

Final Report

**Central City/Clear Creek  
Superfund Site Five-Year Review  
Water Quality Assessment**

June 2014



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## Acronyms

µg/L	micrograms per liter
CDPHE	Colorado Department of Public Health and Environment
CWA	Clean Water Act
ERT	Environmental Response Team
HBI	Hilsenhoff Biotic Index
mg/L	milligrams per liter
MMI	Multi Metric Index
NPL	National Priorities List
OU3 ROD	Operable Unit 3 Record of Decision
QA/QC	quality assurance/quality control
RI	remedial investigation
Site	Central City/Clear Creek Superfund Site
TVS	Table Value Standards
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WQCC, Commission	Water Quality Control Commission
WQCD	Water Quality Control Division
WQS	water quality standards

# Section 1

## Introduction

Gold was discovered in the Clear Creek watershed in the 1850s and 1860s near Idaho Springs and Central City. For the next two decades, the area was the leading mining center in Colorado. Mining continued to be an important industry in Clear Creek and Gilpin Counties through 1950. Since 1950, mining in the area has been limited with only a handful of mines currently in operation.

The Central City/Clear Creek Superfund Site (Site) is located in Clear Creek and Gilpin Counties. The site was added to the National Priorities List (NPL) in 1983 due to environmental and public health threats posed by historical mining activities and the contribution of heavy metals. The Site encompasses the Clear Creek watershed, including the mainstem, North Clear Creek, and several tributaries. Surface waters at the Site were historically impacted by both direct discharges from mine drainage tunnels and from eroding mine waste piles. The Operable Unit 3 Record of Decision (OU3 ROD) was signed in 1991. The OU3 ROD was intended to be a response action for the Site with the flexibility to adapt management practices and implementation to most effectively remediate the Site. The OU3 ROD included a provision to re-evaluate the effectiveness of actions to eliminate or reduce the risks posed at the Site every 5 years.

### 1.1 Study Objective

The Colorado Department of Public Health and Environment (CDPHE) is conducting a Five Year Review of the Central City/Clear Creek Superfund Site. This effort includes an assessment of water quality with regard to applicable water quality standards. This document serves to provide a summary of the following:

- Segmentation of streams within the Site area at the time of the remedy decision (1991)
- Current segmentation of streams within the Site area (2014)
- Applicable water quality standards in effect at the time of the remedy decision (1991)
- Current applicable water quality standards (2014)
- Assessment of current water quality conditions in relation to water quality standards (those applicable in 1991 and those currently applicable)
- Macroinvertebrate data for the Site
- Existing water quality conditions for the North Fork of Clear Creek

## 1.2 Report Overview

The remaining sections of this report contain:

- **Section 2 Water Quality Regulations** provides a description of the historical (1991) and current (2014) segmentation, designated uses, and adopted water quality standards for the Clear Creek watershed.
- **Section 3 Data Review and Analysis** presents the available water quality and macroinvertebrate data. The methodologies used to analyze data are summarized and data are assessed with relation to the applicable water quality standards.
- **Section 4 Findings** includes a discussion of results based on information developed in Sections 2 and 3.

## Section 2

# Water Quality Regulations

Section 303 of the federal Clean Water Act (CWA) establishes the foundation for the protection of surface water quality through the development and implementation of water quality standards. These standards provide the foundation for accomplishing two of the principal goals of the CWA:

- Restore and maintain the chemical, physical, and biological integrity of the nation's waters
- Where attainable, to achieve water quality that promotes protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water

Water quality standards consist of three elements:

- The designated use or uses of a water body or segment of a water body
- The water quality criteria necessary to protect the use or uses of that particular water body
- An antidegradation policy

Examples of designated uses include domestic water supply, recreation, and protection of aquatic life. Water quality criteria describe the quality of water that supports a designated use. Water quality criteria can be expressed as numeric limits or as a narrative statement. Antidegradation policies provide the mechanism for implementing activities in and around waterbodies in a manner that protects water quality.

Under the CWA, each state has the primary responsibility for developing and implementing water quality standards. The CWA requires that each state review their standards at least once every 3 years and submit the results to the U.S. Environmental Protection Agency (USEPA) for review as part of the triennial review process. The Colorado triennial review of water quality standards is conducted by the Colorado Water Quality Control Commission (WQCC, or Commission). Water quality standards applicable to the entire State of Colorado are found in *Regulation 31: The Basic Standards and Methodologies for Surface Water* (5 CCR 1002-31). Water quality standards specific to the Clear Creek watershed are found in *Regulation 38: Classifications and Numeric Standards for South Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin* (5 CCR 1002-38).

## 2.1 Stream Segmentation

As part of the regulatory and assessment process, water bodies are typically segmented into stream lengths or a grouping of tributaries with similar characteristics in order to effectively apply designated uses and their associated water quality standards. Water bodies are identified by a segment number that generally corresponds to the basin in which it is located. Segmentation information also includes a description of the extent of the water body or water bodies.

The segmentation of the study area water bodies at the times of interest for this review (1991 and 2014) are presented in **Table 2-1**. Information on the segmentation of the study area water bodies in 1991 was available from the OU3 ROD. The 1991 segmentation is presented in **Figure 2-1**. Regulation

38 contains information on the current segmentation of the Clear Creek watershed. Segments in Regulation 38 are coded by state, basin, and watershed for identification purposes. All segments in the Clear Creek watershed begin with the code COSPCL (Colorado, South Platte, Clear Creek).

**Figure 2-2** shows the 2014 segmentation for the study area.

The watershed area considered for this Five-Year Review remains the same since the remedy decision in 1991. However, a number of the 1991 segments have been further classified into additional segments. Segments 01, 3b, 04, 05, 06 and 08 are unchanged from the 1991 segment descriptions. An additional segment (Segment 19) is referenced in a number of the 2014 study area segments and has been included in Table 2-1 for information purposes.

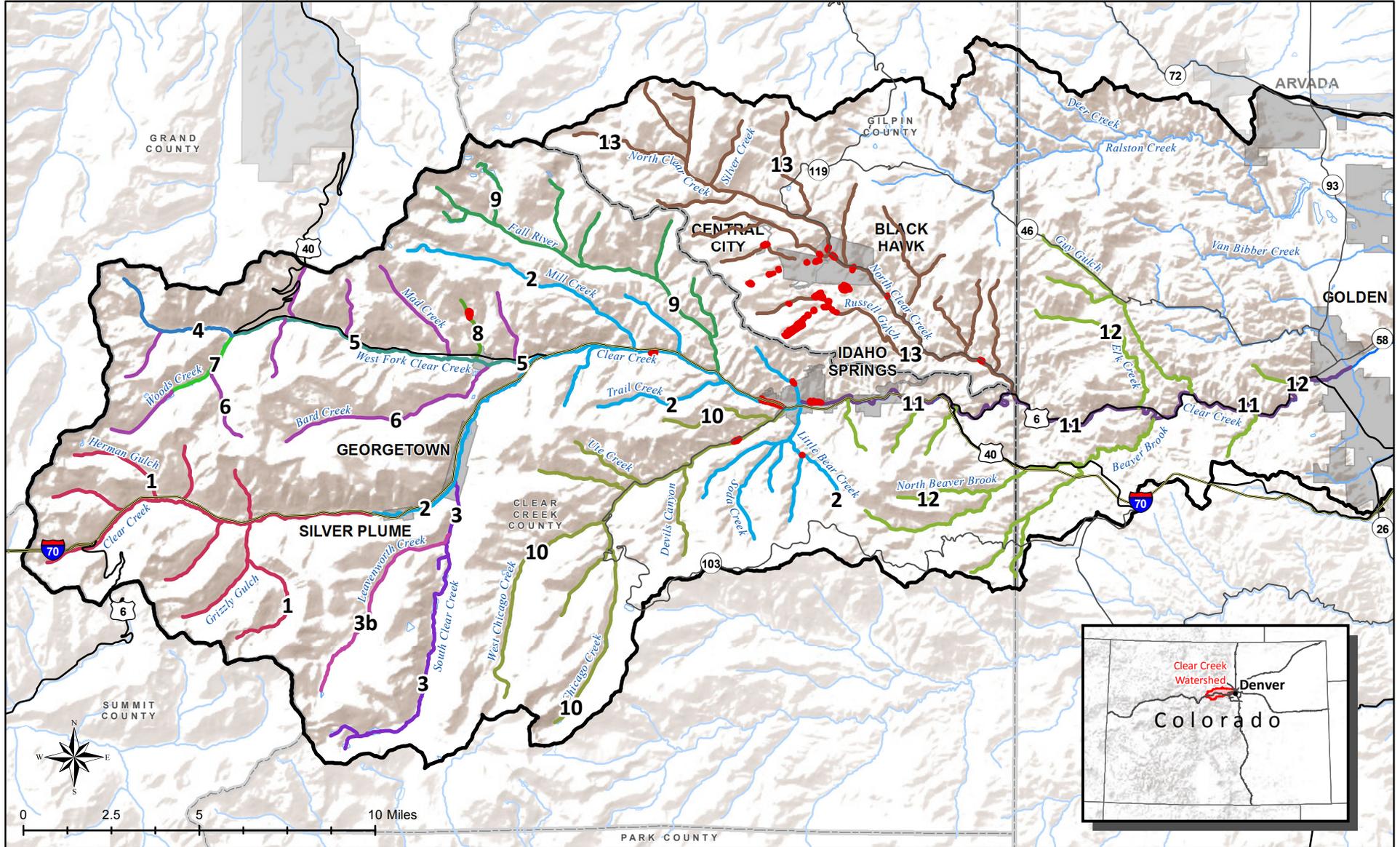
**Table 2-1: Segmentation of Study Area (1991 and 2014)**

Segment ID	1991 Description	2014 Description
01	Mainstem of Clear Creek, including all tributaries, lakes, and reservoirs, from the source to the I-70 bridge above Silverplume	
02	Mainstem of Clear Creek, including all of the tributaries, lakes and reservoirs, from the I-70 bridge above Silverplume to the Argo Tunnel discharge, except for the specific listings in Segments 3 through 9	
2a		Mainstem of Clear Creek, including all of the tributaries <b>and wetlands</b> , from the I-70 bridge above Silver Plume to <b>a point just above the confluence with West Fork Clear Creek</b> , except for the specific listings in Segments <b>3a and 3b</b>
2b		Mainstem of Clear Creek, including all of the tributaries <b>and wetlands</b> , from <b>the confluence with West Fork Clear Creek to a point just below the confluence with Mill Creek</b> , except for the specific listings in Segments <b>4 through 8</b>
2c		Mainstem of Clear Creek, including all of the tributaries <b>and wetlands</b> , from <b>a point just below the confluence with Mill Creek</b> to a point just above the Argo Tunnel discharge, except for the specific listings in Segments <b>9a, 9b, and 10</b>
03	Mainstem of South Clear Creek, including all tributaries, lakes, and reservoirs, from the source to the confluence with Clear Creek, except for the specific listing in 3b	
3a		Mainstem of South Clear Creek, including all tributaries <b>and wetlands</b> , from the source to the confluence with Clear Creek, except for the specific listing in 3b <b>and 19</b>
3b	Mainstem of Leavenworth Creek from source to confluence with South Clear Creek	
04	Mainstem of West Clear Creek from the source to the confluence with Woods Creek	
05	Mainstem of West Clear Creek from the confluence with Woods Creek to the confluence with Clear Creek	
06	All tributaries to West Clear Creek, including all lakes and reservoirs, from the source to the confluence with Clear Creek, except for the specific listings in Segments 7 and 8	
07	Mainstem of Woods Creek from the outlet of Upper Urad Reservoir to the confluence with West Clear Creek	Mainstem of Woods Creek from the outlet of Upper Urad Reservoir to the confluence with West Clear Creek, <b>including Lower Urad Reservoir</b>

Table 2-1: Segmentation of Study Area (1991 and 2014)

Segment ID	1991 Description	2014 Description
08	Mainstem of Lion Creek from the source to the confluence with West Clear Creek	
09	Mainstem of Fall River, including all tributaries, lakes, and reservoirs, from the source to the confluence with Clear Creek	
9a		Mainstem of Fall River, including all tributaries <b>and wetlands</b> , from the source to the confluence with Clear Creek
9b		Mainstem <b>of Trail Creek, including all tributaries and wetlands</b> , from the source to the confluence with Clear Creek
10	Mainstem of Chicago Creek, including all tributaries, lakes, and reservoirs, from the source to the confluence with Clear Creek	Mainstem of Chicago Creek, including all tributaries <b>and wetlands</b> , from the source to the confluence with Clear Creek, <b>except for specific listings in Segment 19</b>
11	Mainstem of Clear Creek from the Argo Tunnel discharge to the Farmers Highline Canal diversion in Golden	Mainstem of Clear Creek from <b>a point just above</b> the Argo Tunnel discharge to the Farmers Highline Canal diversion in Golden, Colorado
12	All tributaries to Clear Creek, including all lakes and reservoirs, from the Argo Tunnel discharge to the Farmers Highline Canal diversion in Golden, except for specific listings in Segment 13	All tributaries to Clear Creek, including all <b>wetlands</b> , from the Argo Tunnel discharge to the Farmers Highline Canal diversion in Golden, Colorado, except for specific listings in Segment <b>13a and 13b</b>
13	Mainstem of North Clear Creek, including all tributaries, lakes and reservoirs, from the source to the confluence	
13a		Mainstem of North Clear Creek, including all tributaries <b>and wetlands</b> , from its source to its confluence <b>with Chase Gulch. And Four Mile Gulch, including all tributaries and wetlands, from their sources to their confluence with North Clear Creek and Eureka Gulch, including all tributaries and wetlands, from its source to its confluence with Gregory Gulch</b>
13b		Mainstem of North Clear Creek, including all tributaries <b>and wetlands</b> , from <b>a point just below the confluence with Chase Gulch to the confluence with Clear Creek, except for the specific listings in Segment 13a</b>
19		All tributaries to Clear Creek, including wetlands, within the Mt. Evans Wilderness Area

\*Bold text added to highlight changes in text from 1991 to 2014

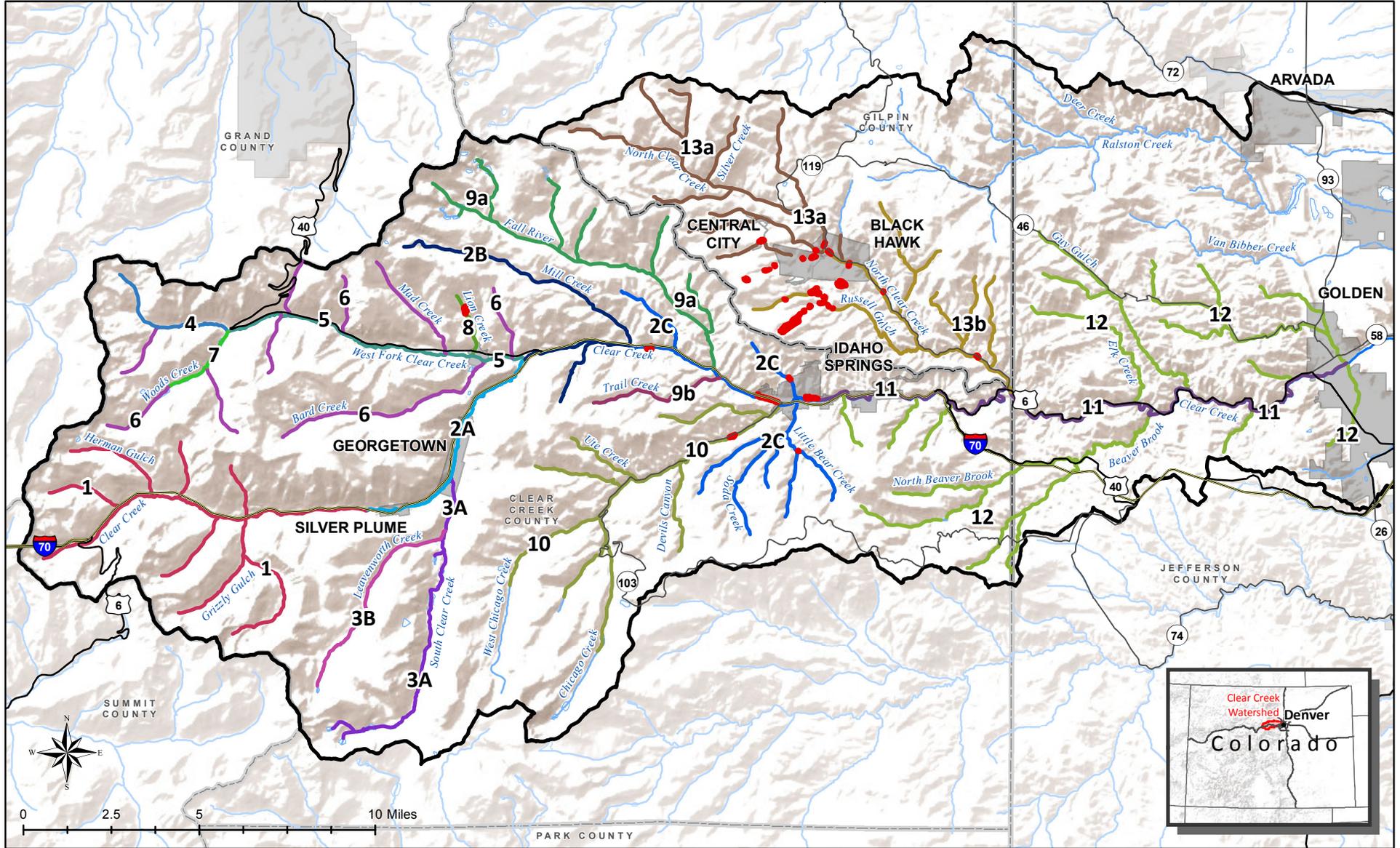


- Central City / Clear Creek NPL Site
- Municipality
- County Boundary

- |            |           |            |            |
|------------|-----------|------------|------------|
| Segment 1  | Segment 4 | Segment 8  | Segment 12 |
| Segment 2  | Segment 5 | Segment 9  | Segment 13 |
| Segment 3  | Segment 6 | Segment 10 |            |
| Segment 3b | Segment 7 | Segment 11 |            |

Figure 2-1  
 1991 Stream Segmentation  
 Clear Creek Watershed





- Central City / Clear Creek NPL Site
  - Municipality
  - County Boundary
- |           |           |           |           |
|-----------|-----------|-----------|-----------|
| COSPCL01  | COSPCL03B | COSPCL08  | COSPCL12  |
| COSPCL02A | COSPCL04  | COSPCL09a | COSPCL13a |
| COSPCL02B | COSPCL05  | COSPCL09b | COSPCL13b |
| COSPCL02C | COSPCL06  | COSPCL10  |           |
| COSPCL03A | COSPCL07  | COSPCL11  |           |

Figure 2-2  
2014 Stream Segmentation  
Clear Creek Watershed

## 2.2 Designated Uses

Waters of the state are assigned a use classification based on the existing uses or any uses for which the water is intended to become suitable.

### 2.2.1 1991 Use Classifications

Appendix B of the 1991 OU3 ROD included information regarding the designated uses applicable at the time of the remedy decision. These included:

- **Recreational Classification** –
  - Class 1 – Primary contact recreation (e.g., swimming).
  - Class 2 – Secondary contact recreation, those not in Class 1.
- **Aquatic Life Classification** –
  - Class 1 – Cold/warm stream segments capable of sustaining cold/warm water biota where physical habitat, water flows, and water quality conditions do not impair biota. Applies to segments with correctable water quality.
  - Class 2 – Cold/warm stream segments not capable of sustaining cold/warm biota where physical habitat, water flows, or uncorrectable water quality conditions impair biota.
- **Domestic Water Supply** – Suitable for potable water supplies after standard water treatment.
- **Agricultural Water Supply** – Suitable for irrigation of crops or watering livestock.

**Table 2-2** summarizes the use classifications applicable to each of the 1991 segments.

**Table 2-2: 1991 Use Classifications, Clear Creek Basin**

Use Classification	1991 Segment Number													
	01	02	03	3b	04	05	06	07	08	09	10	11	12	13
Recreation Class 1			X	X	X		X			X	X			
Recreation Class 2	X	X				X		X	X			X	X	X
Aquatic Life Class 1	X	X	X		X	X	X			X	X	X		
Aquatic Life Class 2				X				X	X				X	X
Domestic Water Supply	X		X	X	X		X			X	X	X	X	
Agricultural Supply	X	X	X	X	X	X	X			X	X	X	X	X

### 2.2.2 2014 Use Classifications

Current use classifications are defined in Regulation 31 (Section 31.13(1)). The designated uses in Colorado (recreation, aquatic life, domestic water supply, and agriculture) remain the same as those in 1991. However, additional definition has been added to the domestic water supply and agricultural uses, and further classification has been adopted for the recreational and aquatic life uses. The definitions found in Regulation 31 that are applicable to the study area segments are as follows:

- **Recreation** –
  - Class E – Existing Primary Contact Use. These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.

- Class N – Not Primary Contact Use. These surface waters are not suitable or intended to become suitable for primary contact recreation uses. This classification shall be applied only where a use attainability analysis demonstrates that there is not a reasonable likelihood that primary contact uses will occur in the water segment(s) in question within the next 20-year period.
- **Aquatic Life** – These surface waters presently support aquatic life uses as described below, or such uses may reasonably be expected in the future due to the suitability of present conditions, or the waters are intended to become suitable for such uses as a goal:
  - Class 1 – Cold Water Aquatic Life. These are waters that (1) currently are capable of sustaining a wide variety of cold water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.
  - Class 2 – Cold and Warm Water Aquatic Life. These are waters that are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species due to physical habitat, water flows or levels, uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.
- **Domestic Water Supply** – These surface waters are suitable or intended to become suitable for potable water supplies. After receiving standard treatment (defined as coagulation, flocculation, sedimentation, filtration, and disinfection with chlorine or its equivalent) these waters will meet Colorado drinking water regulations and any revisions, amendments, or supplements thereto.
- **Agriculture** – These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock.

**Table 2-3** provides information on the use classifications applicable to each of the 2014 segments. Additional classification exist for recreational uses (potential primary contact use (P) and undetermined use (U)), aquatic life use (Class 1 warm water aquatic life), and domestic water supply (direct use water supply lakes and reservoirs). The definitions for these use classifications were not included above because they do not apply to any of the study area segments.

**Table 2-3: 2014 Use Classifications, Clear Creek Basin**

Use Classification	2014 Segment Number																
	01	2a	2b	2c	3a	3b	04	05	06	07	08	9a	9b	10	11	12	13b
Recreation Class E	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Recreation Class P																	
Recreation Class N										X							
Recreation Class U																	
Aquatic Life Class 1 - Cold	X	X	X	X	X		X	X	X			X	X	X	X		
Aquatic Life Class 1 - Warm																	
Aquatic Life Class 2 - Cold						X				X	X					X	X
Domestic Water Supply	X	X	X	X	X	X	X		X			X	X	X	X	X	
Domestic Water Supply (Direct Use Lakes and Reservoirs)																	
Agriculture	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X

## 2.3 Water Quality Standards

The CDPHE's WQCC is the administrative agency responsible for developing specific water quality policies and adopts water quality classifications and standards for waters of the state. The statewide standards are contained within *Regulation 31 – The Basic Standards and Methodologies for Surface Water* (5 CCR 1002-31). Segment-specific standards applicable to given stream segments are published by basin. Standards specifically applicable to the Clear Creek study area are found in Regulation 38 (5 CCR 1002-38). The historical (1991) and current (2014) water quality standards applicable for each segment in the Clear Creek watershed relevant to the available water quality dataset used for this study are discussed in the following sections.

### 2.3.1 1991 Water Quality Standards

Water quality standards applicable during completion of the OU3 ROD and remedial investigation (RI) reports were originally put forth in the August 7, 1989 amended Regulation 31 and Regulation 38 (effective September 30, 1989). Further amendments to the standards were made on October 8, 1991 (effective November 30, 1991) and in total, Regulation 31 and 38 were amended 27 times between 1991 and 2013. Regulations applicable during 1991 were published in Appendix B of the OU3 ROD for the Site. A copy of the summary of 1991 Regulation 31 Table Value Standards (TVS) tables and Regulation 38 segment-specific standards published as Appendix B of the ROD for the Clear Creek watershed along with the Regulation 38 tables and Regulation 31 tables applicable at the time of the Clear Creek RI publication are provided in **Appendix A** of this document. The minimum applicable historical (1991) water quality standards used for the water quality analyses in Section 3 of this document are provided on a segment-by-segment basis within the tables in Section 3.3.2.

### 2.3.2 2014 Water Quality Standards

The water quality standards currently applicable to stream segments in the Clear Creek watershed were published in the amended Regulation 31 and Regulation 38 adopted by WQCC on September 11, 2012 and effective as of January 31, 2013. A number of the applicable standards presented in the current version of Regulation 31 and 38 differ significantly from those applicable at the time of the 1991 OU3 ROD. A copy of the current Regulation 38 tables for the Clear Creek watershed as well as an excerpt from the current Regulation 31 document showing the applicable TVS is provided in **Appendix B** of this document. The current (2014) minimum applicable water quality standards used for the water quality analyses in Section 3 of this document are provided on a segment-by-segment basis within the tables in Section 3.3.2.

### 2.3.3 Changes in Water Quality Standards

A number of changes have been made to Regulation 31 and Regulation 38 water quality standards since the 1991 OU3 ROD was released. Beyond the minor changes to the reach designation in the Clear Creek watershed, significant changes have occurred to segment-specific standards listed in Regulation 38 for every segment in the study area.

In some cases; such as with aluminum, arsenic, and manganese; changes to standards include changes to which sample fraction (dissolved/total/total recoverable) is used to assess the standard. Other modifications involve removal of site-specific standard values and application of standards from the Regulation 31 TVS tables (e.g., most metals on Segments 01 and 02). Changes have also been adopted within the Regulation 31 TVS tables and include significant alterations to the formulas used for calculating hardness-specific standards. Another noted change was the adoption of Fish and Water Ingestion Standards in the 1991 revisions. The standards are applicable to all Class 1 aquatic life

segments which also have a water supply classification or Class 2 aquatic life segments which also have a water supply classification designated by the Commission after rulemaking hearing. Changes applied to each amendment of Regulation 31 are published in the current edition of Regulation 31 available at: <http://www.colorado.gov/cs/Satellite?c=Page&childpagename=CDPHE-Main%2FCBONLayout&cid=1251595703337&pagename=CBONWrapper>

In addition, the temporary modifications in place prior to 1991 have expired (cadmium, manganese, and zinc in segment 07) and in some cases, new temporary modifications have been applied for select parameters at specific segments. Temporary modifications in the Clear Creek watershed study area are currently in place for:

- Segment 01: Arsenic (chronic) – expires 12/31/2021
- Segment 02a: Zinc (acute/chronic), cadmium (chronic) – expires 7/1/2015; and arsenic (chronic) – expires 12/31/2021
- Segment 02c: Copper (chronic) – expires 7/1/2015; and arsenic (chronic) – expires 12/31/2021
- Segment 03a: Arsenic (chronic) – expires 12/31/2021
- Segment 09a: Copper (chronic) – expires 7/1/2015
- Segment 10: Arsenic (chronic) – expires 12/31/2021
- Segment 11: Cadmium (chronic) – expires 7/1/2015; and arsenic (chronic) – expires 12/31/2021
- Segment 13a: Arsenic (chronic) – expires 12/31/2021
- Segment 13b: Cadmium (chronic), iron (chronic), manganese (chronic), and zinc (chronic) – expires 7/1/2015

Modifications to the Regulation 31 and 38 standards that have occurred since the 1991 ROD are reflected in the water quality assessment tables and calculations discussed in Section 3 of this document.

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## Section 3

# Data Review and Analysis

### 3.1 Data Sources

Background information, geographic information, and analytical data were obtained from a number of sources for use in this report. Primary sources of data include the CDPHE, the USEPA, as well as relevant historical documents such as the Central City/Clear Creek Superfund Site OU3 ROD and RI reports.

#### 3.1.1 Water Quality Data – Scribe Database

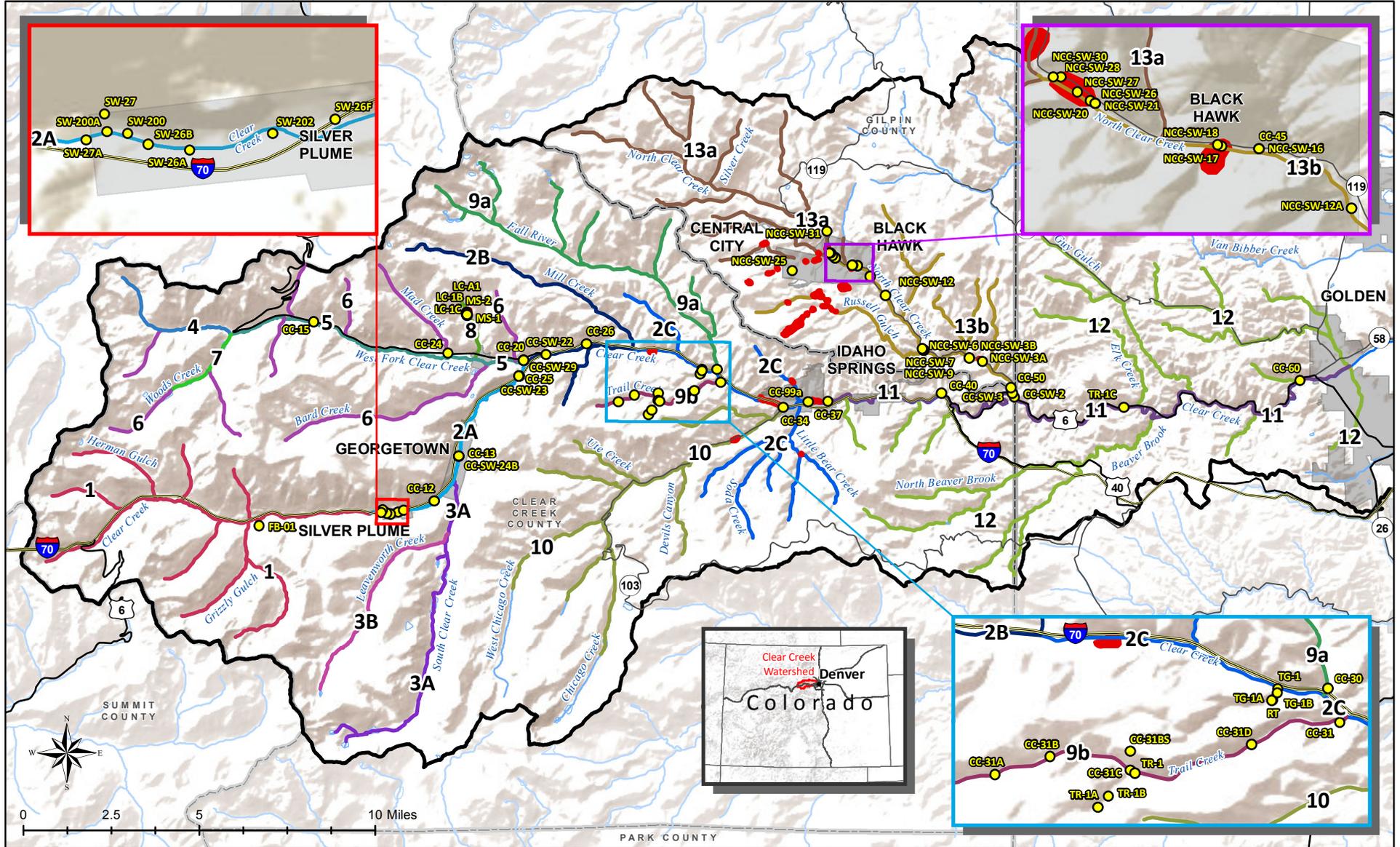
Water quality data for the study area were provided by CDPHE and USEPA via access to the Site's online *Scribe* database. The *Scribe* database platform was developed by the USEPA's Environmental Response Team (ERT) to assist with managing environmental data by providing a consistent platform for storing and retrieving sampling, observational, and monitoring field data collected during water, soil, air, or biota sampling events. *Scribe* databases are stored online using Scribe.NET, which allows for simple data sharing among various user groups.

CDPHE provided access to a database containing water quality data collected from Clear Creek and its tributaries from 2010 – 2013. The water quality data for Clear Creek included over 27,000 data points collected from approximately 130 separate locations and along 12 stream segments within the Clear Creek watershed. Sixty-eight sampling locations were located on segments of interest for this study (**Figure 3-1**). Information on the sampling locations available for review on each study area segment is contained in **Appendix A**. The robust and thorough nature of the data collection and resulting *Scribe* dataset (**Appendix B**) provide a viable dataset for assessing water quality conditions along each of the sampled stream segments.

#### 3.1.2 Macroinvertebrate Data

Macroinvertebrate data for the Clear Creek watershed were provided by CDPHE in *Excel* format (**Appendix C**). Data were available for the study area as well as for a number of sites that extended beyond the extent of this data review (east of Segment COSPCL12, beyond the diversion at the Farmers Highline Canal). Macroinvertebrate data were limited to sites within the study area for purposes of this report.

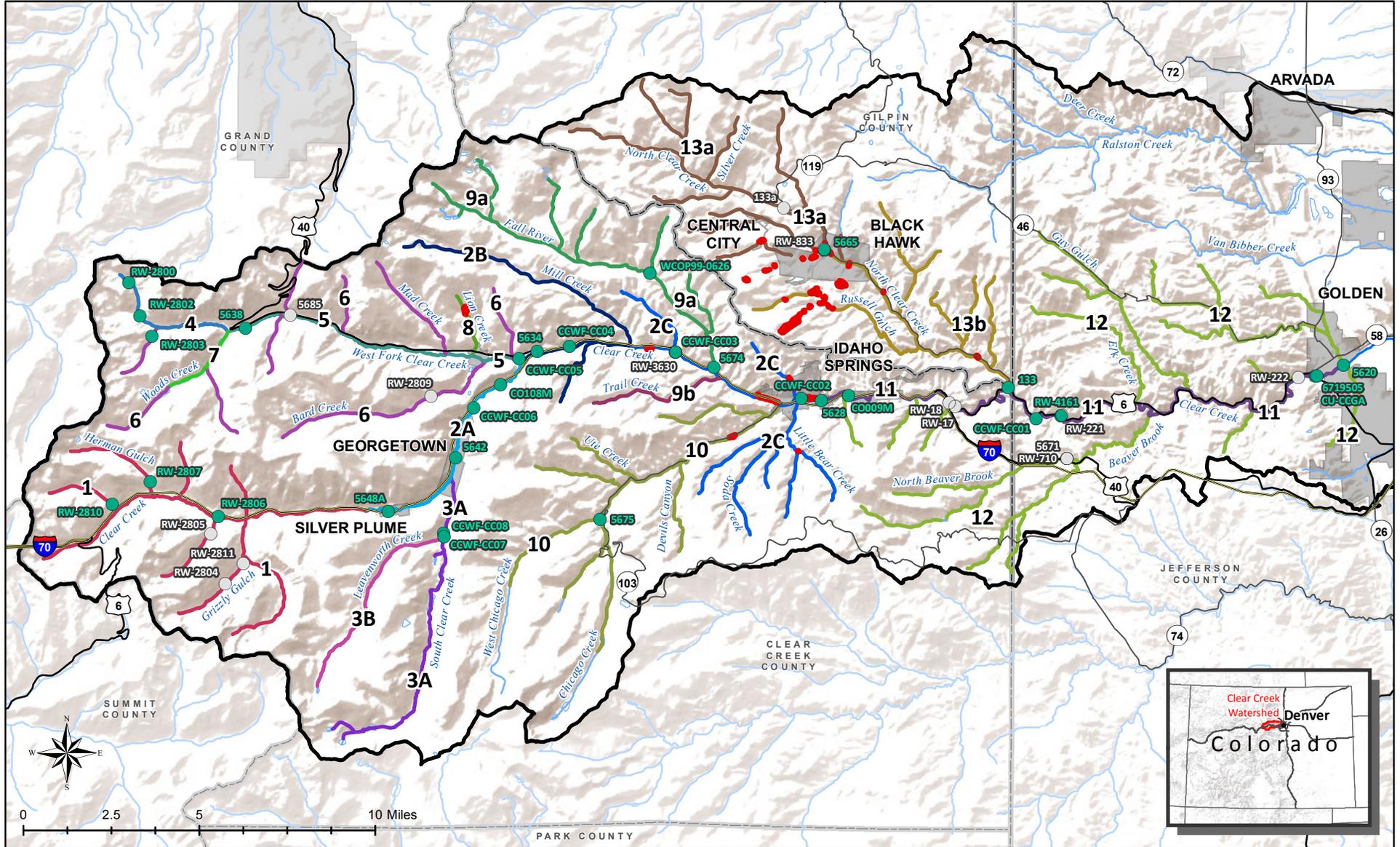
Macroinvertebrate sampling locations within the study area are shown on **Figure 3-2**. Data were collected by CDPHE, USEPA, U.S. Geological Survey (USGS), and other third parties between 1993 and 2013. Data provided include scores for the Colorado Multi Metric Index (MMI), the Hilsenhoff Biotic Index (HBI), and Shannon Diversity Index. The MMI is composed of several metrics that represent categories of benthic community characteristics including richness, composition, functional feeding group, mode of locomotion, and pollution tolerance. The MMI is designed to detect impacts from environmental stresses that may alter the biological community. The HBI provides information on potential impacts from organic pollution, while the Shannon Diversity Index provides information on community diversity.



- Water Quality Sampling Location
- Central City / Clear Creek NPL Site
- Municipality
- County Boundary

- |   |   |   |   |
|---|---|---|---|
| — | — | — | — |
| — | — | — | — |
| — | — | — | — |
| — | — | — | — |
| — | — | — | — |

Figure 3-1  
WQ Sampling Locations  
Clear Creek Watershed



- |  |   |   |   |  |
|--|---|---|---|--|
| <span style="color: green;">●</span> MMI Data Sites  | <span style="color: red;">—</span> COSPCL01       | <span style="color: purple;">—</span> COSPCL03B | <span style="color: green;">—</span> COSPCL08       | <span style="color: lightgreen;">—</span> COSPCL12 |
| <span style="color: grey;">○</span> MMI Data Sites (out of date range)   | <span style="color: cyan;">—</span> COSPCL02A     | <span style="color: blue;">—</span> COSPCL04    | <span style="color: green;">—</span> COSPCL09a      | <span style="color: brown;">—</span> COSPCL13a     |
| <span style="color: red;">■</span> Central City / Clear Creek NPL Site   | <span style="color: darkblue;">—</span> COSPCL02B | <span style="color: teal;">—</span> COSPCL05    | <span style="color: pink;">—</span> COSPCL09b       | <span style="color: orange;">—</span> COSPCL13b    |
| <span style="color: grey;">+</span> Municipality   | <span style="color: blue;">—</span> COSPCL02C     | <span style="color: purple;">—</span> COSPCL06  | <span style="color: yellowgreen;">—</span> COSPCL10 |  |
| <span style="border: 1px solid black; display: inline-block; width: 10px; height: 10px;"></span> County Boundary | <span style="color: purple;">—</span> COSPCL03A   | <span style="color: green;">—</span> COSPCL07   | <span style="color: purple;">—</span> COSPCL11      |  |

Figure 3-2  
Macroinvertebrate Data Locations  
Clear Creek Watershed



## 3.2 Methodology

Assessment of the current water quality and biological community conditions within the Clear Creek watershed in relation to applicable water quality standards and aquatic life use attainment was conducted following the guidance provided by CDPHE and the Commission. Water quality assessments followed guidance provided in the CDPHE Water Quality Control Division's (WQCD) *Section 303(d) Listing Methodology 2012 Listing Cycle* document (CDPHE 2011). Assessment of macroinvertebrate data was conducted using the guidance provided in the Commission's Policy Statement 10-1: *Aquatic Life Use Attainment – Methodology to Determine Use Attainment for Rivers and Streams* (CDPHE 2010).

### 3.2.1 303(d) Listing Methodology

The WQCD *Section 303(d) Listing Methodology 2012 Listing Cycle* document (CDPHE 2011) provides a general framework for the determination of attainment or non-attainment of the water quality standards and designated uses assigned to each waterbody in the state. Procedures outlined in the document were followed during CDPHE's data collection process as well as in the calculations described in Section 3.3.1 of this report. Data interpretation methods outlined in Section 3 Subpart C of the guidance document describe how the WQCD determines attainment of chronic and acute numeric standards.

Attainment of most chronic standards, including all hardness-based metal standards and all dissolved metal standards, are based upon the 85th percentile of the ranked data, where percentile values are calculated by ranking individual data points in order of magnitude. All hardness-based metal standards are typically evaluated by comparing the 85th percentile against the assigned hardness-based equation using the mean (average) hardness value available for a water body. Total recoverable metals are evaluated against the median value, or the 50th percentile. In addition, the guidance states that hardness based metals standards may be further evaluated by a detailed assessment in which the chronic numeric standard is calculated for each set of paired hardness/concentration data and attainment is determined for each data pair. In cases where the paired hardness/concentration assessment was completed, a determination of non-attainment of the chronic standard occurs if the standard is exceeded in more than 15 percent of available paired sample results. In the case where both methods are done and the listing decision differs between the two methods, the decision based on paired hardness/concentration assessment is considered more representative.

Acute standards are evaluated by comparison of individual sample results to the assigned standard. In this case, determination of attainment of acute hardness-based metals criteria includes a preliminary screening of the dataset in which a comparison is made between the maximum recorded parameter value and the acute standard calculated using the mean hardness. An exceedance of the mean hardness-based standard by the maximum analyte concentration will result in a detailed assessment where the acute numeric standard is calculated for each set of paired hardness/concentration data and attainment is determined for each data pair. Data indicates non-attainment of an acute standard if the standard is exceeded more frequently than once in 3 years.

The WQCD document also provides some guidance on the treatment of sample results reported below the laboratory detection limit. The guidance states that sample results reported below the detection limit (non-detects) will generally be treated as zeroes during assessment of attainment calculations.

### 3.2.2 Aquatic Life Use Attainment Policy Statement 10-1

The Commission approved Policy Statement 10-1 in October 2010 to provide a methodology to determine aquatic life use attainment for rivers and streams. The procedure described in the document relies on direct measurement of the aquatic life use rather than on a strict comparison of water quality data results to numeric criteria. Aquatic life thresholds for the MMI, HBI, and Shannon Diversity Index have been established based on analysis of the biological condition at reference sites in each of three biotypes (mountains, transition, and plains/xeric). The MMI score is used as the primary indicator of aquatic life use attainment. Where duplicate samples have been taken, the scores are averaged to produce a result representative of the sample location on a particular date. Thresholds are established for both attainment and impairment. The aquatic life use is attained when the MMI score exceeds the attainment threshold. If MMI scores fall between the established values for attainment and impairment and the stream is classified as Class 2 aquatic life, then the aquatic life use is attained. If the stream is classified as Class 1 aquatic life use and the MMI score falls between the attainment and impairments thresholds, auxiliary metric thresholds for the HBI and the Shannon Diversity Index are then reviewed to determine attainment. **Tables 3-1** and **3-2** contain the thresholds established for each metric for each biotype.

**Table 3-1: Aquatic Life Use Thresholds for MMI Scores**

Biotype	Attainment Threshold	Impairment Threshold
1. Transition	52	42
2. Mountains	50	42
3. Plains & Xeric	37	22

**Table 3-2: Auxiliary Metric Thresholds for Class 1 Waters**

Biotype	HBI	Shannon Diversity Index
1. Transition	<5.4	>2.4
2. Mountains	<5.1	>3.0
3. Plains & Xeric	<7.7	>2.5

Appendix B of Policy 10-1 includes information on Standard Operating Procedures for sampling benthic communities. Appendix B states that "the standard index period utilized by the (WQCD) is summer to early fall, namely July 1 to October 1. This period is congruent with the central tendency of sample dates of macroinvertebrate replicates used to regionally calibrate the multimetric indices." Any samples that were collected on dates outside of this range were excluded from the assessment completed for this report (24 of the available 59 MMI samples collected within the study area were excluded – refer to Appendix C).

## 3.3 Results

Analyses of water quality data collected between 2010 and 2013 and all available macroinvertebrate data were completed following the guidelines described in Section 3.2. Descriptions of the data calculation results including an assessment of existing conditions in the North Fork of Clear Creek as well as comparison of the current dataset to the applicable 1991 and 2014 water quality standards for segments COSPCL01, 2a, 2b, 2c, 3a, 3b, 04, 05, 06, 07, 08, 9a, 9b, 10, 11, 12 of Clear Creek are provided in Section 3.3.1. Macroinvertebrate results are provided in Section 3.3.2.

### 3.3.1 Water Quality Data Analysis

#### 3.3.1.1 North Fork Clear Creek Existing Conditions

The existing water quality conditions in the North Fork of Clear Creek were evaluated using instream data collected from 2010 – 2013. All available data for Segment COSPCL13b were queried from the *Scribe* database for use in the assessment and description of existing conditions within this reach.

##### 3.3.1.1.1 North Fork Clear Creek Segment COSPCL13b

The available dataset for Segment COSPCL13b includes 77 samples collected at 19 separate locations along the segment. Samples were collected on approximately 30 dates from February 2010 – December 2013 at two of the locations in the reach (CC-45 and CC-50). Single samples were collected from the remaining locations in the segment on November 7-8, 2013. Paired total hardness data were reported for each sample. A summary of the available data from COSPCL13b for parameters with numeric water quality standards is provided along with preliminary calculations of the current (2014) acute and chronic water quality standards in **Table 3-3**. Hardness-dependent water quality standards shown in Table 3-3 are calculated using the mean hardness for this segment (172 milligrams per liter [mg/L]).

**Table 3-3: Sample Counts, Summary Statistics, and Applicable 2014 Acute and Chronic Water Quality Standards for Segment COSPCL13b**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile	Mean Hardness	2014 Acute WQS	2014 Chronic WQS
Aluminum, Dissolved	µg/L	78	<15	11,000	276	21	82	172		
Aluminum, Total Recoverable	µg/L	76	55.3	10,900	685	436	750	172		
Arsenic, Dissolved	µg/L	78	<0.5	6	0.16	0	0	172	340	
Arsenic, Total Recoverable	µg/L	76	<2.5	7	0.22	0	0	172		100
Cadmium, Dissolved	µg/L	78	0.35	106	3.85	2.32	3.51	172	2.7 <sup>1</sup>	0.64 <sup>3</sup>
Chromium, Dissolved <sup>2</sup>	µg/L	2	<0.3	<0.3	0	0	0.00	172	16 <sup>2</sup>	11 <sup>2</sup>
Copper, Dissolved	µg/L	78	<0.3	3,490	112	11	31	172		64 <sup>4</sup>
Hardness, Total	mg/L	78	25	972	172	143	268	172		
Iron, Dissolved	µg/L	78	<11	158,000	6,814	649	13,260	172		
Iron, Total Recoverable	µg/L	76	268	164,000	10,660	4,435	20,525	172		5,400 <sup>3,4</sup>
Lead, Dissolved	µg/L	78	<0.09	123	2.4	0	0.77	172	116 <sup>1</sup>	4.5 <sup>1</sup>
Manganese, Dissolved	µg/L	78	71.7	27,700	2,493	1,345	4,161	172	3,579 <sup>1</sup>	1,978 <sup>3</sup>
Manganese, Total Recoverable	µg/L	74	86.1	27,900	2,610	1,415	4,389	172		
Nickel, Dissolved	µg/L	78	<0.5	265	21	11	28	172	742 <sup>1</sup>	82 <sup>1</sup>

**Table 3-3: Sample Counts, Summary Statistics, and Applicable 2014 Acute and Chronic Water Quality Standards for Segment COSPCL13b**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile	Mean Hardness	2014 Acute WQS	2014 Chronic WQS
Selenium, Dissolved	µg/L	78	<0.5	5	0.54	0.52	1.01	172	18.4 <sup>1</sup>	4.6 <sup>1</sup>
Silver, Dissolved	µg/L	78	<0.07	5	0.003	0	0	172	5.2 <sup>1</sup>	0.2 <sup>1</sup>
Thallium, Dissolved	µg/L	2	<0.01	<0.01	0	0	0	172		15
Zinc, Dissolved	µg/L	78	108	17,000	1,162	738	1,269	172		740 <sup>3,4</sup>

µg/L = micrograms per liter

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

<sup>2</sup> Dissolved chromium standards are established using the Chromium VI (hexavalent) criteria when chromium valence stability is not determined (per Reg. 31)

<sup>3</sup> Temporary modifications to the WQS exist for dissolved cadmium (ch) = 4.7 µg/L, dissolved manganese (ch) = 3,841 µg/L, dissolved zinc (ch) = 1,582 µg/L, and total recoverable iron (ch) = 7,941 µg/L; expire 7/1/2015

<sup>4</sup> Segment specific standard (per Reg. 38 tables)

### 3.3.1.2 Water Quality Conditions of Upper Clear Creek and Tributaries

The water quality conditions for segments COSPCL01, 2a, 2b, 2c, 3a, 3b, 04, 05, 06, 07, 08, 9a, 9b, 10, 11, and 12 of Clear Creek were evaluated using instream data collected from 2010 – 2013. In addition, data were assessed based on historical (1991) stream segmentation for segments COSPCL02 (combined 2a, 2b, 2c) and COSPCL09 (combined segments 9a and 9b). Available data were reviewed and are presented in three ways:

- A statistical summary showing the data count, minimum, maximum, mean, median, and 85th percentile values;
- A comparison of available data to applicable 1991 standards and 2014 standards from Regulation 38, supplemented with TVVs from Regulation 31 where data are available for comparison, using mean hardness values for the segment; and
- A comparison of available data to applicable 1991 standards and 2014 standards from Regulation 38, supplemented with TVVs from Regulation 31 where data are available for comparison, using paired hardness-concentration values.

Data used for these evaluations were queried from the *Scribe* database. Data for parameters presented in the following subsections are those that have numeric criteria available for comparison purposes.

#### 3.3.1.2.1 Clear Creek Segment COSPCL01

One laboratory sample was available for Segment COSPCL01 from the 2010 – 2013 dataset. However, the sample location was listed as "FB-01" in the database and an assessment of the analytical results suggests that this sample was not a stream sample but rather a field blank submitted to the laboratory for quality assurance/quality control (QA/QC) purposes. Water quality data representing instream conditions on Segment COSPCL01 were not identified from the 2010 – 2013 *Scribe* dataset.

### 3.3.1.2.2 Clear Creek Historical (1991) Segment COSPCL02

Segment COSPCL02 represents the historical stream segmentation which includes all portions of current segments 2a, 2b, and 2c of Clear Creek. A total of 299 samples were included in the *Scribe* dataset from 37 separate locations within Segment COSPCL02 of the Clear Creek watershed. Data collection occurred on 53 separate dates between February 2010 and December 2013. A summary of the available data from COSPCL02 for parameters with numeric water quality standards is provided in **Table 3-4**.

**Table 3-4: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Historical (1991) Segment COSPCL02.**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	299	<15	25,300	858	0	52
Aluminum, Total Recoverable	µg/L	287	<20	25,200	962	58	263
Arsenic, Dissolved	µg/L	299	<0.5	5	0.041	0	0
Arsenic, Total Recoverable	µg/L	287	<2.5	5	0.029	0	0
Cadmium, Dissolved	µg/L	299	<0.04	172	2.3	0.37	1.3
Chromium, Dissolved	µg/L	12	<0.3	<0.3	0	0	0
Copper, Dissolved	µg/L	299	<0.3	1,960	61	0.62	5.1
Hardness, Total	mg/L	299	28	650	94	67	110
Iron, Dissolved	µg/L	299	<11	17,000	226	0	0
Iron, Total Recoverable	µg/L	287	<100	17,100	399	132	363
Lead, Dissolved	µg/L	299	<0.09	22	0.83	0.38	0.74
Manganese, Dissolved	µg/L	299	<2	14,100	593	10	106
Manganese, Total Recoverable	µg/L	274	4	14,200	698	17	142
Nickel, Dissolved	µg/L	299	<0.05	402	14	0	0.56
Selenium, Dissolved	µg/L	299	<0.5	8	0.27	0	0.64
Silver, Dissolved	µg/L	299	<0.07	8	0.01	0	0
Thallium, Dissolved	µg/L	12	<0.01	<0.01	0	0	0
Zinc, Dissolved	µg/L	299	<3.6	78,800	775	110	319

The water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-5**. Comparison to the 2014 standards is not provided as current segment-specific standards do not exist for the historical segmentation. Attainment designations are determined based on the criteria set forth in the WQCD guidance. Determinations of attainment of the 1991 standards used the methodology for attainment determinations for chronic standards are based on the 85th percentile data point for all dissolved metals and on the median (50th percentile) value for all total metal standards.

**Table 3-5: Historical (1991) Water Quality Standards and Determinations of Attainment for Segment COSPCL02 (1991 stream segmentation from Regulation 38), based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Applicable 1991 WQS	Attainment Determination
Arsenic, Dissolved	µg/L	299	50	TRUE
Cadmium, Dissolved	µg/L	299	2.0	TRUE
Chromium, Dissolved	µg/L	12	25	TRUE
Copper, Dissolved	µg/L	299	10	TRUE
Iron, Total Recoverable	µg/L	287	1,000	TRUE
Lead, Dissolved	µg/L	299	5.0	TRUE
Manganese, Total Recoverable	µg/L	274	1,000	TRUE
Nickel, Dissolved	µg/L	299	50	TRUE
Selenium, Dissolved	µg/L	299	80	TRUE
Silver, Dissolved	µg/L	299	0.10	TRUE
Zinc, Dissolved	µg/L	299	280	FALSE

Historical (1991) standards were attained for all metals except for zinc, based on the 2010-2013 dataset.

### 3.3.1.2.3 Clear Creek Segment COSPCL02a

A total of 216 samples were included in the *Scribe* dataset from over 20 separate locations within Segment COSPCL02a of the Clear Creek watershed. Data collection occurred on 31 separate dates between February 2010 and December 2013. A summary of the available data from COSPCL02a for parameters with numeric water quality standards is provided in **Table 3-6**.

**Table 3-6: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL02a.**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	216	<15	122	9.7	0	28
Aluminum, Total Recoverable	µg/L	206	<20	1,060	72	23	139
Arsenic, Dissolved	µg/L	216	<0.5	2.5	0.05	0	0
Arsenic, Total Recoverable	µg/L	206	<2.5	5	0.03	0	0
Cadmium, Dissolved	µg/L	216	<0.04	172	2.2	0.40	1.3
Chromium, Dissolved	µg/L	10	<0.3	<0.3	0	0	0
Copper, Dissolved	µg/L	216	<0.3	17.7	1.28	0.0	3.1
Hardness, Total	mg/L	216	29	490	68	64	86
Iron, Dissolved	µg/L	216	<11	500	1.10	0	0
Iron, Total Recoverable	µg/L	206	<100	1,210	128	111	221
Lead, Dissolved	µg/L	216	<0.09	22.2	0.60	0.40	0.71
Manganese, Dissolved	µg/L	216	2.79	3120	41	8.6	16.0
Manganese, Total Recoverable	µg/L	195	5.09	14,100	111	12	32
Nickel, Dissolved	µg/L	216	<0.05	44.2	0.41	0	0
Selenium, Dissolved	µg/L	216	<0.5	8.14	0.31	0	0.70
Silver, Dissolved	µg/L	216	<0.07	8	0.01	0	0
Thallium, Dissolved	µg/L	10	<0.01	<0.01	0	0	0
Zinc, Dissolved	µg/L	216	<3.6	78,800	821	111	303

Calculations of the 1991 and 2014 acute and chronic water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-7**. Hardness-dependent water quality standards shown in Table 3-7 are calculated using the mean hardness for this segment (68 mg/L). Attainment designations are determined based on the criteria set forth in the WQCD guidance. Determinations of attainment for acute standards are based on a maximum value for each analyte compare to the standards calculated using mean hardness (where applicable). Attainment determinations for chronic standards are based on the 85<sup>th</sup> percentile data point for all dissolved metals and hardness-dependent standards and on the median (50<sup>th</sup> percentile) value for all total metal standards that are not hardness dependent.

**Table 3-7: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCLO2a, based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS			Attainment Determination		
				1991 WQS	2014 Acute	2014 Chronic	1991 WQS	2014 Acute	2014 Chronic
Arsenic, Dissolved	µg/L	216	68	50	340		TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	206	68			0.02			TRUE
Cadmium, Dissolved	µg/L	216	68	2	1.21 <sup>1</sup>	0.32 <sup>3</sup>	TRUE	FALSE	FALSE
Chromium, Dissolved <sup>2</sup>	µg/L	10	68	25	16	11	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	216	68	10	9.31 <sup>1</sup>	6.42 <sup>1</sup>	TRUE	FALSE	TRUE
Iron, Dissolved	µg/L	216	68			300			TRUE
Iron, Total Recoverable	µg/L	206	68	1,000		1,000	TRUE		TRUE
Lead, Dissolved	µg/L	216	68	5	42 <sup>1</sup>	2 <sup>1</sup>	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	216	68		2,623 <sup>1</sup>	1,449 <sup>1</sup>		FALSE	TRUE
Manganese, Total Recoverable	µg/L	195	68	1,000			TRUE		
Nickel, Dissolved	µg/L	216	68	50	337 <sup>1</sup>	37 <sup>1</sup>	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	216	68	80	18.4	4.6	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	216	68	0.1	1.04 <sup>1</sup>	0.04 <sup>1</sup>	TRUE	FALSE	TRUE
Zinc, Dissolved	µg/L	216	68	280	251 <sup>3</sup>	219 <sup>3</sup>	FALSE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on mean hardness and comparison of the 85<sup>th</sup> percentile (dissolved metals and hardness-dependent standards) and median analytical result values (total recoverable metals).

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

<sup>2</sup> Dissolved chromium standards are established using the Chromium VI (hexavalent) criteria when chromium valence stability is not determined (per Reg. 31)

<sup>3</sup> Temporary modifications to the WQS exist: Cadmium (ch) = 1.54 µg/L, Zinc (ac) = 586 µg/L, and Zinc (ch) = 353 µg/L; expires 7/1/2015

Historical (1991) standards were not attained for dissolved zinc. The current (2014) acute standards for dissolved silver, manganese, copper, and acute and chronic standards for cadmium and zinc were also not attained based on the 2010 – 2013 data.

The total number of exceedances of the applicable 1991 and 2014 water quality standards as well as detailed assessments of the attainment of the acute and chronic water quality standards based on single samples and paired hardness data for each sample are presented in **Table 3-8**. In this table, determinations of attainment for acute standards are based on a single exceedance in the 3-year period of data availability. Attainment determinations for chronic standards are based on exceedances of the numeric and calculated standards in 15 percent of the samples collected over the available period of record.

**Table 3-8: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL02a, based on the 2010-2013 dataset.**

Analyte	Units	Number of Samples	Number of Exceedances			Detailed Attainment Determination		
			1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS
Arsenic, Dissolved	µg/L	216	0	0		TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	206			2 (1%)			TRUE
Cadmium, Dissolved	µg/L	216	14 (6%)	27 (13%)	154 (71%)	TRUE	FALSE	FALSE
Chromium, Dissolved	µg/L	10	0	0	0	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	216	1 (1%)	2 (1%)	5 (2%)	TRUE	FALSE	TRUE
Iron, Dissolved	µg/L	216	0		0	TRUE		TRUE
Iron, Total Recoverable	µg/L	206	3 (1%)		3 (1%)	TRUE		TRUE
Lead, Dissolved	µg/L	216	3 (1%)	0	13 (6%)	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	216		0	2 (1%)		TRUE	TRUE
Manganese, Total Recoverable	µg/L	195	2 (1%)			TRUE		
Nickel, Dissolved	µg/L	216	0	0	0	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	216	0	0	2 (1%)	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	216	6 (3%)	0	6 (3%)	TRUE	TRUE	TRUE
Zinc, Dissolved	µg/L	216	57 (26%)	42 (19%)	47 (22%)	FALSE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on paired hardness values.

As shown in Table 3-8, attainment of acute and chronic standards was shown for all but a small number of the metals parameters reported in the dataset for COSPCL02a. Historical (1991) standards were not attained for dissolved zinc. Attainment of the current (2014) standards for dissolved zinc, copper, and cadmium was not achieved.

#### 3.3.1.2.4 Clear Creek Segment COSPCL02b

A total of 34 samples were included in the *Scribe* dataset from three separate locations within Segment COSPCL02b of the Clear Creek watershed. Data collection occurred on 31 separate dates between February 2010 and December 2013. A summary of the available data from COSPCL02b for parameters with numeric water quality standards is provided in **Table 3-9**.

**Table 3-9: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL02b.**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	34	<15	106	41	37	50
Aluminum, Total Recoverable	µg/L	33	29.3	819	147	86.2	239
Arsenic, Dissolved	µg/L	34	<0.5	<0.9	0.00	0	0
Arsenic, Total Recoverable	µg/L	33	<2.5	<2.5	0.00	0	0
Cadmium, Dissolved	µg/L	34	<0.04	0.41	0.18	0.17	0.31
Chromium, Dissolved	µg/L	1	<0.3	<0.3	0	0	0
Copper, Dissolved	µg/L	34	<0.3	5.56	1.58	1.07	3.43
Hardness, Total	mg/L	34	29	129	77	81	116
Iron, Dissolved	µg/L	34	<11	<100	0	0	0
Iron, Total Recoverable	µg/L	33	<100	921	197	170	297
Lead, Dissolved	µg/L	34	<0.09	0.978	0.22	0.17	0.38

**Table 3-9: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL02b.**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Manganese, Dissolved	µg/L	34	37.6	200	91	81	136
Manganese, Total Recoverable	µg/L	32	61.3	233	120	109	158
Nickel, Dissolved	µg/L	34	<0.05	2	0.05	0	0
Selenium, Dissolved	µg/L	34	<0.5	0.93	0.12	0	0.51
Silver, Dissolved	µg/L	34	<0.07	<1.6	0	0	0
Thallium, Dissolved	µg/L	1	<0.01	<0.01	0	0	0
Zinc, Dissolved	µg/L	34	29.1	162	81	79	122

Calculations of the 1991 and 2014 acute and chronic water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-10**. Hardness-dependent water quality standards shown in Table 3-10 are calculated using the mean hardness for this segment (77 mg/L) and attainment designations are determined based on the criteria set forth in the WQCD guidance. All historical (1991) standards were attained. Current (2014) acute and chronic standards for dissolved zinc were not attained based on the 2010-2013 data.

**Table 3-10: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCL02b, based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS			Attainment Determination		
				1991 WQS	2014 Acute	2014 Chronic	1991 WQS	2014 Acute	2014 Chronic
Arsenic, Dissolved	µg/L	34	77	50	340		TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	33	77			0.02			TRUE
Cadmium, Dissolved	µg/L	34	77	2	1.4 <sup>1</sup>	0.3 <sup>1</sup>	TRUE	TRUE	TRUE
Chromium, Dissolved <sup>2</sup>	µg/L	1	77	25	16	11	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	34	77	10	11 <sup>1</sup>	7.2 <sup>1</sup>	TRUE	TRUE	TRUE
Hardness, Total	mg/L	34	77						
Iron, Dissolved	µg/L	34	77			300			TRUE
Iron, Total Recoverable	µg/L	33	77	1,000		1,000	TRUE		TRUE
Lead, Dissolved	µg/L	34	77	5	49 <sup>1</sup>	2 <sup>1</sup>	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	34	77		2,738 <sup>1</sup>	1,513 <sup>1</sup>		TRUE	TRUE
Manganese, Total Recoverable	µg/L	32	77	1,000			TRUE		
Nickel, Dissolved	µg/L	34	77	50	376 <sup>1</sup>	42 <sup>1</sup>	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	34	77	80	18	4.6	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	34	77	0.1	1.3 <sup>1</sup>	0.05 <sup>1</sup>	TRUE	TRUE	TRUE
Zinc, Dissolved	µg/L	34	77	280	126 <sup>1</sup>	96 <sup>1</sup>	TRUE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on mean hardness and comparison of the 85th percentile (dissolved metals and hardness-dependent standards) and median analytical result values (total recoverable metals).

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

<sup>2</sup> Dissolved chromium standards are established using the Chromium VI (hexavalent) criteria when chromium valence stability is not determined (per Reg. 31)

The total number of exceedances of the applicable 1991 and 2014 water quality standards as well as detailed assessments of the attainment of the acute and chronic water quality standards based on single samples and paired hardness data for each sample are presented in **Table 3-11**. As shown in Table 3-11, attainment of acute and chronic standards was shown for all but one of the metals parameters reported in the dataset for COSPCL02b. All historical (1991) standards were attained; however, attainment of the current (2014) standards for dissolved zinc (acute/chronic) was not achieved.

**Table 3-11: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL02b, based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Number of Exceedances			Detailed Attainment Determination		
			1991 WQS	2014 Acute WQS	2014 Chronic WQS	1991 WQS	2014 Acute WQS	2014 Chronic WQS
Arsenic, Dissolved	µg/L	34	0	0		TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	33			0			TRUE
Cadmium, Dissolved	µg/L	34	0	0	4 (12%)	TRUE	TRUE	TRUE
Chromium, Dissolved	µg/L	1	0	0	0	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	34	0	0	2 (6%)	TRUE	TRUE	TRUE
Iron, Dissolved	µg/L	34	0		0	TRUE		TRUE
Iron, Total Recoverable	µg/L	33	0		0	TRUE		TRUE
Lead, Dissolved	µg/L	34	0	0	0	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	34		0	0		TRUE	TRUE
Manganese, Total Recoverable	µg/L	32	0			TRUE		
Nickel, Dissolved	µg/L	34	0	0	0	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	34	0	0	0	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	34	0	0	0	TRUE	TRUE	TRUE
Zinc, Dissolved	µg/L	34	0	5 (15%)	10 (29%)	TRUE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on paired hardness values.

### 3.3.1.2.5 Clear Creek Segment COSPCL02c

A total of 49 samples were included in the *Scribe* dataset from five separate locations within Segment COSPCL02c of the Clear Creek watershed. Data collection occurred on approximately 39 separate dates between February 2010 and November 2013. A summary of the available data from COSPCL02c for parameters with numeric water quality standards is provided in **Table 3-12**.

**Table 3-12: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL02c.**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	49	<15	25,300	5,165	56	15,400
Aluminum, Total Recoverable	µg/L	48	23.6	25,200	5,343	204	15,540
Arsenic, Dissolved	µg/L	49	<0.5	5	0.01	0	0
Arsenic, Total Recoverable	µg/L	48	<2.5	5	0.06	0	0
Cadmium, Dissolved	µg/L	49	<0.1	21.5	3.99	0.54	11.1
Chromium, Dissolved	µg/L	1	<0.3	<0.3	0.00	0	0
Copper, Dissolved	µg/L	49	<0.3	1,960	365	7.29	1,104
Hardness, Total	mg/L	49	28	650	223	110	544
Iron, Dissolved	µg/L	49	<11	17,000	1,376	0	3,754

**Table 3-12: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCLO2c.**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Iron, Total Recoverable	µg/L	48	<100	17,100	1,703	294	3,755
Lead, Dissolved	µg/L	49	<0.09	12	2.27	0.301	6.114
Manganese, Dissolved	µg/L	49	<2	14,100	3,378	120	10,880
Manganese, Total Recoverable	µg/L	47	3.61	14,200	3,528	151	10,780
Nickel, Dissolved	µg/L	49	<0.05	402	86	1.01	319
Selenium, Dissolved	µg/L	49	<0.5	5	0.22	0	0.61
Silver, Dissolved	µg/L	49	<0.07	5	0.02	0	0
Thallium, Dissolved	µg/L	1	<0.01	<0.01	0	0	0
Zinc, Dissolved	µg/L	49	52.1	4,320	1,055	173	3,056

Calculations of the 1991 and 2014 acute and chronic water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-13**. Hardness-dependent water quality standards shown in Table 3-13 are calculated using the mean hardness for this segment (223 mg/L) and attainment designations are determined based on the criteria set forth in the WQCD guidance. Historical standards were also not attained for dissolved cadmium, copper, lead, nickel, and zinc. Current (2014) acute and chronic standards for dissolved cadmium, copper, manganese, and zinc were also as not achieved based on the 2010 – 2013 data. Current chronic standards for dissolved lead, iron, and nickel were also not attained.

**Table 3-13: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCLO2c, based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS			Attainment Determination		
				1991 WQS	2014 Acute	2014 Chronic	1991 WQS	2014 Acute	2014 Chronic
Arsenic, Dissolved	µg/L	49	223	50	340		TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	48	223			0.02			TRUE
Cadmium, Dissolved	µg/L	49	223	2	3.43 <sup>1</sup>	0.78 <sup>1</sup>	FALSE	FALSE	FALSE
Chromium, Dissolved <sup>2</sup>	µg/L	1	223	25	16	11	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	49	223	10	29 <sup>1</sup>	17.8 <sup>3</sup>	FALSE	FALSE	FALSE
Hardness, Total	mg/L	49	223						
Iron, Dissolved	µg/L	49	223			300			FALSE
Iron, Total Recoverable	µg/L	48	223	1,000		1,000	TRUE		TRUE
Lead, Dissolved	µg/L	49	223	5	153 <sup>1</sup>	6 <sup>1</sup>	FALSE	TRUE	FALSE
Manganese, Dissolved	µg/L	49	223		3,901 <sup>1</sup>	2,156 <sup>1</sup>		FALSE	FALSE
Manganese, Total Recoverable	µg/L	47	223	1,000			TRUE		
Nickel, Dissolved	µg/L	49	223	50	924 <sup>1</sup>	103 <sup>1</sup>	FALSE	TRUE	FALSE
Selenium, Dissolved	µg/L	49	223	80	18.4 <sup>1</sup>	4.6 <sup>1</sup>	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	49	223	0.1	8 <sup>1</sup>	0.30 <sup>1</sup>	TRUE	TRUE	TRUE
Zinc, Dissolved	µg/L	49	223	280	693 <sup>1,4</sup>	606 <sup>1,4</sup>	FALSE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on mean hardness and comparison of the 85th percentile (dissolved metals and hardness-dependent standards) and median analytical result values (total recoverable metals).

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

<sup>2</sup> Dissolved chromium standards are established using the Chromium VI (hexavalent) criteria when chromium valence stability is not determined (per Reg. 31)

<sup>3</sup> Temporary modification to the WQS for Copper (Ch) = 11.4 µg/L; expires 7/1/2015

<sup>4</sup> Segment specific standard (per Reg. 38 tables)

**Table 3-14** provides a summary of the total number of exceedances of the applicable 1991 and 2014 water quality standards as well as detailed assessments of the attainment of the acute and chronic water quality standards based on single samples and paired hardness data for each sample. As shown in Table 3-14, attainment of either historical or current standards was not achieved for a number of metals parameters reported in the dataset for COSPCL02c including; dissolved cadmium, dissolved copper, total recoverable iron, dissolved lead, dissolved and total recoverable manganese, dissolved nickel and dissolved zinc.

**Table 3-14: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL02c and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Number of Exceedances			Detailed Attainment Determination		
			1991 WQS	2014 Acute WQS	2014 Chronic WQS	1991 WQS	2014 Acute WQS	2014 Chronic WQS
Arsenic, Dissolved	µg/L	49	0	0		TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	48			1 (2%)			TRUE
Cadmium, Dissolved	µg/L	49	15 (31%)	13 (27%)	33 (67%)	FALSE	FALSE	FALSE
Chromium, Dissolved	µg/L	1	0	0	0	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	49	18 (37%)	19 (39%)	24 (49%)	FALSE	FALSE	FALSE
Iron, Dissolved	µg/L	49	0		16 (33%)	TRUE		FALSE
Iron, Total Recoverable	µg/L	48	19 (40%)		19 (40%)	FALSE		FALSE
Lead, Dissolved	µg/L	49	13 (27%)	0	3 (6%)	FALSE	TRUE	TRUE
Manganese, Dissolved	µg/L	49		15 (31%)	16 (33%)		FALSE	FALSE
Manganese, Total Recoverable	µg/L	47	16 (34%)			FALSE		
Nickel, Dissolved	µg/L	49	16 (33%)	0	13 (27%)	FALSE	TRUE	FALSE
Selenium, Dissolved	µg/L	49	0	0	0	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	49	2 (4%)	0	2 (4%)	TRUE	TRUE	TRUE
Zinc, Dissolved	µg/L	49	18 (37%)	16 (33%)	16 (33%)	FALSE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on paired hardness values

#### 3.3.1.2.6 Clear Creek Segment COSPCL03a

No analytical data were available for sampling locations along Segment COSPCL03a in the 2010-2013 *Scribe* dataset

#### 3.3.1.2.7 Clear Creek Segment COSPCL03b

No analytical data were available for sampling locations along Segment COSPCL03b in the 2010-2013 *Scribe* dataset.

#### 3.3.1.2.8 Clear Creek Segment COSPCL04

No analytical data were available for sampling locations along Segment COSPCL04 in the 2010-2013 *Scribe* dataset.

### 3.3.1.2.9 Clear Creek Segment COSPCL05

A total of 62 samples were included in the *Scribe* dataset from four separate locations within Segment COSPCL05 of the Clear Creek watershed. Data collection occurred on 30 separate dates between February 2010 and December 2013. A summary of the available data from COSPCL05 for parameters with numeric water quality standards is provided in **Table 3-15**.

**Table 3-15: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL05.**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	62	<15	222	96	82	172
Aluminum, Total Recoverable	µg/L	60	74.4	684	214	190	339
Arsenic, Dissolved	µg/L	62	<0.5	0.9	0.01	0	0
Arsenic, Total Recoverable	µg/L	60	<2.5	<2.5	0.00	0	0
Cadmium, Dissolved	µg/L	62	<0.04	0.48	0.08	0.05	0.16
Chromium, Dissolved	µg/L	2	<0.3	<0.3	0	0	0
Copper, Dissolved	µg/L	62	<0.3	14.7	2.6	2.7	4.4
Hardness, Total	mg/L	62	27	362	114	107	192
Iron, Dissolved	µg/L	62	<11	<100	0.00	0	0
Iron, Total Recoverable	µg/L	60	<100	562	141	143	273
Lead, Dissolved	µg/L	62	<0.09	1.01	0.05	0	0
Manganese, Dissolved	µg/L	62	66.5	916	335	277	537
Manganese, Total Recoverable	µg/L	58	112	923	371	314	573
Nickel, Dissolved	µg/L	62	<0.05	2	0.14	0	0
Selenium, Dissolved	µg/L	62	<0.5	0.77	0.07	0	0
Silver, Dissolved	µg/L	62	<0.07	2.86	0.14	0	0.15
Thallium, Dissolved	µg/L	2	<0.01	<0.01	0.00	0	0
Zinc, Dissolved	µg/L	62	<3.6	149	51	40	82

Calculations of the 1991 and 2014 acute and chronic water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-16**. Hardness-dependent water quality standards shown in Table 3-16 are calculated using the mean hardness for this segment (114 mg/L) and attainment designations are determined based on the criteria set forth in the WQCD guidance. Attainment of each standard was shown for all but one of the metals parameters reported in the dataset for COSPCL05. Historical (1991) standards were not attained for dissolved silver. Current (2014) acute and chronic standards for dissolved silver were not achieved based on the 2010 – 2013 data.

**Table 3-16: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCL05 and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS			Attainment Determination		
				1991 Chronic	2014 Acute	2014 Chronic	1991 Chronic	2014 Acute	2014 Chronic
Arsenic, Dissolved	µg/L	62	114	50	340		TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	60	114			7.6 <sup>3</sup>			TRUE
Cadmium, Dissolved	µg/L	62	114	3.0	1.9 <sup>1</sup>	0.5 <sup>1</sup>	TRUE	TRUE	TRUE
Chromium, Dissolved <sup>2</sup>	µg/L	2	114	25	16	11	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	62	114	23	15 <sup>1</sup>	10 <sup>1</sup>	TRUE	TRUE	TRUE
Iron, Dissolved	µg/L	62	114			300			TRUE
Iron, Total Recoverable	µg/L	60	114	1,000		1,000	TRUE		TRUE

**Table 3-16: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCL05 and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS			Attainment Determination		
				1991 Chronic	2014 Acute	2014 Chronic	1991 Chronic	2014 Acute	2014 Chronic
Lead, Dissolved	µg/L	62	114	25	75 <sup>1</sup>	2.9 <sup>1</sup>	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	62	114		3,121 <sup>1</sup>	1,724 <sup>1</sup>		TRUE	TRUE
Manganese, Total Recoverable	µg/L	58	114	1,100			TRUE		
Nickel, Dissolved	µg/L	62	114	100	524 <sup>1</sup>	58 <sup>1</sup>	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	62	114	80	18	4.6	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	62	114	0.10	2.5 <sup>1</sup>	0.09 <sup>1</sup>	FALSE	FALSE	FALSE
Zinc, Dissolved	µg/L	62	114	100	352 <sup>1,3</sup>	243 <sup>1,3</sup>	TRUE	TRUE	TRUE

Note: Hardness-dependent standards and attainment values based on mean hardness and comparison of the 85th percentile (dissolved metals and hardness-dependent standards) and median analytical result values (total recoverable metals).

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

<sup>2</sup> Dissolved chromium standards are established using the Chromium VI (hexavalent) criteria when chromium valence stability is not determined (per Reg. 31)

<sup>3</sup> Segment specific standard (per Reg. 38 tables)

The total number of exceedances of the applicable 1991 and 2014 water quality standards as well as detailed assessments of the attainment of the acute and chronic water quality standards based on single samples and paired hardness data for each sample are presented in **Table 3-17**. As shown in Table 3-17, attainment of the historical (1991) standards was shown for all of the metals parameters reported in the dataset for COSPCL05 except for dissolved silver. Attainment of the current (2014) acute standards for dissolved copper and dissolved silver was not achieved.

**Table 3-17: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL05, based on the 2010-2013 Dataset**

Analyte	Units	Number of Samples	Number of Exceedances			Detailed Attainment Determination		
			1991 WQS	2014 Acute WQS	2014 Chronic WQS	1991 WQS	2014 Acute WQS	2014 Chronic WQS
Arsenic, Dissolved	µg/L	62	0	0		TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	60			0			TRUE
Cadmium, Dissolved	µg/L	62	0	0	3 (5%)	TRUE	TRUE	TRUE
Chromium, Dissolved	µg/L	2	0	0	0	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	62	1 (2%)	4 (6%)	7 (11%)	TRUE	FALSE	TRUE
Iron, Dissolved	µg/L	62	0		0	TRUE		TRUE
Iron, Total Recoverable	µg/L	60	0		0	TRUE		TRUE
Lead, Dissolved	µg/L	62	0	0	1 (2%)	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	62		0	0		TRUE	TRUE
Manganese, Total Recoverable	µg/L	58	0			TRUE		
Nickel, Dissolved	µg/L	62	0	0	0	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	62	0	0	0	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	62	11 (18%)	3 (5%)	9 (15%)	FALSE	FALSE	TRUE
Zinc, Dissolved	µg/L	62	6 (10%)	0	1 (2%)	TRUE	TRUE	TRUE

Note: Hardness-dependent standards and attainment values based on paired hardness values.

### 3.3.1.2.10 Clear Creek Segment COSPCL06

A total of 30 samples were included in the *Scribe* dataset from a single sampling location on Segment COSPCL06 of the Clear Creek watershed. Data collection occurred on 30 separate dates between February 2010 and November 2013. A summary of the available data from COSPCL06 for parameters with numeric water quality standards is provided in **Table 3-18**.

**Table 3-18: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL06**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	30	<15	51.1	2.65	0	0
Aluminum, Total Recoverable	µg/L	29	<20	168	25	20	44
Arsenic, Dissolved	µg/L	30	<0.5	<0.9	0	0	0
Arsenic, Total Recoverable	µg/L	29	<2.5	<2.5	0	0	0
Cadmium, Dissolved	µg/L	30	<0.04	<0.1	0	0	0
Chromium, Dissolved	µg/L	1	<0.3	<0.3	0	0	0
Copper, Dissolved	µg/L	30	<0.3	4	0.39	0	0.52
Hardness, Total	mg/L	30	7	15	11	11	14
Iron, Dissolved	µg/L	30	<11	<100	0.00	0	0
Iron, Total Recoverable	µg/L	29	<100	137	9.17	0	0
Lead, Dissolved	µg/L	30	<0.09	0.557	0.02	0	0
Manganese, Dissolved	µg/L	30	<0.3	<2	0.00	0	0
Manganese, Total Recoverable	µg/L	28	<2	4.98	0.89	0	2.7
Nickel, Dissolved	µg/L	30	<0.05	<2	0	0	0
Selenium, Dissolved	µg/L	30	<0.5	<0.5	0	0	0
Silver, Dissolved	µg/L	30	<0.07	<0.5	0	0	0
Thallium, Dissolved	µg/L	1	<0.01	<0.01	0	0	0
Zinc, Dissolved	µg/L	30	<3.6	22	4.18	0	13

Calculations of the 1991 and 2014 acute and chronic water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-19**. Hardness-dependent water quality standards shown in Table 3-19 are calculated using the mean hardness for this segment (11 mg/L) and attainment designations are determined based on the criteria set forth in the WQCD guidance. Historical (1991) standards were not attained for dissolved copper (acute) and dissolved zinc (acute/chronic). Current (2014) acute standards for dissolved copper dissolved zinc were not achieved based on the 2010 – 2013 data.

**Table 3-19: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCL06 and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS				Attainment Determination			
				1991 Acute	1991 Chronic	2014 Acute	2014 Chronic	1991 Acute	1991 Chronic	2014 Acute	2014 Chronic
Arsenic, Dissolved	µg/L	30	11	360	150	340		TRUE	TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	29	11				0.02				TRUE
Cadmium, Dissolved	µg/L	30	11	0.33 <sup>1</sup>	0.20 <sup>1</sup>	0.25 <sup>1</sup>	0.08 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Chromium, Dissolved <sup>2</sup>	µg/L	1	11	16	11	16	11	TRUE	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	30	11	2.23 <sup>1</sup>	1.80 <sup>1</sup>	1.69 <sup>1</sup>	1.37 <sup>1</sup>	FALSE	TRUE	FALSE	TRUE
Hardness, Total	mg/L	30	11								
Iron, Dissolved	µg/L	30	11				300				TRUE
Iron, Total Recoverable	µg/L	29	11		1000		1000		TRUE		TRUE
Lead, Dissolved	µg/L	30	11	2.74 <sup>1</sup>	0.17 <sup>1</sup>	5.51 <sup>1</sup>	0.21 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	30	11			1,435 <sup>1</sup>	793 <sup>1</sup>			TRUE	TRUE
Manganese, Total Recoverable	µg/L	28	11		1000				TRUE		
Nickel, Dissolved	µg/L	30	11	173 <sup>1</sup>	18 <sup>1</sup>	73 <sup>1</sup>	8 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	30	11	135 <sup>1</sup>	17 <sup>1</sup>	18.4	4.6	TRUE	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	30	11	0.05 <sup>1</sup>	0.002 <sup>1</sup>	0.05 <sup>1</sup>	0.00 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Zinc, Dissolved	µg/L	30	11	18.4 <sup>1</sup>	0.17 <sup>1</sup>	21.6 <sup>1</sup>	16.4 <sup>1</sup>	FALSE	FALSE	FALSE	TRUE

Note: Hardness-dependent standards and attainment values based on mean hardness and comparison of the 85th percentile (dissolved metals and hardness-dependent standards) and median analytical result values (total recoverable metals).

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

<sup>2</sup> Dissolved chromium standards are established using the Chromium VI (hexavalent) criteria when chromium valence stability is not determined (per Reg. 31)

**Table 3-20** provides a summary of the total number of exceedances of the applicable 1991 and 2014 water quality standards as well as detailed assessments of the attainment of the acute and chronic water quality standards based on single samples and paired hardness data for each sample. As shown in Table 3-20, attainment of historical and current acute and chronic standards was shown for the majority of metals parameters in segment COSPCL06. The historical acute standards for dissolved copper and historical chronic standards for dissolved zinc were not attained. Current standards for acute dissolved copper were not attained based on paired data shown in the 2010 – 2013 *Scribe* database.

**Table 3-20: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL06 and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Number of Exceedances				Detailed Attainment Determination			
			1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS	1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS
Arsenic, Dissolved	µg/L	30	0		0	0	TRUE	TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	29				0				TRUE
Cadmium, Dissolved	µg/L	30	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Chromium, Dissolved	µg/L	1	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	30	3 (10%)	4 (13%)	4 (13%)	4 (13%)	FALSE	TRUE	FALSE	TRUE
Iron, Dissolved	µg/L	30		0		0		TRUE		TRUE
Iron, Total Recoverable	µg/L	29		0		0		TRUE		TRUE
Lead, Dissolved	µg/L	30	0	1 (3%)	0	1 (3%)	TRUE	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	30			0	0			TRUE	TRUE
Manganese, Total Recoverable	µg/L	28		0				TRUE		
Nickel, Dissolved	µg/L	30	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	30	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	30	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Zinc, Dissolved	µg/L	30	1 (3%)	8 (27%)	0	2 (7%)	TRUE	FALSE	TRUE	TRUE

Note: Hardness-dependent standards and attainment values based on paired hardness values.

### 3.3.1.2.11 Clear Creek Segment COSPCL07

No analytical data were available for sampling locations along Segment COSPCL07 in the 2010 – 2013 *Scribe* dataset.

### 3.3.1.2.12 Clear Creek Segment COSPCL08

A total of five samples were included in the *Scribe* dataset from separate sampling locations along Segment COSPCL08 of the Clear Creek watershed. All available data for this segment were collected on August 26, 2010. A summary of the available data from COSPCL08 for parameters with numeric water quality standards is provided in **Table 3-21**.

**Table 3-21: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL08**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	5	29.5	86,800	31,130	9,850	67,420
Aluminum, Total Recoverable	µg/L	5	38.3	89,900	31,962	9,940	68,900
Arsenic, Dissolved	µg/L	5	<0.5	<5	0	0	0
Arsenic, Total Recoverable	µg/L	5	<2.5	<2.5	0	0	0
Cadmium, Dissolved	µg/L	5	<0.1	17	5.5	2.3	11
Copper, Dissolved	µg/L	5	3.23	2,490	901	267	1,974
Hardness, Total	mg/L	5	15	660	286	126	595
Iron, Dissolved	µg/L	5	<100	109,000	28,721	7,790	59,260
Iron, Total Recoverable	µg/L	5	<100	116,000	30,794	8,040	63,620
Lead, Dissolved	µg/L	5	<0.1	1.00	0.04	0	0.08
Manganese, Dissolved	µg/L	5	9.16	64,100	20,696	7,380	42,620
Manganese, Total Recoverable	µg/L	5	9.8	64,700	20,878	7,420	42,980
Nickel, Dissolved	µg/L	5	<0.5	257	97	37	206
Selenium, Dissolved	µg/L	5	<0.5	12	4.5	1.4	10
Silver, Dissolved	µg/L	5	<0.1	1	0.05	0	0.11
Zinc, Dissolved	µg/L	5	<10	2,270	837	346	1,730

There are currently no water quality standards for metals or other parameters of concern listed for Segment 08 in the Regulation 38 tables. No comparisons of the available water quality data to standards were completed for this report.

### 3.3.1.2.13 Clear Creek Historical (1991) Segment COSPCL09

Segment COSPCL09 represents the historical stream segmentation which includes all portions of current segments 9a and 9b of Clear Creek. A total of 200 samples were included in the *Scribe* dataset from 13 sampling locations on Segment COSPCL09 of the Clear Creek watershed. Data collection occurred on 50 separate dates between February 2010 and December 2013. A summary of the available data from COSPCL09 for parameters with numeric water quality standards is provided in **Table 3-22**.

**Table 3-22: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL09**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	204	<15	4,310	178	23	99
Aluminum, Total Recoverable	µg/L	202	<20	660,000	3,795	114	882
Arsenic, Dissolved	µg/L	204	<0.5	1.5	0.049	0	0
Arsenic, Total Recoverable	µg/L	202	<2.5	2,400	12	0	0
Cadmium, Dissolved	µg/L	204	<0.04	17	2.5	2.0	4.3
Chromium, Dissolved	µg/L	2	<0.3	<0.3	0	0	0
Copper, Dissolved	µg/L	204	<0.3	883	66	22	83
Hardness, Total	mg/L	204	11	187	71	80	105
Iron, Dissolved	µg/L	204	<11	240	4.1	0	0
Iron, Total Recoverable	µg/L	202	<100	1,730,000	9,088	116	494
Lead, Dissolved	µg/L	204	<0.09	13	1.7	1.0	3.6
Manganese, Dissolved	µg/L	204	<2	3,370	513	316	1,146
Manganese, Total Recoverable	µg/L	200	<2	104,000	1,065	345	1,186
Nickel, Dissolved	µg/L	204	<0.05	50	7.3	6.5	11

**Table 3-22: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL09**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Selenium, Dissolved	µg/L	204	<0.5	1.1	0.07	0	0
Silver, Dissolved	µg/L	204	<0.07	1.5	0.03	0	0
Thallium, Dissolved	µg/L	2	<0.01	<0.01	0	0	0
Zinc, Dissolved	µg/L	204	<3.6	3,240	596	640	997

Calculations of the 1991 acute and chronic water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-23**. Comparison to the 2014 standards is not provided as current segment-specific standards do not exist for the historical segmentation. Hardness-dependent water quality standards shown in Table 3-23 are calculated using the mean hardness for this segment (71.1 mg/L) and attainment designations are determined based on the criteria set forth in the WQCD guidance. Historical acute and chronic standards for dissolved cadmium, dissolved copper and dissolved zinc were not attained. Historical acute standards for dissolved silver were also not attained.

**Table 3-23: Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCL09 (1991 stream segmentation), based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS		Attainment Determination	
				1991 Acute	1991 Chronic	1991 Acute	1991 Chronic
Arsenic, Dissolved	µg/L	204	71.1	360	150	TRUE	TRUE
Cadmium, Dissolved	µg/L	204	71.1	2.7 <sup>1</sup>	0.87 <sup>1</sup>	FALSE	FALSE
Chromium, Dissolved <sup>2</sup>	µg/L	2	71.1	16	11	TRUE	TRUE
Copper, Dissolved	µg/L	204	71.1	13 <sup>1</sup>	8.8 <sup>1</sup>	FALSE	FALSE
Iron, Dissolved	µg/L	204	71.1		300		TRUE
Iron, Total Recoverable	µg/L	202	71.1		1,000		TRUE
Lead, Dissolved	µg/L	204	71.1	55 <sup>1</sup>	2.4 <sup>1</sup>	TRUE	FALSE
Manganese, Total Recoverable	µg/L	200	71.1		1,000		TRUE
Nickel, Dissolved	µg/L	204	71.1	712 <sup>1</sup>	74 <sup>1</sup>	TRUE	TRUE
Selenium, Dissolved	µg/L	204	71.1	135	17	TRUE	TRUE
Silver, Dissolved	µg/L	204	71.1	1.1 <sup>1</sup>	0.042 <sup>1</sup>	FALSE	TRUE
Zinc, Dissolved	µg/L	204	71.1	108 <sup>1</sup>	6.1 <sup>1</sup>	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on mean hardness and comparison of the 85th percentile (dissolved metals and hardness-dependent standards) and median analytical result values (total recoverable metals).

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

<sup>2</sup> Dissolved chromium standards are established using the Chromium VI (hexavalent) criteria when chromium valence stability is not determined (per Reg. 31)

The total number of exceedances of the applicable 1991 water quality standards as well as detailed assessments of the attainment of the acute and chronic water quality standards based on single samples and paired hardness data for each sample are presented in **Table 3-24**. Historical chronic standards for dissolved cadmium, copper, lead, and zinc and total recoverable manganese were to be attained based on the current dataset.

**Table 3-24: Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL09 (1991 stream segmentation) and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Number of Exceedances		Detailed Attainment Determination	
			1991 Acute WQS	1991 Chronic WQS	1991 Acute WQS	1991 Chronic WQS
Arsenic, Dissolved	µg/L	204	0	0		TRUE
Arsenic, Total Recoverable	µg/L	202	0	0		
Cadmium, Dissolved	µg/L	204	52 (25%)	148 (73%)	FALSE	FALSE
Chromium, Dissolved	µg/L	2	0	0	TRUE	TRUE
Copper, Dissolved	µg/L	204	128 (63%)	144 (71%)	FALSE	FALSE
Hardness, Total	mg/L	204	0	0		
Iron, Dissolved	µg/L	204	0	0		TRUE
Iron, Total Recoverable	µg/L	202	0	17 (8%)		TRUE
Lead, Dissolved	µg/L	204	0	50 (25%)		FALSE
Manganese, Total Recoverable	µg/L	200	0	39 (20%)		FALSE
Nickel, Dissolved	µg/L	204	0	0		TRUE
Selenium, Dissolved	µg/L	204	0	0		TRUE
Silver, Dissolved	µg/L	204	6 (3%)	13 (6%)		TRUE
Thallium, Dissolved	µg/L	2	0	0		TRUE
Zinc, Dissolved	µg/L	204	150 (74%)	181 (89%)	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on paired hardness values.

#### 3.3.1.2.14 Clear Creek Segment COSPCL09a

A total of 31 samples were included in the *Scribe* dataset from a single sampling location on Segment COSPCL09a of the Clear Creek watershed. Data collection occurred on 31 separate dates between February 2010 and December 2013. A summary of the available data from COSPCL09a for parameters with numeric water quality standards is provided in **Table 3-25**.

**Table 3-25: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL09a**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	31	<15	129	29	24	59
Aluminum, Total Recoverable	µg/L	30	<20	906	112	49	201
Arsenic, Dissolved	µg/L	31	<0.5	<0.9	0	0	0
Arsenic, Total Recoverable	µg/L	30	<2.5	<2.5	0	0	0
Cadmium, Dissolved	µg/L	31	<0.04	0.44	0.04	0	0.12
Chromium, Dissolved	µg/L	1	<0.3	<0.3	0	0	0
Copper, Dissolved	µg/L	31	<0.3	28	6.1	4.7	7.8
Hardness, Total	mg/L	31	13	43	26	20	41
Iron, Dissolved	µg/L	31	<11	122	3.94	0	0
Iron, Total Recoverable	µg/L	30	<100	1,070	141	0	322
Lead, Dissolved	µg/L	31	<0.09	2.97	0.10	0	0
Manganese, Dissolved	µg/L	31	3.03	71.9	12	7.8	18
Manganese, Total Recoverable	µg/L	29	6.67	102	19	14	28
Nickel, Dissolved	µg/L	31	<0.05	2	0.21	0	0.57
Selenium, Dissolved	µg/L	31	<0.5	<0.5	0	0	0
Silver, Dissolved	µg/L	31	<0.07	<0.5	0	0	0
Thallium, Dissolved	µg/L	1	<0.01	<0.01	0	0	0
Zinc, Dissolved	µg/L	31	<3.6	76	21	22	37

Calculations of the 1991 and 2014 acute and chronic water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-26**. Hardness-dependent water quality standards shown in Table 3-26 are calculated using the mean hardness for this segment (26 mg/L) and attainment designations are determined based on the criteria set forth in the WQCD guidance. Historical acute and chronic standards for dissolved copper and dissolved zinc were not attained. Current (2014) acute standards for dissolved copper and acute and chronic standards for dissolved zinc were also not achieved based on the 2010-2013 data.

**Table 3-26: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCL09a based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS				Attainment Determination			
				1991 Acute	1991 Chronic	2014 Acute	2014 Chronic	1991 Acute	1991 Chronic	2014 Acute	2014 Chronic
Arsenic, Dissolved	µg/L	31	26	360	150	340		TRUE	TRUE	TRUE	
Arsenic, Tot. Recoverable	µg/L	30	26				0.02				TRUE
Cadmium, Dissolved	µg/L	31	26	0.87 <sup>1</sup>	0.40 <sup>1</sup>	0.53 <sup>1</sup>	0.15 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Chromium, Dissolved <sup>2</sup>	µg/L	1	26	16	11	16	11	TRUE	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	31	26	5.04 <sup>1</sup>	3.78 <sup>1</sup>	3.82 <sup>1</sup>	2.86 <sup>3</sup>	FALSE	FALSE	FALSE	TRUE
Hardness, Total	mg/L	31	26								
Iron, Dissolved	µg/L	31	26		300		300		TRUE		TRUE
Iron, Tot. Recoverable	µg/L	30	26		1,000		1,000		TRUE		TRUE
Lead, Dissolved	µg/L	31	26	11.1 <sup>1</sup>	0.59 <sup>1</sup>	14.70 <sup>1</sup>	0.57 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	31	26			1,914 <sup>1</sup>	1,057 <sup>1</sup>			TRUE	TRUE
Manganese, Tot. Recoverable	µg/L	29	26		1,000				TRUE		
Nickel, Dissolved	µg/L	31	26	334 <sup>1</sup>	35 <sup>1</sup>	151 <sup>1</sup>	17 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	31	26	135	17	18.4	4.6	TRUE	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	31	26	0.20 <sup>1</sup>	0.008 <sup>1</sup>	0.20 <sup>1</sup>	0.01 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Zinc, Dissolved	µg/L	31	26	37 <sup>1</sup>	1 <sup>1</sup>	48 <sup>1</sup>	36 <sup>1</sup>	FALSE	FALSE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on mean hardness and comparison of the 85th percentile (dissolved metals and hardness-dependent standards) and median analytical result values (total recoverable metals).

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

<sup>2</sup> Dissolved chromium standards are established using the Chromium VI (hexavalent) criteria when chromium valence stability is not determined (per Reg. 31)

<sup>3</sup> Temporary modification to the WQS expires for copper (ch) = 9.6 µg/L; 7/1/2015

The total number of exceedances of the applicable 1991 and 2014 water quality standards as well as detailed assessments of the attainment of the acute and chronic water quality standards based on single samples and paired hardness data for each sample are presented in **Table 3-27**. Attainment of historical acute and chronic standards was shown for all but two of the metals parameters reported in the dataset for COSPCL09a: dissolved copper and dissolved zinc. Attainment of the current (2014) acute and chronic standards was not met for dissolved copper.

**Table 3-27: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL09a, based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Number of Exceedances				Detailed Attainment Determination			
			1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS	1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS
Arsenic, Dissolved	µg/L	31	0	0	0	0	TRUE	TRUE	TRUE	
Arsenic, Tot. Recoverable	µg/L	30	0	0	0	0				TRUE
Cadmium, Dissolved	µg/L	31	0	0	0	1 (3%)	TRUE	TRUE	TRUE	TRUE
Chromium, Dissolved	µg/L	1	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	31	14 (45%)	20 (65%)	18 (58%)	25 (81%)	FALSE	FALSE	FALSE	FALSE
Iron, Dissolved	µg/L	31		0		0		TRUE		TRUE
Iron, Total Recoverable	µg/L	30		1 (3%)		1 (3%)		TRUE		TRUE
Lead, Dissolved	µg/L	31	0	1 (3%)	0	1 (3%)	TRUE	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	31			0	0			TRUE	TRUE
Manganese, Tot. Recoverable	µg/L	29		0				TRUE		
Nickel, Dissolved	µg/L	31	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	31	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	31	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Zinc, Dissolved	µg/L	31	2 (6%)	21 (68%)	1 (3%)	4 (13%)	FALSE	FALSE	TRUE	TRUE

Note: Hardness-dependent standards and attainment values based on paired hardness values.

### 3.3.1.2.15 Clear Creek Segment COSPCL09b

A total of 173 samples were included in the *Scribe* dataset from nine separate sampling locations along Segment COSPCL09b of the Clear Creek watershed. Data collection occurred over 40 separate dates between February 2010 and December 2013. A summary of the available data from COSPCL09b for parameters with numeric water quality standards is provided in **Table 3-28**.

**Table 3-28: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL09b**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	173	<15	4,310	204	22	105
Aluminum, Total Recoverable	µg/L	172	<20	660,000	4,437	131	1,075
Arsenic, Dissolved	µg/L	173	<0.5	1	0	0	0
Arsenic, Total Recoverable	µg/L	172	<2.5	2,400	14	0	0

**Table 3-28: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL09b**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Cadmium, Dissolved	µg/L	173	<0.1	17	2.9	2.3	5.0
Chromium, Dissolved	µg/L	1	<0.3	<0.3	0	0	0
Copper, Dissolved	µg/L	173	<2	883	76	27	96
Hardness, Total	mg/L	173	11	187	79	89	106
Iron, Dissolved	µg/L	173	<11	240	4.2	0	0
Iron, Total Recoverable	µg/L	172	<100	1,730,000	10,648	117	554
Lead, Dissolved	µg/L	173	<0.09	13	2.0	1.3	4.2
Manganese, Dissolved	µg/L	173	<2	3,370	603	424	1,192
Manganese, Total Recoverable	µg/L	171	<2	104,000	1,242	461	1,235
Nickel, Dissolved	µg/L	173	<0.5	50	8.5	7.1	13
Selenium, Dissolved	µg/L	173	<0.5	1	0.086	0	0
Silver, Dissolved	µg/L	173	<0.07	2	0.035	0	0
Thallium, Dissolved	µg/L	1	<0.01	<0.01	0	0	0
Zinc, Dissolved	µg/L	173	<10	3,240	699	695	1,022

Calculations of the 1991 and 2014 acute and chronic water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-29**. Hardness-dependent water quality standards shown in Table 3-29 are calculated using the mean hardness for this segment (79 mg/L) and attainment designations are determined based on the criteria set forth in the WQCD guidance. Historical (1991) standards were not attained for dissolved cadmium (acute/chronic), dissolved copper (acute/chronic), dissolved lead (chronic), dissolved silver (acute), and dissolved zinc (acute/chronic). Current (2014) standards for total recoverable aluminum (acute) and arsenic (chronic), dissolved cadmium (acute/chronic), dissolved copper (acute/chronic), dissolved lead (chronic), dissolved silver (acute), and dissolved zinc (acute/chronic) were also not attained based on the 2010 – 2013 data.

**Table 3-29: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCL09b and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS				Attainment Determination			
				1991 Acute	1991 Chronic	2014 Acute	2014 Chronic	1991 Acute	1991 Chronic	2014 Acute	2014 Chronic
Arsenic, Dissolved	µg/L	173	79	360	150	340		TRUE	TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	172	79				0.02				TRUE
Cadmium, Dissolved	µg/L	173	79	3.0 <sup>1</sup>	0.94 <sup>1</sup>	1.4 <sup>1</sup>	0.36 <sup>1</sup>	FALSE	FALSE	FALSE	FALSE
Chromium, Dissolved <sup>2</sup>	µg/L	1	79	16	11	16	11	TRUE	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	173	79	14 <sup>1</sup>	9.7 <sup>1</sup>	11 <sup>1</sup>	7.3 <sup>1</sup>	FALSE	FALSE	FALSE	FALSE
Hardness, Total	mg/L	173	79								
Iron, Dissolved	µg/L	173	79		300		300		TRUE		TRUE
Iron, Total Recoverable	µg/L	172	79		1,000		1,000		TRUE		TRUE
Lead, Dissolved	µg/L	173	79	66 <sup>1</sup>	2.8 <sup>1</sup>	50 <sup>1</sup>	1.9 <sup>1</sup>	TRUE	FALSE	TRUE	FALSE
Manganese, Diss.	µg/L	173	79			2,762 <sup>1</sup>	1,526 <sup>1</sup>			FALSE	TRUE

**Table 3-29: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPL09b and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS				Attainment Determination			
				1991 Acute	1991 Chronic	2014 Acute	2014 Chronic	1991 Acute	1991 Chronic	2014 Acute	2014 Chronic
Manganese, Total Recoverable	µg/L	171	79		1,000				TRUE		
Nickel, Dissolved	µg/L	173	79	772 <sup>1</sup>	80 <sup>1</sup>	384 <sup>1</sup>	43 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	173	79	135 <sup>1</sup>	17 <sup>1</sup>	18.4	4.6	TRUE	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	173	79	1.36 <sup>1</sup>	0.050 <sup>1</sup>	1.36 <sup>1</sup>	0.05 <sup>1</sup>	FALSE	TRUE	FALSE	TRUE
Zinc, Dissolved	µg/L	173	79	120 <sup>1</sup>	8 <sup>1</sup>	137 <sup>1</sup>	200 <sup>3</sup>	FALSE	FALSE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on mean hardness and comparison of the 85th percentile (dissolved metals and hardness-dependent standards) and median analytical result values (total recoverable metals).

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

<sup>2</sup> Dissolved chromium standards are established using the Chromium VI (hexavalent) criteria when chromium valence stability is not determined (per Reg. 31)

<sup>3</sup> Segment specific standard (per Reg. 38 tables)

**Table 3-30** provides a summary of the total number of exceedances of the applicable 1991 and 2014 water quality standards as well as detailed assessments of the attainment of the acute and chronic water quality standards based on single samples and paired hardness data for each sample. Based on the detailed assessment calculations, the historical (1991) standards were not attained for dissolved cadmium (acute/chronic), dissolved copper (acute/chronic), dissolved lead (chronic), total recoverable manganese (chronic), dissolved silver (acute), and dissolved zinc (acute/chronic). Current (2014) standards for dissolved cadmium (acute/chronic), dissolved copper (acute/chronic), dissolved lead (chronic), dissolved manganese (acute), dissolved silver (acute), and dissolved zinc (acute/chronic) were also not attained based on the 2010-2013 data.

**Table 3-30: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPL09b and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Number of Exceedances				Detailed Attainment Determination			
			1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS	1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS
Arsenic, Dissolved	µg/L	173	0	0	0		TRUE	TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	172				9 (5%)				TRUE
Cadmium, Dissolved	µg/L	173	52 (30%)	148 (86%)	130 (75%)	150 (87%)	FALSE	FALSE	FALSE	FALSE
Chromium, Dissolved	µg/L	1	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	173	114 (66%)	124 (72%)	121 (70%)	139 (80%)	FALSE	FALSE	FALSE	FALSE
Iron, Dissolved	µg/L	173		0		0		TRUE		TRUE
Iron, Total Recoverable	µg/L	172		16 (9%)		16 (9%)		TRUE		TRUE
Lead, Dissolved	µg/L	173	0	49 (28%)	0	55 (32%)	TRUE	FALSE	TRUE	FALSE
Manganese, Dissolved	µg/L	173			2 (1%)	14 (8%)			FALSE	TRUE

**Table 3-30: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL09b and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Number of Exceedances				Detailed Attainment Determination			
			1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS	1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS
Manganese, Tot. Recoverable	µg/L	171		39 (23%)				FALSE		
Nickel, Dissolved	µg/L	173	0	0	0	1 (1%)	TRUE	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	173	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	173	6 (3%)	13 (8%)	6 (3%)	13 (8%)	FALSE	TRUE	FALSE	TRUE
Zinc, Dissolved	µg/L	173	148 (86%)	160 (92%)	147 (85%)	147 (85%)	FALSE	FALSE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on paired hardness values.

### 3.3.1.2.16 Clear Creek Segment COSPCL10

No analytical data were available for sampling locations along Segment COSPCL10 in the 2010 – 2013 *Scribe* dataset.

### 3.3.1.2.17 Clear Creek Segment COSPCL11

A total of 133 samples were included in the *Scribe* dataset from seven separate sampling locations along Segment COSPCL11 of the Clear Creek watershed. Data collection occurred over 56 separate dates between February 2010 and December 2013. Total alkalinity, total sulfate, and total chloride data were also available for this segment. A summary of the available data from COSPCL11 for parameters with numeric water quality standards is provided in **Table 3-31**.

**Table 3-31: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL11**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	87	<15	142	51	45	79
Aluminum, Total Recoverable	µg/L	85	29	194,000	2,959	153	507
Arsenic, Dissolved	µg/L	88	<0.5	1	0.041	0	0
Arsenic, Tot. Recoverable	µg/L	86	<2.5	1,160	15	0	0
Cadmium, Dissolved	µg/L	88	<0.1	3	0.49	0.38	0.74
Chloride, Total	mg/L	2	4.9	11	8.0	8.0	10
Chromium, Dissolved	µg/L	3	<0.3	<2	0	0	0
Copper, Dissolved	µg/L	88	<0.3	43	6.9	5.8	8.9
Hardness, Total	mg/L	88	29	156	80	71	131
Iron, Dissolved	µg/L	88	<11	2,640	34	0	0
Iron, Total Recoverable	µg/L	86	<100	555,000	7,836	225	677
Lead, Dissolved	µg/L	88	<0.09	2.9	0.25	0.15	0.45
Manganese, Dissolved	µg/L	88	16	885	148	115	233
Manganese, Total Recoverable	µg/L	84	48	22,600	488	183	301
Mercury, Total	µg/L	2	<0.1	<0.1	0	0	0
Nickel, Dissolved	µg/L	87	<0.05	5.6	0.72	0.63	1.3
Selenium, Dissolved	µg/L	88	<0.5	0.78	0.16	0	0.63

**Table 3-31: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment Cospcl11**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Silver, Dissolved	µg/L	88	<0.07	0.50	0.005	0	0
Sulfate as SO <sub>4</sub> , Total	mg/L	2	16	2,230	1,123	1,123	1,898
Thallium, Dissolved	µg/L	2	<0.01	<0.01	0	0	0
Zinc, Dissolved	µg/L	88	<3.6	476	133	105	218

Calculations of the 1991 and 2014 acute and chronic water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-32**. Historical (1991) standards were not attained for dissolved cadmium (acute), dissolved copper, and sulfate (chronic). Current (2014) standards for dissolved cadmium (acute/chronic), dissolved copper (acute/chronic), total sulfates (chronic), and dissolved zinc (acute) were also not attained based on the 2010 – 2013 data.

**Table 3-32: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment Cospcl11 and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS				Attainment Determination			
				1991 Acute	1991 Chronic	2014 Acute	2014 Chronic	1991 Acute	1991 Chronic	2014 Acute	2014 Chronic
Arsenic, Dissolved	µg/L	88	80	360	150	340		TRUE	TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	86	80				0.02				TRUE
Cadmium, Dissolved	µg/L	88	80		3.0 <sup>4</sup>	1.4 <sup>1</sup>	0.36 <sup>3</sup>		FALSE	FALSE	FALSE
Chloride, Total	mg/L	2	80		250		250		TRUE		TRUE
Chromium, Dissolved	µg/L	3	80	16	11	16	11	TRUE	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	88	80		17	11 <sup>1</sup>	7 <sup>1</sup>		TRUE	FALSE	FALSE
Hardness, Total	mg/L	88	80								
Iron, Dissolved	µg/L	88	80				300				TRUE
Iron, Total Recoverable	µg/L	86	80		1,000		1,000		TRUE		TRUE
Lead, Dissolved	µg/L	88	80	67 <sup>1</sup>	3 <sup>1</sup>	51 <sup>11</sup>	2 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Manganese, Diss.	µg/L	88	80			2,774	1,533			TRUE	TRUE
Manganese, Total Recoverable	µg/L	84	80		1,000				TRUE		
Mercury, Total	µg/L	2	80	2.4	0.01		0.01	TRUE	TRUE		TRUE
Nickel, Dissolved	µg/L	87	80	780 <sup>1</sup>	81 <sup>1</sup>	388 <sup>1</sup>	43 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	88	80	135 <sup>1</sup>	17 <sup>1</sup>	18.4	4.6	TRUE	TRUE	TRUE	TRUE

**Table 3-32: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCL11 and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS				Attainment Determination			
				1991 Acute	1991 Chronic	2014 Acute	2014 Chronic	1991 Acute	1991 Chronic	2014 Acute	2014 Chronic
Silver, Dissolved	µg/L	88	80	1 <sup>1</sup>	0.1 <sup>1</sup>	1 <sup>1</sup>	0.1 <sup>1</sup>	TRUE	TRUE	TRUE	TRUE
Sulfate as SO <sub>4</sub> , Total	mg/L	2	80		250		250		FALSE		FALSE
Zinc, Dissolved	µg/L	88	80		30 <sup>4</sup>	289 <sup>1,4</sup>	253 <sup>1,4</sup>	TRUE	FALSE	FALSE	TRUE

Note: Hardness-dependent standards and attainment values based on mean hardness and comparison of the 85th percentile (dissolved metals and hardness-dependent standards) and median analytical result values (total recoverable metals).

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

<sup>2</sup> Dissolved chromium standards are established using the Chromium VI (hexavalent) criteria when chromium valence stability is not determined (per Reg. 31)

<sup>3</sup> Temporary modification to the WQS exists for dissolved cadmium (ch) = 1.42 µg/L; expires 7/1/2015

<sup>4</sup> Segment specific standard (per Reg. 38 tables)

**Table 3-33** provides a summary of the total number of exceedances of the applicable 1991 and 2014 water quality standards for Segment COSPCL11 as well as detailed assessments of the attainment of the acute and chronic water quality standards based on single samples and paired hardness data for each sample. Based on the detailed assessment calculations, the historical (1991) standards were not attained for dissolved copper (acute), total sulfate (chronic), and dissolved zinc (chronic). Current (2014) standards for dissolved copper (acute/chronic), total sulfate (chronic), and dissolved zinc (acute) were also not attained based on the 2010-2013 data.

**Table 3-33: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL11, based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Number of Exceedances				Detailed Attainment Determination			
			1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS	1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS
Arsenic, Dissolved	µg/L	88	0	0	0		TRUE	TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	86				3 (3%)				TRUE
Cadmium, Dissolved	µg/L	88		1 (1%)	1 (1%)	54 (61%)		TRUE	TRUE	FALSE
Chromium, Dissolved	µg/L	3	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Copper, Dissolved	µg/L	88		3 (3%)	13 (15%)	26 (30%)		TRUE	FALSE	FALSE
Iron, Dissolved	µg/L	88		0		1 (1%)		TRUE		TRUE
Iron, Total Recoverable	µg/L	86		9 (10%)		9 (10%)		TRUE		TRUE
Lead, Dissolved	µg/L	88	0	2 (2%)	0	2 (2%)	TRUE	TRUE	TRUE	TRUE
Manganese, Dissolved	µg/L	88			0	0			TRUE	TRUE
Manganese, Tot. Recoverable	µg/L	84		2 (2%)				TRUE		

**Table 3-33: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL11, based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Number of Exceedances				Detailed Attainment Determination			
			1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS	1991 Acute WQS	1991 Chronic WQS	2014 Acute WQS	2014 Chronic WQS
Mercury, Total	µg/L	2	0	0		0	TRUE	TRUE		TRUE
Nickel, Dissolved	µg/L	87	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Selenium, Dissolved	µg/L	88	0	0	0	0	TRUE	TRUE	TRUE	TRUE
Silver, Dissolved	µg/L	88	0	3 (3%)	0	3 (3%)	TRUE	TRUE	TRUE	TRUE
Sulfate as SO <sub>4</sub> , Total	mg/L	2		1 (50%)		1 (50%)		FALSE		FALSE
Zinc, Dissolved	µg/L	88		87 (99%)	7 (8%)	9 (10%)		FALSE	FALSE	TRUE

Note: Hardness-dependent standards and attainment values based on paired hardness values.

### 3.3.1.2.18 Clear Creek Segment COSPCL12

A total of 88 samples were included in the *Scribe* dataset from 2 separate sampling locations along Segment COSPCL12 of the Clear Creek watershed. Data collection occurred 12 separate dates between March 2010 and September 2011. A summary of the available data from COSPCL12 for parameters with numeric water quality standards is provided in **Table 3-34**.

**Table 3-34: Sample Count and Statistical Summary of the 2010-2013 Analytical Dataset for Segment COSPCL12**

Analyte	Units	Number of Samples	Min	Max	Mean	Median	85th Percentile
Aluminum, Dissolved	µg/L	19	11,500	48,100	23,595	23,200	29,850
Aluminum, Total Recoverable	µg/L	19	11,100	50,200	24,158	23,300	30,380
Arsenic, Dissolved	µg/L	19	<3.51	5	0.448	0	0
Arsenic, Tot. Recoverable	µg/L	19	<5	110	10	0	13
Cadmium, Dissolved	µg/L	19	174	838	379.00	331.00	505.60
Chloride, Total	mg/L	17	<3.5	20	6.6	10.3	12
Copper, Dissolved	µg/L	19	1,430	7,090	2,874.7	2,280.0	4,223.0
Hardness, Total	mg/L	19	466	1,360	904	811	1,257
Iron, Dissolved	µg/L	19	<500	12,100	1,255	0	1,931
Iron, Total Recoverable	µg/L	19	<500	14,600	2,312	1,110	3,672
Lead, Dissolved	µg/L	19	46.8	297	101.34	74.80	147.60
Manganese, Dissolved	µg/L	19	101,000	292,000	202,105	190,000	275,700
Manganese, Total Recoverable	µg/L	19	128,000	303,000	207,053	191,000	277,600
Nickel, Dissolved	µg/L	19	260	679	394.11	365.00	546.1
Selenium, Dissolved	µg/L	19	6.33	17.7	11.36	12	13.48
Silver, Dissolved	µg/L	19	<0.5	5	0.415	0	1
Sulfate as SO <sub>4</sub> , Total	mg/L	17	871	2,220	1,526	1,430	1,994
Zinc, Dissolved	µg/L	19	47,300	101,000	68,189	66,200	87,430

Calculations of the 1991 and 2014 acute and chronic water quality standards applicable to this segment, along with preliminary analysis of attainment of these standards, are provided in **Table 3-35**. Due to the high mean hardness at this segment (904 mg/L) hardness-dependent water quality standards shown in Table 3-35 are calculated with a hardness of 400 mg/L and attainment designations are determined based on the criteria set forth in the WQCD guidance. Historical (1991) standards were not attained for dissolved cadmium, dissolved copper, dissolved iron, dissolved lead, dissolved manganese (chronic), dissolved selenium (chronic), and dissolved zinc (chronic). Current (2014) standards for arsenic (acute/chronic), dissolved cadmium (acute/chronic), dissolved copper (acute/chronic), iron (chronic), manganese (acute/chronic), nickel (acute/chronic), silver (acute/chronic), dissolved selenium (chronic), total sulfates (chronic), and dissolved zinc (acute) were also not attained based on the 2010 – 2013 data.

**Table 3-35: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using mean hardness values for Segment COSPCL12 and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Mean Hardness	Applicable WQS			Attainment Determination		
				1991 WQS	2014 Acute	2014 Chronic	1991 WQS	2014 Acute	2014 Chronic
Arsenic, Dissolved	µg/L	19	904	50	340		TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	19	904			0.02			FALSE
Cadmium, Dissolved	µg/L	19	904	10	5.7 <sup>1</sup>	1.3 <sup>1</sup>	FALSE	FALSE	FALSE
Chloride, Total	mg/L	17	904	250		250	TRUE		TRUE
Copper, Dissolved	µg/L	19	904	1,000	50 <sup>1</sup>	29 <sup>1</sup>	FALSE	FALSE	FALSE
Iron, Dissolved	µg/L	19	904	300		300	FALSE		FALSE
Iron, Total Recoverable	µg/L	19	904			1,000			FALSE
Lead, Dissolved	µg/L	19	904	50	281 <sup>1</sup>	11 <sup>1</sup>	FALSE	FALSE	FALSE
Manganese, Dissolved	µg/L	19	904	50	4,738 <sup>1</sup>	2,618 <sup>1</sup>	FALSE	FALSE	FALSE
Nickel, Dissolved	µg/L	19	904		1,513 <sup>1</sup>	168 <sup>1</sup>		TRUE	FALSE
Selenium, Dissolved	µg/L	19	904	10	18.4	4.6	FALSE	TRUE	FALSE
Silver, Dissolved	µg/L	19	904	50	22 <sup>1</sup>	1 <sup>1</sup>	TRUE	TRUE	FALSE
Sulfate as SO <sub>4</sub> , Total	mg/L	17	904	250		250	FALSE		FALSE
Zinc, Dissolved	µg/L	19	904	5,000	928 <sup>1</sup>	787 <sup>1</sup>	FALSE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on mean hardness and comparison of the 85th percentile (dissolved metals and hardness-dependent standards) and median analytical result values (total recoverable metals).

<sup>1</sup> Hardness-dependent standard calculated using site-wide mean hardness.

**Table 3-36** provides a summary of the total number of exceedances of the applicable 1991 and 2014 water quality standards for Segment COSPCL12 as well as detailed assessments of the attainment of the acute and chronic water quality standards based on single samples and paired hardness data for each sample. Based on the detailed assessment calculations, the historical (1991) standards were not attained for dissolved cadmium, dissolved copper, dissolved iron, dissolved silver, total sulfate, and dissolved zinc. Current (2014) standards for total recoverable arsenic (chronic), dissolved cadmium (acute/chronic), dissolved copper (acute/chronic), dissolved manganese (acute), dissolved nickel (chronic), dissolved selenium (chronic), dissolved silver (chronic), total sulfate (chronic), and dissolved zinc (acute/chronic) were also not attained based on the 2010-2013 data.

**Table 3-36: Current (2014) and Historical (1991) Acute and Chronic Water Quality Standards and Determinations of Attainment calculated using paired hardness values for Segment COSPCL12 and based on the 2010-2013 Dataset.**

Analyte	Units	Number of Samples	Number of Exceedances			Detailed Attainment Determination		
			1991 WQS	2014 Acute WQS	2014 Chronic WQS	1991 WQS	2014 Acute WQS	2014 Chronic WQS
Arsenic, Dissolved	µg/L	19	0	0		TRUE	TRUE	
Arsenic, Total Recoverable	µg/L	19			8 (42%)			FALSE
Cadmium, Dissolved	µg/L	19	19 (100%)	19 (100%)	19 (100%)	FALSE	FALSE	FALSE
Chloride, Total	µg/L	17	0		0	TRUE		TRUE
Copper, Dissolved	µg/L	19	19 (100%)	19 (100%)	19 (100%)	FALSE	FALSE	FALSE
Iron, Dissolved	µg/L	19	7 (37%)		7 (37%)	TRUE		TRUE
Iron, Total Recoverable	µg/L	19			10 (53%)			FALSE
Lead, Dissolved	µg/L	19	19 (100%)	1 (5%)	19 (100%)	FALSE	FALSE	FALSE
Manganese, Dissolved	µg/L	19	19 (100%)	19 (100%)	19 (100%)	FALSE	FALSE	FALSE
Nickel, Dissolved	µg/L	19		0	19 (100%)		TRUE	FALSE
Selenium, Dissolved	µg/L	19	1 (5%)	0	19 (100%)	TRUE	TRUE	FALSE
Silver, Dissolved	µg/L	19	17 (89%)	0	17 (89%)	FALSE	TRUE	FALSE
Sulfate as SO <sub>4</sub> , Total	mg/L	17	17 (100%)	0	17 (100%)	FALSE	TRUE	FALSE
Zinc, Dissolved	µg/L	19	19 (100%)	19 (100%)	19 (100%)	FALSE	FALSE	FALSE

Note: Hardness-dependent standards and attainment values based on paired hardness values.

### 3.3.2 Macroinvertebrate Analyses

Attainment of the aquatic life use for Segments COSPCL01, 2a, 2b, 2c, 3a, 3b, 04, 05, 06, 9a, 10, 11, and 13b of Clear Creek was evaluated using the MMI, HBI, and Shannon Diversity Index data collected between 1993 and 2013. No data were available for Segments COSPCL07, 08, 9b or 12. Data were first sorted by segment. Scores that were calculated based on an average of duplicate samples have been bolded. The index scores were then compared to the biological thresholds appropriate for each segment's biotype (biotype information was described in Section 3.2.2; information on each segment's biotype is included in the following subsections). The biotype for each segment was included in the data that were provided by CDPHE. A color-coding system has been used in the following subsections to graphically display attainment information. MMI scores that exceeded the attainment threshold were shaded green while MMI scores that fell below the impairment threshold were shaded red. MMI scores that were between the thresholds for attainment and impairment were shaded grey, indicating that impairment decisions required a review of the HBI and Shannon Diversity Index scores. HBI and Shannon Diversity Index scores were then shaded red (impaired) or green (attainment) based on their values with relation to the established thresholds (refer to Table 3-2).

### 3.3.2.1 Clear Creek Segment COSPCL01

Three sites on Segment 01 were sampled for macroinvertebrate data in September 2009. Segment 01 of Clear Creek is made up of mountain streams (biotype 2) and classified to support Cold Water Class 1 aquatic life. **Table 3-37** shows that the MMI scores from this segment exceed the established attainment threshold.

**Table 3-37: COSPCL01 Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
RW-2810	RW	Dry Gulch	NA	9/17/2009	50.9	2.23	3.75
RW-2807	RW	Herman Gulch	NA	9/17/2009	50.3	3.55	2.68
RW-2806	RW	Clear Creek	Above confluence with Kearney Gulch	9/17/2009	56.8	3.95	3.06

RW = River Watch NA = Not Available SDI = Shannon Diversity Index

### 3.3.2.2 Clear Creek Segment COSPCL2a

Four sites on Segment 2a were sampled for macroinvertebrate data. Sampling was conducted by USEPA on Clear Creek below Georgetown Reservoir in September 1995. Additional sampling was conducted by the WQCD above Georgetown Reservoir in August 2009 and below the reservoir in August 2013. Segment 2a of Clear Creek is a mountain stream (biotype 2) and classified to support Cold Water Class 1 aquatic life. **Table 3-38** shows that the MMI scores from this segment exceed the established attainment threshold.

**Table 3-38: COSPCL02a Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
5648A	WQCD	Clear Creek	at Silverplume	8/25/2009	60.4	5.07	3.62
5642	WQCD	Clear Creek	above Georgetown Reservoir	8/25/2009	60.2	2.74	3.85
CCWF-CC06	WQCD	Clear Creek	0.75 mile below Georgetown Lake	8/7/2013	54.3	3.70	2.81
CO108M	EPA-REMAP	Clear Creek		9/12/1995	55.0	4.90	3.56

### 3.3.2.3 Clear Creek Segment COSPCL2b

Two sites have been monitored by the WQCD on Segment 2b. Clear Creek was sampled below the West Fork in August 2009 and samples were collected at Lawson Bridge in August 2013. Segment 2b is a mountain stream (biotype 2) and classified to support Cold Water Class 1 aquatic life. **Table 3-39** shows that the MMI scores from this segment exceed the established attainment threshold.

**Table 3-39: COSPCL02b Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
5634	WQCD	Clear Creek	below West Fork	8/26/2009	63.4	2.80	3.76
CCWF-CC04	WQCD	Clear Creek	at Lawson Bridge	8/7/2013	72.9	3.93	4.23

### 3.3.2.4 Clear Creek Segment COSPCL2c

Two sites on Segment 2c were sampled for macroinvertebrate data in August 2013. Segment 2c of Clear Creek is made up of transition streams (biotype 1) and classified to support Cold Water Class 1 aquatic life. **Table 3-40** shows that the MMI scores from this segment fell between the thresholds for attainment and impairment. HBI scores at both sites were below the established threshold (attainment) while the Shannon Diversity Index was not met (impaired) on Clear Creek at Courtney-Riley Cooper Park.

**Table 3-40: COSPCL02c Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
CCWF-CC03	WQCD	Clear Creek	at Spring Gulch Rd Bridge	8/3/2013	50.7	3.15	3.71
CCWF-CC02	WQCD	Clear Creek	at Courtney-Riley Cooper Park	8/3/2013	49.9	3.60	2.08

### 3.3.2.5 Clear Creek Segment COSPCL3a

South Fork Clear Creek was sampled above Leavenworth Creek for macroinvertebrate data in August 2013. Segment 3a is a mountain stream (biotype 2) and classified to support Cold Water Class 1 aquatic life. **Table 3-41** shows that the MMI score from this segment exceeded the established attainment threshold.

**Table 3-41: COSPCL03a Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
CCWF-CC07	WQCD	South Fork Clear Creek	above Leavenworth Creek	8/1/2013	83.4	3.40	4.08

### 3.3.2.6 Clear Creek Segment COSPCL3b

Leavenworth Creek was sampled above South Fork Clear Creek for macroinvertebrate data in August 2013. Segment 3b is a mountain stream (biotype 2) and classified to support Cold Water Class 2 aquatic life. **Table 3-42** shows that the MMI score from this segment exceeded the established attainment threshold.

**Table 3-42: COSPCL03b Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
CCWF-CC08	WQCD	Leavenworth Creek	above South Fork Clear Creek	8/1/2013	73.2	2.85	3.80

### 3.3.2.7 Clear Creek Segment COSPCL04

Two sites on West Fork Clear Creek (above Trail Crossing and above Butler Gulch) were sampled for macroinvertebrate data in September 2009. Segment 04 is a mountain stream (biotype 2) and classified to support Cold Water Class 1 aquatic life. **Table 3-43** shows that the MMI scores from this segment exceed the established attainment threshold.

**Table 3-43: COSPCL04 Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
RW-2800	RW	West Fork Clear Creek	above Trail Crossing	8/13/2009	67.7	2.08	3.36
RW-2802	RW	West Fork Clear Creek	above Butler Gulch about 1/2 mile	8/13/2009	76.3	1.83	3.18

### 3.3.2.8 Clear Creek Segment COSPCL05

Three sites on West Fork Clear Creek (below Empire, below Woods Creek, and above Clear Creek) were sampled for macroinvertebrate data at various times between 2004 and 2009. Segment 05 is a mountain stream (biotype 2) and is classified to support Cold Water Class 1 aquatic life. **Table 3-44** shows that the MMI scores from this segment exceed the established attainment threshold.

**Table 3-44: COSPCL05 Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
CU-WFCC	CU	West Fork Clear Creek	below Empire	9/10/2004	80.2	2.66	4.08
5638	WQCD	West Fork Clear Creek	below Woods Creek	8/25/2009	59.6	1.71	3.10
5638	WQCD	West Fork Clear Creek	below Woods Creek	8/15/2013	69.9	1.55	3.40
5638	WQCD	West Fork Clear Creek	below Woods Creek	7/18/2013	74.2	0.98	2.82
CCWF-CC05	WQCD	West Fork Clear Creek	above bridge 0.25 mile above confluence with Clear Creek	8/3/2013	67.5	2.50	2.99

### 3.3.2.9 Clear Creek Segment COSPCL06

Butler Gulch was sampled for macroinvertebrate data in September 2009. Segment 06 of Clear Creek is made up of mountain streams (biotype 2) and classified to support Cold Water Class 1 aquatic life. **Table 3-45** shows that the MMI score from this segment exceeded the established attainment threshold.

**Table 3-45: COSPCL06 Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
RW-2803	RW	Butler Gulch	Butler G	8/13/2009	66.5	1.69	3.24

### 3.3.2.10 Clear Creek Segment COSPCL9a

Two sites on Fall River were sampled for macroinvertebrate data. An upstream sample was collected in September of 2002 while two samples were collected at the mouth in July and August of 2013. Segment 9a of Clear Creek is a mountain stream (biotype 2) and classified to support Cold Water Class 1 aquatic life. **Table 3-46** shows that the MMI scores from this segment exceed the established attainment threshold.

**Table 3-46: COSPCL09a Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
WCOP99-0626	EPA-WEMAP	Fall River		9/5/2002	76.4	3.84	3.32
5674	WQCD	Fall River	at mouth near Idaho Springs	8/15/2013	64.6	3.07	3.73
5674	WQCD	Fall River	at mouth near Idaho Springs	7/18/2013	65.4	3.14	2.97

### 3.3.2.11 Clear Creek Segment COSPCL10

South Chicago Creek was sampled at the mouth for macroinvertebrate data in July and August of 2013. Segment 10 of Clear Creek is a mountain stream (biotype 2) and classified to support Cold Water Class 1 aquatic life. **Table 3-47** shows that the MMI scores from this segment exceed the established attainment threshold.

**Table 3-47: COSPCL010 Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
5675	WQCD	South Chicago Creek	at mouth	7/18/2013	72.0	3.74	3.68
5675	WQCD	South Chicago Creek	at mouth	8/15/2013	71.6	3.54	3.76

### 3.3.2.12 Clear Creek Segment COSPCL11

Macroinvertebrate data are available from seven stations along Segment 11 of Clear Creek. Data for this segment were collected between 1993 and 2013. Segment 11 of Clear Creek is a mountain stream (biotype 2) until Golden where it then becomes a transitional stream (biotype 1). The entire segment is classified to support Cold Water Class 1 aquatic life. **Table 3-48** shows that the MMI scores have exceeded the MMI attainment threshold below the Argo Tunnel discharge in August 2009, at Gold Miners Gulch in August 2013, above Golden in September 2004, and at the Ford Street Bridge in September of 2009. The MMI scores calculated on Clear Creek approximately 0.5 miles downstream of the Argo Tunnel discharge fell between the attainment and impairment thresholds in September 1994. The Shannon Diversity Index threshold was not met at this site resulting in an impairment decision. Similarly, the MMI scores calculated on Clear Creek at Mayhem Gulch also fell between the attainment and impairment thresholds in September 2012. The Shannon Diversity Index threshold was not met at this site resulting in an impairment decision. Clear Creek at Golden was monitored in 3 consecutive years (September 1993, August 1994, and August 1995). The MMI index fell between the attainment and impairment thresholds in 1993 and 1994. Both the HBI and Shannon Diversity Index Thresholds were met in both years resulting in attainment. The MMI score calculated in 1995 fell below the impairment threshold.

**Table 3-48: COSPCL11 Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
5628	WQCD	Clear Creek	100 yds below Argo Discharge	8/25/2009	66.8	4.69	3.73
CO009M	EPA-REMAP	Clear Creek	0.5 mile downstream Argo Discharge	9/21/1994	47.2	3.06	2.64
CCWF-CC01	WQCD	Clear Creek	at Gold Miners Gulch	8/7/2013	72.0	3.72	2.69
RW-4161	RW	Clear Creek	Hwy 6 at Mayhem Gulch	9/22/2012	49.4	4.26	2.14
6719505	USGS	Clear Creek	at Golden	8/23/1993	44.5	4.73	3.80
6719505	USGS	Clear Creek	at Golden	8/11/1994	43.6	4.76	2.76
6719505	USGS	Clear Creek	at Golden	9/8/1995	32.3	5.24	3.28
CU-CCGA	CU	Clear Creek	above Golden	9/20/2004	77.3	2.81	4.15
5620	WQCD	Clear Creek	at Ford St bridge	9/22/2009	68.9	4.19	3.03

### 3.3.2.13 Clear Creek Segment COSPCL13b

North Fork Clear Creek was sampled for macroinvertebrates at Highway 6 and 119 in May 2004. The date of sample falls outside of the suggested macroinvertebrate sampling period (see discussion in Section 3.2.2) but were included in this report for reference and due to a lack of other available data for this segment. Segment 13b is a of mountain stream (biotype 2) and classified as a Cold Water Class 2 stream. **Table 3-49** shows that the MMI score from this segment fell below the impairment threshold.

**Table 3-49: COSPCL13b Macroinvertebrate Data**

Station ID	Agency	Stream	Location	Sample Date	Results		
					MMI	HBI	SDI
133	WQCD	North Fork Clear Creek	at Hwy 6 & 119	5/27/2004	21.6	4.59	2.50

## Section 4

### Summary

The following tables provide a summary of the data analyses presented in Section 3. **Table 4-1** includes information on each parameter not attaining 2014 water quality standards for each segment while **Table 4-2** summarizes attainment of the 1991 water quality standards for each segment (using current data). The segments with the most attainment issues are:

- **Segment 2c:** Mainstem of Clear Creek, including all of the tributaries and wetlands, from a point just below the confluence with Mill Creek to a point just above the Argo Tunnel discharge, except for the specific listings in Segments 9a, 9b, and 10.
- **Segment 9b:** Mainstem of Trail Creek, including all tributaries and wetlands, from the source to the confluence with Clear Creek.
- **Segment 11:** Mainstem of Clear Creek from a point just above the Argo Tunnel discharge to the Farmers Highline Canal diversion in Golden, Colorado.
- **Segment 12:** All tributaries to Clear Creek, including all wetlands, from the Argo Tunnel discharge to the Farmers Highline Canal diversion in Golden, Colorado, except for specific listings in Segments 13a and 13b.

In addition, the existing conditions of North Fork Clear Creek Segment 13b were established in Section 3.3.1.1. **Table 4-3** provides information regarding parameters not attaining 2014 standards by segment.

**Table 4-1: Summary of Non-Attainment of 2014 Standards in the Clear Creek Watershed Study Area**

Segment	Designated Use	Causes of Impairment <sup>1</sup>
COSPCL01	Aquatic Life- Cold 1	<i>No Data</i>
COSPCL02 (a,b,&c) <sup>4</sup>	Aquatic Life- Cold 1	Zinc
COSPCL02a	Aquatic Life- Cold 1	Cadmium (ac), Copper (ac), Zinc (ac/ch)
COSPCL02b	Aquatic Life- Cold 1	Zinc (ac/ch)
COSPCL02c	Aquatic Life- Cold 1	Cadmium (ac/ch), Copper (ac/ch), Iron <sup>2</sup> (ch), Manganese (ac/ch), Nickel (ch), Zinc (ac/ch), Aquatic Life (MMI)
COSPCL03a	Aquatic Life- Cold 1	<i>No Data</i>
COSPCL03b	Aquatic Life- Cold 2	<i>No Data</i>
COSPCL04	Aquatic Life- Cold 1	<i>No Data</i>
COSPCL05	Aquatic Life- Cold 1	Copper (ac), Silver (ac)
COSPCL06	Aquatic Life- Cold 1	Copper (ac)
COSPCL07	Aquatic Life- Cold 2	<i>No Data</i>
COSPCL08	Aquatic Life- Cold 2	<i>No standards applied in Regulation 38</i>
COSPCL09 (a & b) <sup>4</sup>	Aquatic Life- Cold 1	Cadmium (ac/ch), Copper (ac/ch), Lead (ch), Manganese (ac), Silver (ac), Zinc (ac/ch)
COSPCL09a	Aquatic Life- Cold 1	Copper (ac/ch)
COSPCL09b	Aquatic Life- Cold 1	Cadmium (ac/ch), Copper (ac/ch), Lead (ch), Manganese (ac), Silver (ac), Zinc (ac/ch)

**Table 4-1: Summary of Non-Attainment of 2014 Standards in the Clear Creek Watershed Study Area**

Segment	Designated Use	Causes of Impairment <sup>1</sup>
COSPCL10	Aquatic Life- Cold 1	<i>No Data</i>
COSPCL11	Aquatic Life- Cold 1	Cadmium (ac), Copper (ac/ch), Sulfate (ch), Zinc (ac), Aquatic Life (SDI) <sup>3</sup>
COSPCL12	Aquatic Life- Cold 2	Arsenic (ch), Cadmium (ac/ch), Copper (ac/ch), Iron <sup>5</sup> (ch), Lead (ac/ch), Manganese (ac/ch), Nickel (ch), Selenium (ch), Silver (ac), Sulfate (ch), Zinc (ac/ch)

Notes:

- <sup>1</sup> Causes of impairment based on applicable current (2014) water quality standards evaluated using the detailed assessment procedure with paired hardness values for hardness dependent standards.
- <sup>2</sup> Both total recoverable and dissolved iron impairments present.
- <sup>3</sup> SDI = Shannon Diversity Index.
- <sup>4</sup> Historical (1991) stream segmentation
- <sup>5</sup> Total Recoverable

**Table 4-2: Summary of Non-Attainment of 2010-2013 Data Compared to 1991 Water Quality Standards within the Clear Creek Watershed Study Area**

Segment	Designated Use	Causes of Impairment <sup>1</sup>
COSPCL01	Aquatic Life- Cold 1	<i>No Data</i>
COSPCL02 (a,b,&c) <sup>3</sup>	Aquatic Life- Cold 1	Zinc
COSPCL02a	Aquatic Life- Cold 1	Zinc
COSPCL02b	Aquatic Life- Cold 1	
COSPCL02c	Aquatic Life- Cold 1	Cadmium, Copper, Tot. Rec. Iron, Lead, Manganese, Nickel, Zinc
COSPCL03a	Aquatic Life- Cold 1	<i>No Data</i>
COSPCL03b	Aquatic Life- Cold 2	<i>No Data</i>
COSPCL04	Aquatic Life- Cold 1	<i>No Data</i>
COSPCL05	Aquatic Life- Cold 1	Silver
COSPCL06	Aquatic Life- Cold 1	Copper (ac), Zinc (ch)
COSPCL07	Aquatic Life- Cold 2	<i>No Data</i>
COSPCL08	Aquatic Life- Cold 2	<i>No standards applied in Regulation 38</i>
COSPCL09 (a & b) <sup>3</sup>	Aquatic Life- Cold 1	Cadmium (ac/ch), Copper (ac/ch), Lead (ch), Manganese (ch), Zinc (ch)
COSPCL09a	Aquatic Life- Cold 1	Copper (ac/ch), Zinc (ac/ch)
COSPCL09b	Aquatic Life- Cold 1	Cadmium (ac/ch), Copper (ac/ch), Lead (ch), Manganese (ch), Silver (ac), Zinc (ac/ch)
COSPCL10	Aquatic Life- Cold 1	<i>No Data</i>
COSPCL11	Aquatic Life- Cold 1	Sulfate (ch), <del>Zinc (ch)</del>
COSPCL12	Aquatic Life- Cold 2	<i>No Data</i>

Notes:

- <sup>1</sup> Causes of impairment based on the water quality standards applicable at the time of the 1991 ROD and evaluated using the detailed assessment procedure with paired hardness values for hardness dependent standards.
- <sup>2</sup> Both total recoverable and dissolved iron impairments present.
- <sup>3</sup> Historical (1991) stream segmentation

**Table 4-3: Attainment of 2014 Water Quality Standards within the North Fork of Clear Creek Watershed (Segment COSPCL13b)**

Segment	Designated Use	Causes of Impairment <sup>1</sup>
COSPCL13b	Aquatic Life- Cold 2	Cadmium (ac), Copper (ac/ch), Iron <sup>2</sup> (ch), Manganese (ac/ch), Zinc (ac), Aquatic Life (MMI) <sup>3</sup>

Notes:

- <sup>1</sup> Causes of impairment based on applicable current (2014) water quality standards evaluated using the detailed assessment procedure with paired hardness values for hardness dependent standards.
- <sup>2</sup> Both total recoverable and dissolved iron impairments present.
- <sup>3</sup> MMI = Multi Metric Index

## Section 5

### References

CDPHE (Colorado Department of Public Health and Environment). Colorado Water Quality Control Commission. 2013. Regulation No. 31. The Basic Standards and Methodologies for Surface Water. 5 CCR 1002-31.

CDPHE. Colorado Water Quality Control Commission. 2013. Regulation No. 38. Classifications and Numeric Standards for South Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin. 5 CCR 1002-38.

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CDPHE. Water Quality Control Division. 2011. Section 303(d) Listing Methodology. 2012 Listing Cycle.

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# Appendices

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Appendices available in electronic format.

