

**TOTAL MAXIMUM DAILY LOAD ASSESSMENT
SAN MIGUEL RIVER
SEGMENTS COGUSM03a, COGUSM03b, COGUSM06a, COGUSM06b
Zinc and Cadmium**

**SAN MIGUEL COUNTY, COLORADO
August 2008**

TMDL SUMMARY

Waterbody Name/Segment Number	COGUSM03a Mainstem of San Miguel River from the confluence of Bridal Veil and Ingram Creeks to a point immediately above the confluence of Marshall Creek COGUSM03b Mainstem of the San Miguel River from a point immediately above the confluence of Marshall Creek to a point immediately above the confluence of South Fork San Miguel River COGUSM06a Mainstem of Ingram Creek including all tributaries, lakes, reservoirs, and wetlands from source to confluence with San Miguel River COGUSM06b Mainstem of Marshall Creek including all tributaries, lakes, reservoirs, and wetlands from source to confluence with San Miguel River																										
Pollutant/Condition Addressed	Zn (dissolved): COGUSM03a, COGUSM03b, COGUSM06a, COGUSM06b Cd (dissolved): COGUSM03b																										
Affected Portion of Segments	All																										
Use Classifications/Designations	<u>COGUSM03a/ COGUSM03b</u> Agriculture Aquatic Life Cold 1 Recreation E	<u>COGUSM06a/ COGUSM06b</u> Agriculture Aquatic Life Cold 2 Recreation E																									
Waterbody Designation	Reviewable																										
Water Quality Targets (dissolved metal fraction)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Segment</th> <th style="text-align: left;">Metal</th> <th style="text-align: left;">Chronic</th> <th style="text-align: left;">Acute</th> </tr> </thead> <tbody> <tr> <td>COGUSM03a</td> <td>Zn</td> <td>190</td> <td>-</td> </tr> <tr> <td>COGUSM03b</td> <td>Zn</td> <td>190</td> <td>-</td> </tr> <tr> <td>COGUSM03b</td> <td>Cd</td> <td> $1.101672 - \frac{[\ln(\text{hardness})]^* (0.041838)]^*}{e^{(0.7998[\ln(\text{hardness})]-4.4451)}}$ </td> <td> $1.136672 - \frac{[\ln(\text{hardness})]^* (0.041838)]^*}{e^{0.9151[\ln(\text{hardness})]-3.6236}}$ </td> </tr> <tr> <td>COGUSM06a</td> <td>Zn</td> <td> $0.986^* e^{(8525[\ln(\text{hardness})]+0.9109)}$ </td> <td> $0.978^* e^{(8525[\ln(\text{hardness})]+1.0617)}$ </td> </tr> <tr> <td>COGUSM06b</td> <td>Zn</td> <td>190</td> <td>-</td> </tr> </tbody> </table>			Segment	Metal	Chronic	Acute	COGUSM03a	Zn	190	-	COGUSM03b	Zn	190	-	COGUSM03b	Cd	$1.101672 - \frac{[\ln(\text{hardness})]^* (0.041838)]^*}{e^{(0.7998[\ln(\text{hardness})]-4.4451)}}$	$1.136672 - \frac{[\ln(\text{hardness})]^* (0.041838)]^*}{e^{0.9151[\ln(\text{hardness})]-3.6236}}$	COGUSM06a	Zn	$0.986^* e^{(8525[\ln(\text{hardness})]+0.9109)}$	$0.978^* e^{(8525[\ln(\text{hardness})]+1.0617)}$	COGUSM06b	Zn	190	-
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TMDL Goal	Attainment of water quality standards																										

I. EXECUTIVE SUMMARY

Segments of the upper San Miguel River including the mainstem of the San Miguel River from Bridal Veil and Ingram Creeks to Marshall Creek (COGUSM03a), the mainstem below Marshall Creek to the South Fork of the San Miguel River (COGUSM03b), Ingram Creek (COGUSM06a), and Marshall Creek (COGUSM06b) have been identified as water-quality limited due to non-attainment of the assigned Aquatic Life Use-based chronic zinc standard on the 1998 303(d) List and on subsequent lists. In 2008, Segment COGUSM03b also was listed due to exceedances of the Aquatic Life Use-based cadmium standard (Table 1). This Total Daily Maximum Load (TMDL) assessment addresses the aquatic life impairments due to contributions of dissolved zinc from the Idarado Mine. The TMDL also addresses the aquatic life impairments in COGUSM03b due to dissolved cadmium. This TMDL derives load allocations for dissolved zinc and dissolved cadmium to demonstrate the load reduction necessary to attain the currently adopted standards.

For informational purposes, dissolved cadmium TMDLs are also provided for Segments COGUSM03a, COGUSM06a, and COGUSM06b. Although these segments currently are not on the 303(d) List they are not in attainment of the currently assigned Aquatic Life Use-based acute and chronic cadmium standards. This information was added after the initial Public Notice process (April 2008) in response to comments received from EPA. At this time, the Division is not seeking approval of the cadmium TMDLs for COGUSM03a, COGUSM06a and COGUSM06b. These TMDLs will be sent to Public Notice at a later date.

II. INTRODUCTION

Section 303(d) of the federal Clean Water Act requires states to identify water bodies or stream segments which are water quality limited. Water quality limited segments are those water bodies or stream segments which, for one or more assigned use classifications or standards, the classification or standard is not fully achieved. Once listed, the State is required to quantify the amount of a specific pollutant that a listed water body can assimilate without violating applicable water quality standards and to apportion that allowable quantity among the different pollutant sources. This maximum allowable pollutant quantity is referred to as the Total Maximum Daily Load (TMDL). The TMDL is comprised of the Load Allocation (LA) which is that portion of the pollutant load attributed to natural background or the nonpoint sources, the Waste Load Allocation (WLA) which is that portion of the pollutant load associated with point source discharges, and a Margin of Safety (MOS). The TMDL may also include an allocation reserved to accommodate future growth. The TMDL may be expressed as the sum of the LA, WLA and MOS.

The San Miguel River from Bridal Veil and Ingram Creeks to Marshall Creek (COGUSM03a), the mainstem below Marshall Creek to the South Fork of the San Miguel River (COGUSM03b), Ingram Creek (COGUSM06a), and Marshall Creek (COGUSM06b) were first identified as impaired on the 1992 303(d) List. The cause of impairments was identified as "metals". The listing of these segments remained unchanged on the 1994 and 1996 303(d) Lists. On Colorado's 1998 303(d) List, the San Miguel River (segments COGUSM03a and COGUSM03b), and Marshall Creek (COGUSM06b) were identified as impaired for dissolved zinc. Segment COGUSM03b was also listed for impairment of cadmium, manganese, and sediment standards. A sediment TMDL for COGUSM03b was completed and approved by the U. S. Environmental Protection Agency (EPA) in 2000.

In the subsequent 2002 303(d) List, all four segments were identified for impairment due to zinc. Also in 2002, the listing for segment COGUSM03b was modified to remove cadmium, manganese, and sediment. These segment listings remained the same in 2004, and 2006. In 2008, Segment COGUSM03b was listed for cadmium. All segments addressed by this TMDL were in non-attainment for the d numeric chronic zinc standard. In addition, Segment COGUSM03b was in non-attainment for Aquatic Life Use-based acute and chronic cadmium standards. Numeric standards for all other classified uses are attained, and those uses are supported (Table 1).

The goal of this TMDL document is to identify the reductions in metals loadings for dissolved zinc and dissolved cadmium necessary to attain the applicable water quality standards for each segment.

Segment #	Segment Description	Portion	303(d) Listed Contaminants	Designated Uses/Impairment Status
COGUSM03a	Mainstem of San Miguel River from the confluence of Bridal Veil and Ingram Creeks to a point immediately above the confluence of Marshall Creek	All	Zn (dissolved)	Aquatic Life Cold 1 / Impaired Recreation E / Not Impaired Agriculture / Not Impaired
COGUSM03b	Mainstem of the San Miguel River from a point immediately above the confluence of Marshall Creek to a point immediately above the confluence of South Fork San Miguel River	All	Zn (dissolved), Cd (dissolved)	Aquatic Life Cold 1 / Impaired Recreation E / Not Impaired Agriculture / Not Impaired
COGUSM06a	Mainstem of Ingram Creek including all tributaries, lakes, reservoirs, and wetlands from source to confluence with San Miguel River	All	Zn (dissolved)	Aquatic Life Cold 2 / Impaired Recreation E / Not Impaired Agriculture / Not Impaired
COGUSM06b	Mainstem of Marshall Creek including all tributaries, lakes, reservoirs, and wetlands from source to confluence with San Miguel River	All	Zn (dissolved),	Aquatic Life Cold 2 / Impaired Recreation E / Not Impaired Agriculture / Not Impaired

Table 1. Segments within the San Miguel River watershed that appear on the 2006 and 2008 303(d) list of impaired water bodies and status of use attainment

III. SEGMENT DESCRIPTIONS

The San Miguel River originates in the San Juan Mountains of San Miguel County near Telluride, Colorado. The headwater tributaries flow through historic mining areas. The regulatory segments of concern for this TMDL include San Miguel segments COGUSM03a, COGUSM03b, COGUSM06a, and COGUSM06b. All four segments fall within the Hydrologic Unit 14030003. Segment COGUSM03a consists of the mainstem of San Miguel River from the confluence of Bridal Veil and Ingram Creeks to a point immediately above the confluence of Marshall Creek. Segment COGUSM03b consists of the mainstem of the San Miguel River from a point immediately above the confluence of Marshall Creek to a point immediately above the confluence of South Fork San Miguel River. Segment COGUSM06a consists of the mainstem of Ingram Creek including all tributaries, lakes, reservoirs, and wetlands from the source to the confluence with San Miguel River. Segment COGUSM06b consists of the mainstem of Marshall Creek, including all tributaries, lakes, reservoirs, and wetlands from the source to the confluence with San Miguel River. The San Miguel watershed area above the U.S.G.S. Placerville gage is 310 square miles. The watershed area of the 4 segments addressed by this TMDL is approximately 50.74 square miles (Figure 1).

The tributaries to the San Miguel drain several historic mining districts; however, no active mining is currently underway in the region. The Idarado Mine Natural Resource Damage site is located in the upper basin and is undergoing remedial activities. The Idarado Mine is located between Telluride and Ouray. The western portal of the mine is approximately 2 miles east of Telluride on the San Miguel River, upstream from Marshall Creek, but downstream from the Ingram/Bridal Veil confluence. Water flows into infiltration lagoons, with no discernable point-source to the river. The Idarado Mine includes 7 infiltration lagoons, 6 tailings ponds, and numerous mine waste piles. (HMWMD report)

The State of Colorado filed suit against the Idarado Mining Company (Idarado) for natural resource damages under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1983. Court actions and negotiations continued until 1992 when a Consent Decree was finalized in federal court. The Consent Decree included a Remedial Action Plan describing required cleanup that involved stabilizing and re-vegetating tailings piles, clearing sediments, diverting surface runoff around mine wastes and re-routing internal mine waters away from mineralized regions in the underground workings. The mine company was responsible for the remediation. Cadmium and zinc contributions from the Idarado Mine are treated as non-permitted point sources in Segments COGUSM03a, COGUSM06a, and COGUSM06b for the purposes of this TMDL assessment.



Permitted dischargers to Segment COGUSM03b include the Town of Telluride Regional WWTP (permit number CO-0041840) that discharges to the San Miguel River below Society Turn, and Telecam-Lawson Hill (permit number COG584021), Last Dollar (permit number COG584005), and St. Barnabas (permit number COG584033). These latter three discharge to the San Miguel above the confluence with the South Fork of the San Miguel. All permitted facilities discharge treated domestic wastewater.

IV. HISTORY

Gold, silver, and lead mining in the Telluride area began in 1875 and continued through 1978. Hundreds of mines with hundreds of miles of tunnels were constructed, and dozens of ore mills were built. Many of these are considered historic treasures. Mining evolved from gold and silver mining to lead mining. The area became one of the most important producers of lead for the WWII war effort. The Telluride mines and mill closed in 1978. Remnants of mining activities are scattered throughout the watersheds of the upper San Miguel Basin. Tailings piles, abandoned mining equipment and abandoned mills from one hundred years of mining dot the landscape.



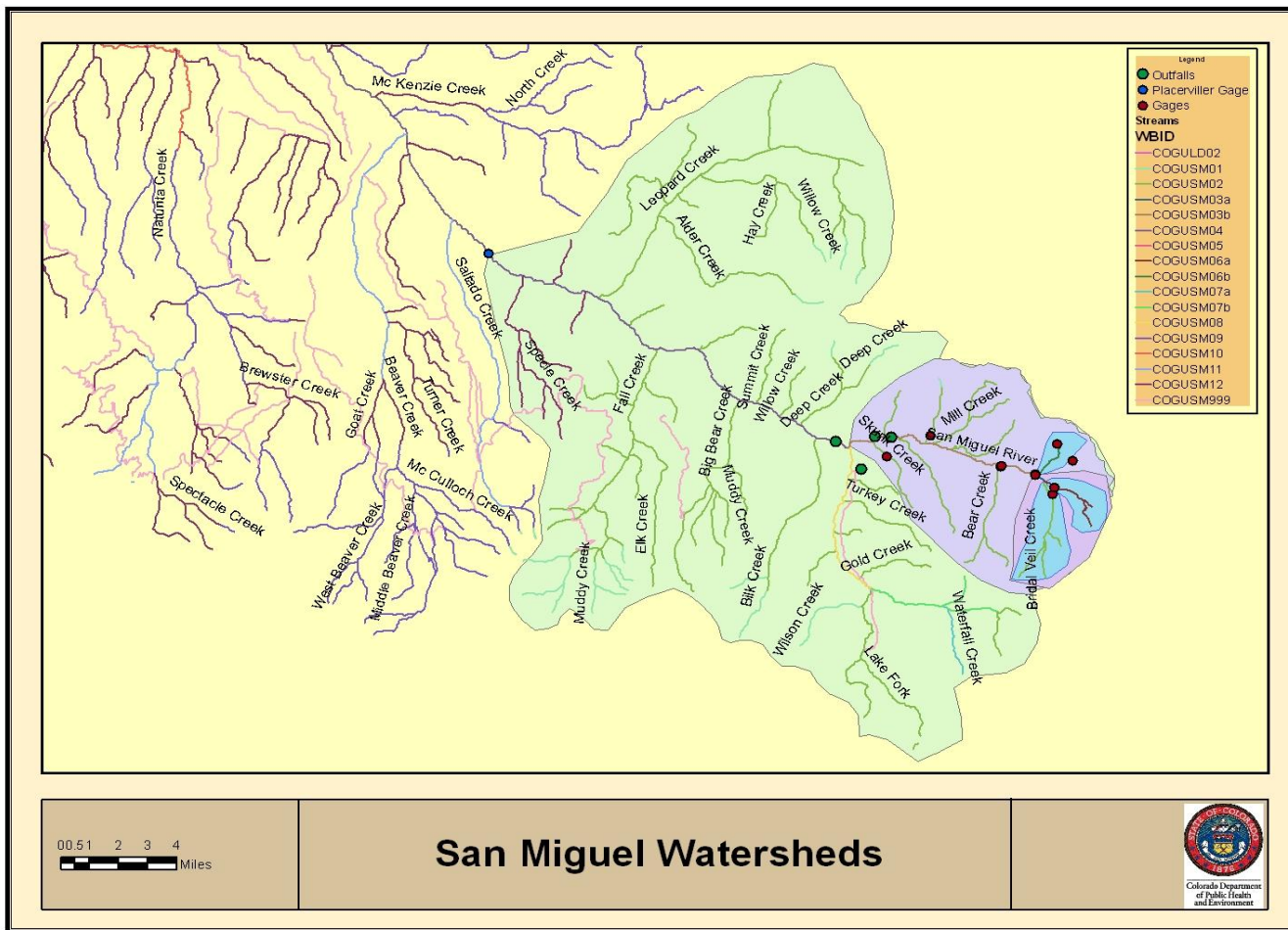


Figure 1. San Miguel Watersheds

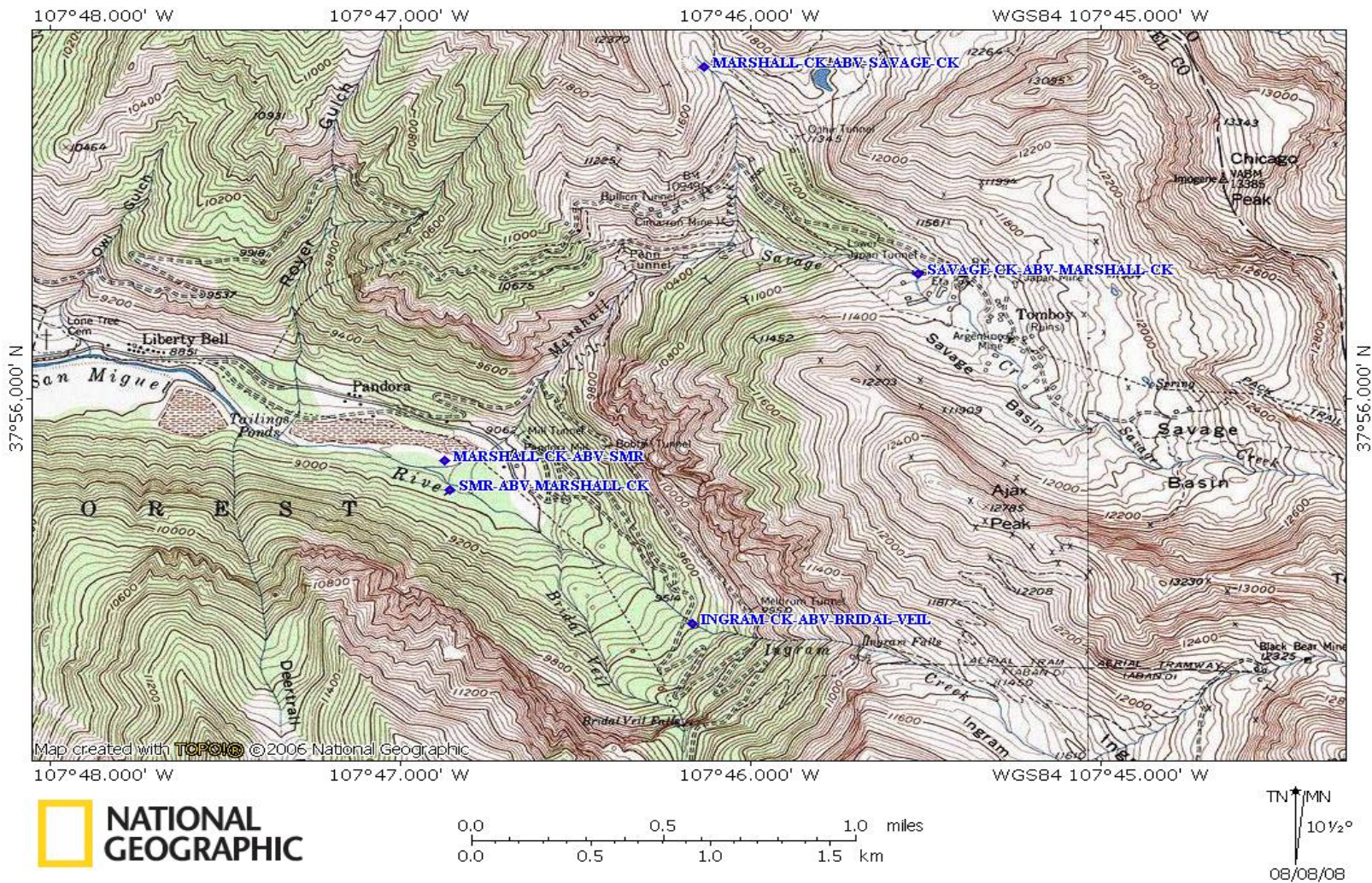


Figure 2. Topo map of upper San Miguel sites and mine features.

The Telluride Valley drainage basin includes the San Miguel River and its tributaries. Sub-basins include the Marshall Basin (Marshall Creek and Savage Creek), Ingram Basin, and Bridal Veil Basin. Ten mine portals discharged water to the Telluride Valley drainage basin (State of Colorado, v. Idarado Mining Company, 1989; Consent Decree, 1992). The High Country includes Marshall Basin, Savage Basin and Ingram Basin. Portals in the Marshall Basin include Union, Ophir, Bullion and Penn Tunnels. Portals in the Savage Basin include the Columbia, Tomboy, and Lower Japan Tunnels. Drainage from Marshall and Savage Basins merge into Marshall Creek which flows into the San Miguel River. Most of the waste rock piles are located at the base of Marshall Creek. Most of the water from the Idarado Mine drains from two tunnels: the Meldrum and the Mill Level Tunnels.

The Black Bear Tunnel and the Meldrum Tunnel are located in The Ingram Basin. The Black Bear Tunnel was reported to be the worst mine water source, with zinc concentrations of 460 mg/L, as well as elevated lead concentrations. The pH of this water is 2.9 s.u. However, as noted above, the Black Bear Tunnel does not contribute significantly, in terms of flow. The Black Bear Tunnel has been remediated to re-route the drainage to the Meldrum Tunnel.

The Meldrum has a base flow of 300 gpm and a peak flow of 8,000 gpm. Discharge from this tunnel flows through a perforated pipe (weep line), seeps into the ground, and ultimately reaches Ingram Creek. The annual load of zinc from the Meldrum Tunnel into the San Miguel River was approximately 60,000 pounds. There is no discernable point source discharge to Ingram Creek.

The Mill Level portal discharges into a series of infiltration lagoons and then into the ground. The base flow for this tunnel averages 2,000 gpm; peak flow averages 13,000 gpm. The portal water generates an average load of 91,000 pounds of zinc per year.

In 1976, the Colorado Department of Health issued a NPDES discharge permit for discharges from the Mill Level, Meldrum, and Treasury Tunnels. (The Treasury Tunnel discharged to Red Mountain) No releases to surface waters were authorized. The discharge permit was terminated through negotiations between the State and Idarado resulting in the Consent Decree. Drainage from the Meldrum and Mill Level Tunnels are infiltrated into the ground. There are no discernable discharges to Ingram Creek and the San Miguel River, respectively.

In the 1980's and 1990's, activities changed from mining to reclamation. As a result of a 1983 law suit filed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (State of Colorado vs. Idarado), remediation efforts became a focus in the watershed.

A Consent Decree was entered into by the State of Colorado and Idarado in 1992. The Consent Decree includes a Remedial Action Plan (RAP) that describes remedial activities to be performed at the Idarado Mine sites. The remedial activities were specified as Scheduled Activities and included such work as remediating tailings piles, constructing diversion channels around tailings and mine waste piles, plugging or re-routing mine drainages to flow to the Meldrum and Mill Level tunnels for treatment through infiltration.

Eight of the tunnels located in what is called the High Country, were remediated as part of the Consent Decree by plugging and re-routing the drainage to the Mill Level or Meldrum tunnels. Any residual flow is a relatively small amount of water (<5 gallons per minute (gpm)). The Black Bear Tunnel has been remediated to re-route the drainage to the Meldrum Tunnel.

Idarado has conducted water quality monitoring at several locations in the watershed over a period from 1992 to the present. For the purposes of this TMDL, water quality data from 2002-2006 were obtained from hard-copy reports submitted to the State of Colorado.

V. WATER QUALITY STANDARDS

Standards Framework

Waterbodies in Colorado are divided into discrete units or “segments”. The Colorado *Basic Standards and Methodologies for Surface Water*, Regulation 31, discusses segmentation of waterbodies in terms of several broad considerations:

31.6(4)(b)...Segments may constitute a specified stretch of a river mainstem, a specific tributary, a specific lake or reservoir, or a generally defined grouping of waters within the basin (e.g., a specific mainstem segment and all tributaries flowing into that mainstem segment.

(c) Segments shall generally be delineated according to the points at which the use, physical characteristics or water quality characteristics of a watercourse are determined to change significantly enough to require a change in use classifications and/or water quality standards

As noted in paragraph 31.6(4)(c), the use or uses of surface waters are an important consideration with respect to segmentation. In Colorado there are four categories of beneficial use which are recognized. These include Aquatic Life Use, Recreational Use, Agricultural Use and Water Supply Use. A segment may be designated for any or all of these “Use Classifications”:

31.6 Waters shall be classified for the present beneficial uses of the water, or the beneficial uses that may be reasonably expected in the future for which the water is suitable in its present condition or the beneficial uses for which it is to become suitable as a goal.

Each assigned use is associated with a series of pollutant specific numeric standards. These pollutants may vary and are relevant to a given Classified Use. Numeric pollutant criteria are identified in sections 31.11 and 31.16 of the *Basic Standards and Methodologies for Surface Water*.

Uses and Standards Addressed in this TMDL

The segments of the San Miguel basin addressed by this TMDL, COGUSM03a, COGUSM03b, COGUSM06a, and COGUSM06b have use classifications and water quality standards assigned by the Colorado Water Quality Control Commission (see Table 1). The Colorado Basic Standards and Methodologies for Surface Water, Regulation 31, identifies standards applicable to all surface waters of the state (WQCC 2007a). The segment-specific numeric standards can be found in Regulation 35, Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins (WQCC, 2007b). These four listed segments have been assigned the following uses: Aquatic Life, Recreation, and Agriculture. The numeric water quality standards assigned to these segments are based on these uses. The segment descriptions and associated standards are shown in Table 2 below.

Assessments for TVS metals are based on segment-specific mean hardness values. The mainstem of the San Miguel River and Marshall Creek (segments **COGUSM03a, COGUSM03b, and COGUSM06b**) have been **assigned site-specific chronic zinc standards and are set at 190 ug/L (dissolved). No acute zinc standards are assigned for these three segments. Table Value Standards (TVS) are hardness based standards.** Acute and chronic zinc standards are assigned for Ingram Creek (segment COGUSM06a). Based on a mean total hardness value of 120 mg /l the chronic zinc TVS is 145 ug/L (Table 5). Mean total hardness value was calculated from the 9 samples summarized in Table 5. Acute TVS are calculated on a sample-specific hardness. A single exceedence of the Aquatic Life Use-based TVS for zinc has been reported and Ingram Creek is considered to be in attainment of the acute zinc standard.

According to the 1992 Consent Decree between Idarado and the State, the court-approved performance objective for improving water quality in the San Miguel River, was to reduce zinc by 50% or 276 ug/L dissolved zinc, measured as a 52-week average below the confluence with Bear Creek. However, this TMDL is required to address the underlying zinc standard assigned by the Colorado Water Quality Control Commission (WQCC) as the EPA approved standard, not the Consent Decree performance objectives.

Table 2.STREAM CLASSIFICATIONS and WATER QUALITY STANDARDS

Segment	Uses	Physical and Biological	Inorganic (mg/L)			Metals ug/L All metals in dissolved form unless noted			Temporary Modifications and qualifiers
			NH ₃ (ac/ch)=TVS Cl ₂ (ac)=0.019 Cl ₂ (ch)=0.011 CN=.005	S=0.002 B=0.75 NO ₂ =0.05 NO ₃ =100	As(ac)=340 As(ch)= 7.6(Trec) Cd(ac/ch)=TVS CrIII(ac/ch)=TVS CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ac/ch)=TVS Hg(ch)=0.01(tot) Ni(ac/ch)=TVS	Se(ac/ch)=TVS Ag(ac)=TVS Zn(ch)=190		
COGUSM03a. Mainstem of San Miguel River from the confluence of Bridal Veil and Ingram Creeks to a point immediately above the confluence of Marshall Creek.	Aq Life Cold 1 Recreation E Agriculture	D.O.=6.0 mg/L D.O.(sp)=7.0 mg/L pH=6.5-9.0 E.Coli=126/100ml	NH ₃ (ac/ch)=TVS Cl ₂ (ac)=0.019 Cl ₂ (ch)=0.011 CN=.005	S=0.002 B=0.75 NO ₂ =0.05 NO ₃ =100	As(ac)=340 As(ch)= 7.6(Trec) Cd(ac/ch)=TVS CrIII(ac/ch)=TVS CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ac/ch)=TVS Hg(ch)=0.01(tot) Ni(ac/ch)=TVS	Se(ac/ch)=TVS Ag(ac)=TVS Zn(ch)=190		
COGUSM03b. Mainstem of the San Miguel River from a point immediately above the confluence of Marshall Creek to a point immediately above the confluence of South Fork San Miguel River.	Aq Life Cold 1 Recreation E Agriculture	D.O.=6.0 mg/L D.O.(sp)=7.0 mg/L pH=6.5-9.0 E.Coli=126/100ml	NH ₃ (ac/ch)=TVS Cl ₂ (ac)=0.019 Cl ₂ (ch)=0.011 CN=.005	S=0.002 B=0.75 NO ₂ =0.05 NO ₃ =100	As(ac)=340 As(ch)= 7.6(Trec) Cd(ac)=TVS(tr) Cd(ch)=TVS CrIII(ac/ch)=TVS CrVI(ac/ch)=TVS Cu(ch)=TVS	Fe(ch)=1000(Trec) Pb(ch)=TVS Mn(ac/ch)=TVS Hg(ch)=0.01(tot) Ni(ac/ch)=TVS	Se(ac/ch)=TVS Ag(ac)=TVS Ag(ch)=TVS(tr) Zn(ch)=190	Temporary Modifications: Cd(ch) = 0.7 Zn(ch)= 198 Expiration date of 12/31/2011.	
COGUSM06a. Mainstem of Ingram Creek including all tributaries, lakes, reservoirs, and wetlands from source to confluence with San Miguel River.	Aq Life Cold 2 Recreation E Agriculture	D.O.=6.0 mg/L D.O.(sp)=7.0 mg/L pH=6.5-9.0 E.Coli=126/100ml	NH ₃ (ac/ch)=TVS Cl ₂ (ac)=0.019 Cl ₂ (ch)=0.011 CN=.005	S=0.002 B=0.75 NO ₂ =0.05 NO ₃ =100	As(ac)=340 As(ch)= 150 Cd(ac/ch)=TVS CrIII(ac/ch)=TVS CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ac/ch)=TVS Hg(ch)=0.01(tot) Ni(ac/ch)=TVS	Se(ac/ch)=TVS Ag(ac/ch)=TVS Zn(ac/ch)=TVS		
6b. Mainstem of Marshall Creek including all tributaries, lakes, reservoirs, and wetlands from source to confluence with San Miguel River.	Aq Life Cold 2 Recreation E Agriculture	D.O.=6.0 mg/L D.O.(sp)=7.0 mg/L pH=6.5-9.0 E.Coli=126/100ml	NH ₃ (ac/ch)=TVS Cl ₂ (ac)=0.019 Cl ₂ (ch)=0.011 CN=.005	S=0.002 B=0.75 NO ₂ =0.05 NO ₃ =100	As(ac)=340 As(ch)= 150 Cd(ac/ch)=TVS CrIII(ac/ch)=TVS CrVI(ac/ch)=TVS Cu(ac/ch)=TVS	Fe(ch)=1000(Trec) Pb(ac/ch)=TVS Mn(ac/ch)=TVS Hg(ch)=0.01(tot) Ni(ac/ch)=TVS	Se(ac/ch)=TVS Ag(ac/ch)=TVS Zn(ch)=190		

All assigned Aquatic Life Use-based cadmium standards are hardness-based TVS. The dissolved cadmium TVS (chronic) standard for the San Miguel River below Marshall Creek (COGUSM03b), based on a mean total hardness of 123.1 mg/L, is 0.5 ug/L. Mean total hardness was calculated from the available hardness data (n=9) for the segment. The other segments addressed in this TMDL assessment are not currently identified as in non-attainment of cadmium standards on the 2008 Section 303(d) List. However data made available in response to solicitation of public comment indicates cadmium to be in non-attainment. Therefore cadmium TMDLs for the San Miguel River between Ingram Creek and Marshall Creek (COGUSM03a), Ingram Creek (COGUSM06a), and Marshall Creek(COGUSM06b) have been calculated and are included in this TMDL assessment for informational purposes.

The mainstem of the San Miguel River from Bridal Veil and Ingram Creeks to Marshall Creek (COGUSM03a), the mainstem below Marshall Creek to the South Fork of the San Miguel River (COGUSM03b), Ingram Creek (COGUSM06a), and Marshall Creek (COGUSM06b) are in attainment of numeric standards associated with all other assigned uses.

VI. PROBLEM IDENTIFICATION

The watershed of the 303(d) listed area is highly mineralized and has a long history of mining. Although minerals such as zinc are naturally occurring, mining activities resulted in tunnels and tailing piles. These mining features are exposed to infiltration and surface runoff that leaches metals such as zinc and carries them into the surface waters.

Dissolved zinc is one pollutant of concern in this TMDL. The TMDL addresses four segments in the upper San Miguel River: the mainstem of the San Miguel River from Bridal Veil and Ingram Creeks to Marshall Creek (COGUSM03a), the mainstem below Marshall Creek to the South Fork of the San Miguel River (COGUSM03b), Ingram Creek (COGUSM06a), and Marshall Creek (COGUSM06b). The listing history is described in section II above. These segments were included on the 1998 303(d) List of Impaired Waters and are therefore addressed in the 1999 Settlement Agreement between the State, EPA and EarthJustice. As such the Division has committed to the completion of these TMDLs by June 30, 2008.

Dissolved cadmium also is a pollutant of concern for segment COGUSM03b addressed in this TMDL. For informational purposes, dissolved cadmium TMDLs were also developed for segments COGUSM03a, COGUSM06a, and COGUSM06b.

VII. WATER QUALITY GOALS

The goal of this TMDL is attainment of the assigned Aquatic Life Use-based standards for zinc and cadmium for the mainstem of the San Miguel River from Bridal Veil and Ingram Creeks to Marshall Creek (COGUSM03a), the mainstem below Marshall Creek to the South Fork of the San Miguel River (COGUSM03b), Ingram Creek (COGUSM06a), and Marshall Creek (COGUSM06b). This TMDL is written to address these standards.

VIII. SOURCE ANALYSIS

The geology of the upper San Miguel watershed is highly mineralized. As described above, the area has a long history of mining. Mining activities resulted in tunnels and tailing piles exposed to runoff that leaches metals such as zinc and cadmium and carries them into the surface waters. The Idarado Mine is the prominent mine in the area. As a result of a Consent Decree, remediation efforts have been made to reduce loadings of these metals.

Idarado conducts routine monitoring at six sites in the watershed. Data from the monitoring program are submitted in annual reports to the State of Colorado. Data from annual reports from 2002-2006 were used for this TMDL report. The State also conducts water quality monitoring at select sites in the watershed. In addition, the State conducted a limited sampling effort during September 2007. During this sampling effort, the State collected samples from Idarado's 6 sites plus 4 additional sites. The State observed that there were few accessible sites with surface flow and determined that Idarado's sites were representative of the system.

Idarado Sites: Idarado monitors one site in Segment COGUSM03a (SM-3 San Miguel River above Marshall Creek); one site in Segment COGUSM03b (SM-1 San Miguel River below Bear Creek), one site in Segment COGUSM06a (SM-4 Ingram Creek above the confluence with Bridal Veil Creek), and three sites in Segment 6b (SM-2 Marshall Creek above San Miguel River, SM-5 Marshall Creek above the confluence with Savage Creek, SM-6 Savage Creek above the confluence with Marshall Creek. Idarado collects total and dissolved zinc data from these monitoring sites. No hardness or cadmium data are collected.

The State of Colorado periodically monitors one site in Segment COGUSM03b (San Miguel River at Society Turn). The State also had historic data from monitoring the San Miguel River upstream of Marshall Creek and Marshall Creek upstream of San Miguel River.

Permitted outfalls in the watershed did not yield significant zinc loads to the system. The four permitted discharges are issued to domestic wastewater treatment facilities. As such, they are not considered major contributors of metals. Most permittees do not monitor zinc or cadmium. The Town of Telluride monitors total zinc, total cadmium and potentially dissolved cadmium (Permit CO-0041840). Sample results were all well below the assigned standards for dissolved cadmium and dissolved zinc. The discharge point is at the lower end of COGUSM03b, and is downstream from all surface water monitoring sites assessed for this report. Therefore, no wasteload allocation addressing this discharge is necessary.

IX. AMBIENT WATER QUALITY

Data sources used to assess water quality for the San Miguel 303(d) listed segments are described in the Source Analysis section above. The compiled data for assessment of dissolved zinc include both Idarado data and Division data. As mentioned above, Idarado does not collect cadmium or hardness data. Therefore the dissolved cadmium assessments use only Division data.

According to the Division's assessment methodology, available data from a segment are used to calculate the relevant statistic (85th percentile for dissolved metals, or mean for hardness) to represent ambient quality. For the purpose of this TMDL, if multiple sites within a segment were available, the data were examined separately for each site as well as combined (see discussion below in Assessment Methodology).

Zinc Ambient Quality

Assessment of the dissolved zinc data documents non-attainment of chronic Aquatic Life Use-based standards for the mainstem of the San Miguel River from Bridal Veil and Ingram Creeks to Marshall Creek (COGUSM03a), the mainstem below Marshall Creek to the South Fork of the San Miguel River (COGUSM03b), Ingram Creek (COGUSM06a), and Marshall Creek (COGUSM06b). Ambient quality for each of the listed segments for dissolved zinc is presented in Table 3.

The quantity of data for each segment is considered adequate for this report. Although data for COGUSM06a is limited, the individual samples are consistent and therefore considered representative of the segment.

Table 3. Ambient water quality (dissolved zinc) for San Miguel 303(d) Listed segments.

Segment #	n	Avg. Hardness, mg/L	Zn, diss, chronic (ug/L)	Zn, diss Observed (ug/L)
COGUSM03a	57	N/A	190	266
COGUSM03b	267	N/A	190	430
COGUSM06a	9	120	145	1190
COGUSM06b	70	N/A	190	2299

Acute zinc standards are not applicable to COGUSM03a, COGUSM03b, and COGUSM06b. The acute Aquatic Life Use-based standard for Ingram Creek (COGUSM06a) is based on sample-specific hardness and therefore is calculated for each discrete sampling event. Data from Ingram Creek were assessed for attainment of the acute standard for dissolved zinc. Although a single acute exceedance was observed in the 5-year data record, according to the Section 303(d) Listing Methodology – 2008 Listing Cycle, Ingram Creek is in attainment of the acute standard (exceedance of the standard less frequently than twice in three years).

Cadmium Ambient Quality

Although Segment COGUSM03b is the only San Miguel River segment currently listed for non-attainment of the dissolved cadmium standard, the limited cadmium data available for the other listed segments addressed in this TMDL assessment suggest that all four segments exceed the chronic cadmium standard. Assessment of the dissolved cadmium data documents non-attainment of Aquatic Life Use-based chronic cadmium standards for aquatic life uses for the mainstem of the San Miguel River from Bridal Veil and Ingram Creeks to Marshall Creek (COGUSM03a), the mainstem below Marshall Creek to the South Fork of the San Miguel River (COGUSM03b), Ingram Creek (COGUSM06a), and Marshall Creek (COGUSM06b). Although only COGUSM03b is currently listed for cadmium, this document includes cadmium TMDLs for all 4 segments. Table 4 presents the ambient quality for dissolved cadmium for each segment. Observed cadmium values are 85th percentiles.

Table 4. Ambient water quality (dissolved cadmium) for San Miguel segments.

Segment #	N	Avg. Hardness, mg/L	Cd, diss, chronic (ug/L)	Cd, diss Observed (ug/L)
COGUSM03a	12	104	0.44	1.14
COGUSM03b*	81	123	0.50	0.89
COGUSM06a	1	120	0.49	5.4
COGUSM06b	6	88	0.38	9.35

*Note that only Segment COGUSM03b is on the 303(d) List due to cadmium non-attainment.

The cadmium data were assessed for exceedances of the acute standards as well as chronic standards. Acute standards may be assigned based upon the likely presence or absence of reproducing trout populations. The acute standard applied to San Miguel River segment 3b is that which is based upon trout toxicity. The alternate acute standard is assigned to the remaining segments. The acute Aquatic Life Use-based cadmium standards are based on sample-specific hardness and therefore are calculated for each discrete sampling event.

Although a single acute exceedance was observed in the data record (n=81), according to the 303(d) Listing Methodology, San Miguel River segment 3b is in attainment of the trout-based acute cadmium standard. Segment COGUSM03a is in attainment of the acute cadmium standards as no acute exceedances were observed. The single cadmium sample from Ingram Creek (COGUSM06a) exceeded the acute standard. Acute exceedances were observed in Marshall Creek (COGUSM06b) in 5 of the 6 samples.

The Division collected samples from four undisturbed (i.e. no visual evidence of historic mining activity) tributaries in the basin. Data from these tributaries is assumed to be representative of natural background conditions. The cadmium results for these 4 samples were all reported as less than the analytical detection limits. For assessment purposes these results are treated as 0.0 ug/L dissolved cadmium.

The cadmium sources appear to be in the upper reaches of the basin, namely in Segments COGUSM03a, COGUSM06a and COGUSM06b. The cadmium probably originates from mining features associated with the Idarado Mine. As stated in Section III, these are considered non-permitted point sources. Cadmium TMDLs will therefore be identified as Wasteload Allocations.

IX. TECHNICAL ANALYSIS

Hydrology

Discharge data are required to calculate loads for TMDL assessments. Flow records are rarely as complete or extensive as the chemistry from monitoring data. The data record for the San Miguel segments includes instantaneous flow measurements for much of the period of record. However, the data for flow are less complete than the chemistry data. The gaps in the hydrology were filled in using flow records from a nearby gage.

The hydrograph for the San Miguel River is typical of a high mountain stream, with low flows occurring in the late fall to early spring followed by increases in flow in spring (May-June) due to snow melt. High flows may occur in September due to precipitation events. The Placerville gage is the only gage in the system, and has the most extensive data record. The hydrograph for the San Miguel River at the Placerville gage should approximate the patterns higher in the watershed, except at a larger magnitude (Figure 2). These Placerville gage data were used to model flows for monitoring stations upstream in the watershed.

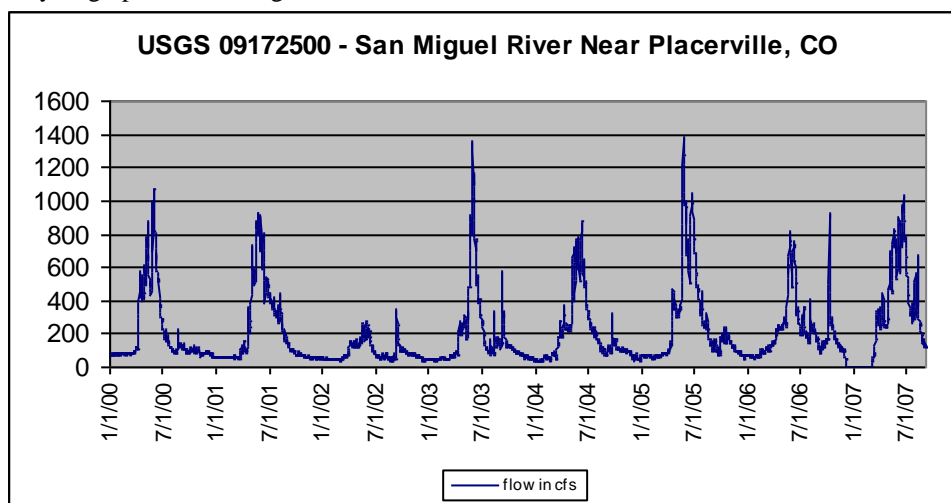
Flow measurements are available for all sampling events conducted for Ingram Creek (COGUSM06a) (n=9). The data for some of the monitoring stations in mainstem San Miguel segments COGUSM03a and COGUSM03b, and Marshall Creek (COGUSM06b) included instantaneous flow measurements. For each segment, available flow data were regressed with Placerville gage data. Power functions were used to calculate missing flow values. The equations and associated r-squared values determined for each site are presented in Table 5.

No flow data were available for WQCD site 10815 in COGUSM03b. In this case, the sub-basin land area was compared to the land area for the Placerville Gage. The resulting ratio was applied to the Placerville Gage data to estimate flow values for site.

Table 5

Segment/site	Parameter	Equation/Ratio	R ²
COGUSM03a	Zn	$Y=0.0012*X^{1.623}$	0.71
COGUSM03b	Zn	$Y=0.0093*X^{1.4852}$	0.82
COGUSM03b	Cd	0.16	
COGUSM06a	Zn	*Used available data	
COGUSM06b	Zn	$Y=0.0035*X^{1.3151}$	0.78

Figure 2. Hydrograph for San Miguel River near Placerville



Assessment Methodology

Streamflow and instream pollutant concentrations were analyzed to determine existing loading and necessary load reductions for zinc. Typically, instream effects are larger during high flow events, as would be expected from nonpoint sources of pollution. The loading estimates and load reductions are calculated using monthly median stream flows (based on instantaneous and estimated flows) and 85th percentile water quality data. For segments with data records to support analysis of the full annual cycle, monthly loads for the listed pollutants of concern were determined. For segments with limited data sets, loading estimates and loading reductions were based on a seasonal or annual basis.

All available data were examined to obtain information for each segment. However, the TMDLs were calculated based on a practical point of attainment. The point of attainment, or decision point for each segment's TMDL depended on several factors. The main factor was where data were available. For segments that had only one monitoring site, that site is identified as the attainment point. For segments with more than one monitoring site, the WQCD determined that attainment of the standard at points in the upper reaches of the segment would ensure attainment throughout the segment. Therefore, the TMDL was determined from data from that upper site, rather than by pooling all data for the segment.

For example, San Miguel River segment COGUSM03b had monitoring data from the upper end of the segment and from the lower end of the segment. The data record demonstrated attenuation of the zinc concentration occurs at the downstream sampling location. The TMDL for zinc was therefore determined from the data for the upper site. Attainment of the standard at this point would ensure protection of the uses throughout the entire segment. However, for the same segment, cadmium data were available only from the lower monitoring station. Therefore, the cadmium TMDL was determined from those data. The cadmium TMDLs for all other segments are based on all data from those segments.

TMDL

A Total Maximum Daily Load (TMDL) is the maximum allowable pollutant quantity a listed water body can assimilate without violating applicable water quality standards. The components of a TMDL include a Waste Load Allocation (WLA) which is the portion of the pollutant load associated with point source discharges, a Load Allocation (LA) which is the portion of the TMDL attributed to natural background or nonpoint sources, and a Margin of Safety (MOS).

Although point sources within the listed segments are relatively insignificant in terms of loading, anthropogenic sources of zinc loading are assumed to be derived from mining features. Limited data were available to distinguish background loads. One sample representative of conditions for background zinc concentrations showed a zinc concentration approximately 10 percent of the concentrations measured in mining-impacted areas. This 10 percent factor for background was applied as the Load Allocation (LA) for zinc TMDLs. The remainder of the zinc TMDL is allocated to the WLA. Necessary load reductions are expressed for the TMDL.

For cadmium, anthropogenic sources also are assumed to be derived from mining features. Limited data were available to determine background loads, but the four samples all showed 0.0 ug/L dissolved cadmium. Therefore the entire cadmium TMDL is allocated to the WLA.

Federal regulations require that TMDLs include a Margin of Safety (MOS). The MOS is an element that considers loading calculations and accounts for the uncertainty inherent in those calculations. While the MOS may be implicit or explicit, these TMDLs include an explicit MOS. The total load for each segment was calculated using median monthly stream flows and the existing stream standard plus a ten percent MOS. This load represented the TMDL and was partitioned between the WLA and the LA.

Total Maximum Daily Loads by Segment

Segment COGUSM03a. San Miguel Segment COGUSM03a includes the mainstem of San Miguel River from the confluence of Bridal Veil and Ingram Creeks to a point immediately above the confluence of Marshall Creek. Monitoring data were available from Idarado (SM-3) and from WQCD (WQCD #10818). Data from both sources were pooled to calculate the TMDL. Although this site is from the lower end of the segment, these are the only data available for the segment.

Table 6 documents the ambient water quality, the TMDL, and associated load reductions for zinc for San Miguel segment COGUSM03a. Negative percent reduction values indicate attainment of the zinc standard for those months and no load reductions would be required. The standard is attained during low flow months from December through April. No monitoring data were available for January and February at this site. However, based on the observation that the zinc standard is attained in adjacent months, it is likely that the standard is attained in January and February. The TMDL for segment COGUSM03a is expressed as Waste Load Allocations (WLAs) and Load Allocations (LAs).

Table 6. Zn TMDL and Load Reduction by month										
Segment: COGUSM03a										
San Miguel River above Marshall Creek (SM-3) (n= 58)										
	Zn-D	Zn-D	Median Flow	Zn-D	TMDL	MOS	Reduction	%	TMDL LA	TMDL WLA
	TVS ug/L	Observed ug/L	cfs	Observed, lbs/day	lbs/day	lbs/day	lbs/day	Reduction	lbs/day	lbs/day
Jan	190									
Feb	190									
Mar	190	51.0	2.8	0.76	2.56	0.3	-1.80	-235	0.3	2.3
Apr	190	82.5	8.3	3.72	7.71	0.9	-3.99	-107	0.8	6.9
May	190	187.0	16.5	16.61	15.19	1.7	1.42	9	1.5	13.7
Jun	190	396.0	56.4	120.53	52.05	5.8	68.49	57	5.2	46.8
Jul	190	178.0	5.8	5.61	5.39	0.6	0.22	4	0.5	4.9
Aug	190	360.0	2.4	4.59	2.18	0.2	2.41	53	0.2	2.0
Sep	190	258.0	3.2	4.40	2.91	0.3	1.48	34	0.3	2.6
Oct	190	196.0	2.4	2.50	2.18	0.2	0.32	13	0.2	2.0
Nov	190	222.5	2.1	2.50	1.92	0.2	0.58	23	0.2	1.7
Dec	190	70.0	1.5	0.58	1.41	0.2	-0.84	-144	0.1	1.3

For cadmium, monitoring data were available from WQCD (WQCD #10818). Table 7 documents the ambient water quality, the TMDL, and associated load reductions for cadmium for San Miguel segment COGUSM03a. The TMDL for segment COGUSM03a is expressed as a Waste Load Allocation (WLA).

Table 7. Annual Cd TMDL and Load Reduction (includes 10% MOS)								
Segment: COGUSM03a								
San Miguel River above Marshall Creek (SM-3) (n= 12)								
	Cd-D	Cd-D	Median Flow	Cd-D	TMDL WLA	MOS	Reduction	%
Hardness	TVS ug/L	Observed ug/L	cfs	Observed, lbs/day	lbs/day	lbs/day	lbs/day	Reduction
104	0.44	1.14	4.4	0.03	0.01	0.001	0.02	65

Segment COGUSM03b. San Miguel Segment COGUSM03b includes the mainstem of the San Miguel River from a point immediately above the confluence of Marshall Creek to a point immediately above the confluence of South Fork San Miguel River. Data were available from two sites in this segment. Idarado monitors a site in the upper part of this segment on the San Miguel River below Bear Creek (SM-1). WQCD monitors a site near the lower boundary of the segment on the San Miguel at Society Turn (WQCD #10815). Data from both sites were examined. However, the zinc TMDL is based on the Idarado site SM-1 as attainment of the water quality standards at this site will result in attainment throughout the segment. Idarado data from 2002 through 2006 were used to calculate the zinc TMDL. Table 8 documents the zinc TMDL for San Miguel segment COGUSM03b. The zinc TMDL for segment COGUSM03b is expressed as Waste Load Allocations (WLAs) and Load Allocations (LAs).

Table 8. Zn TMDL and Load Reduction by month (includes 10% MOS)										
Segment: COGUSM03b										
San Miguel River below Bear Creek (SM-1) (n=267)										
	Zn-D	Zn-D	Median Flow	Zn-D	TMDL	MOS	Reduction	%	TMDL LA	TMDL WLA
	TVS ug/L	Observed ug/L	cfs	Observed, lbs/day	Lbs/day	Lbs/day	Lbs/day	Reduction	lbs/day	lbs/day
Jan	190	290.0	2.8	4.3	2.6	0.3	1.8	41	0.3	2.3
Feb	190	260.0	4.5	6.3	4.1	0.5	2.2	34	0.4	3.7
Mar	190	265.5	6.5	9.4	6.0	0.7	3.3	36	0.6	5.4
Apr	190	550.0	29.2	86.6	26.9	3.0	59.7	69	2.7	24.2
May	190	460.0	87.9	218.4	81.2	9.0	137.2	63	8.1	73.1
Jun	190	370.0	117.9	235.6	108.9	12.1	126.7	54	10.9	98.0
Jul	190	377.0	29.8	60.7	27.6	3.1	33.2	55	2.8	24.8
Aug	190	380.0	15.9	32.6	14.6	1.6	17.9	55	1.5	13.2
Sep	190	552.0	14.8	44.1	13.7	1.5	30.4	69	1.4	12.3
Oct	190	415.0	11.2	25.2	10.4	1.2	14.8	59	1.0	9.3
Nov	190	287.0	7.9	12.3	7.3	0.8	5.0	40	0.7	6.6
Dec	190	317.0	4.2	7.2	3.9	0.4	3.3	46	0.4	3.5

The cadmium TMDL for San Miguel Segment COGUSM03b is based on data from the WQCD site at the lower boundary of the segment (WQCD #10815), as this was the only site in the segment for which cadmium data were available. No acute cadmium exceedances were observed in the data record. Therefore, this TMDL addresses the chronic cadmium standard. Table 9 documents the cadmium TMDL for segment COGUSM03b which is expressed entirely as Waste Load Allocation. There is no LA term for the cadmium TMDL.

Table 9. Cd TMDL and Load Reduction by month (includes 10% MOS)									
Segment: COGUSM03b									
San Miguel River at Society Turn (WQCD 10815) (n=81)									
Mean Total Hardness=123 mg/L									
	Mean Hardness	Cd-D	Cd-D	Median Flow	Cd-D	TMDL	MOS	Reduction	%
		TVS ug/L	Observed ug/L	cfs	Observed, lbs/day	lbs/day		lbs/day	Reduction
Jan	125	0.50	0.67	10.5	0.04	0.03	0.003	0.013	33
Feb	153	0.58	0.57	9.8	0.03	0.03	0.003	0.002	8
Mar	156	0.59	0.69	14.4	0.05	0.04	0.005	0.013	23
Apr	143	0.56	0.80	24.4	0.11	0.07	0.007	0.039	37
May	85	0.38	1.03	105.7	0.59	0.20	0.022	0.390	37
Jun	66	0.31	0.90	112.7	0.55	0.17	0.019	0.376	69
Jul	98	0.42	0.85	29.8	0.14	0.06	0.007	0.075	55
Aug	110	0.46	0.87	42.4	0.20	0.10	0.011	0.103	52
Sep	125	0.50	0.94	20.1	0.10	0.05	0.005	0.053	52
Oct	127	0.51	0.90	16.2	0.08	0.04	0.004	0.039	49
Nov	148	0.57	0.95	13.1	0.07	0.04	0.004	0.031	46
Dec	150	0.58	0.76	12.8	0.05	0.04	0.004	0.016	31

Segment COGUSM06a. San Miguel Segment COGUSM06a is the mainstem of Ingram Creek including all tributaries, lakes, reservoirs, and wetlands from source to the confluence with San Miguel River. Idarado and WQCD monitored one site in this segment. WQCD sampled Idarado's site during 2007. Idarado data from 2002-2006 and WQCD data from 2007 were pooled to calculate the TMDL for this segment. Table 10 documents the zinc TMDL for COGUSM06a. The TMDL is expressed as Waste Load Allocations (WLAs) and Load Allocations (LAs).

Table 10. Annual Zn TMDL and Load Reduction (includes 10% MOS)										
Segment: COGUSM06a										
Ingram Creek above the confluence with Bridal Veil Creek (n=9)										
Hardness	Zn-D	Zn-D	Median Flow	Zn-D	TMDL	MOS	Reduction	TMDL WLA	TMDL LA	%
	TVS ug/L	Observed ug/L	cfs	Observed, lbs/day	lbs/day		lbs/day	lbs/day	lbs/day	Reduction
120	145	1190	5.8	37.3	4.1	0.5	33.2	3.7	0.4	89

Cadmium data for Segment COGUSM06a was available from one sampling event. Table 11 documents the ambient water quality, the cadmium TMDL, and associated load reductions for cadmium for San Miguel segment COGUSM06a. The cadmium TMDL is expressed as a Waste Load Allocations (WLA). Attainment of the TMDL for the chronic standard will ensure the acute cadmium standard is not exceeded.

Table 11. Annual Cd TMDL and Load Reduction (includes 10% MOS)								
Segment: COGUSM06a								
Ingram Creek above the confluence with Bridal Veil Creek (n=1)								
Hardness	Cd-D	Cd-D	Median Flow	Cd-D	TMDL WLA	MOS	Reduction	%
	TVS ug/L	Observed ug/L	cfs	Observed, lbs/day	lbs/day		lbs/day	Reduction
120	0.49	5	1.2	0.034	0.003	0.0003	0.031	92

Segment 6b. San Miguel Segment 6b is the mainstem of Marshall Creek including all tributaries, lakes, reservoirs, and wetlands from source to confluence with San Miguel River. Idarado and WQCD monitored 3 sites in this segment: Marshall Creek upstream of the San Miguel River (SM-2), Marshall Creek upstream from the confluence with Savage Creek (SM-5), and Savage Creek upstream from the confluence with Marshall Creek (SM-6).

The site Marshall Creek upstream of the San Miguel River is at the lower end of the segment and has the most complete data record. Idarado monitors monthly at this site. Monthly TMDLs are presented for this site (Table 12). The zinc TMDLs for segment COGUSM06b is expressed as Waste Load Allocations (WLAs) and Load Allocations (LAs).

Table 12. Zn TMDL and Load Reduction by month (includes 10% MOS)											
Segment: COGUSM06b											
Marshall Creek above San Miguel River (Idarado SM-2) (n=70)											
	Hardness	Zn-D	Zn-D	Median Flow	Zn-D	TMDL	MOS	Reduction	TMDL	TMDL	%
		TVS ug/L	Observed ug/L	cfs	Observed, lbs/day	lbs/day	lbs/day	lbs/day	LA lbs/day	WLA lbs/day	Reduction
Jan	81	190	1579	0.6	5.3	0.6	0.1	4.7	0.1	0.5	89
Feb	81	190	1392	0.8	6.0	0.7	0.1	5.3	0.1	0.7	88
Mar	81	190	1904	1.0	10.0	0.9	0.1	9.1	0.1	0.8	91
Apr	81	190	2943	3.1	49.7	2.9	0.3	46.8	0.3	2.6	91
May	81	190	2325	4.8	60.6	4.5	0.5	56.1	0.5	4	93
Jun	81	190	1225	14.8	97.6	13.6	1.5	84.0	1.4	12.3	86
Jul	81	190	1212	4.8	31.2	4.4	0.5	26.8	0.4	4.0	86
Aug	81	190	1682	2.1	19.1	1.9	0.2	17.1	0.2	1.7	90
Sep	81	190	2164	4.7	54.8	4.3	0.5	50.5	0.4	3.9	92
Oct	81	190	2225	1.5	18.0	1.4	0.2	16.6	0.1	1.2	92
Nov	81	190	1428	1.2	9.6	1.1	0.1	8.5	0.1	1.0	88
Dec	81	190	1602	0.8	7.0	0.8	0.1	6.3	0.1	0.7	89

Cadmium data for COGUSM06b were limited to 6 samples. Table 13 presents the ambient water quality, the cadmium TMDL, and associated load reductions for segment COGUSM03a. Attainment of the TMDL for the chronic standard will ensure the acute cadmium standard is not exceeded

Table 13. Annual Cd TMDL and Load Reduction (includes 10% MOS)								
Segment: COGUSM06b								
Ingram Creek above the confluence with Bridal Veil Creek (n=6)								
Hardness	Cd-D	Cd-D	Median Flow	Cd-D	TMDL WLA	MOS	Reduction	%
	TVS ug/L	Observed ug/L	cfs	Observed, lbs/day	lbs/day		lbs/day	Reduction
120	0.49	5	1.2	0.034	0.003	0.0003	0.031	92

IX. Remediation Planning and Implementation Process

There is no known cadmium or additional zinc remediation planned for the San Miguel watershed segments addressed in this TMDL other than remediation required by and described in the Consent Decree. This remediation has been completed by Idarado. Sources of cadmium and zinc are diffuse rather than readily identifiable point sources. The remediation required by the Consent Decree did not target attainment of surface water standards. The observed exceedances of cadmium and zinc probably are due to effects of the mining features in the upper basins.

Monitoring

Continued monitoring should be conducted to confirm that the TMDLs are protective of the Uses assigned to the listed segments. The WQCD will conduct routine monitoring in the basin in anticipation of the 2011 surface water standards Rule Making Hearing for the Gunnison Basin. No ongoing monitoring efforts other than the Division’s activities have been identified. It is likely that those segments not currently listed for cadmium will be included for that parameter on the 2010 303(d) List of Impaired Waters. The standards for these metals are hardness-based TVS. Additional monitoring for cadmium and hardness is recommended.

Conclusion

The goal of this TMDL is attainment of the water quality standards for dissolved zinc and dissolved cadmium in San Miguel River from Bridal Veil and Ingram Creeks to Marshall Creek (COGUSM03a), the mainstem below Marshall Creek to the South Fork of the San Miguel River (COGUSM03b), Ingram Creek (COGUSM06a), and Marshall Creek (COGUSM06b). Substantial loading reductions of both metals are necessary to attain the TMDLs for each segment.

X. Public Involvement

Three of the four segments addressed by this TMDL have alternative zinc standards rather than hardness-based table value standards. As discussed in Section V, segments COGUSM03a, COGUSM03b, and COGUSM06b have zinc standards of 190 ug/L. These numeric standards were adopted during a 1988 rule-making hearing (RMH) for Regulation 35. This RMH was a public hearing before the Colorado Water Quality Control Commission. As such, public notice was provided regarding the changes in the numeric standards. As part of this 1988 RMH, the basin was re-segmented, and revised standards for zinc were adopted. However, the existing classifications for all segments were retained.

The 1988 revised standards were adopted based on information available at the RMH indicating that more stringent levels would be attainable within a twenty year period. The parties agreed that significant improvement in water quality would occur as the result of the changes implemented due to the legal actions instituted under CERCLA. At a minimum, the clean-up plan proposed by Idarado would result in some water quality improvement. Furthermore, the standards were consistent with the levels found to be achievable by the Record of Decision prepared by the State in the CERCLA action. The CERCLA action also included significant public involvement.

The segments addressed in this TMDL (COGUSM03a, COGUSM03b, COGUSM06a, COGUSM06b,) were included on Colorado's 303(d) lists of impaired segments since 1998 based on water quality data. The development of the 303(d) list is a public process involving solicitation from the public of candidate waterbodies, formation of a technical review committee comprised of representatives of both the public and private sector, and a public hearing before the Colorado Water Quality Control Commission. Public notice is provided concerning both the solicitation of impaired waterbodies and the public hearing.

The TMDL itself is the subject of an independent public process. This TMDL report was made available for public review and comment during a 30 day public notice period in April 2008. For the April 2008 public notice period, TMDLs for dissolved zinc (COGUSM03a, COGUSM03b, COGUSM06a and COGUSM06b) and dissolved cadmium (COGUSM03b) were noticed in the Colorado Water Quality Information Bulletin. TMDL's for dissolved cadmium for COGUSM03a, COGUSM06a, and COGUSM06b were added to the report after the public notice period in response to comments received from EPA.

References:

Colorado Hazardous Materials and Waste Management Division Idarado Mine Natural Resource Damage Site. <http://www.cdphe.state.co.us/HM/rpidarado.htm>

Colorado Water Quality Control Commission, Regulation 31- The Basic Standards and Methodologies for Surface Water (amended 2/12/07, effective 7/1/07).

Colorado Water Quality Control Commission, Regulation 35 - Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins (amended 2/12/07, effective 7/1/07).

Colorado Water Quality Control Division, Section 303(d) Listing Methodology – 2008 Listing Cycle. 2007.

Idarado Consent Decree, July 6, 1992. Colorado v Idarado Mining Co. 83-C-2385, U S District Court, Colorado.

The Idarado Legacy, Idarado Mining Company. IdaradoBooklet.pdf

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