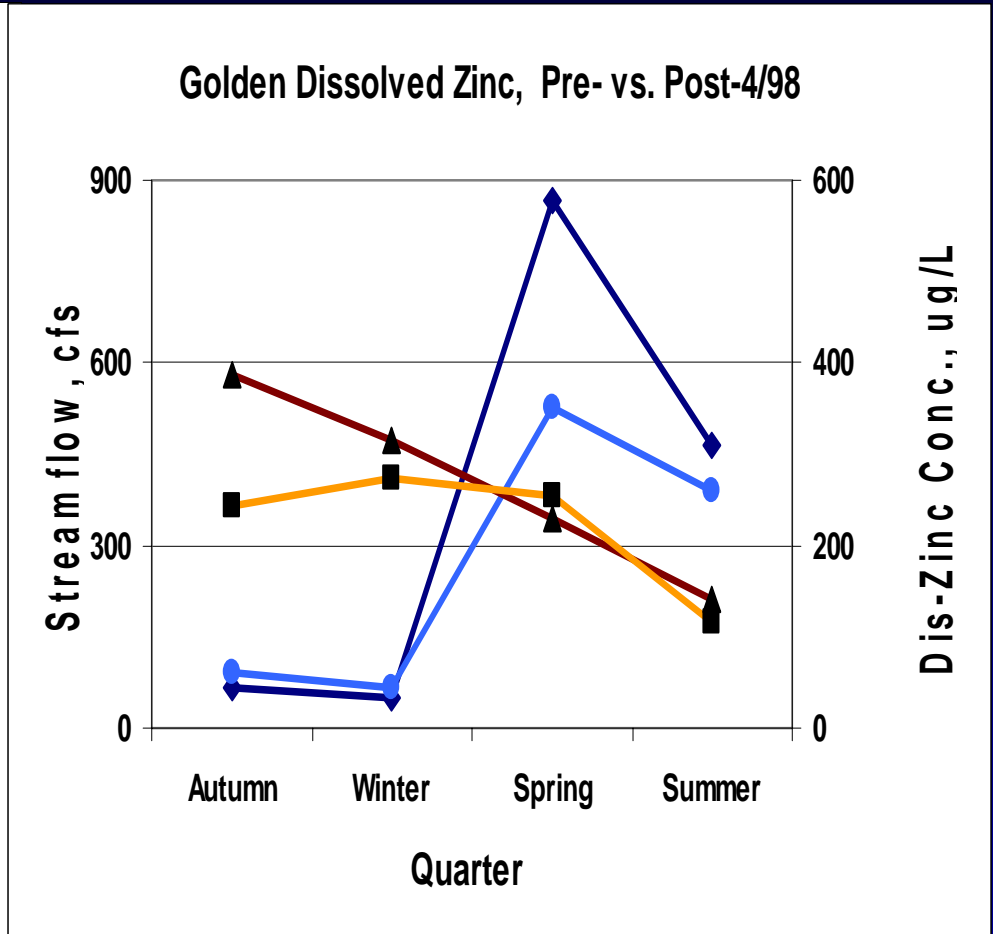
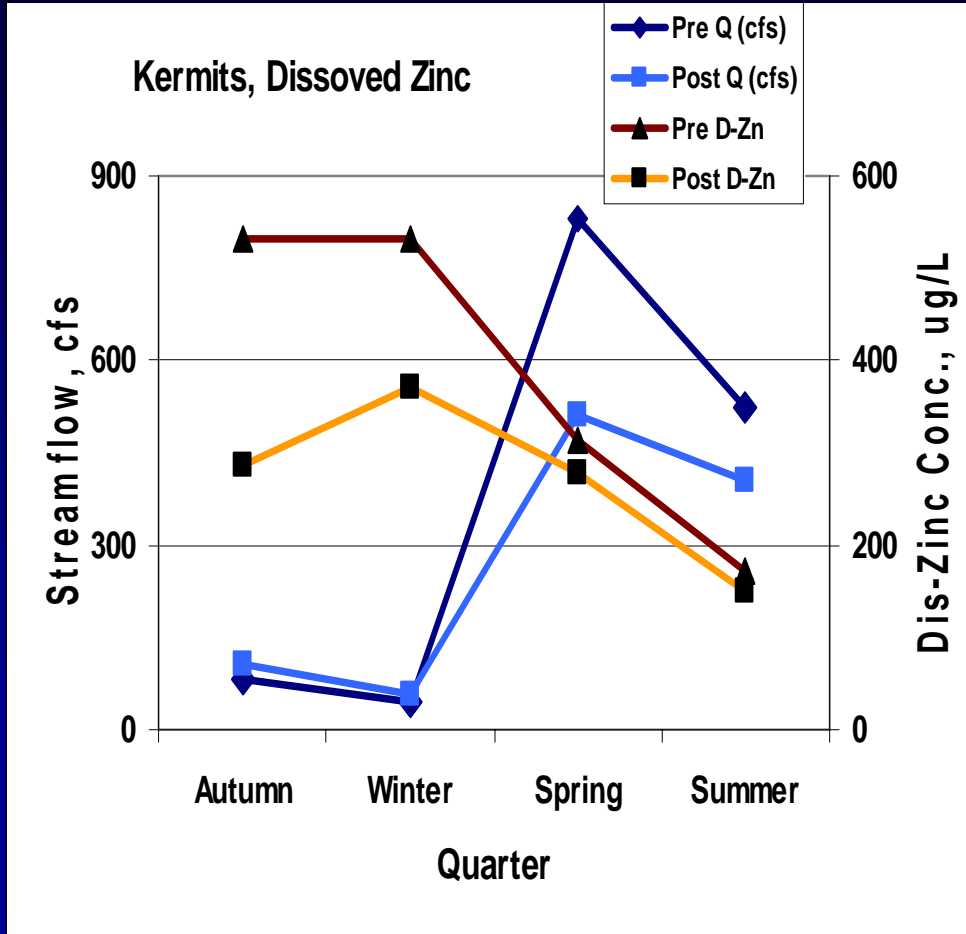




Seasonal Hardness

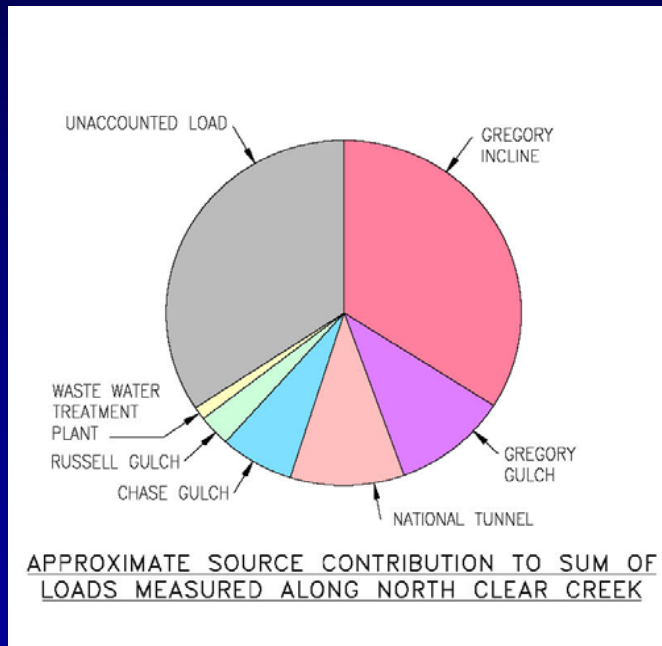
<i>Segment</i>	<i>High Flow May 1 Through August 31</i>	<i>Low Flow September 1 through April 30</i>
North Clear Creek Segment 13b	80	184
Clear Creek Segment 11	53	103

Clear Creek Below Idaho Springs and at Golden Dissolved Zinc

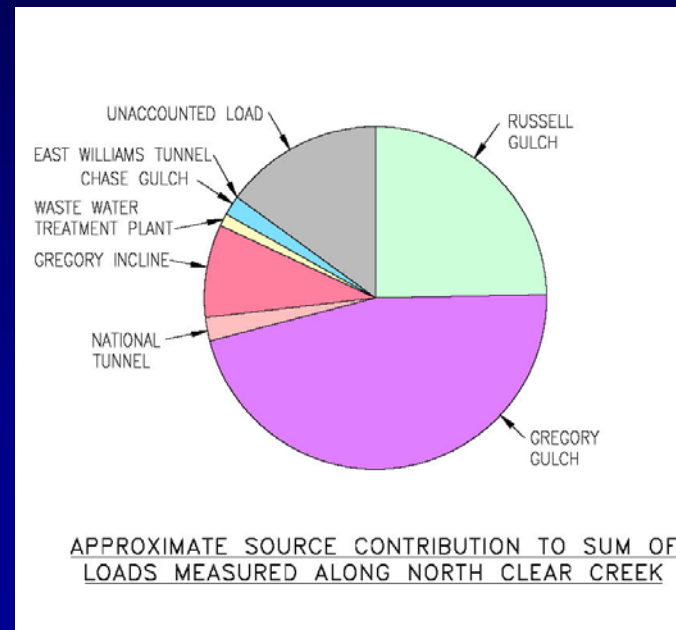


Summary of Remedial Action Objectives

- ***North Clear Creek to Improve North Clear Creek***
 - North Clear Creek is significantly impaired. Improvement of surface water quality to a point that is protective of aquatic life (i.e., survival of a brown trout population) is a goal of the OU4 remedy.
- ***North Clear Creek to Improve Clear Creek.***
- ***Do not degrade drinking water supplies obtained from Clear Creek.***
- ***Reduce the toxicity to aquatic insects by reducing metal in sediments.***
- ***Control or reduce runoff from tailings/waste rock piles to reduce sediment loading of streams and ground water.***
 - Sediment loading from the piles continues to degrade water quality and habitat in receiving streams, and may continue to limit habitat for aquatic life.



Low Flow



High Flow



Priority Waste Piles

<i>Pile</i>	<i>Remedial Action</i>
Old Jordan	Remove (to Druid)
Niagra	Remove
Mattie May	Cap with Rock
Baltimore	Cap with Rock
Centennial	Remove
Pittsburgh	Cap with Rock
Upper Nevada Gulch Piles	Soil Cap and Revegetate (northern aspect)
Upper Nevada Gulch Piles	Cap with Rock (southern aspect)
Gregory Gulch No. 3	Remove
Argo	Cap with Rock
Druid	Soil Cap and Revegetate
Iroquois	Cap with Rock
Anchor	Soil Cap and Revegetate
Hazeltine	Soil Cap and Revegetate

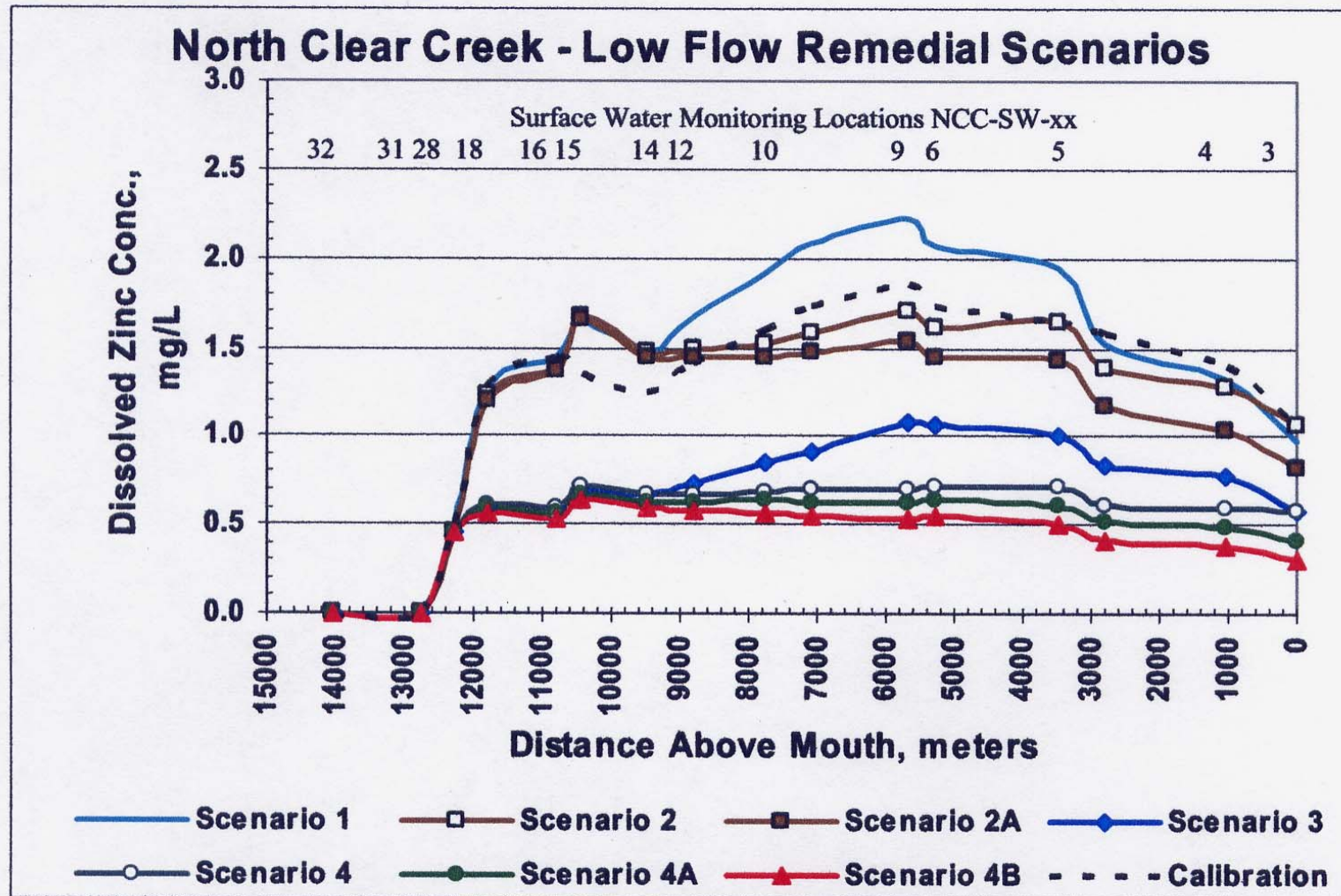


Figure 54. Dissolved Zinc Concentration for Remedial Scenarios- Low Flow.

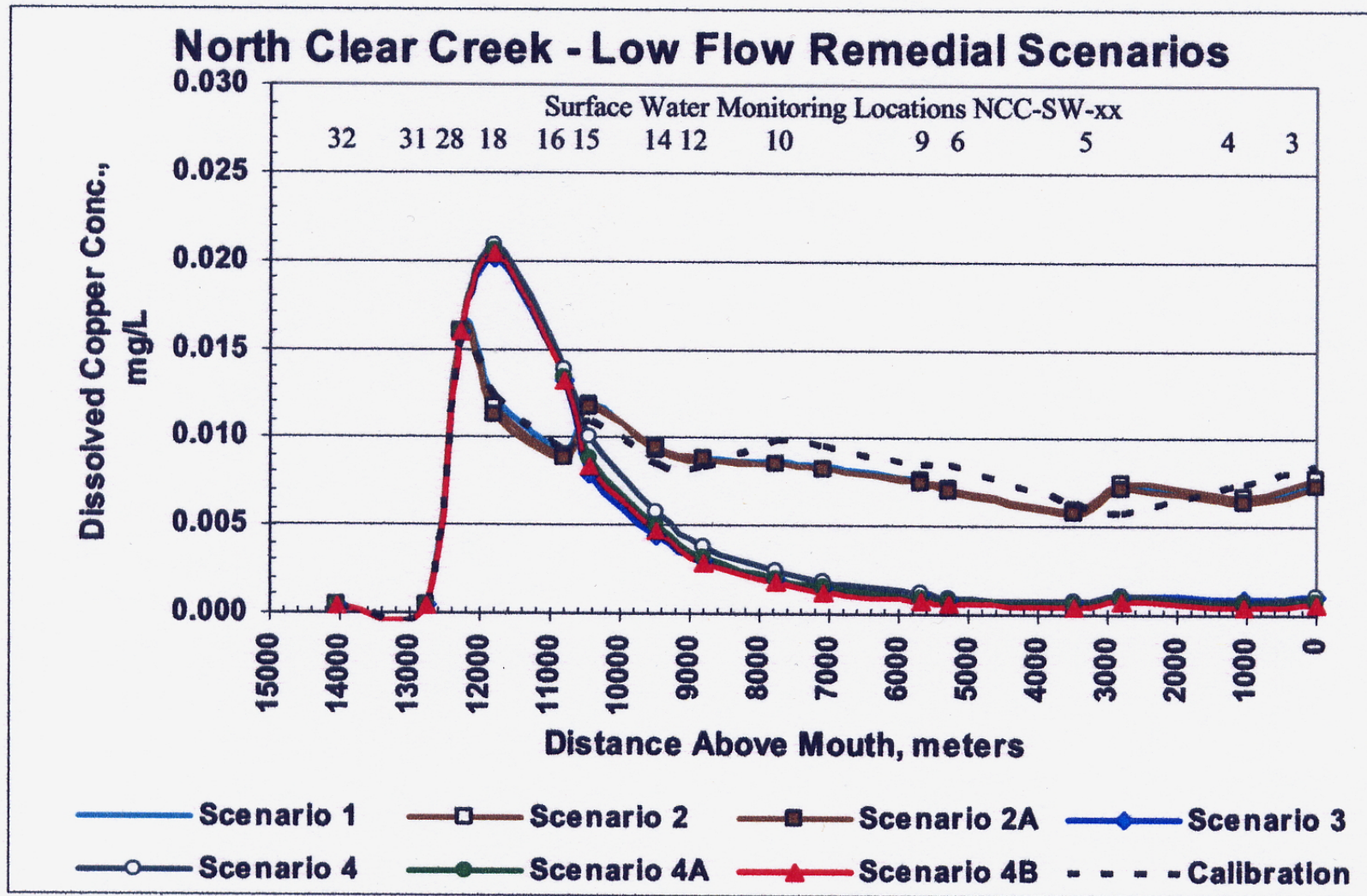


Figure 56. Dissolved Copper Concentration for Remedial Scenarios- Low Flow.

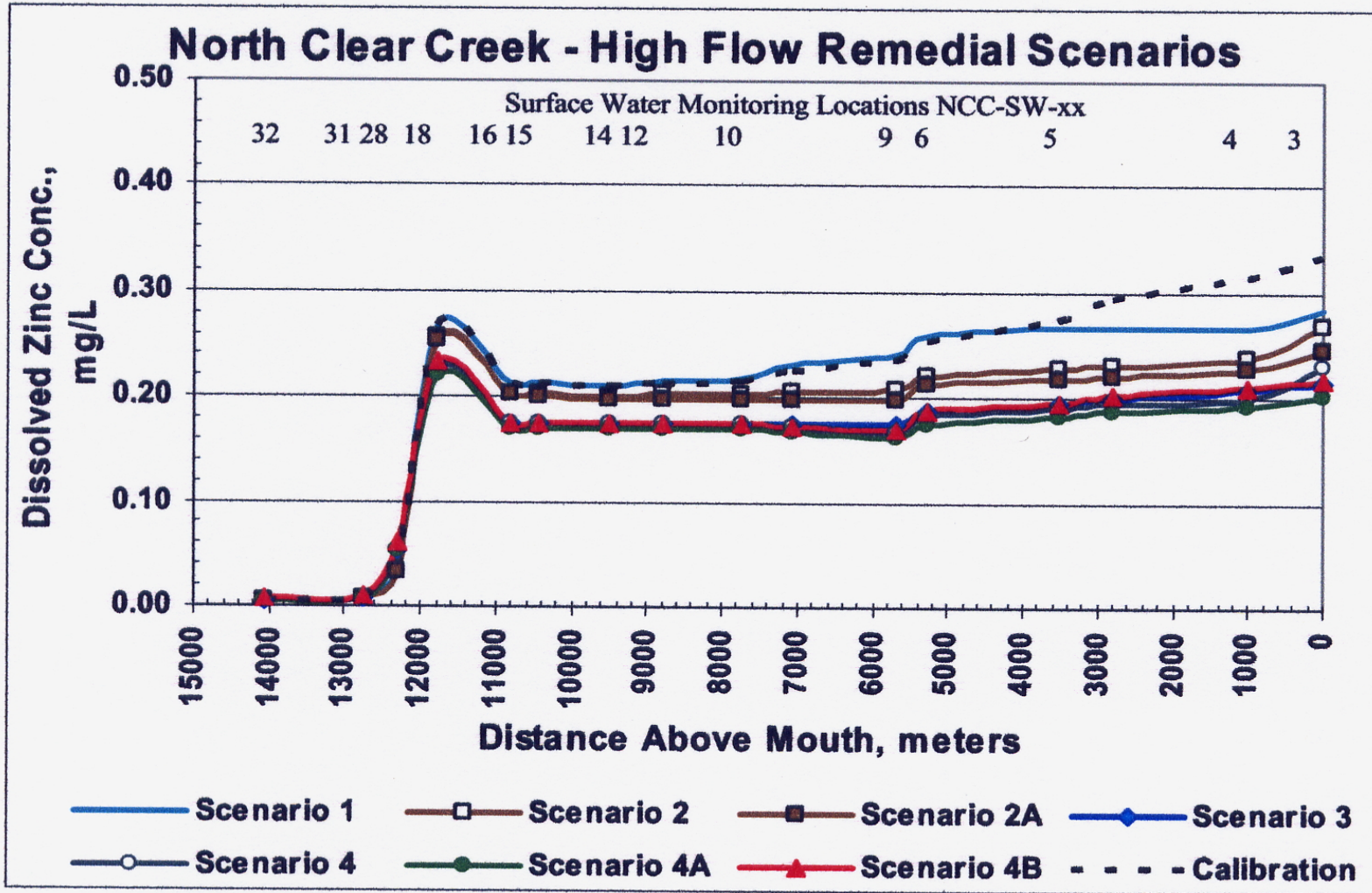


Figure 66. Dissolved Zinc Concentration for Remedial Scenarios- High Flow.

North Clear Creek Removal Needed

Low Flow

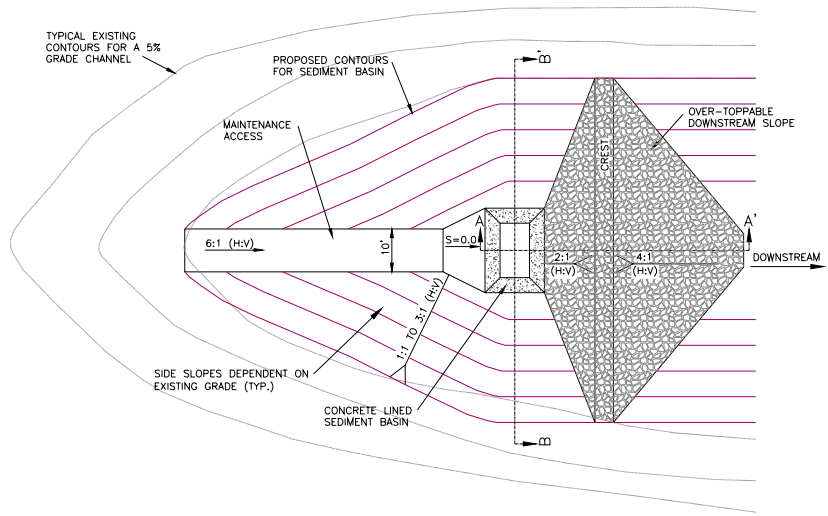
<i>Concentration/Mass Flux</i>	<i>Zinc (dissolved)</i>	<i>Copper (dissolved)</i>	<i>Cadmium (dissolved)</i>	<i>Manganese (dissolved)</i>	<i>Iron (total recoverable)</i>
<i>Current Low-Flow Conditions</i>					
Concentration (µg/L)	1,657	15.5	6.0	3,579	7,856
<i>Low-Flow Goals</i>					
Concentration (µg/L)	675	15.1	3.5	2,021	5,400
<i>Load Reduction Required to Goals Under Low-Flow Conditions</i>					
Percent Reduction	59%	2%	41%	44%	31%

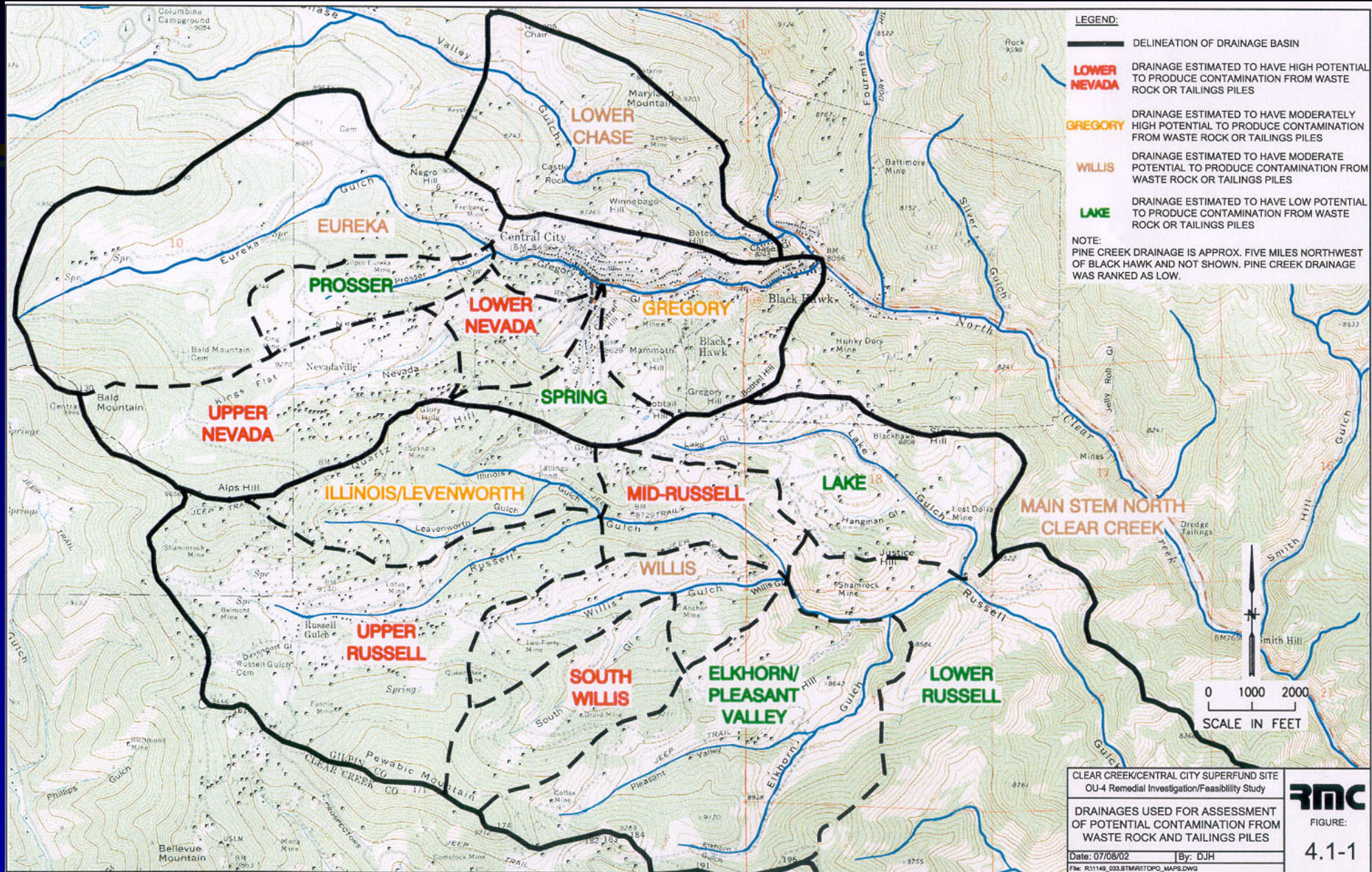
Alternatives Considered

- **Alternative 1A & B** **No Action / Institutional Controls**
- **Alternative 2A & B** **Tier 1 Sediment Reduction
(Tributaries and North Clear Creek)**
- **Alternative 3A, B & C** **Water Treatment at Argo, at New
Plant in NCC, varying Tiers of
Sediment Reduction**
- **Alternative 4A & B** **Passive (Wetland Substrate),
Combined Active and Passive Water
Treatment with Tier 2 Sediment**

Preferred Alternative (4B)

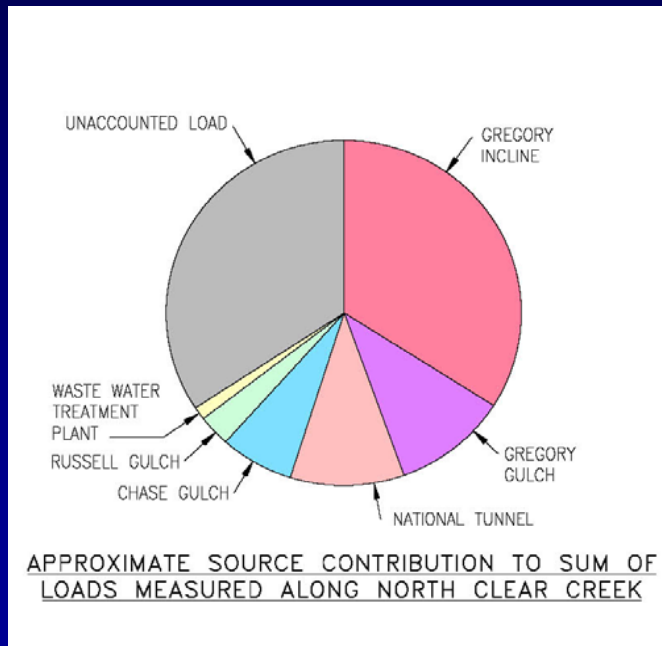
- **Treatment of Gregory Incline and Gregory Gulch ground water at Bates Hunter**
- **Treatment of National Tunnel with a wetland**
- **Sediment Controls – Detention ponds & mine waste capping on Russell & Gregory Gulch**
- **North Clear Creek improvements**
- **Cost 11.8 Million, \$900,000 / year operations**



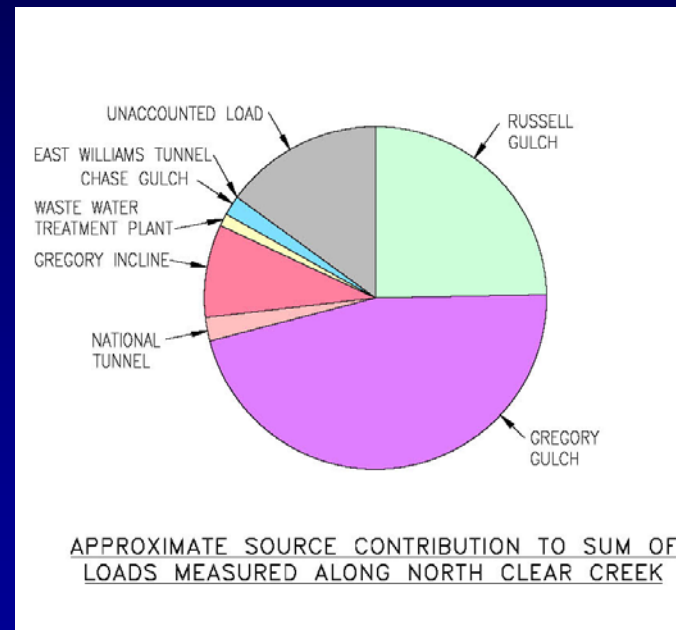


- LEGEND:**
- DELINEATION OF DRAINAGE BASIN
 - LOWER NEVADA DRAINAGE ESTIMATED TO HAVE HIGH POTENTIAL TO PRODUCE CONTAMINATION FROM WASTE ROCK OR TAILINGS PILES
 - GREGORY DRAINAGE ESTIMATED TO HAVE MODERATELY HIGH POTENTIAL TO PRODUCE CONTAMINATION FROM WASTE ROCK OR TAILINGS PILES
 - WILLIS DRAINAGE ESTIMATED TO HAVE MODERATE POTENTIAL TO PRODUCE CONTAMINATION FROM WASTE ROCK OR TAILINGS PILES
 - LAKE DRAINAGE ESTIMATED TO HAVE LOW POTENTIAL TO PRODUCE CONTAMINATION FROM WASTE ROCK OR TAILINGS PILES
- NOTE:
PINE CREEK DRAINAGE IS APPROX. FIVE MILES NORTHWEST OF BLACK HAWK AND NOT SHOWN. PINE CREEK DRAINAGE WAS RANKED AS LOW.

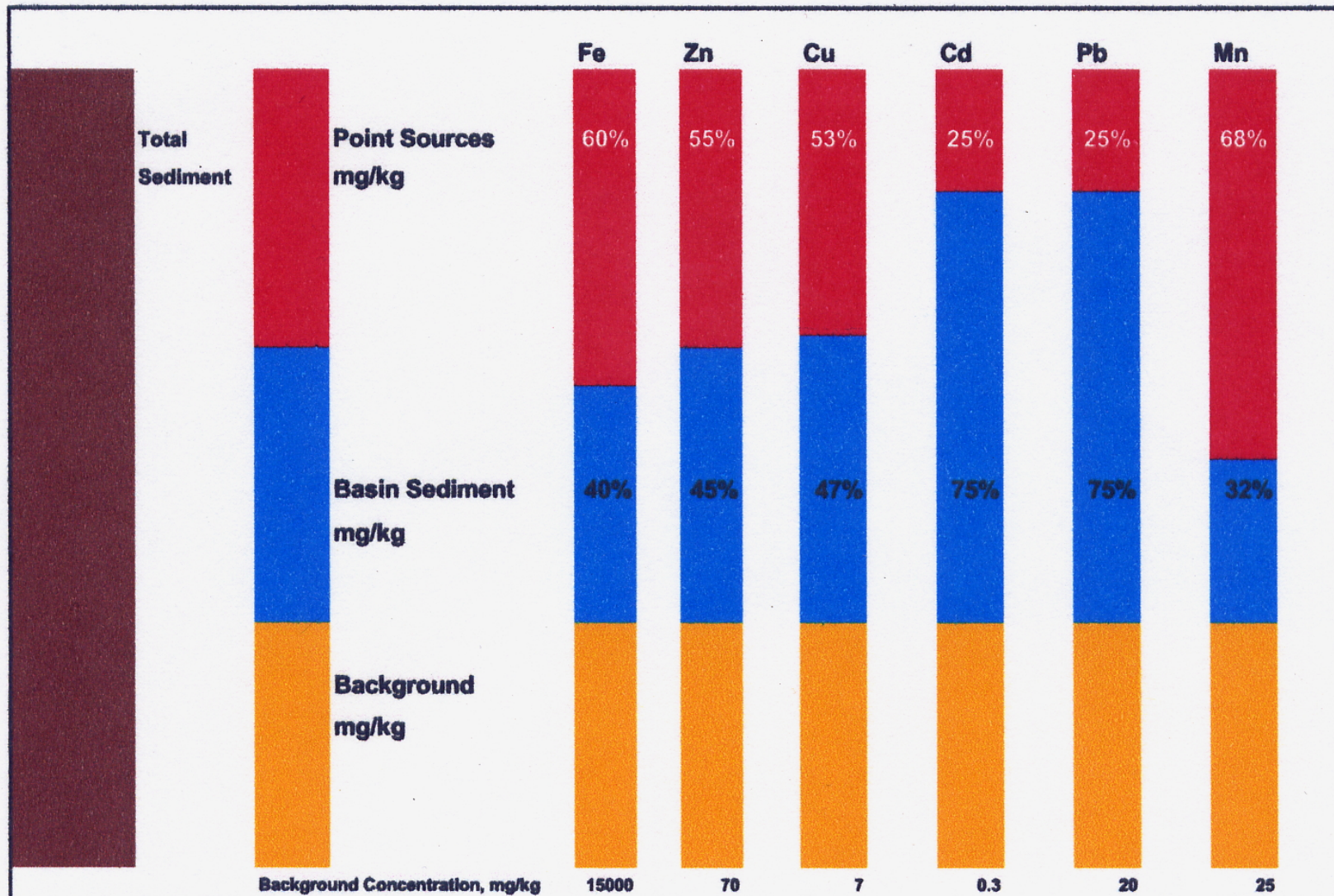
CLEAR CREEK/CENTRAL CITY SUPERFUND SITE OU-4 Remedial Investigation/Feasibility Study		RMC FIGURE: 4.1-1
DRAINAGES USED FOR ASSESSMENT OF POTENTIAL CONTAMINATION FROM WASTE ROCK AND TAILINGS PILES		
Date: 07/08/02	By: DJH	
File: R11149_033.BTMRTI0PO_MAPS.DWG		



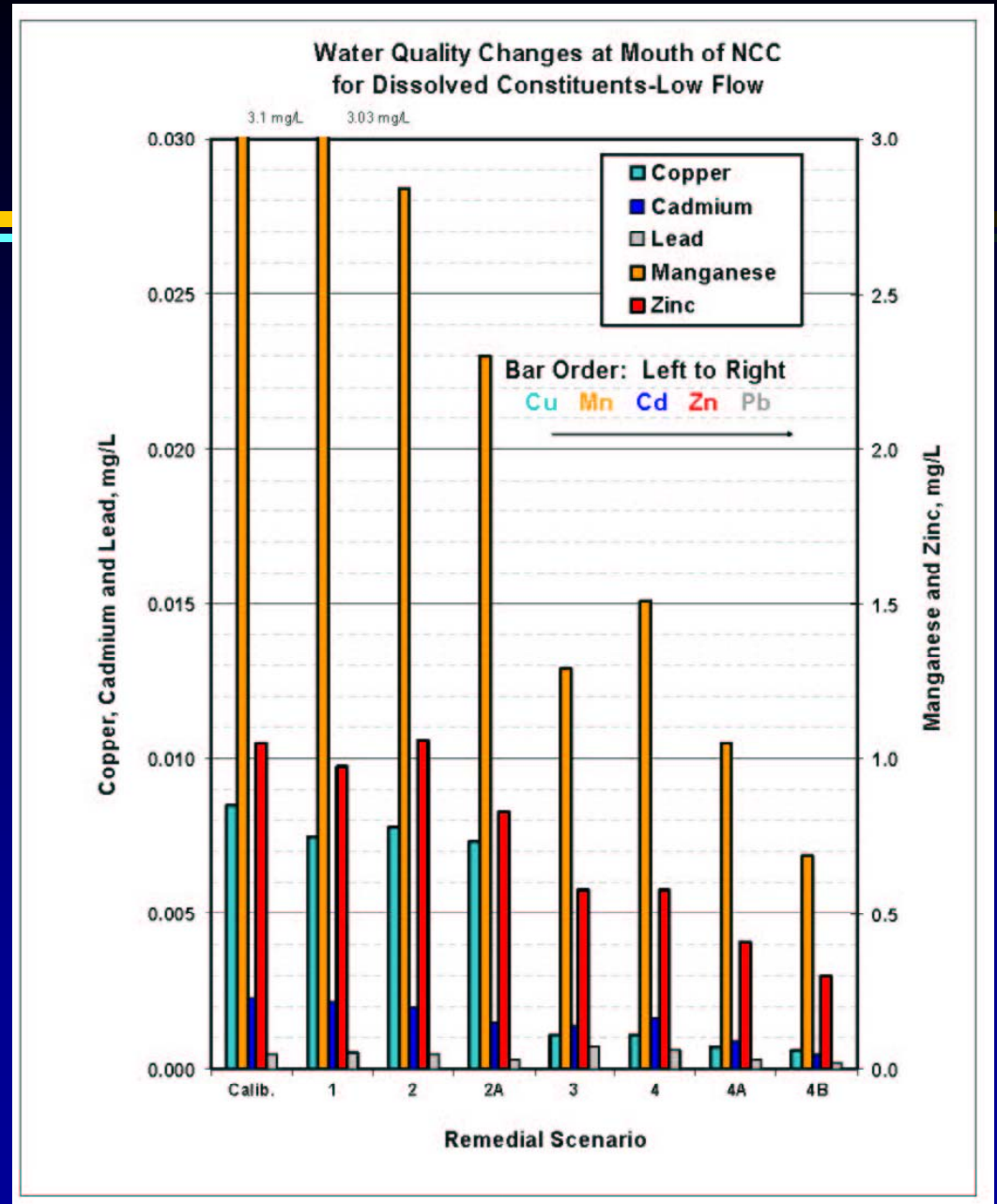
Low Flow



High Flow



Cadmium point load % decreased due to additional load below Comp 7—43%—>25%
 Lead point load % decreased due to additional load below Comp 7—46%—>25%



Anticipated Load Reduction (NCC) Alternative 4B

<i>Source Area</i>	<i>Percent Reduction in Loading for the Given Flow Regime</i>	
	<i>Low-Flow</i>	<i>High-Flow</i>
Gregory Incline	99%	85%
National Tunnel	85%	85%
Gregory Gulch	25%	45%
Russell Gulch	20%	40%
Chase Gulch	10%	5%
Non-Point Sources	40%	40%

<i>Waste Pile</i>	<i>Remedial Action</i>	<i>Capped Surface Area (acres)</i>	<i>Volume Removed (cy)</i>	<i>Length of Channel Stabilization (ft)</i>
Old Jordan	Remove (to Druid)		2,900	200
Mattie May	Rock Cap	10.0		2,700
Baltimore	Rock Cap			
Argo	Rock Cap			
Pittsburgh	Rock Cap			
Druid	Soil Cap	19.0		
Upper Nevada Gulch (South Aspect)	Rock Cap	16.5		4,800
Upper Nevada Gulch (North Aspect)	Soil Cap	16.5		
Gregory Gulch #3	Remove		3,700	300
Centennial	Remove		1,500	100
Niagra	Remove		5,600	200
Iroquois	Rock Cap	3.0		300
Hazeltine	Soil Cap	0.9		300
Anchor	Soil Cap	1.9		300
Total		67.8	13,700	9,200

Provide Comments on the Proposed Plan



Next Steps

- **Public Comment 8/23**
- **Agencies consider comments and prepare a Record of Decision by 9/30/2004**



