7.0 APPENDICES

APPENDIX A – SUMMARY OF CHERRY CREEK BASIN USE DESIGNATIONS AND WATER QUALITY STANDARDS (EXCERPTS FROM REGULATION 38-1)

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

WATER QUALITY CONTROL COMMISSION

5 CCR 1002-38

REGULATION NO. 38
CLASSIFICATIONS AND NUMERIC STANDARDS
FOR
SOUTH PLATTE RIVER BASIN, LARAMIE RIVER BASIN
REPUBLICAN RIVER BASIN, SMOKY HILL RIVER BASIN

APPENDIX 38-1
Stream Classifications and Water Quality Standards Tables

Effective 06/30/2016

REGULATION #38 STREAM CLASSIFICATIONS and WATER QUALITY STANDARDS
Cherry Creek Basin

1. Mainstem of Cherry Creek from the source of East and West Cherry Creek to the inlet of Cherry Creek Reservoir.

COSPCH01	Classifications
Designation	Agriculture
Reviewable	Aq Life Warm 2
	Recreation E
	Water Supply

Qualifiers:

Other:

Temporary Modification(s):

Copper(ac/ch) = current condition*

Expiration Date of 12/31/2020

*chlorophyll a (mg/m^2)(chronic) = applies only above the facilities listed at 38.5(4).
*Phosphorus(chronic) = effective 12/31/2020. Applies only above the facilities listed at 38.5(4).
*TempMod: Copper = below the PWSD WWTF outfall.

Physical and Biological	DM	MWAT
Temperature °C	WS-II	WS-II
	acute	**chronic**
D.O. (mg/L)	---	5.0
pH	6.5 - 9.0	---
chlorophyll a (mg/m^2)	---	150*
E. Coli (per 100 mL)	---	126
Inorganic (mg/L)		
	acute	**chronic**
Ammonia	TVS	TVS
Boron	---	0.75
Chloride	---	250
Chlorine	0.019	0.011
Cyanide	0.005	---
Nitrate	10	---
Nitrite	---	0.5
Phosphorus	---	0.17*
Sulfate	---	WS
Sulfide	---	0.002

Metals (ug/L)	acute	chronic
Aluminum	---	---
Arsenic	340	0.02-10(T) [A]
Beryllium	---	---
Cadmium	TVS	TVS
Cadmium	5.0(T)	---
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	---	WS
Iron	---	1000(T)
Lead	TVS	TVS
Lead	50(T)	---
Manganese	TVS	TVS
Manganese	---	WS
Mercury	---	0.01(t)
Molybdenum	---	150(T)
Nickel	TVS	TVS
Nickel	---	100(T)
Selenium	TVS	TVS
Silver	TVS	TVS
Uranium	---	---
Zinc	TVS	TVS

2. Cherry Creek Reservoir.

COSPCH02	Classifications
Designation	Agriculture
Reviewable	Aq Life Warm 1
	Recreation E
	Water Supply

Qualifiers:

Other:

*chlorophyll a (ug/L)(chronic) = Season mean concentration measured in the upper three meters of the water column for the months of July through September with an exceedance frequency of once in five years.

Physical and Biological		DM	MWAT
Temperature °C		WL	WL
		acute	**chronic**
D.O. (mg/L)		---	5.0
pH		6.5 - 9.0	---
chlorophyll a (ug/L)	7/1 - 9/30	---	18*
E. Coli (per 100 mL)		---	126
Inorganic (mg/L)			
		acute	**chronic**
Ammonia		TVS	TVS
Boron		---	0.75
Chloride		---	250
Chlorine		0.019	0.011
Cyanide		0.005	---
Nitrate		10	---
Nitrite		---	0.5
Phosphorus		---	---
Sulfate		---	WS
Sulfide		---	0.002

Metals (ug/L)	acute	chronic
Aluminum	---	---
Arsenic	340	0.02(T)
Beryllium	---	---
Cadmium	TVS	TVS
Cadmium	5.0(T)	---
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	---	WS
Iron	---	1000(T)
Lead	TVS	TVS
Lead	50(T)	---
Manganese	TVS	TVS
Manganese	---	WS
Mercury	---	0.01(t)
Molybdenum	---	150(T)
Nickel	TVS	TVS
Nickel	---	100(T)
Selenium	TVS	TVS
Silver	TVS	TVS
Uranium	---	---
Zinc	TVS	TVS

All metals are dissolved unless otherwise noted.
T = total recoverable
t = total
tr = trout

D.O. = dissolved oxygen
DM = daily maximum
MWAT = maximum weekly average temperature
See 38.6 for details on TVS, TVS(tr), WS, temperature standards.

REGULATION #38 STREAM CLASSIFICATIONS and WATER QUALITY STANDARDS
Cherry Creek Basin

3. Mainstem of Cherry Creek from the outlet of Cherry Creek Reservoir to the confluence with the South Platte River.

COSPCH03	Classifications
Designation	Agriculture
Reviewable	Aq Life Warm 2
	Recreation E
	Water Supply

Qualifiers:

Other:

Physical and Biological	DM	MWAT
Temperature °C	WS-II	WS-II
	acute	**chronic**
D.O. (mg/L)	---	5.0
pH	6.5 - 9.0	---
chlorophyll a (mg/m^2)	---	---
E. Coli (per 100 mL)	---	126
Inorganic (mg/L)		
	acute	**chronic**
Ammonia	TVS	TVS
Boron	---	0.75
Chloride	---	250
Chlorine	0.019	0.011
Cyanide	0.005	---
Nitrate	10	---
Nitrite	---	0.5
Phosphorus	---	---
Sulfate	---	WS
Sulfide	---	0.002

Metals (ug/L)	acute	chronic
Aluminum	---	---
Arsenic	340	0.02-10(T) [A]
Beryllium	---	---
Cadmium	TVS	TVS
Cadmium	5.0(T)	---
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	---	WS
Iron	---	1000(T)
Lead	TVS	TVS
Lead	50(T)	---
Manganese	TVS	TVS
Manganese	---	WS
Mercury	---	0.01(t)
Molybdenum	---	150(T)
Nickel	TVS	TVS
Nickel	---	100(T)
Selenium	TVS	TVS
Silver	TVS	TVS
Uranium	---	---
Zinc	TVS	TVS

4a. All tributaries to Cherry Creek, including all wetlands, from the source of East and West Cherry Creeks to the confluence with the South Platte River except for specific listings in Segment 4b.

COSPCH04A	Classifications
Designation	Agriculture
UP	Aq Life Warm 2
	Recreation E
	Water Supply

Qualifiers:

Other:

*chlorophyll a (mg/m^2)(chronic) = applies only above the facilities listed at 38.5(4).
*Phosphorus(chronic) = effective 12/31/2020. Applies only above the facilities listed at 38.5(4).

Physical and Biological	DM	MWAT
Temperature °C	WS-II	WS-II
	acute	**chronic**
D.O. (mg/L)	---	5.0
pH	6.5 - 9.0	---
chlorophyll a (mg/m^2)	---	150*
E. Coli (per 100 mL)	---	126
Inorganic (mg/L)		
	acute	**chronic**
Ammonia	TVS	TVS
Boron	---	0.75
Chloride	---	250
Chlorine	0.019	0.011
Cyanide	0.005	---
Nitrate	10	---
Nitrite	---	0.5
Phosphorus	---	0.17*
Sulfate	---	WS
Sulfide	---	0.002

Metals (ug/L)	acute	chronic
Aluminum	---	---
Arsenic	340	0.02-10(T) [A]
Beryllium	---	---
Cadmium	TVS	TVS
Cadmium	5.0(T)	---
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	---	WS
Lead	TVS	TVS
Lead	50(T)	---
Manganese	TVS	TVS
Manganese	---	WS
Mercury	---	0.01(t)
Molybdenum	---	150(T)
Nickel	TVS	TVS
Nickel	---	100(T)
Selenium	TVS	TVS
Silver	TVS	TVS
Uranium	---	---
Zinc	TVS	TVS

All metals are dissolved unless otherwise noted.
T = total recoverable
t = total
tr = trout

D.O. = dissolved oxygen
DM = daily maximum
MWAT = maximum weekly average temperature
See 38.6 for details on TVS, TVS(tr), WS, temperature standards.

REGULATION #38 STREAM CLASSIFICATIONS and WATER QUALITY STANDARDS
Cherry Creek Basin

4b. Cottonwood Creek, including all tributaries and wetlands, from the source to Cherry Creek Reservoir.

COSPCH04B	Classifications
Designation	Agriculture
UP	Aq Life Warm 2
	Recreation E
	Water Supply

Qualifiers:

Other:

*chlorophyll a (mg/m^2)(chronic) = applies only above the facilities listed at 38.5(4).
*Phosphorus(chronic) = effective 12/31/2020. Applies only above the facilities listed at 38.5(4).
*Selenium(acute) = See section 38.6(4)(i) for selenium standards and assessment locations.
*Selenium(chronic) = See section 38.6(4)(i) for selenium standards and assessment locations.

Physical and Biological	DM	MWAT
Temperature °C	WS-II	WS-II
	acute	**chronic**
D.O. (mg/L)	---	5.0
pH	6.5 - 9.0	---
chlorophyll a (mg/m^2)	---	150*
E. Coli (per 100 mL)	---	126
Inorganic (mg/L)		
	acute	**chronic**
Ammonia	TVS	TVS
Boron	---	0.75
Chloride	---	250
Chlorine	0.019	0.011
Cyanide	0.005	---
Nitrate	10	---
Nitrite	---	0.5
Phosphorus	---	0.17*
Sulfate	---	WS
Sulfide	---	0.002

Metals (ug/L)	acute	chronic
Aluminum	---	---
Arsenic	340	0.02-10(T) [A]
Beryllium	---	---
Cadmium	TVS	TVS
Cadmium	5.0(T)	---
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	---	WS
Lead	TVS	TVS
Lead	50(T)	---
Manganese	TVS	TVS
Manganese	---	WS
Mercury	---	0.01(t)
Molybdenum	---	150(T)
Nickel	TVS	TVS
Nickel	---	100(T)
Selenium	varies*	varies*
Silver	TVS	TVS
Uranium	---	---
Zinc	TVS	TVS

5. Lakes and reservoirs in the Cherry Creek system from the source of East and West Cherry Creeks to the confluence with the South Platte River, except for specific listings in Segments 2 and 6.

COSPCH05	Classifications
Designation	Agriculture
Reviewable	Aq Life Warm 2
	Recreation E
	Water Supply

Qualifiers:

Other:

*chlorophyll a (ug/L)(chronic) = applies only above the facilities listed at 38.5(4), applies only to lakes and reservoirs larger than 25 acres surface area.
*Phosphorus(chronic) = applies only above the facilities listed at 38.5(4), applies only to lakes and reservoirs larger than 25 acres surface area.

Physical and Biological	DM	MWAT
Temperature °C	WL	WL
	acute	**chronic**
D.O. (mg/L)	---	5.0
pH	6.5 - 9.0	---
chlorophyll a (ug/L)	---	20*
E. Coli (per 100 mL)	---	126
Inorganic (mg/L)		
	acute	**chronic**
Ammonia	TVS	TVS
Boron	---	0.75
Chloride	---	250
Chlorine	0.019	0.011
Cyanide	0.005	---
Nitrate	10	---
Nitrite	---	0.5
Phosphorus	---	0.083*
Sulfate	---	WS
Sulfide	---	0.002

Metals (ug/L)	acute	chronic
Aluminum	---	---
Arsenic	340	0.02-10(T) [A]
Beryllium	---	---
Cadmium	TVS	TVS
Cadmium	5.0(T)	---
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	---	WS
Iron	---	1000(T)
Lead	TVS	TVS
Lead	50(T)	---
Manganese	TVS	TVS
Manganese	---	WS
Mercury	---	0.01(t)
Molybdenum	---	150(T)
Nickel	TVS	TVS
Nickel	---	100(T)
Selenium	TVS	TVS
Silver	TVS	TVS
Uranium	---	---
Zinc	TVS	TVS

All metals are dissolved unless otherwise noted.
T = total recoverable
t = total
tr = trout

D.O. = dissolved oxygen
DM = daily maximum
MWAT = maximum weekly average temperature
See 38.6 for details on TVS, TVS(tr), WS, temperature standards.

REGULATION #38 STREAM CLASSIFICATIONS and WATER QUALITY STANDARDS
Cherry Creek Basin

6. Lakes and reservoirs in watersheds tributary to Cherry Creek within the City and County of Denver.

COSPCH06	Classifications
Designation	Agriculture
Reviewable	Aq Life Warm 2
	Recreation E

Qualifiers:

Fish Ingestion Standards

Other:

Physical and Biological	DM	MWAT
Temperature °C	WL	WL
	acute	**chronic**
D.O. (mg/L)	---	5.0
pH	6.5 - 9.0	---
chlorophyll a (ug/L)	---	---
E. Coli (per 100 mL)	---	126
Inorganic (mg/L)		
	acute	**chronic**
Ammonia	TVS	TVS
Boron	---	0.75
Chloride	---	---
Chlorine	0.019	0.011
Cyanide	0.005	---
Nitrate	100	---
Nitrite	---	0.5
Phosphorus	---	---
Sulfate	---	---
Sulfide	---	0.002

Metals (ug/L)	acute	chronic
Aluminum	---	---
Arsenic	340	7.6(T)
Beryllium	---	---
Cadmium	TVS	TVS
Chromium III	TVS	TVS
Chromium III	---	100(T)
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	---	1000(T)
Lead	TVS	TVS
Manganese	TVS	TVS
Mercury	---	0.01(t)
Molybdenum	---	150(T)
Nickel	TVS	TVS
Selenium	TVS	TVS
Silver	TVS	TVS
Uranium	---	---
Zinc	TVS	TVS

All metals are dissolved unless otherwise noted.
T = total recoverable
t = total
tr = trout

D.O. = dissolved oxygen
DM = daily maximum
MWAT = maximum weekly average temperature
See 38.6 for details on TVS, TVS(tr), WS, temperature standards.

APPENDIX B – SAMPLING AND ANALYSIS PLAN / QUALITY ASSURANCE PROCEDURES AND PROTOCOLS, 2016

2015

modified 5/19/16

The Cherry Creek Basin Water Quality Authority Routine Sampling and Analysis Plan/ Quality Assurance Project Plan

SAP | QAPP

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Preamble

The 2015 SAP was modified, as approved by the Cherry Creek Basin Water Quality Authority (Authority), on May 19, 2016 to refine sampling procedures and monitoring locations in the Reservoir and Watershed. Refinements to the sampling and analysis program are important, recognizing that the program is dynamic and changes are needed from time to time based on:

- Monitoring objectives being met,
- New objectives being formulated,
- Changes to sampling methodology,
- Duplicative efforts and opportunities to reduce costs,
- Meeting regulatory objectives or regulatory changes,
- Opportunities to improve quality of data and sampling methodology to reflect sound science and limnology.

The SAP modifications, summarized in the Table below, support regulatory requirements and SAP objectives to provide defensible data to track ongoing water quality benefits of the Cherry Creek Basin Water Quality Authority's current and future actions. Appendix C provides additional description of the 2016 modifications and rationale.

Summary of 2016 SAP Modifications
Reservoir Program
Zooplankton Sampling - Discontinue compositing zooplankton tows from all 3 reservoir sample sites; Station CCR-2 shall be analyzed for zooplankton; 1 Tow = 1 Sample. The sampling frequency remains unchanged.
Phytoplankton Sampling – Discontinue compositing phytoplankton samples from all 3 reservoir sample sites. Analyze the photic zone composite from Station CCR-2; Sampling frequency remains unchanged.
De-stratification Profile Sampling - Discontinue de-stratification vertical profile sampling from sampling program, particularly as de-stratification system is not operational.
Watershed Program (Surface Water, Groundwater and PRFs)
Discontinue Groundwater Monitoring at MW-3c (historic KOA well site) – No monitoring access at this site; Identify as deleted from SAP.
Clarify No Sampling in the Piney Creek sub-basin. Monitoring station and monitoring well do not exist at this time; Identify as deleted from SAP until such time as a monitoring site(s) are initiated.

1.0 Introduction

The Cherry Creek Basin Water Quality Authority (Authority) was formally created in 1988 by the Colorado State Legislature by statue (see Colorado Revised Statues (C.R.S.) 25.8.5-101 et seq.). The Authority was created as a quasi-municipal corporation and political subdivision of the state, and was provided with specific authorities. The Authority is tasked with improving, protecting, and preserving the water quality of Cherry Creek and Cherry Creek Reservoir as well as achieving and maintaining state water quality standards for the reservoir and watershed. The Authority has the power to develop and implement plans and studies for water quality controls for the reservoir and watershed to achieve and maintain the water quality standards, and make recommendations regarding water quality projects and programs to achieve water quality standards. The Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) includes long-term monitoring of nutrient levels within the reservoir and its tributaries, nutrient levels in precipitation and groundwater, and chlorophyll *a* levels within the reservoir. The overall goal of the monitoring program is to assess attainment of the water quality standards (including beneficial uses and the numeric criteria adopted to protect the uses) and to assess the effectiveness of the Authority's actions.

2.0 Purpose

The Cherry Creek Basin Water Quality Authority (Authority) is required to samples biological, physical, and nutrient parameters in the Cherry Creek Reservoir and its tributaries under Regulation 72, the Cherry Creek Reservoir Control Regulation. Pursuant to this charge, the monitoring program is to meet the following purposes stemming from Regulation 72:

- For the purpose of supporting and calibrating the reservoir water quality model, as anticipated by Regulation 72[1];
- For the purpose of meeting parameter-specific monitoring required of the Authority by Regulation 72 and additional non-specified monitoring determined by the Authority to be supportive of Authority goals;
- For the purpose of meeting nutrient Pollutant Reduction Facility (PRF) monitoring required of the Authority by Regulation 72;

[1] As future special studies are identified, the SAP/QAPP will be reviewed to determine if any modifications need to be made to support the new study. In some instances, a short, stand-alone SAP may be more appropriate. "Special studies" are anticipated by Regulation 72, the Cherry Creek Reservoir Control Regulation, Section 72.8.4: "Special studies may include, but are not limited to, the following areas of investigation: (a) Feasibility study of nutrient removal from point sources; (b) Quantification of effectiveness of nonpoint source concentration-based phosphorus control strategies called PRFs; (c) Quantification of effectiveness of regulated stormwater concentration-based phosphorus control strategies called BMPs; and (d) Quantification of the effectiveness of source control BMPs that include low-impact development techniques." The reservoir model qualifies as a special study. A special study such as a side-by-side comparison of methods for cyanobacteria analysis, e.g., filtering vs. settling, would also require a separate special SAP.

- For the purpose of assessing the effects of the destratification system, as required of the Authority by Regulation 72 as part of its PRF monitoring for nutrients and additional monitoring as may be determined by the Authority;
- For the purpose of determining attainment of applicable water quality standards, as required of the Authority by Regulation 72; and
- For the purpose of evaluating nutrient sources and transport, evaluating fate and transport of phosphorus, and calculating flow-weighted phosphorus concentrations, as required of the Authority by Regulation 72.
- For the purpose of calculating flow-weighted nitrogen concentrations and evaluating the fate and transport of nitrogen, as well as calculating mass balances for both phosphorus and nitrogen inputs and losses from the reservoir, as determined by the Authority to be supportive of its goals, according to the 2010 expansion of Regulation 72 to consider all nutrients, and not just phosphorus.

3.0 Sampling Program Objectives

The Authority's long-term goals serve as assessment end-points for the reservoir and watershed (for example, protection of beneficial uses, and preservation and enhancement of water quality). The sampling program helps the Authority evaluate whether it is attaining its long-term goals. Specific objectives of the sampling program are to:

- Determine biological productivity in the reservoir, as measured by chlorophyll *a* concentrations and collect other data (i.e., phytoplankton) related to the effect of chlorophyll *a* on beneficial uses;
- Determine the concentrations of phosphorus and nitrogen species in the reservoir and streams, and how it changes over time;
- Determine the annual flow-weighted phosphorus concentration and changes to the concentrations entering the reservoir from streams and precipitation and the phosphorus export from the reservoir via the outlet structure;
- Determine the effectiveness of pollutant removal by Pollutant Reduction Facilities; and
- Determine the effectiveness of the destratification system[2] in protecting the beneficial uses by reducing the algal biomass as measured by chlorophyll *a* and reducing

[2] Note that the destratification system was originally designed to achieve the following goals: 1) reduce the release of phosphorus and nitrogen nutrients from the bottom sediments into the water column of the reservoir in a typical year by 810 lbs/yr and 1140 lbs/yr, respectively; 2) decrease the seasonal mean (July-Sept) chlorophyll *a* concentrations by approximately 8 ug/L under typical year conditions; 3) decrease annual peak chlorophyll *a* concentrations by up to 30 ug/L; 4) increase dissolved oxygen concentrations in the deepest and most vulnerable zones of the reservoir into the range of 5 mg/L; and 5) reduce the production of blue-green algae by making the habitat of the reservoir less suitable for the production of blue-green algae via vertical mixing. (AMEC Earth & Environmental, Inc., Alex Horne Associates, Hydrosphere Resource Consultants, Inc. (December 5, 2005). *Feasibility Report Cherry Creek Reservoir Destratification.)*

cyanobacteria production as measured by species identification, enumeration, and biovolume.

The SAP/QAPP identifies field and laboratory protocols necessary to achieve high quality data. The 2014 SAP/QAPP is intended to build off of the 2008 Sampling and Analysis Plan and Quality Assurance Work Plan (GEI 2008) and includes: quality assurance objectives for the measurement of data in terms of accuracy, representativeness, comparability, and completeness; field sampling and sample preservation procedures, laboratory processing and analytical procedures; and guidelines for data verification and reporting; quality control check; corrective actions; and quality assurance reporting.

4.0 Regulation No. 72 Requirements

Regulation 72 states that the Authority shall develop and implement, in conjunction with local governments, a routine annual water quality monitoring program of the Cherry Creek watershed and Cherry Creek Reservoir. The monitoring program shall include monitoring of the reservoir water quality and inflow volumes, alluvial water quality, and nonpoint source flows. Monitoring shall include, but not be limited to nitrate, nitrite, ammonia, total phosphorus, total soluble phosphorus, and orthophosphate concentrations.

- Routine monitoring of surface water, ground water, and the reservoir shall be implemented to determine the total annual flow-weighted concentration of nutrients to the reservoir; and
- Monitoring of PRFs shall be implemented to determine inflow and outflow nutrient concentrations.

The Authority shall consult with the Colorado Water Quality Control Division (Division) in the development of the monitoring program to ensure that the monitoring plan includes the collection of data to evaluate nutrient sources and transport, to characterize reductions in nutrient concentrations, and to determine attainment of water quality standards in Cherry Creek Reservoir. In addition, the Authority shall consult with the Division and other appropriate entities in development of any water quality investigative special studies.

The monitoring data shall be used by the Authority to determine phosphorus fate and transport, calculate annual flow-weighted phosphorus concentrations, document compliance with the applicable water quality standards, analyze long-term trends in water quality for both the reservoir and the Cherry Creek watershed, and calibrate water quality models (72.8).

Reporting requirements are also required under Regulation 72. The Authority shall submit an annual report on the activities to the Commission and Division by March 31 of each year (72.9).

The SAP/QAPP facilitates the above Regulation 72 requirements, and ensures a high quality, auditable, and well-documented monitoring program.

5.0 Review and Updates

A review of the SAP/QAPP shall be performed by the Technical Advisory Committee (TAC) or Water Quality Committee when there are material changes made to the sampling program (e.g. new monitoring sites, additional parameters, laboratory changes, changes in personnel, etc.), and any updates shall be made as needed. In addition, a review and update of the SAP/QAPP shall be conducted by the TAC or Water Quality Committee in preparation for Water Quality Control Commission (WQCC) Rule Making Hearings (RMH) and other special studies, as needed. Changes and amendments shall be incorporated into the SAP/QAPP in a timely manner, and shall be well-documented.

6.0 Timeline

Sampling and data collection shall be implemented per Regulation 72. The Cherry Creek Basin is subject to the hearing timelines of the Cherry Creek Reservoir Control Regulation (Regulation 72), statewide water quality standards (Regulation 31), Cherry Creek water quality standards (Regulation 38), statewide water quality standards assessment (Regulation 93), and other regulations (Regulation 22, 43, 61, 85). As these regulations change, the SAP/QAPP may need to be revisited and may change. The next Water Quality Control Commission Triennial Review Informational Hearing for Regulation 72 will be held in May 2015. Figure 1 below shows the timeline of regulation hearings pertaining to the Cherry Creek Basin.

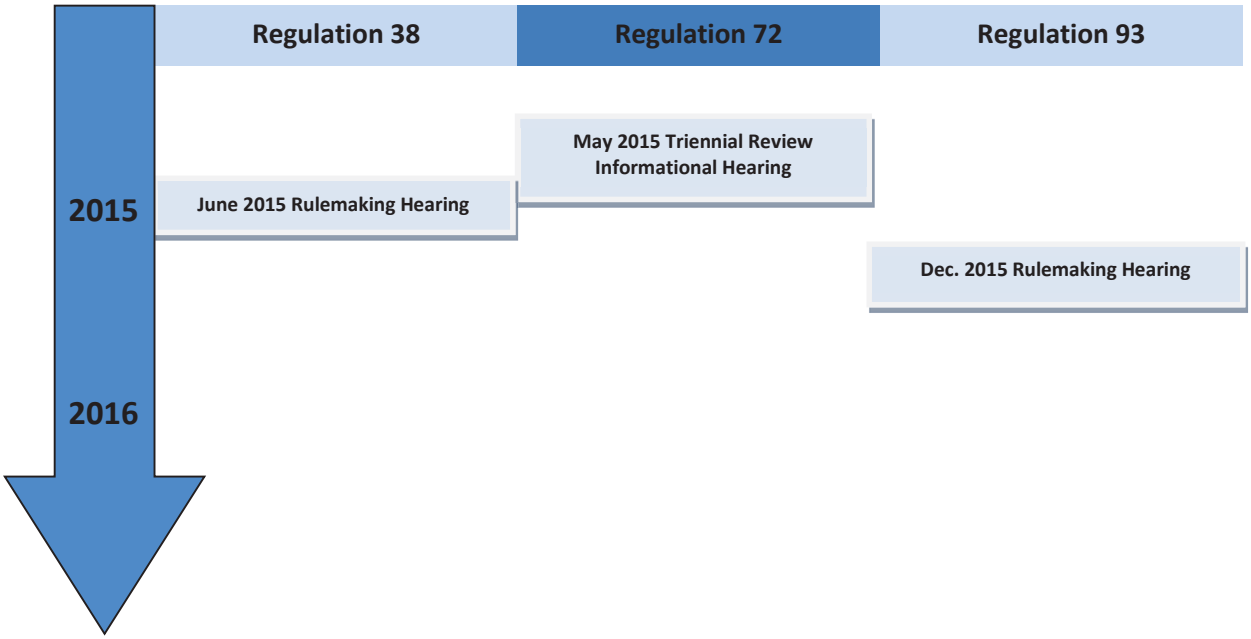

Figure 1: Water Quality Control Commission Regulation Hearing Timeline

7.0 Project Description

The Authority has been collecting water quality data since 1994. The data has provided an extensive site-specific data set for Cherry Creek Reservoir and its tributaries. This SAP/QAPP has been designed to better define water quality conditions and to gain a better understanding of changes of nutrients in the reservoir and its tributaries and the effectiveness of PRFs. The following includes an overview of sampling site locations, sampling teams and structures, sampling parameters, and frequency of sampling.

7.1 Sample Site Locations

Reservoir, watershed, and PRF sampling shall be routinely conducted at 13 sites, including three sites in Cherry Creek Reservoir, eighteen stream monitoring sites (on Cherry Creek, Cottonwood Creek, and McMurdo Gulch), and seven alluvial groundwater sites along Cherry Creek mainstem, and one site on Cherry Creek downstream of the Reservoir (Figure 2). Data from many of these monitoring sites are used to assess the effectiveness of several of the Authority's PRFs (Figure 3). In addition to these routine monitoring sites, three continuous temperature logging sites are located in the reservoir near the three routine reservoir monitoring sites.

All sampling sites are summarized below. Site coordinates for the currently monitored sites can be found in Appendix A. Information on sites that were previously monitored but have been abandoned is found in Appendix B.

7.1.1 Cherry Creek Reservoir Monitoring Sites

CCR-1 This site is also called the Dam site, and was established in 1987. Site CCR-1 corresponds to the northwest area within the reservoir (Knowlton, 1993). Sampling was discontinued at this site in 1996 and 1997 following determination that this site exhibited similar characteristics to the other two sites. Sampling recommenced in July 1998 at the request of consultants for Greenwood Village.

CCR-2 This site is also called the Swim Beach site, and was established in 1987. Site CCR-2 corresponds to the northeast area within the reservoir (Knowlton, 1993).

CCR-3 This site is also called the Inlet site, and was established in 1987. Site CCR-3 corresponds to the south area within the reservoir (Knowlton, 1993).

7.1.2 Stream Monitoring Sites

7.1.2.1 Cherry Creek

Castlewood This site has been sampled since 1994, and is located in Castlewood Canyon State Park where the Homestead Trail crosses Cherry Creek. It is located about 0.2 miles north of the USGS gaging station known as "Cherry Creek near Franktown."

CC-1	This site was established in 2012 on Cherry Creek. This site is located on Cherry Creek approximately 380 m upstream of where Bayou Gulch Road crosses Cherry Creek near Parker Road.
CC-2	This site has been sampled since 1994 and is located on Cherry Creek below the Pinery's wastewater treatment plant. This site is located approximately 0.85 km upstream of Stroh Road.
CC-4	This site has been sampled since 1994, and is located on Cherry Creek below the confluence with Sulphur Gulch and below the outfall for Parker's AWT plant. This site is located approximately 0.50 km downstream of Main Street in Parker.
CC-5	This site has been sampled since 1994, and is located on Cherry Creek immediately downgradient of the confluence with Newlin Gulch. This site is located where Pine Lane crosses Cherry Creek, approximately 0.65 km west of Parker Road.
CC-6	This site has been sampled since 1994, and is located on Cherry Creek downgradient of Parker's North AWT plant. However, the discharge from this AWT plant is transported via pipeline to Sulphur Gulch. This site is located approximately 1.38 km downstream of Cottonwood Drive and 0.41 km west of Parker Road.
CC-7 EcoPark	This site was reestablished in 2013 on Cherry Creek at the downstream boundary of Cherry Creek Valley Ecological Park (EcoPark). This site is approximately 1.7 kilometers (km) upstream (south) of Arapahoe Road, and serves to monitor water quality conditions downstream of the EcoPark Stream Reclamation Project (PRF). This site also provides more accurate flow estimates in this reach of Cherry Creek. (The original CC-7 site, located ¾ mile south of Arapahoe Road, was abandoned in 2000 due to development.)
CC-8	This site has been sampled since 1994, and is located on Cherry Creek, approximately 0.5 miles north of Arapahoe Road.
CC-9	This site was re-established in 2012 on Cherry Creek, and is located in Cherry Creek State Park just upgradient of Cherry Creek Reservoir. This site is located immediately downstream of where East Lake View Drive crosses Cherry Creek in Cherry Creek State Park.
CC-10	This site is on Cherry Creek immediately downstream of the Shop Creek confluence, approximately 0.5 km upstream of Cherry Creek Reservoir. This site provides data to estimate phosphorus loads to the Reservoir from Cherry Creek and includes inputs from upstream tributaries, including Shop Creek.
CC-O	This site was established in 1987, and is located on Cherry Creek downstream of Cherry Creek Reservoir and upstream of the Hampden Avenue-Havana Street junction in the Kennedy Golf Course near the historical USGS gage (06713000).

In 2007, Site CC-O (also identified in the past as Site CC-Out at I225) was relocated immediately downstream of the dam outlet structure and is used to monitor the water quality of the Reservoir outflow.

7.1.2.2 Cottonwood Creek

CT-P1 This site was established in 2002, and is located on Cottonwood Creek just north of where Caley Avenue crosses Cottonwood Creek, and west of Peoria Street. This site monitors the water quality of Cottonwood Creek before it enters the Peoria Pond PRF, also created in 2001/2002 on the west side of Peoria Street.

CT-P2 This site was established in 2002 and is located on Cottonwood Creek at the outfall of the PRF, on the west side of Peoria Street. The ISCO® stormwater sampler and pressure transducer is located inside the outlet structure. This site monitors the effectiveness of the PRF on water quality.

CT-1 This site was established in 1987 where the Cherry Creek Park Perimeter Road crosses Cottonwood Creek. It was chosen to monitor the water quality of Cottonwood Creek before it enters the Reservoir. During the fall/winter of 1996, a PRF, consisting of a water quality/detention pond and wetland system, was constructed downstream of this site. As a result of the back-flow from this pond inundating this site, this site was relocated approximately 250 m upstream near Belleview Avenue in 1997. In 2009, this site was relocated approximately 75 m upstream of the Perimeter Road as it crosses Cottonwood Creek, due to the Cottonwood Creek stream reclamation project. This site is now approximately 200 m upstream of the PRF. It is also used to evaluate the effectiveness of the PRF by documenting the stream concentrations above the PRF.

CT-2 This site was established in 1996, and was originally located downstream of the Perimeter Pond on Cottonwood Creek. The ISCO pressure transducer and staff gage was located in a section of the stream relatively unobstructed by vegetation, and approximately 50 m downstream of the PRF. However, over the years the growth of vegetation considerably increased along the channel, creating problems with accurately determining stream flow. Eventually, when no accurate and reliable streamflow measurements could be performed in 2003, other locations were evaluated. In August 2004, the pressure transducer and staff gage were relocated inside of the outlet structure for the PRF to mitigate problems associated with streamflow measurements by providing a reliable multilevel weir equation. In 2013, modifications to the PRF overflow elevation and internal weir structure changed the relationship of the multilevel weir equation, resulting in unreliable stream flow estimates. In 2014, the weir elevations were resurveyed and the weir equations were adjusted accordingly. Water quality samples are collected from the outlet structure. This site monitors the effectiveness of the PRF on Cottonwood Creek water quality and provides information on the stream before it enters the Reservoir.

7.1.2.3 McMurdo Gulch

MCM-1 This site was established in 2012 on McMurdo Gulch, approximately 150 m upstream of the McMurdo Gulch Stream Reclamation Project boundary. This site is also 120 m upstream of the confluence with an unnamed tributary that receives runoff from the Castle Oaks Subdivision. This site serves as the upstream monitoring location for the McMurdo Gulch Stream Reclamation project.

MCM-2 This site was established in 2012 on McMurdo Gulch, approximately 80 m upstream of the Castle Oaks Drive Bridge crossing of McMurdo Gulch, near the North Rocky View Road intersection. This site serves as the downstream monitoring location for the McMurdo Gulch Stream Reclamation Project. This site is located within the project boundary, and consistently maintains base flows, whereas the reach further downstream was often dry due to surface flow becoming subsurface.

7.1.3 Precipitation Sampling Site

PRECIP This site is located near the Quincy Drainage, upstream of the Perimeter Road. The sampler consists of a clean, inverted trash can lid used to funnel rainfall into a one-gallon container. While this collection vessel is maintained and cleaned on a routine basis, precipitation will wash any atmospheric dry fall that has accumulated between cleanings into the one-gallon container. Therefore, these data more appropriately represent a “bulk” atmospheric deposition component for the reservoir.

7.1.4 Alluvial Groundwater Sites

MW-1 This alluvial well monitor has been sampled since 1994, and is located approximately 270 m southeast of where Bayou Gulch Road crosses Cherry Creek near Parker Road.

MW-2 This alluvial well monitor has been sampled since 1994, and is located downstream of the Pinery’s wastewater treatment plant. This site is located approximately 0.85 km upstream of Stroh Road.

MW-5 This alluvial well monitor has been sampled since 1994, and is located immediately downgradient of the confluence with Newlin Gulch. This site is located where Pine Lane crosses Cherry Creek, approximately 0.65 km west of Parker Road.

MW-6 This alluvial well monitor has been sampled since 1994, and is located downgradient of Parker’s North AWT plant. However, the discharge from this AWT plant is transported via pipeline to Sulphur Gulch. This site is located approximately 1.38 km downstream of Cottonwood Drive and is approximately 0.41 km west of Parker Road.

MW-7a	Site MW-7a was established in 2013 as part of monitoring for the Eco-Park Reclamation Project. This alluvial well monitor has been sampled since 2013, and is located at the downstream boundary of Cherry Creek Valley Ecological Park (EcoPark). This site is approximately 1.7 km upstream of Arapahoe Road. (The original site MW-7 was located adjacent to the Arapahoe Ford #2 production well; it was abandoned as a water quality monitoring site in 2000 due to development.)
MW-9	This alluvial well monitor has been sampled since 1994, and is located in Cherry Creek State Park near the Nature Center. This site is monitored to assess alluvial groundwater that is entering Cherry Creek Reservoir.
Kennedy	This alluvial well monitor has been sampled since 1994, and is located on the Kennedy Golf Course to monitor groundwater quality downgradient from Cherry Creek Reservoir.

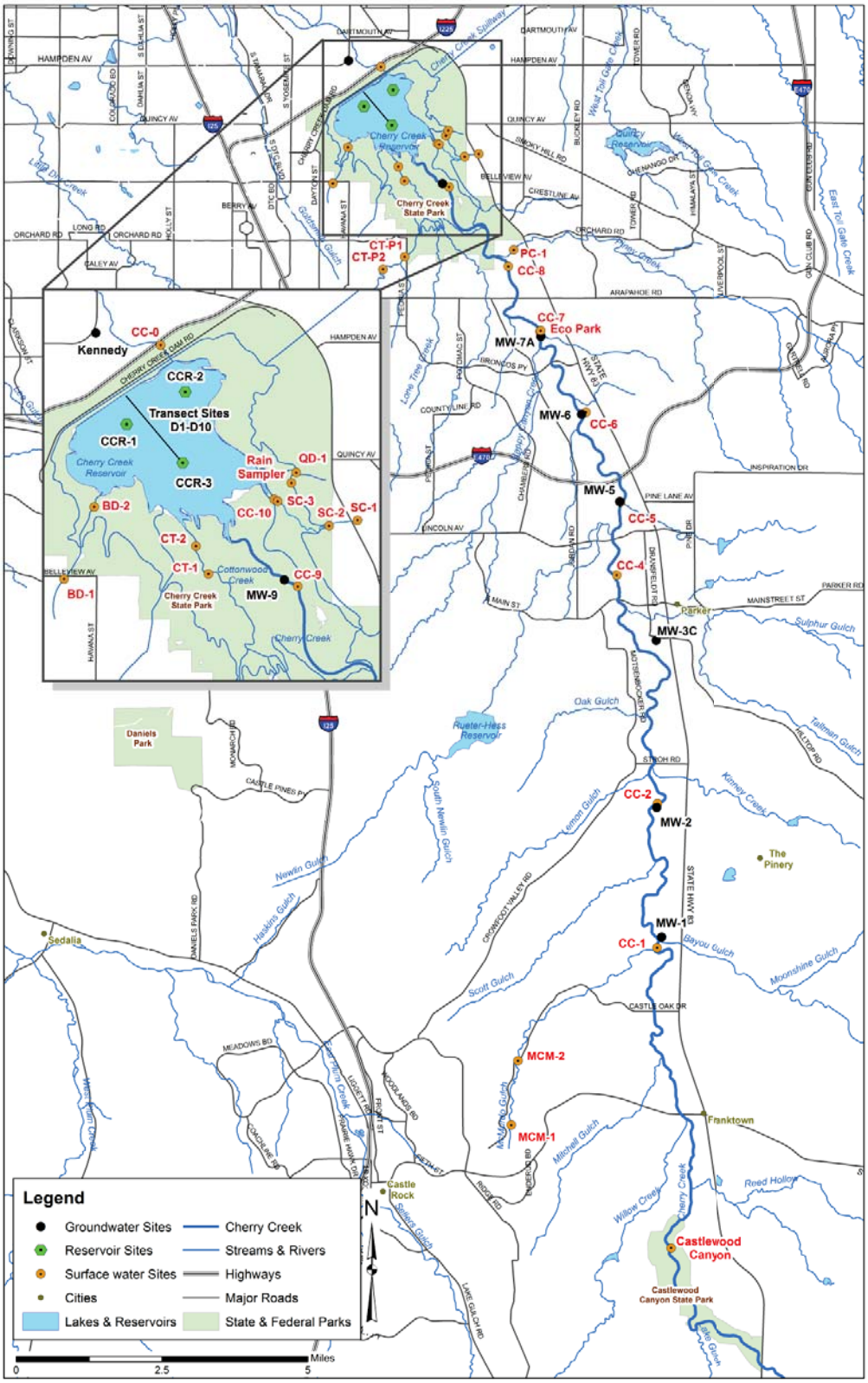

Figure 2: Sample Sites on Cherry Creek Reservoir, Surface Water Monitoring Sites, and Alluvial Groundwater Sites (Note: Transect sites D1-D10 and groundwater monitoring site 3C (MW-3C) are discontinued effective May 2016).

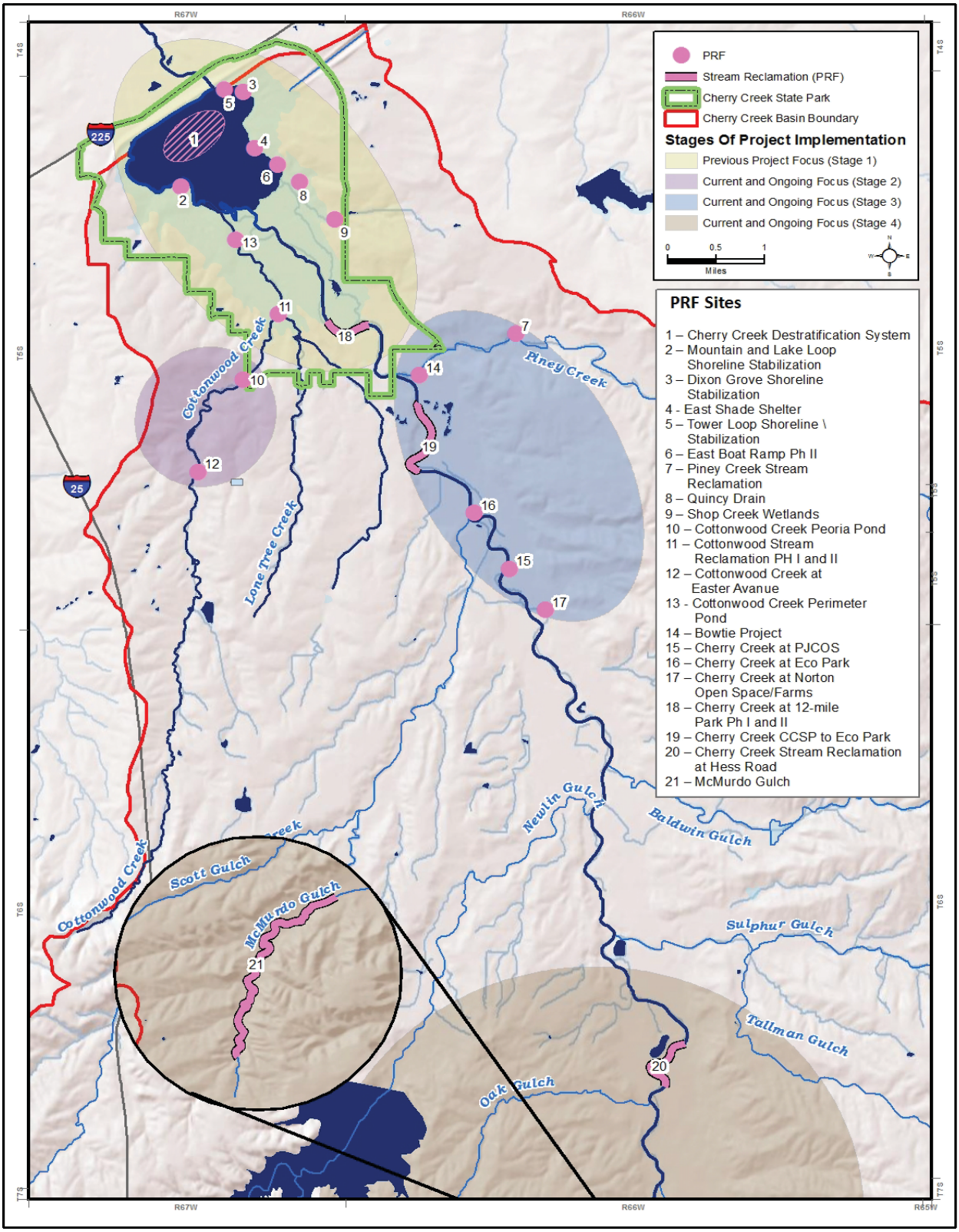

Figure 3: Pollutant Reduction Facility (PRF) Sites Located Throughout the Cherry Creek Watershed.

7.2 Sampling Parameters and Frequency

To ensure a high level of accuracy and precision, sampling and analyses shall be conducted according to the protocols and method and detection limits set forth in this SAP/QAPP. Monitoring parameters include physical, inorganic, organic, and biological parameters. Table 1 summarizes reservoir sampling parameters and sampling frequencies for sites within the reservoir. Table 2 summarizes similar information for stream and alluvial groundwater monitoring.

Table 1. Reservoir Sampling Parameters and Frequency.

ANALYTE	Monthly Vertical Profile WQ Sonde (Oct – April)	Monthly Nutrient-Biological Samples (Photic Zone)		Monthly Nutrient Profile (4m-7m)	Bi-monthly Sonde & Nutrient Samples (May-Sept)	Precipi-tation
	CCR-1, CCR-2, CCR-3	CCR-1, CCR-3	CCR-2	CCR-2	CCR-1, CCR- 2, CCR- 3	Rain Sampler
Temperature	x				x	
Conductivity	x				x	
pH	x				x	
Dissolved Oxygen	x				x	
Oxidation/Reduction Pot'l	x				x	
1% Transmittance	x				x	
Secchi disk	x				x	
Temperature, Continuous (15-minute interval)	x					
Total Nitrogen		x	x	x	x	x
Total Dissolved Nitrogen		x	x	x	x	x
Ammonia as N		x	x	x	x	x
Nitrate+Nitrite as N		x	x	x	x	x
Total Phosphorus		x	x	x	x	x
Total Dissolved		x	x	x	x	x
Orthophosphate as P		x	x	x	x	
Total Organic Carbon			x	x	x	
Dissolved Organic			x	x	x	
Total Volatile Suspended		x	x		x	
Total Suspended Solids		x	x		x	
Chlorophyll *a*		x	x		x	
Phytoplankton			X		x	
Zooplankton			x		x	

Table 2. Stream and Groundwater Sampling Parameters and Frequency.

ANALYTE	Monthly Surface Water Samples	Storm Event Surface Water ISCO Samples	Bi-annual Surface Water Samples	Bi-annual Groundwater Samples
	10 sites (CC-0, CC-10,	7 sites (CC-10,	9 sites	7 sites

	CC-7-EcoPark, CT-1, CT-2, CT-P1, CT-P2, MCM-1, MCM-2, PC-1)	CC-7-EcoPark, CT-1, CT-2, CT-P1, CT-P2, PC-1)	**(Castlewood, CC-1, CC-2. CC-4. CC-5, CC-6, CC-8, CC-9)**	(MW-1, MW-2, MW-5, MW-6, MW-7a, MW-9, Kennedy)
Physical				
Temperature	x		x	x
Conductivity	x		x	x
pH	x		x	x
Dissolved Oxygen	x		x	x
Oxidation/Reduction Pot'l				x
Water Level, Continuous (15-minute interval)		x		x **(MW-9 only)**
Discharge, Rating Curve		x		
Inorganics				
Total Nitrogen	x	x		
Total Dissolved Nitrogen	x	x		
Ammonia as N	x	x	x	x
Nitrate+Nitrite as N	x	x	x	x
Nitrate as N			x	x
Nitrite as N			x	x
Total Phosphorus	x	x	x	
Total Dissolved Phosphorus	x	x	x	x
Orthophosphate as P	x	x	x	x
Chloride			x	x
Sulfate			x	x
Organics				
Total Organic Carbon				x **(MW-9 only)**
Dissolved Organic Carbon				x **(MW-9 only)**
Total Volatile Suspended Solids	x	x		
Total Suspended Solids	x	x		

Note that the Total and Dissolved Organic Carbon samples collected at CCR-1, CCR-2, CCR-3, and MW-9, and the water levels at MW-9, are being collected at the request of the Authority's Reservoir Modeler as input for the model, and should be revisited and perhaps discontinued when this SAP/QAPP is next updated.

7.3 Authority Roles and Participation

The Authority is responsible for the following tasks:

- Manage the water quality monitoring contract
- Prepare the Annual Report to the Colorado Water Quality Control Commission
- Ensure periodic outside Peer Review is solicited at appropriate times
- Coordinate the monitoring program and budgetary needs arising from regulatory changes and new facility monitoring needs (e.g., PRFs)
- Identify and coordinate monitoring needs for any new special studies (see footnote 1 on the bottom of page 3 for more detail re: special studies)
- Periodically review and revise, as needed, the Sampling Program Objectives (see Section 3.0)
- Ensure the monitoring program complies with Regulation 72 requirements (see Section 4.0)
- Provide periodic review and updates to this SAP/QAPP (see Section 5.0)

7.4 Sampling Teams and Structure

The monitoring consultant shall be responsible for implementing sampling requirements per the SAP/QAPP. All personnel involved in the investigation and in the generation of data are a part of the overall project and quality assurance program. The following roles have specifically delegated responsibilities, which is structured to ensure the highest quality of data collection, management, and reporting.

7.4.1 Project Manager

The Project Manager is responsible for fiscal oversight and management of the project and for ensuring that all work is conducted in accordance with the Scope of Service, Sampling and Analysis Plan, and approved procedures. Tasks include:

- Maintain routine contact with the project's progress;
- Regularly review the project schedule, and review all work products; and
- Evaluate impacts on project objectives and the need for corrective actions based on quality control checks.

7.4.2 Quality Assurance Manager

The Quality Assurance Manager is responsible for the aquatic biological and field sampling portions of the project as well as the technical management of the monitoring program and reporting. The Quality Assurance Manager shall be responsible for evaluation and review of all data reports relevant to the project and perform data verification. The Quality Assurance Manager shall work with the Project Manager to determine the need for corrective actions and, together, will make recommendations for any needed changes to either sampling methodologies or laboratory analytical procedures. Tasks include:

- Ensure data collection is in accordance with the Sampling and Analysis Plan;
- Maintain a repository for all documents relating to this project; and

- Coordinate with the Authority, the WQCD, and the Authority's other consultants to ensure compliance with the Cherry Creek Reservoir Control Regulation 72.

7.4.3 Analytical and Biological Laboratory Managers

The Analytical Laboratory Manager will ensure that all water quality and chlorophyll *a* samples are analyzed in a technically sound and timely manner. The Analytical Laboratory Manager shall be responsible for ensuring all laboratory quality assurance procedures associated with the project are followed, including proper sample entry, sample handling procedures, and quality control records for samples delivered to the laboratory. The Analytical Laboratory Manager will be responsible for all data reduction and verification, and ensure that the data is provided in a format agreed upon between the Project Manager, the Analytical Laboratory Manager, and the Authority. The Biological Laboratory Manager(s) will ensure that phytoplankton and zooplankton identification, enumeration, and biovolume/biomass analyses are analyzed in a technically sound and timely manner, in accordance with the requirements of this SAP/QAPP. The Biological Laboratory Manager(s) shall be responsible for ensuring all laboratory quality assurance procedures associated with the project are followed, including proper sample entry, sample handling procedures, and quality control records for samples delivered to the laboratory.

7.4.4 Sampling Crew

The field sampling efforts shall be conducted by individuals qualified in the collection of chemical, physical, and biological surface water samples. Field tasks and sampling oversight will be provided by the Quality Assurance Manager. The Sampling Crew shall be responsible for following all procedures for sample collection, including complete and accurate documentation.

7.5 Field Methodologies

7.5.1 Reservoir Sampling

7.5.1.1 Transparency

Transparency shall be determined using a Secchi disk and Licor quantum sensors. The Secchi reading shall be slowly lowered on the shady side of the boat, until the white quadrants disappear, at which point the depth is recorded. The disk is then lowered roughly 1 m further and slowly brought back up until the white quadrants reappear and again the depth is recorded. The Secchi disk depth is recorded as the average of these two readings.

Licor quantum sensors provide a quantitative approach to determine the depth at which 1 percent of the light penetrates the water column. This is considered the point at which light no longer can sustain photosynthesis in excess of oxygen consumption from respiration (Goldman and Horne 1983) and represents the deepest portion of the photic zone. This is accomplished by using an ambient and underwater quantum sensor attached to a data logger. The ambient quantum

sensor remains on the surface, while the underwater sensor is lowered into the water on the sunny side of the boat. The underwater sensor is lowered until the value displayed on the data logger is 1 percent of the value of the ambient sensor, and the depth is recorded.

7.5.1.2 Depth Profile Measurements

Measurements for dissolved oxygen, temperature, conductivity, pH, and oxidation/reduction potential (ORP) shall be collected at 1 m intervals, including the surface and near the water/sediment interface, using a multiparameter sonde. The sonde shall be calibrated prior to each sampling episode to ensure accurate readings.

In an effort to minimize probe contamination at the water/sediment interface, a depth sounding line is used to determine maximum depth. The bottom profile measurement is collected approximately 10 cm from the benthos.

7.5.1.3 Continuous Temperature Monitoring

Continuous temperature monitoring to document the water column profiles shall be performed at three locations in the Reservoir (CCR-1, CCR-2, and CCR-3). At each site, Onset HOBO® Water Temp Pro data loggers shall be deployed at 1 m increments, from the 1 m layer to near the sediment/water interface and configured to collect 15-minute interval temperature data.

The temperature arrays shall be deployed using the State Park's buoy system, beginning in March/April and operated through October/November, with periodic downloading of data to minimize potential loss of data.

7.5.1.4 Water Samples

A primary task of the monitoring program is to characterize the chemical and biological constituents of the upper 3 m layers of the reservoir. This layer represents the most active layer for algae production (photic zone), and represents approximately 54 percent of the total lake volume given the typical lake level of 5550 ft. At each reservoir site, water from the surface, and 1 m, 2 m, and 3 m depths is sampled individually using a 2-liter vertical Van Dorn water sampler and combined into a clean 5-gallon container to create a composite photic zone sample (Table 3). The vertical Van Dorn sampler is lowered to the appropriate depth, such that the middle of the sampler is centered on the selected depth. The "messenger" is sent to activate the sampler and the water is retrieved. Four one-liter aliquots are collected from the composite photic zone sample and stored on ice, until transferred to the laboratory for chemical and biological analyses (Table 2). Nutrient analyses shall be performed on all reservoir water samples. Chlorophyll *a* analyses shall be performed on all photic zone composite samples. Phytoplankton analyses shall be performed on all photic zone composite samples. See Table 4 on page 24 for the list of analytes, laboratory methods, and detection limits.

At Site CCR-2, profile water samples are also collected on 1 m increments, starting from 4 m and continuing down to the 7 m depth. The 7 m sample is collected as close to the water/sediment interface as possible, without disturbing the sediment. At times, if the reservoir is unusually full, it may be necessary to collect an additional profile water sample, such as occurred after the September 2013 precipitation events. The sampler and 5-gallon container are rinsed thoroughly with lake water between sites. Based on this sampling scheme, the number of samples collected at each site is shown in Table 3 below:

Table 3. Number of Reservoir Samples Collected.

Reservoir Site	Upper 3 m Composite (Photic zone)	1 m Depth Profiles	Number of Samples
CCR-1	1	0	1
CCR-2	1	4	5
CCR-3	1	0	1
Total Samples/Sample Event	**3**	**4**	**7**

7.5.1.5 Zooplankton Samples

Zooplankton samples shall be collected at reservoir site CCR-2. The zooplankton sample should always be collected following the collection of water samples, so as not to compromise the integrity of the water samples. Collection of a vertical water column zooplankton sample is performed using an eight inch mouth, 80 µm mesh Turtox Student Net. The zooplankton net is rinsed with reservoir water and lowered to the 6 m depth at site CCR-2. At each site, the net is slowly retrieved and the concentrated sample is drained into the sample container with all organic matter being rinsed from the net and into the sample container. One site tow at CCR-2 is pulled per sampling event. The sample is preserved with 70% alcohol. The diameter of the tow net and combined length of each tow is recorded to provide an estimate of the water volume sampled. The zooplankton are identified, enumerated, and estimates of biomass are performed.

7.5.2 Stream Sampling

7.5.2.1 Monthly Base Flow Sampling

One sample shall be collected from each stream site on a monthly basis, when there is sufficient flow (CT-1, CT-2, CT-P1, CT-P2, CC-10, EcoPark, Piney Creek, MCM-1, and MCM-2). Samples shall be collected as mid-stream mid-depth grab samples using a 5-gallon container. Two one-liter aliquots are collected from this grab sample and stored on ice, until transferred to the laboratory for chemical analyses.

7.5.2.2 Storm Event Sampling

Samples from storm flow events are collected using ISCO automatic samplers, which are programmed to collect samples when the flow reaches a threshold level. The threshold level is determined by analyzing annual hydrographs from each stream and determining storm levels. When the threshold is reached, the ISCO collects a sample every 15 minutes for approximately 2.5 hours (i.e., a timed composite) or until the water recedes below the threshold level. This sampling procedure occurs at CT-1, CT-2, CT-P1, CT-P2, CC-10, EcoPark, and Piney Creek. Following the storm event, water collected by the automatic samplers is combined (timed composite) into a clean 5-gallon container, with two 1 liter (L) aliquots collected from the composited sample and stored on ice until transferred to the laboratory for analysis. Approximately 4 L would be collected from the 24 bottles, with each bottle contributing a sample amount representative of the flow at which it was collected. Up to seven storm samples shall be collected from each of the monitoring sites during the April to October storm season.

7.5.2.3 Continuous Water Level Monitoring

At sites containing an ISCO automated sampler, continuous water level is also monitored using an ISCO flow module and pressure transducer. Rating curves are developed for each sampling site by measuring stream discharge (ft^3/sec) with a Marsh McBirney Model # 2000 flowmeter, and recording the water level at the staff gage (ft) and ISCO flowmeter (ft). Discharge is measured using methods outlined in Harrelson et al. 1994. To determine flow rate, the level must be translated into flow rate using a stage-discharge relationship. Since stage-discharge relationships can change over the years, the relationship is calibrated annually using a flow meter to record stream flow measurements three to four times per year at a range of flows. These data are combined with historical data, as long as stream geomorphology conditions are similar, to validate and modify the stage-discharge relationship for that site. If the staff gage is reset, moved to a new location, or geomorphology conditions have changed, then a new stage-discharge relationship is created for that site.

Water level data are collected on 15-minute intervals and stored in the ISCO sampler. These data are downloaded on a monthly basis to minimize the risk of data loss due to power failure or ISCO failure. The flow data and stage-discharge rating curves shall be checked throughout the year by comparing calculated flow estimates to actual flow measurements recorded in the field with a flowmeter.

The USACE also reports daily inflow to Cherry Creek Reservoir as a function of storage, based on changes in reservoir level. This daily inflow value incorporates information regarding measured outflow, precipitation, and evaporation. The Authority monitors inflow to the Reservoir using gaging stations on Cherry Creek and Cottonwood Creek to provide a daily surface inflow record. Given the differences in the two methods for determining inflow, combined with the potential of unmonitored alluvial and surface flows that may result in greater seepage through the adjacent wetlands during storm events, and other unmonitored surface

inflows (i.e., Belleview and Quincy drainages), an exact match between USACE and calculated inflows is not expected. Therefore, the Authority normalizes their streamflow data to match the USACE computed inflow value.

7.5.3 Watershed Surface Water Sampling

The Cherry Creek mainstem monitoring was initiated in 1994. The monitoring includes semiannual sampling at seven surface water sites along Cherry Creek (Castlewood, CC-1, CC-2, CC-4, CC-5, CC-6, CC-8, and CC-9). Other sites are included on the Cherry Creek mainstem (e.g. CC-7 (EcoPark), CC-10, and CC-0) which are monitoring on a more frequent basis as part of the Reservoir and PRF efforts. The following constituents are monitored on a semi-annual basis at the seven Cherry Creek mainstem sites:

- Nitrite + Nitrate
- Nitrite
- Nitrate
- Ammonia
- Total dissolved phosphorus
- Total phosphorus
- Soluble reactive phosphorus (AKA Orthophosphate)
- Chloride
- Sulfate

Historically, the sampling frequency was on a monthly basis, but was reduced to semiannual monitoring (May and November) in 2003.

7.5.4 Alluvial Groundwater Sampling

Cherry Creek alluvial groundwater sites are generally paired with mainstem surface water sites to provide corresponding data. Groundwater sampling was initiated in 1994, and includes semiannual sampling at eight alluvial sites along Cherry Creek (MW-1, MW-2, MW-5, MW-6, MW-7a, MW-9, and Kennedy) for the following constituents:

- Nitrite + Nitrate
- Nitrite
- Nitrate
- Ammonia
- Total dissolved phosphorus
- Soluble reactive phosphorus (AKA Orthophosphate)
- Chloride
- Sulfate

The sampling frequency was reduced from monthly monitoring to semiannual monitoring (May and November) in 2003.

7.5.5 Precipitation Sampling

After each monitored storm, the sample bottle shall be removed, stored on ice, and transferred to the laboratory for analysis of phosphorus and nitrogen fractions. The sampler shall be inspected and cleaned of any accumulations of unimportant precipitation on a weekly basis. This will minimize extraneous “dry fall” from being washed into the sampler between monitored storm events. A precipitation event of greater than 0.25 inches at the Centennial Airport KAPA weather station is generally a sufficient storm event that activates ISCO samplers and storm event monitoring.

8.0 Laboratory Procedures

The sampling and analyses shall be conducted in accordance with the methods and detection limits provided in the table below.

The turnaround time is variable and generally ranges from 30 days for most routine chemical analyses up to 120 days for biological (i.e., phytoplankton and zooplankton) analyses, but the turnaround time will depend on the analyses to be performed, the number of samples, and the laboratory backlog. Rapid turnaround time is generally available for an additional fee by most laboratories. In the case of cyanotoxin analyses, the turnaround time is generally 2-3 days, but rapid turnaround times (i.e., 12 hours) are generally available for an additional fee by most laboratories.

Table 4. List of Analytes, Abbreviations, Analytical Methods, Recommended Hold Times, and Detection Limits for Chemical Laboratory Analyses.

Parameter	Abbreviation	Analytical Method	Recommended Hold Times	Detection Limit
Physicochemical				
Total Nitrogen	TN	10-107-04-4-B*	< 24 hrs before digestion; < 7 days after digestion	2 µg/L
Total Dissolved Nitrogen	TDN	10-107-04-4-B	48 hrs	2 µg/L
Nitrate/Nitrite Nitrogen	NO_3+NO_2	10-107-04-1-C	48 hrs	2 µg/L
Ammonium Ion Nitrogen	NH_4	10-107-06-2-A	24 hrs	3 µg/L
Total Phosphorus	TP	10-115-01-4-B*	< 24 hrs before digestion	2 µg/L
Total Dissolved Phosphorus	TDP	10-115-01-4-B	48 hrs	2 µg/L
Soluble Reactive Phosphorus	SRP	10-115-01-1-T	48 hrs	2 µg/L
Total Suspended Solids	TSS	SM 2540D	7 days	4 mg/L
Total Volatile Suspended Solids	TVSS	SM 2540 E	7 days	4 mg/L
Total Organic Carbon	TOC	SM 5310 B	28 days	0.16 mg/L
Dissolved Organic Carbon	DOC	SM 5310 B	28 days	
Chloride	Cl	EPA 300.0/SW846 9056	28 days	0.1 mg/L
Sulfate	SO_4	EPA 300.0/SW846 9056	28 days	0.1 mg/L
Biological				
Chlorophyll *a*	Chl	SM 10200 H	< 24 hrs before filtration	0.1 µg/L
Phytoplankton	--	SM 10200 B.2.a SM 10200 C.2 SM 10200 .D.2 SM 10200 E.4 SM 10200 F.2.c	NA	NA
Zooplankton	--	SM 10200 B.2.B SM 10200 C.4 SM 10200 D.4 SM 10200 E.4 SM 10200 .G	NA	NA

* TP and TN can be measured from same digest.

Method References:

American Public Health Association, American Water Works Association, and Water Environment Federation. (2005). *Standard Methods for Examination of Water and Wastewater.* (21st Edition). Washington DC 1985.

Pfaff, John D. August 1993. Method 300.0 - Determination of Inorganic Anions by Ion Chromatography, Inorganic Chemistry Branch, Chemistry Research Division, Revision 2.1. Environmental Monitoring Systems Laboratory, Office Of Research and Development, U.S. Environmental Protection Agency. Cincinnati, Ohio 45268
http://water.epa.gov/scitech/methods/cwa/bioindicators/upload/2007_07_10_methods_method_300_0.pdf

http://www.epa.gov/wstew/hazard/testmethods/sw846/online/index.htm

8.1 Biological Laboratory Analysis

Biological analyses for the samples collected in the study, include chlorophyll a, phytoplankton (identification, enumeration, and biovolume), and zooplankton (identification, enumeration, and biomass). The methods of these analyses, with appropriate QA/QC procedures shall be in accordance with the methods provided in Table 1.

8.2 Laboratory Quality Assurance/Quality Control Protocols

Analytical laboratory equipment calibrations are performed every time new standards are prepared (minimum of once per week). Instrument values are compared to known standard concentration and if the correlation coefficient of the standard curve is less than 0.999, the instrument is recalibrated or standards are remade, with the process being completed until the instrument passes the test. Pseudo-replicate analyses are performed on each sample analyzed (i.e., sample analyzed twice) and the percent difference must be within 10 percent, if the resultant concentration is above the minimum detection limit. If the difference of the pseudo-replicate analyses are >10 percent, a new analytical sample is placed in a clean test tube and analyzed. During a sample analysis run, check standards are analyzed between every 5 samples (or 10 replicates). The check standards consist of one high range standard, one mid-range standard, and the control blank (zero). Check standards analyzed before and after each group of samples must be within 10 percent of the theoretical value. If standards are outside of this range, new analytical samples and standards are placed in clean test tubes and analyzed to try to determine the source of the error. Sample values are not accepted until the problem has been resolved and all check standards pass the QC criteria. One matrix spike is run for every 10 samples analyzed (or 20 replicates). The percent recovery for matrix spikes must be ± 20 percent.

Following sample analyses, a final QC check is performed to determine if all parameters measured are in agreement. Final analyses for each sample are compared to ensure that concentrations of total phosphorus ≥ total dissolved phosphorus ≥ orthophosphate and that the concentration of total nitrogen ≥ total dissolved nitrogen ≥ nitrate/nitrite an ammonia. If parameters are not in agreement samples are reanalyzed.

9.0 Program Quality Assurance/Quality Control Protocols

Field Sampling

All field team members will be responsible for visually inspecting and monitoring for contamination and should a bottle be contaminated it will be replaced with a clean one. To provide Quality Control/Quality Assurance (QC/QA) information on the field samples, both field blanks and field duplicates shall be collected and will comprise approximately 10 percent of the total number of samples analyzed for the project. The field blank and duplicate samples will be labeled and stored with the field collected samples and analyzed using the same laboratory methods. The QC/QA samples will provide information on sampling and analytical error.

Laboratory

The analytical and biological laboratories will follow their in-house Quality Assurance Plans (QAP), which will be consistent with specific state requirements. These documents will be available to the Authority upon request.

10.0 Data Validation and Usability

All field data and chain-of-custody (COC) forms will be reviewed the Field Team Leader for correctness. The QA Manager will be responsible for data validation, and will review the field book, laboratory's results and reports for accuracy and will report any issues to the Project Manager. Laboratory data will be reviewed to ensure that appropriate methods were used and that data are qualified with method detection limits. Any problems that arise will be brought to the attention of the Project Manager and it is this person's responsibility to accept or reject the data.

11.0 Data Verification, Reduction, and Reporting

Data verification shall be conducted to ensure that raw data are not altered. All field data, such as those generated during any field measurements and observations, will be entered directly into a bound Field Book. Sampling Crew members will be responsible for proof reading all data transfers, if necessary. All data transfers will be checked for accuracy.

The Quality Assurance Project Manager will conduct data verification activities to assess laboratory performance in meeting quality assurance requirements. Such reviews include verification that: 1) the correct samples were analyzed and reported in the correct units; 2) the samples were properly preserved and not held beyond applicable holding times; 3) instruments are regularly calibrated and meeting performance criteria; and 4) laboratory QA objectives for precision and accuracy are being met.

Data reduction for laboratory analyses is conducted by Consultant's personnel in accordance with EPA procedures, as available, for each method. Analytical results and appropriate field measurements are input into a computer spreadsheet. No results will be changed in the spreadsheet unless the cause of the error is identified and documented.

A data control program will be followed to insure that all documents generated during the project are accounted for upon their completion. Accountable documents include: Field Books, Sample Chain of Custody, Sample Log, analytical reports, quality assurance reports, and interpretive reports.

Data shall be summarized and provided to the Authority's Technical Advisory Committee on a monthly basis and presented in the Annual Report.

12.0 References

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APPENDIX A – Sampling Site Locations

Waterbody	ID	Latitude	Longitude
Cherry Creek Reservoir	CCR-1	39°38'34.68"N	104°51'41.88"W
Cherry Creek Reservoir	CCR-2	39°38'49.09"N	104°51'08.15"W
Cherry Creek Reservoir	CCR-3	39°38'17.46"N	104°51'09.69"W
Cherry Creek Reservoir	D-1	39°38'47.04"N	104°51'34.27"W
Cherry Creek Reservoir	D-2	39°38'43.13"N	104°51'31.93"W
Cherry Creek Reservoir	D-3	39°38'39.66"N	104°51'29.20"W
Cherry Creek Reservoir	D-3.5	39°38'36.42"N	104°51'26.95"W
Cherry Creek Reservoir	D-4	39°38'33.91"N	104°51'24.64"W
Cherry Creek Reservoir	D-5	39°38'30.57"N	104°51'22.50"W
Cherry Creek Reservoir	D-6	39°38'27.78"N	104°51'20.76"W
Cherry Creek Reservoir	D-7	39°38'25.01"N	104°51'18.02"W
Cherry Creek Reservoir	D-8	39°38'22.46"N	104°51'15.87"W
Cherry Creek Reservoir	D-9	39°38'19.75"N	104°51'13.29"W
Cherry Creek Reservoir	D-10	39°38'17.52"N	104°51'10.12"W
Cherry Creek	Castlewood	39°21'28.58"N	104°45'49.69"W
Cherry Creek	CC-1	39°25'57.80"N	104°46'05.10"W
Cherry Creek	CC-2	39°28'6.90"N	104°46'04.20"W
Cherry Creek	CC-4	39°31'33.10"N	104°46'50.50"W
Cherry Creek	CC-5	39°32'38.70"N	104°46'46.00"W
Cherry Creek	CC-6	39°33'59.40"N	104°47'25.70"W
Cherry Creek	CC-7	39°35'12.06"N	104°48'18.63"W
Cherry Creek	CC-8	39°36'10.40"N	104°48'55.10"W
Cherry Creek	CC-9	39°37'28.10"N	104°50'03.60"W
Cherry Creek	CC-10	39°38'00.46"N	104°50'17.22"W
Cherry Creek	CC-O	39°39'10.60"N	104°51'22.52"W
Cottonwood Creek	CT-P1	39°36'07.96"N	104°51'20.03"W
Cottonwood Creek	CT-P2	39°36'19.23"N	104°50'55.01"W
Cottonwood Creek	CT-1	39°37'27.73"N	104°50'54.95"W
Cottonwood Creek	CT-2	39°37'40.27"N	104°51'00.94"W
Piney Creek	PC-1	39°36'23.21"N	104°48'52.02"W
McMurdo Gulch	MCM-1	39°23'19.54"N	104°48'53.63"W
McMurdo Gulch	MCM-2	39°24'16.60"N	104°48'46.01"W
Precipitation	PRECIP	39°38'12.40"N	104°50'8.47"W
Groundwater	MW-1	39°26'07.50"N	104°45'59.80"W
Groundwater	MW-2	39°28'03.50"N	104°46'4.90"W
Groundwater	MW-3c	39°30'34.57"N	104°46'05.07"W
Groundwater	MW-5	39°32'39.10"N	104°46'46.88"W
Groundwater	MW-6	39°33'57.70"N	104°47'30.90"W
Groundwater	MW-7a	39°35'07.55"N	104°48'17.63"W
Groundwater	MW-9	39°37'25.00"N	104°50'11.20"W
Groundwater	Kennedy	39°39'15.80"N	104°52'0.20"W

APPENDIX B –Abandoned Sampling Sites

Historical Surface Water Sites (Abandoned)

CC-3	This site was located 1 mile south of West Parker Road. It is no longer used as a water quality sampling location.
CC-7	This was the original CC-7 site, located ¾ mile south of Arapahoe Road. It was abandoned in 2000 due to development.
CC-10A	This site was established in 1999 on an intermittent channel of Cherry Creek. CC-10A is active during spring runoff and some precipitation events. Flow measurements at this site were used to provide additional data on total inflows into the Reservoir. This site has not been monitored since 2001.
SC-1	This site was established in 1987, immediately east of Parker Road on Shop Creek. Originally, SC-1 monitored phosphorous levels prior to the confluence with Cherry Creek. From 1990 through 2001, this site monitored water quality upstream of the Shop Creek detention pond/wetland PRF. This site has not been monitored since 2001.
SC-2	This site was established in 1990, and was located west of Parker Road at the outlet from the Shop Creek detention pond. This site monitored the water quality as it left the detention pond. This site has not been monitored since 2001.
SC-3	This site is located 35 m upstream of its confluence with Cherry Creek, and was used to monitor the water quality of Shop Creek before it joins Cherry Creek. Sampling ceased at this site in 2013 because flow and total phosphorus loads were less than one percent of the total annual flow-weighted load entering the reservoir.
QD-1	This site was established in 1996 on Quincy Drainage, above of the Perimeter Road wetlands, which were constructed in 1990 just downstream of the outlet for the Quincy Road/Parker Road stormwater drain. This site monitored water quality of the Quincy Drainage upstream of the wetlands and a new PRF, consisting of a water quality/berm system, established in late 1995, downstream of the Perimeter Road. This site has not been monitored since 2001.
BD-1	This site was established in mid-1996 at the suggestion of State Parks personnel, and is used to monitor the inflow to an old stock pond on this drainage near Belleview Avenue. This site has not been monitored since 2001.
BD-2	This site was established in mid-1996 at the suggestion of State Parks personnel, and is used to monitor this drainage as it crosses the Perimeter Road before entering the Reservoir. This site monitors the nutrient removal abilities of the

historic stock pond and natural wetland system. This sites has not been monitored since 2001.

Historical Groundwater Sites (Abandoned)

MW-3c	This is the historic KOA well. Access was denied starting in 2014. This site was discontinued May 2016.
MW-4b	This site was located downstream of Sulphur Gulch, and was abandoned in 2002 due to development.
MW-7	This site was located south of Arapahoe Road near EcoPark, and it was abandoned in 2000 due to development.
MW-8	This site was the Arapahoe Deem production well, located north of Arapahoe Road. It was abandoned as a sampling site in 2000 due to development.

APPENDIX C – May 2016 Sampling Modifications and Rationale

SAP Refinement - Background Memorandum

To: CCBWQA

From: Tetra Tech

Date: July 18, 2016

Subject: 2016 Sampling and Analysis Program Refinements - Zooplankton

This memo provides the scientific basis and institutional history to support the proposed monitoring refinement(s) for zooplankton, while addressing the potential issues and implications of these actions. Specific parameters in the 2016 Sampling and Analysis Program were reviewed by the TAC in March – May 2016. Based on review of data collected and analyzed by the Authority in accordance with the SAP, there are opportunities to refine the sampling and data collection effort to promote sound science and limnology. Refinements to the sampling and analysis program are important, recognizing that the program is dynamic and changes are needed from time to time based on:

- Monitoring objectives being met,
- New objectives being formulated,
- Changes to sampling methodology,
- Duplicative efforts and opportunities to reduce costs,
- Meeting regulatory objectives or regulatory changes,
- Opportunities to improve quality of data and sampling methodology to reflect sound science and limnology.

These proposed refinement(s) provided herein for zooplankton will support regulatory requirements and SAP objectives and provide defensible data to track ongoing water quality benefits of the Board's current and future actions. Zooplankton sampling addresses objectives of Regulation 72 (72.8 (5). The monitoring data shall be used by Authority to determine water quality trends in the reservoir and calibrate water quality models. The data promotes understanding of reservoir biology, promoting a sustainable fishery, and food chain dynamics to maintain the aquatic life beneficial use in the Reservoir.

Refinement	Potential Issues and Implications	Justification [1]
Conduct zooplankton composite from CCR-2 (1 sample = 1 tow; Discontinue compositing the zooplankton tows from the 3 reservoir sites)	Recognizing prior methodology was inappropriate, what are the implications of this refinement on the following; • Changes on sampling methodology to future data. • Changes on sampling to future modeling and calibration efforts.	✓ Vertical zooplankton tows are necessary due to vertical diurnal migration of the zooplankton based upon predation and food source swimming to depth. Zooplankton will be both vertically and horizontally distributed depending upon food source and refugia. Hence vertical tows at specific sites not composited between sites is necessary (Cooke,G.D.,E.B.Welch,S.A.Peterson, and S. A. Nichols. 2005. *Restoration and Management of Lakes and Reservoirs.* 3rd ed., CRC Press, Boca Raton, Fl.) ✓ The original sampling procedure of compositing the zooplankton tows for the whole reservoir did not reflect the actual zooplankton community and characteristics; potential errors result when trying to look at relationships between chlorophyll, phytoplankton, zooplankton or the food web. ✓ Sound science - Representative zooplankton data are required to understand food web dynamics in Cherry Creek Reservoir. Accurate data will address food chain dynamics and whether zooplankton are grazing on algae or not. ✓ Monitoring refinement supports regulatory objectives to protect beneficial uses (promotes understanding of the fishery, aquatic life use and sustainability of fishery). ✓ Addresses objectives of Regulation 72 (72.8 (5)). The monitoring data shall be used by Authority to determine….water quality trends in the reservoir and calibrate water quality models. ✓ Database and annual reports will document and note changes to lab and methodology. ✓ Models are adaptive fluid processes. As such, the model will be calibrated in the future with valid zooplankton data and model is adjusted accordingly.

Refinement	Potential Issues and Implications	Justification [1]
Changing phycology laboratories for zooplankton analyses.	While the phycology data may be more accurate or precise, the mere fact that the field sampling team and phycology laboratory has changed will result in different data and results from what was historically collected by Authority. What are the implications of changing labs and the differences between zooplankton biomass, cell count, and # species? Is there a concern of not performing split samples between the original and current phycology lab or is there merit to split samples?	✓ Defensible data. Phycology from Phycotech laboratory provides the most reputable and valid phycological data by using the inverted scope and focusing counts of biomass, cell counts and species based on full profile or entire spectrum of the sample (not just the bottom, like most labs). ✓ Reduces misinformation and data errors. ✓ Phycotech provides reduced turnaround time (4-6 weeks). Timely data will support decision making and scientific understanding. ✓ Splitting samples between prior phycology lab and Phycotech is not cost effective; there will be a miscorrelation between chl-a and biomass. ✓ Database metadata and documentation (Annual Reports, updates, etc.) will document lab change and sampling methodology.

[1] The rationale to implement a proposed change while understanding (1) the potential impacts this change would have on meeting regulatory requirements & SAP objectives (2) evaluating long term trends, (3) ability to track water quality benefits of our current and future actions, (4) sampling procedures with a sound scientific and limnology basis, and (5) duplicative efforts and opportunities to reduce costs.

Budget Impact: No change in budget impact of monitoring refinements proposed herein; better data results in better science and decision-making.

Project Partners: Protection of aquatic life uses are important to CPW and avid sportsman using the fishery. Fish data from the Reservoir are obtained annually from CPW. Protecting beneficial uses in the reservoir benefits local economies receiving dollars from residents and out of state visitors (BBC Research & Consulting, "The Economic Impacts of Hunting, Fishing and Wildlife Watching in Colorado, September, 2008).

Authority Nexus: Sound data to support Authority decision-making and meet regulatory requirements.

Next Steps: Document and implement SAP refinements as approved by Board; include these approved changes, by addendum, in the field team sampling notebook (along with the SAP (2015); include discussion of these proposed changes in the 2016 monitoring report; incorporate these refinements and other potential updates in the future version of the SAP.

SAP Refinement - Background Memorandum

To: CCBWQA

From: Tetra Tech

Date: July 18, 2016

Subject: 2016 Sampling and Analysis Program Refinements - Phytoplankton

This memo provides the scientific basis and institutional history to support the proposed sampling and analysis program refinement(s) for phytoplankton, while addressing the potential issues and implications of these actions. Specific parameters in the 2016 Sampling and Analysis Program were reviewed by the TAC in March – May 2016. Based on review of data collected and analyzed by the Authority in accordance with the SAP, there are opportunities to refine the sampling and data collection effort to promote sound science and limnology. Refinements to the sampling and analysis program are important, recognizing that the program is dynamic and changes are needed from time to time based on:

- Monitoring objectives being met,
- New objectives being formulated,
- Changes to sampling methodology,
- Duplicative efforts and opportunities to reduce costs,
- Meeting regulatory objectives or regulatory changes,
- Opportunities to improve quality of data and sampling methodology to reflect sound science and limnology.

These proposed refinement(s) provided herein for phytoplankton will support regulatory requirements and SAP objectives and provide defensible data to track ongoing water quality benefits of the Board's current and future actions. The phytoplankton data supports promoting protection of aquatic life and recreational beneficial uses in the reservoir, by providing important data for understanding reservoir nutrient loading, chlorophyll a, cyanobacteria, oxygen depletions and the fishery food chain dynamics to meet the aquatic life beneficial use in the Reservoir.

Phytoplankton sampling addresses objectives of Regulation 72 (72.8 (3) and (5), as follows;

72.8 (3)…the monitoring plan includes the collection of data to evaluate nutrients in the watershed and Reservoir….and to determine the attainment of water quality standards in Cherry Creek Reservoir.

72.8 (5) …the data shall be used by Authority to determine….water quality trends in the reservoir and calibrate water quality models.

Refinement	Potential Issues and Implications	Justification [1]
Conduct phytoplankton composite from CCR-2; Discontinue compositing between all 3 Reservoir Stations for one phytoplankton analysis.	Recognizing prior methodology was inappropriate, what are the implications of this refinement on the following; • Changes on sampling methodology to future data. • Changes on sampling to future modeling and calibration efforts.	✓ The current sampling approach does not have a scientific or limnology basis. Vertical compositing of phytoplankton will under estimate algal production and bloom risk. Phytoplankton are horizontally distributed based upon depth, wind, and currents so multiple site composite will also underestimate production and bloom risk. (Cooke,G.D., E.B.Welch, S.A.Peterson, and S.A. Nichols. 2005. *Restoration and Management of Lakes and Reservoirs.* 3rd ed., CRC Press, Boca Raton, Fl.) ✓ Under the prior sampling procedure, the photic zone composites diluted the phytoplankton sample; therefore this historic sampling practice and procedure was not representative of the phytoplankton community in the reservoir. ✓ The prior sampling approach leads to the inability to correlate phytoplankton to chlorophyll a concentrations and TP concentrations or zooplankton. ✓ The monitoring refinement supports scientific basis and regulatory objectives to understand (or correlate) chlorophyll a and TP concentrations and protect the beneficial uses in the reservoir (recreation, aquatic life, water supply, and agriculture). ✓ Database and annual reports will document and note changes to lab and methodology. ✓ Models are adaptive and dynamic processes. As such, the model can be calibrated in the future with valid phytoplankton data and model is adjusted accordingly.

Refinement	Potential Issues and Implications	Justification [1]
Changing phycology laboratories for phytoplankton analyses.	While the phycology data may be more accurate or precise, the mere fact that the field sampling team and phycology laboratory has changed will result in different data and results from what was historically collected by Authority. What are the implications of changing labs and the differences between phytoplankton biomass, cell count, and # species? Is there a concern of not performing split samples between the original and current phycology lab or is there merit to split samples?	✓ Defensible data. Phycology from Phycotech laboratory provides the most reputable and valid phycological data by using the inverted scope and focusing counts of biomass, cell counts and species based on full profile or entire spectrum of the sample (not just the bottom, like most labs); focusing on bottom only will miss blue greens because they are typically found on top of sample. ✓ Reduces misinformation and data errors. ✓ Phycotech provides reduced turnaround time (4-6 weeks). Timely data will support decision making and scientific understanding. ✓ Splitting samples between prior phycology lab and Phycotech is not cost effective; there will be a miscorrelation between chl-a and biomass. ✓ Documentation in the database metadata and reports will clearly note changes in phycology lab and sampling methodology.

[1] The rationale to implement a proposed change while understanding (1) the potential impacts this change would have on meeting regulatory requirements & SAP objectives (2) evaluating long term trends, (3) ability to track water quality benefits of our current and future actions, (4) sampling procedures with a sound scientific and limnology basis, and (5) duplicative efforts and opportunities to reduce costs.

Budget Impact: No budget impact of monitoring refinements proposed herein; better data results in better science and decision-making.

Project Partners: Protection of recreation and aquatic life uses are important to CPW, Tri-County Health and those visitors that use the reservoir for recreation and water contact. Protecting beneficial uses in the reservoir benefits local economies receiving dollars from residents and out of state visitors (BBC Research, 2008(BBC Research & Consulting, "The Economic Impacts of Hunting, Fishing and Wildlife Watching in Colorado, September, 2008))

Authority Nexus: Sound data to support Authority decision-making and meet regulatory requirements.

Next Steps: Document and implement SAP refinements as approved by Board; include these approved changes, by addendum, in the field team sampling notebook (along with the SAP (2015); include discussion of these proposed changes in the 2016 monitoring report; incorporate these refinements and other potential updates in the future version of the SAP.

SAP Refinement - Background Memorandum

To: CCBWQA

From: Tetra Tech

Date: July 18, 2016

Subject: 2016 Sampling and Analysis Program Refinements – Discontinue De-stratification Profile Sampling

This memo provides the scientific basis and institutional history to support the proposed sampling and analysis program refinement(s) for discontinuing de-stratification profile sampling in Cherry Creek Reservoir, while addressing the potential issues and implications of these actions. Specific parameters in the 2016 Sampling and Analysis Program were reviewed by the TAC in March – May 2016. Based on review of data collected and analyzed by the Authority in accordance with the SAP, there are opportunities to refine the sampling and data collection effort to promote sound science and limnology. Refinements to the sampling and analysis program are important, recognizing that the program is dynamic and changes are needed from time to time based on:

- Monitoring objectives being met,
- New objectives being formulated,
- Changes to sampling methodology,
- Duplicative efforts and opportunities to reduce costs,
- Meeting regulatory objectives or regulatory changes,
- Opportunities to improve quality of data and sampling methodology to reflect sound science and limnology.

These proposed refinement for discontinuing de-stratification profile sampling continue to support regulatory requirements and SAP objectives and provide defensible data to track ongoing water quality benefits of the Board's current and future actions. The table below summarizes the refinement, potential issues and justification.

Refinement	Potential Issues and Implications	Justification [1]
Discontinue de-stratification transect vertical profile data at 12 monitoring sites. Remove from sampling program, particularly as the de-stratification system is not operational.	Will we regret not continuing to monitor at these de-stratification sites even though the system has not been operational since 2012? Do existing profile data and monitoring at the three reservoir monitoring stations (CCR-1, CCR-2, and CCR-3) provide adequate data, representative of the reservoir profiles at these de-stratification sites?	✓ Ten-years of data are available from these de-stratification transect locations (12 monitoring sites), characterizing periods of aeration system operation and non-operation. Data analysis supports discontinuance of D-transect data collection during operation and non-operation. ✓ The de-stratification profile transect data was evaluated by reservoir modelers and it did not provide critical data for the reservoir modeling. (Hydros, Memo 3, September 2015). ✓ Through the existing monitoring procedure, similar profile data continue to be collected at 3 sampling sites in the Reservoir (CCR-1, CCR-2 and CCR-3). ✓ The existing sampling procedure does not provide value added data and information when the de-stratification system is not operating; it is not cost effective. ✓ Regulatory water quality objectives are met under proposed recommendation. ✓ Cost savings.

[1] The rationale to implement a proposed change while understanding (1) the potential impacts this change would have on meeting regulatory requirements & SAP objectives (2) evaluating long term trends, (3) ability to track water quality benefits of our current and future actions, (4) sampling procedures with a sound scientific and limnology basis, and (5) duplicative efforts and opportunities to reduce costs.

Budget Impact: Reduced level of staff monitoring effort during the June – September timeframe.

Project Partners: N/A

Authority Nexus: Cost effective refinement to support Authority decision-making and meet regulatory requirements.

Next Steps: Document and implement SAP refinements as approved by Board; include these approved changes, by addendum, in the field team sampling notebook (along with the SAP (2015);

include discussion of these proposed changes in the 2016 monitoring report; incorporate these refinements and other potential updates in the future version of the SAP.

SAP Refinement - Background Memorandum

To: CCBWQA

From: Tetra Tech

Date: August 8, 2016

Subject: 2016 Sampling and Analysis Program Refinements –Discontinue Sampling at MW-3C and Piney Creek Station

This memo provides the scientific basis and institutional history to support the proposed sampling and analysis program refinement(s) for discontinuing watershed sampling at groundwater monitoring site MW-3C (aka KOA well) and deleting reference to the Piney Creek monitoring station, as this monitoring site has not been constructed. Specific parameters in the 2016 Sampling and Analysis Program were reviewed by the TAC in March – May 2016, including the subject of this memo. Based on review of data collected and analyzed by the Authority in accordance with the SAP, there are opportunities to refine the sampling and data collection effort to promote sound science and cost efficiencies. Refinements to the sampling and analysis program are important, recognizing that the program is dynamic and changes are needed from time to time based on:

- Monitoring objectives being met,
- New objectives being formulated,
- Changes to sampling methodology,
- Duplicative efforts and opportunities to reduce costs,
- Meeting regulatory objectives or regulatory changes,
- Opportunities to improve quality of data and sampling methodology to reflect sound science and limnology.

Discontinuing MW-3C and clarifying the Piney creek site does not exist, continues to support regulatory requirements and SAP objectives, while providing defensible data to track ongoing water quality benefits of the Board's current and future actions. The table below summarizes the refinements, potential issues and justification.

Refinement	Potential Issues and Implications	Justification [1]
Formally discontinue groundwater Monitoring MW-3c (historic KOA well site)	Do other groundwater sites provide sufficient data to characterize the alluvium?	✓ Geochemistry (phosphate) and depth to groundwater suggests this well is not reflective of alluvial groundwater sources. ✓ No sampling access; last sampled in 2014. ✓ Other alluvial groundwater sites along Cherry creek provide sufficient data to characterize groundwater quality. ✓ Cost savings.
Delete reference to Piney Creek monitoring site, as it does not exist at this time.	None. Add to SAP when site is installed.	✓ SAP clarification.

[1] The rationale to implement a proposed change while understanding (1) the potential impacts this change would have on meeting regulatory requirements & SAP objectives (2) evaluating long term trends, (3) ability to track water quality benefits of our current and future actions, (4) sampling procedures with a sound scientific and limnology basis, and (5) duplicative efforts and opportunities to reduce costs.

Budget Impact: Reduced level of staff monitoring effort.

Project Partners: N/A

Authority Nexus: Cost effective refinement to support Authority decision-making and meet regulatory requirements.

Next Steps: Document and implement SAP refinements as approved by Board; include these approved changes, by addendum, in the field team sampling notebook (along with the SAP (2015); include discussion of these proposed changes in the 2016 monitoring report; incorporate these refinements and other potential updates in the future version of the SAP.

APPENDIX C – SPLIT SAMPLE ANALYSIS

Purpose: Results Comparison between two Water Quality Laboratories (IEH and GEI)

1. Understand lab variability;
2. Understand data comparability.

Laboratory performance for reporting of water quality results is evaluated by estimating precision between repeated measures of the same sample. Precision of laboratory performance is different than precision measured from replicate samples collected in the field. Precision in field replicates represents temporal variability (timing) in sample collection. These concepts are further described below by standard language included in a Quality Assurance Project Plan (QAPP) that describe elements of measurement quality objectives (EPA 2001; Section A7).

Precision is the degree of agreement among repeated measurements of the same parameter and provides information about the consistency of methods. Precision is expressed in terms of the relative percent difference (RPD) between two measurements (A and B).

For field measurements, precision is assessed by measuring replicate (paired) samples at the same locations and as soon as possible to limit temporal variance in sample results. Overall project precision is measured by collecting blind (to the laboratory) field replicate samples. Laboratory precision is determined similarly via analysis of laboratory duplicate samples. For paired and small data sets, project precision is calculated using the following formula:

$$RPD = 100 * \frac{(A - B)}{\left({(A + B)}/{2}\right)}$$

Where: RPD = relative percent difference
A = primary sample
B = replicate field sample or laboratory duplicate sample

Note: Precision is agreement among repeated measures by using the same instrument to make those measurements and hopefully the same analyst that runs the instrument. All aspects of the analytical process are held constant when determining concentrations in the split sample or in field replicates.

Determining Differences between Laboratory Results

Comparison of results generated by two independent laboratories uses a parametric statistic for determining if both are identical or if results from analyzing the same water sample are significantly different. This comparison is different from estimating precision within a laboratory. Results generated independently by each laboratory using the same water sample is a measure of difference, if any, in laboratory performance. Results generated from individual laboratories represent the combined within-laboratory error (e.g., precision, accuracy, bias, *et al.*).

Laboratory split samples were provided to IEH and GEI during each water sample date. Results for each split sample were reported and compared. Further comparison of these pairs of results

should be made for each parameter using a parametric statistic (Analysis of Variance: pairwise comparisons). The goal for this approach is to determine if both laboratories are generating identical results and, if not, is there a consistent bias between the laboratories. The utility for identifying bias would be used to construct a "correction factor" that could re-express results for individual parameters and then combine data from both laboratories.

Statistical design for evaluating data results from each laboratory following analysis of split samples is as follows:

Total Phosphorus Sampling Results (mg/L)			
Sample Effects		Laboratory Effects	
a) Sample Site	b) Sample Date	c) IEH	d) GEI
CCR-1 Photic	05/24/2016	0.080	0.050
CCR-2 Photic	05/24/2016	0.058	0.048
CCR-3 Photic	05/24/2016	0.063	0.051
CCR-1 Photic	09/27/2016	0.104	0.118
CCR-2 Photic	09/27/2016	0.109	0.103
CCR-3 Photic	09/27/2016	0.102	0.115

Steps for analysis of pairs of results for each sampling date:

1) **ANOVA: Pairwise Comparison**
    a. Comparison of results c) and d); determine if the difference between each pair is significant.
2) Determine if a) sample site or b) sample date has an effect on the outcome of the pairwise analysis.
3) Describe the relationship between laboratory results if significantly different (e.g., regression analysis).
4) If secondary effects from date or sample site, partition data set into multiple sets before developing a regression function.

Some of the parameters can show high variability in the environment; spatially and temporally. If this is the case, then an alternative non-parametric statistic for use with paired data from the two laboratories would be the following:

Wilcoxon Ranks Test (comparing pairs of variables; non-parametric test)

Factors Explaining Differences between Laboratory Results

Pairs of results from each laboratory are compared and statistically analyzed to identify a significant difference, if one exists. A significant difference between paired results for samples from the two laboratories means there is one or more factors that provide an explanation that include the following:

a) Different Analytical Methods;
b) Effect of Inconsistent Detection Limits between laboratories; or
c) Field Sampling Technique and Sample Container types.

The value in determining the factor(s) that cause differences in analytical results is to identify how changes can be made in the laboratory setting to begin generating results with greater accuracy. This way both sets of data can be combined and used for analysis of conditions. Analytical methods and detection limits are listed in the following Table for identification of potential factors that cause differences in paired samples.

Analytical Methods and Data Quality Objectives

WQ Parameter	Laboratory	Method	Detection Limit (mg/L)
Total Phosphorus	IEH	SM18 4500PF	0.002
	GEI		
Total Dissolved Phosphorus	IEH	SM18 4500PF	0.002
	GEI		
Soluble Reactive Phosphorus	IEH	SM18 4500PF	0.001
	GEI		
Ammonia	IEH	SM18 4500NH3H	0.010
	GEI		
NO3+NO2-N	IEH	SM184500N03F	0.010
	GEI		
Total Nitrogen	IEH	SM204500NC	0.050
	GEI		
Dissolved Nitrogen	IEH	SM204500NC	0.050
	GEI		
Chlorophyll *a*	IEH	SM10200 H	0.10
	GEI	SM10200 H (modified)	0.10

Conclusion

Comparison of results between laboratories should be completed for each water quality parameter in 2017, after another season of split samples are collected to provide a suitable sample size for statistical analysis. Should significant differences be identified, determination for accuracy of each data set should be made. If possible, the data set with results further from the known concentration(s) should be corrected and can be combined for further use.

References

EPA (U.S. Environmental Protection Agency). 2001. *EPA Requirements for Quality Assurance Project Plans (QA/R-5)*, EPA/240/B-01/003, Office of Environmental Information. Washington, D.C. 40p.

APPENDIX D – EQUATIONS AND HYDROGRAPHS

WY2016 - Cherry Creek Reservoir Discharge - CC-outflow

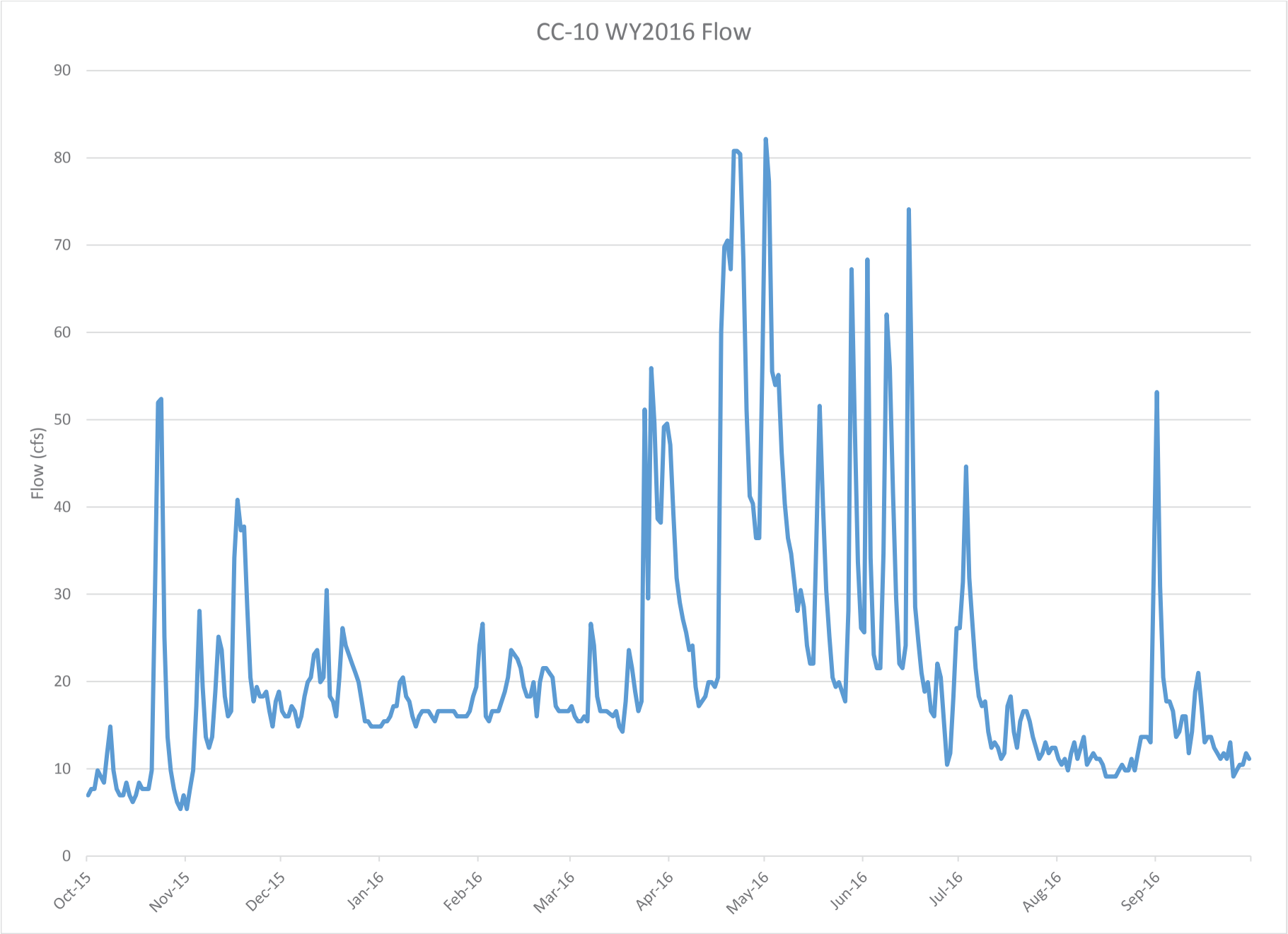
Day	October	November	December	January	February	March	April	May	June	July	August	September
1	3.2	36	38	25	23	25	70	56	155	3.9	18	4.7
2	3.2	36	38	24	24	20	71	108	49	4.9	18	4.8
3	3	11	34	25	23	20	74	146	45	4.3	14	4.8
4	3	0.79	31	25	27	21	73	142	46	4.2	11	4.7
5	3.1	1.4	31	25	31	21	74	149	47	17	11	4.7
6	1.8	0.6	31	25	31	21	71	153	49	38	11	4.7
7	0.45	0.54	30	25	31	22	72	157	48	37	11	22
8	0.33	0.58	30	24	31	21	52	159	48	37	11	34
9	0.31	0.59	30	24	24	21	35	111	48	37	6.6	35
10	0.37	8.7	28	24	20	21	35	41	48	37	4.3	35
11	0.42	23	26	24	20	21	35	41	49	37	4.4	35
12	0.48	22	27	25	20	22	35	42	48	31	4.3	36
13	0.52	22	26	24	20	22	36	44	52	20	4.4	35
14	0.52	22	26	24	20	22	36	45	51	20	4.4	23
15	0.58	22	26	24	20	22	37	45	56	21	4.3	13
16	0.6	24	26	24	20	21	39	47	62	20	4.4	13
17	0.65	30	26	24	20	21	40	45	62	20	4.3	14
18	0.65	38	27	24	25	21	66	45	62	21	4.4	14
19	0.63	38	26	24	30	20	89	44	62	22	4.4	13
20	0.64	38	26	23	30	20	133	44	62	18	4.3	12
21	1.7	38	26	24	30	20	186	43	43	18	4.2	9.1
22	2.2	38	26	24	31	20	184	42	29	18	4.2	9.4
23	0.81	38	26	24	31	21	185	19	29	18	4.2	9.2
24	0.48	38	26	24	31	21	187	2.2	28	18	4.3	9.4
25	0.57	38	26	24	31	40	183	2	28	18	4.3	9.6
26	19	38	25	23	31	54	116	1.7	28	18	4.3	9.8
27	34	38	25	23	31	55	53	20	16	18	4.3	12
28	35	38	24	22	31	54	54	43	4.4	18	4.3	14
29	36	38	25	23	31	64	56	44	3.9	18	4.8	14
30	36	38	25	23		71	56	43	3.9	18	4.9	14
31	36		25	23		69		43		18	4.9	

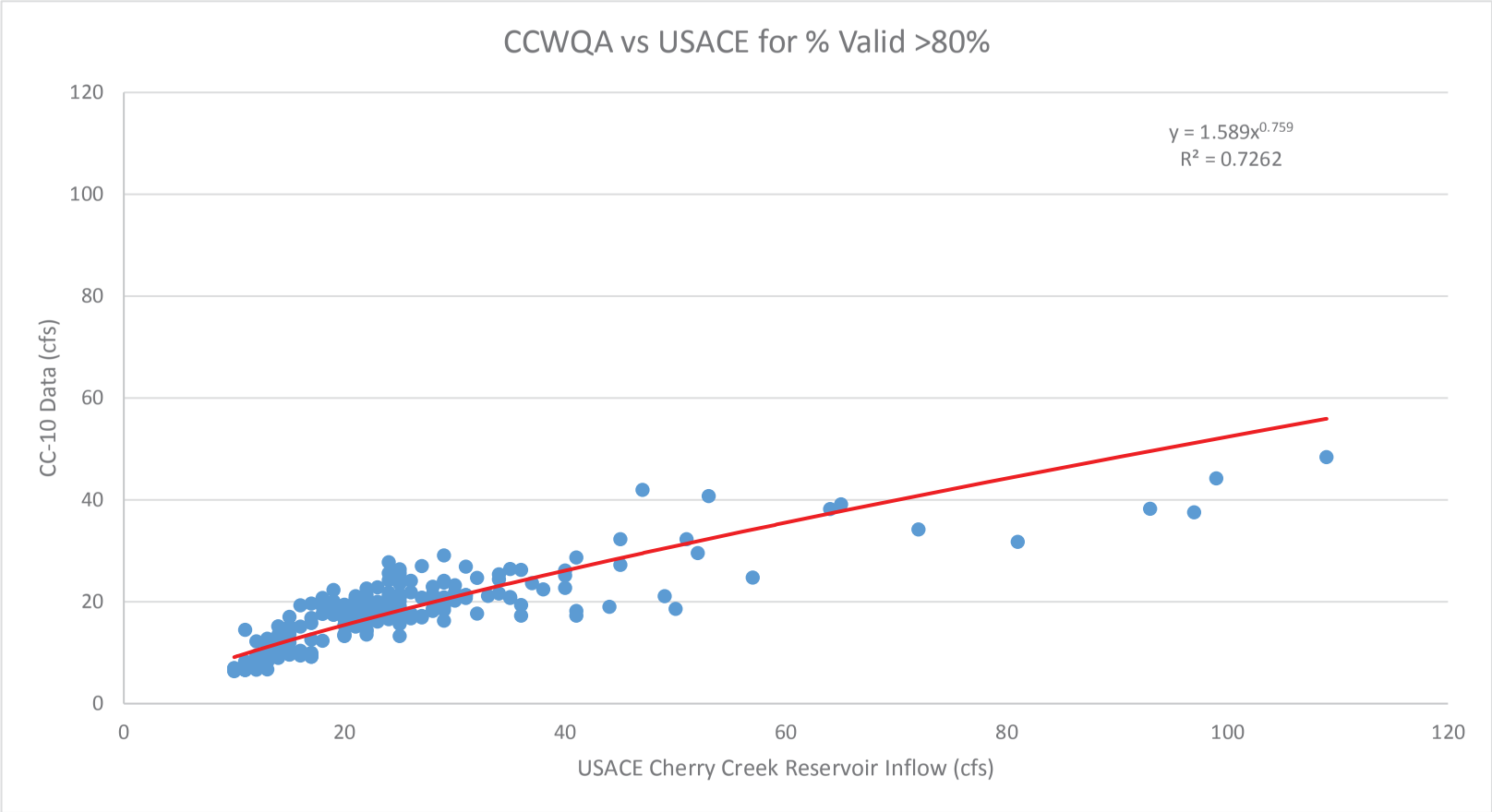
WY 2016 - Cottonwood Creek Streamflows at CT-2

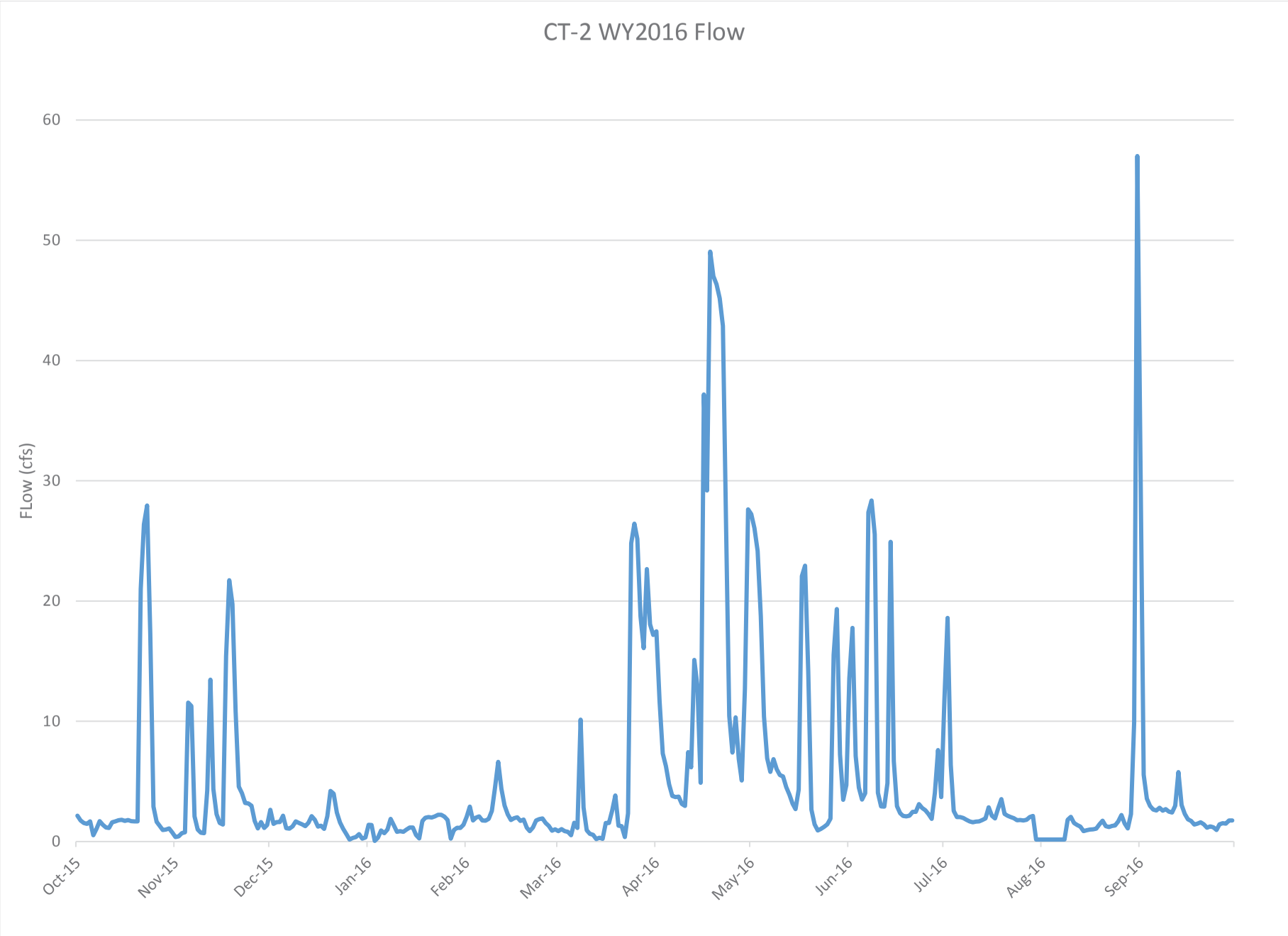
Day	October	November	December	January	February	March	April	May	June	July	August	September
1	2.2	0.4	2.6	1.4	2.1	0.9	17.5	27.2	13.6	11.8	0.2	31.6
2	1.8	0.4	1.5	1.4	2.9	1.0	11.7	26.1	17.8	18.6	0.2	5.5
3	1.6	0.7	1.6	0.1	1.7	0.9	7.3	24.2	7.1	6.4	0.2	3.6
4	1.5	0.8	1.6	0.3	2.0	0.8	6.3	18.8	4.5	2.6	0.2	3.0
5	1.7	11.6	2.2	0.9	2.1	0.5	4.8	10.4	3.5	2.0	0.2	2.7
6	0.5	11.3	1.1	0.7	1.8	1.6	3.8	6.9	4.0	2.0	0.2	2.6
7	1.1	2.1	1.1	1.0	1.7	1.1	3.7	5.8	27.4	2.0	0.2	2.8
8	1.7	1.0	1.3	1.9	1.9	10.1	3.7	6.9	28.4	1.8	0.2	2.6
9	1.4	0.7	1.7	1.4	2.5	2.8	3.1	6.0	25.5	1.7	1.8	2.7
10	1.2	0.7	1.6	0.8	4.5	0.9	3.0	5.5	4.1	1.6	2.1	2.5
11	1.1	4.3	1.4	0.9	6.6	0.6	7.4	5.4	2.9	1.7	1.6	2.4
12	1.6	13.5	1.3	0.8	4.4	0.6	6.2	4.5	2.9	1.7	1.4	3.0
13	1.7	4.4	1.6	1.0	3.0	0.2	15.1	3.9	4.9	1.8	1.2	5.8
14	1.8	2.3	2.1	1.2	2.3	0.3	12.9	3.1	24.9	1.9	0.9	3.0
15	1.8	1.5	1.8	1.2	1.8	0.2	4.9	2.7	6.7	2.9	0.9	2.3
16	1.7	1.4	1.2	0.5	2.0	1.5	37.2	4.3	2.9	2.2	1.0	1.9
17	1.8	15.4	1.3	0.3	2.0	1.6	29.2	22.1	2.4	1.9	1.0	1.7
18	1.7	21.7	1.1	1.7	1.7	2.6	49.1	22.9	2.1	2.8	1.1	1.4
19	1.7	19.7	2.1	2.0	1.8	3.8	47.0	14.1	2.1	3.5	1.4	1.5
20	1.7	10.8	4.2	2.0	1.2	1.3	46.3	2.7	2.2	2.3	1.7	1.6
21	21.0	4.6	4.0	2.0	0.9	1.3	45.2	1.4	2.5	2.2	1.3	1.4
22	26.4	4.0	2.4	2.1	1.2	0.4	42.9	0.9	2.5	2.0	1.2	1.1
23	27.9	3.2	1.6	2.2	1.8	2.3	26.2	1.1	3.1	1.9	1.3	1.3
24	17.3	3.2	1.1	2.2	1.9	24.8	10.5	1.2	2.8	1.8	1.3	1.2
25	2.9	3.0	0.6	2.1	1.9	26.4	7.4	1.4	2.6	1.8	1.7	1.0
26	1.6	1.7	0.2	1.8	1.5	25.2	10.3	1.9	2.3	1.8	2.2	1.4
27	1.3	1.1	0.3	0.3	1.3	18.7	6.9	15.5	1.9	1.8	1.5	1.5
28	1.0	1.6	0.4	1.0	0.9	16.1	5.1	19.3	4.1	2.0	1.1	1.5
29	1.0	1.1	0.6	1.1	1.0	22.7	12.7	7.3	7.6	2.1	2.3	1.8
30	1.1	1.4	0.2	1.1		18.1	27.6	3.5	3.7	0.2	9.9	1.8
31	0.7		0.3	1.4		17.2		4.7		0.2	57.0	

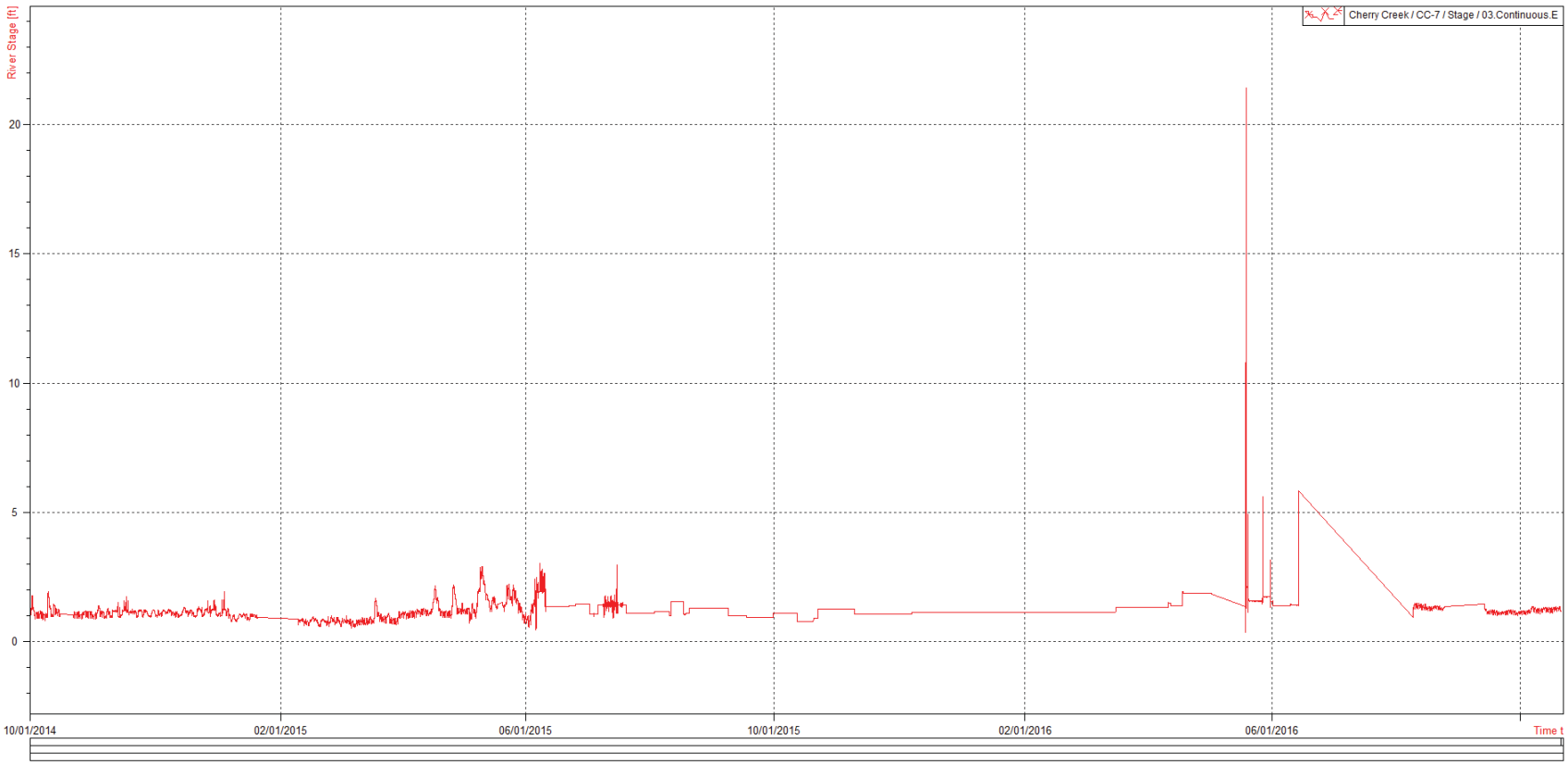
WY 2016 - Cherry Creek Streamflow at CC-10

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	7.0	5.4	16.6	14.8	24.1	17.2	47.1	82.2	25.6	26.1	11.1	53.2
2	7.7	7.7	16.0	15.4	26.6	16.0	39.1	77.3	68.3	31.4	10.5	30.9
3	7.7	9.8	16.0	15.4	16.0	15.4	31.9	55.5	34.2	44.6	11.1	20.5
4	9.8	17.2	17.2	16.0	15.4	15.4	29.1	54.0	23.1	31.9	9.8	17.7
5	9.1	28.1	16.6	17.2	16.6	16.0	27.1	55.1	21.5	26.6	11.8	17.7
6	8.4	19.4	14.8	17.2	16.6	15.4	25.6	46.3	21.5	21.5	13.0	16.6
7	11.8	13.6	16.0	19.9	16.6	26.6	23.6	40.4	34.6	18.3	11.1	13.6
8	14.8	12.4	18.3	20.5	17.7	24.1	24.1	36.4	62.0	17.2	12.4	14.3
9	9.8	13.6	19.9	18.3	18.8	18.3	19.4	34.6	55.9	17.7	13.6	16.0
10	7.7	18.8	20.5	17.7	20.5	16.6	17.2	31.4	41.7	14.3	10.5	16.0
11	7.0	25.1	23.1	16.0	23.6	16.6	17.7	28.1	29.5	12.4	11.1	11.8
12	7.0	23.6	23.6	14.8	23.1	16.6	18.3	30.5	22.1	13.0	11.8	14.3
13	8.4	18.3	19.9	16.0	22.6	0.0	19.9	28.6	21.5	12.4	11.1	18.8
14	7.0	16.0	20.5	16.6	21.5	16.0	19.9	24.1	24.1	11.1	11.1	21.0
15	6.2	16.6	30.5	16.6	19.4	16.6	19.4	22.1	74.1	11.8	10.5	17.2
16	7.0	34.2	18.3	16.6	18.3	14.8	20.5	22.1	53.2	17.2	9.1	13.0
17	8.4	40.8	17.7	16.0	18.3	14.3	60.1	36.9	28.6	18.3	9.1	13.6
18	7.7	37.3	16.0	15.4	19.9	17.7	69.8	51.6	24.6	14.3	9.1	13.6
19	7.7	37.8	20.5	16.6	16.0	23.6	70.5	40.0	21.0	12.4	9.1	12.4
20	7.7	28.6	26.1	16.6	19.9	21.5	67.2	30.5	18.8	15.4	9.8	11.8
21	9.8	20.5	24.1	16.6	21.5	18.8	80.8	25.1	19.9	16.6	10.5	11.1
22	29.5	17.7	23.1	16.6	21.5	16.6	80.8	20.5	16.6	16.6	9.8	11.8
23	52.0	19.4	22.1	16.6	21.0	17.7	80.4	19.4	16.0	15.4	9.8	11.1
24	52.4	18.3	21.0	16.6	20.5	51.2	68.3	19.9	22.1	13.6	11.1	13.0
25	25.1	18.3	19.9	16.0	17.2	29.5	51.2	18.8	20.5	12.4	9.8	9.1
26	13.6	18.8	17.7	16.0	16.6	55.9	41.2	17.7	15.4	11.1	11.8	9.8
27	9.8	16.6	15.4	16.0	16.6	49.6	40.4	28.1	10.5	11.8	13.6	10.5
28	7.7	14.8	15.4	16.0	16.6	38.6	36.4	67.2	11.8	13.0	13.6	10.5
29	6.2	17.7	14.8	16.6	16.6	38.2	36.4	49.6	18.3	11.8	13.6	11.8
30	5.4	18.8	14.8	18.3		49.2	56.3	33.7	26.1	12.4	13.0	11.1
31	7.0		14.8	19.4		49.6		26.1		12.4	32.3	


CC-10 WY2016 Flow
Flow (cfs)
90
80
70
60
50
40
30
20
10
0
Oct-15
Nov-15
Dec-15
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16


CCWQA vs USACE for % Valid >80%
y = 1.589x^0.759
R² = 0.7262
CC-10 Data (cfs)
USACE Cherry Creek Reservoir Inflow (cfs)
0
20
40
60
80
100
120


CT-2 WY2016 Flow
FLow (cfs)
60
50
40
30
20
10
0
Oct-15
Nov-15
Dec-15
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16


Cherry Creek / CC-7 / Stage / 03.Continuous.E
River Stage [ft]
20
15
10
5
0
10/01/2014
02/01/2015
06/01/2015
10/01/2015
02/01/2016
06/01/2016
Time t

APPENDIX E – USACE DATA

USACE Data - Cherry Creek Inflow

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	7	5	22	19	36	23	87	181	39	40	13	102
2	8	8	21	20	41	21	68	167	142	51	12	50
3	8	11	21	20	21	20	52	108	57	81	13	29
4	11	23	23	21	20	20	46	104	34	52	11	24
5	10	44	22	23	22	21	42	107	31	41	14	24
6	9	27	19	23	22	20	39	85	31	31	16	22
7	14	17	21	28	22	41	35	71	58	25	13	17
8	19	15	25	29	24	36	36	62	125	23	15	18
9	11	17	28	25	26	25	27	58	109	24	17	21
10	8	26	29	24	29	22	23	51	74	18	12	21
11	7	38	34	21	35	22	24	44	47	15	13	14
12	7	35	35	19	34	22	25	49	32	16	14	18
13	9	25	28	21	33	22	28	45	31	15	13	26
14	7	21	29	22	31	21	28	36	36	13	13	30
15	6	22	49	22	27	22	27	32	158	14	12	23
16	7	57	25	22	25	19	29	32	102	23	10	16
17	9	72	24	21	25	18	120	63	45	25	10	17
18	8	64	21	20	28	24	146	98	37	18	10	17
19	8	65	29	22	21	35	148	70	30	15	10	15
20	8	45	40	22	28	31	139	49	26	20	11	14
21	11	29	36	22	31	26	177	38	28	22	12	13
22	47	24	34	22	31	22	177	29	22	22	11	14
23	99	27	32	22	30	24	176	27	21	20	11	13
24	100	25	30	22	29	97	142	28	32	17	13	16
25	38	25	28	21	23	47	97	26	29	15	11	10
26	17	26	24	21	22	109	73	24	20	13	14	11
27	11	22	20	21	22	93	71	44	12	14	17	12
28	8	19	20	21	22	67	62	139	14	16	17	12
29	6	24	19	22	22	66	62	93	25	14	17	14
30	5	26	19	25		92	110	56	40	15	16	13
31	7		19	27		93		40		15	53	

USACE Cherry Creek Pool Elevation

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	5549.7	5550.2	5550.3	5550.3	5550.2	5550.0	5550.7	5550.7	5550.6	5550.2	5549.9	5550.1
2	5549.7	5550.1	5550.3	5550.3	5550.2	5550.0	5550.7	5550.9	5550.4	5550.3	5549.8	5550.2
3	5549.7	5550.0	5550.3	5550.3	5550.2	5550.0	5550.6	5550.9	5550.4	5550.4	5549.8	5550.2
4	5549.7	5550.1	5550.2	5550.3	5550.2	5550.0	5550.5	5550.8	5550.4	5550.5	5549.8	5550.3
5	5549.7	5550.2	5550.2	5550.3	5550.2	5550.0	5550.4	5550.8	5550.3	5550.6	5549.8	5550.3
6	5549.7	5550.2	5550.2	5550.3	5550.1	5550.0	5550.3	5550.6	5550.2	5550.6	5549.8	5550.3
7	5549.7	5550.3	5550.2	5550.3	5550.1	5550.1	5550.2	5550.5	5550.3	5550.6	5549.8	5550.3
8	5549.8	5550.3	5550.2	5550.3	5550.1	5550.1	5550.1	5550.3	5550.4	5550.5	5549.8	5550.3
9	5549.8	5550.3	5550.2	5550.3	5550.1	5550.1	5550.0	5550.1	5550.5	5550.5	5549.8	5550.2
10	5549.8	5550.4	5550.2	5550.3	5550.1	5550.1	5550.0	5550.0	5550.6	5550.4	5549.8	5550.2
11	5549.8	5550.4	5550.2	5550.3	5550.1	5550.1	5550.0	5550.0	5550.5	5550.3	5549.8	5550.1
12	5549.8	5550.4	5550.2	5550.2	5550.2	5550.1	5550.0	5550.0	5550.5	5550.2	5549.8	5550.0
13	5549.8	5550.4	5550.2	5550.2	5550.2	5550.1	5550.0	5550.0	5550.4	5550.2	5549.8	5550.0
14	5549.8	5550.4	5550.2	5550.2	5550.2	5550.1	5550.0	5550.0	5550.4	5550.1	5549.8	5549.9
15	5549.8	5550.4	5550.3	5550.2	5550.3	5550.1	5550.1	5550.0	5550.6	5550.1	5549.8	5549.9
16	5549.8	5550.5	5550.3	5550.2	5550.3	5550.1	5550.1	5549.9	5550.7	5550.1	5549.8	5549.9
17	5549.8	5550.6	5550.2	5550.2	5550.3	5550.1	5550.3	5550.0	5550.6	5550.1	5549.8	5549.9
18	5549.8	5550.7	5550.2	5550.2	5550.3	5550.1	5550.5	5550.1	5550.5	5550.1	5549.8	5549.9
19	5549.8	5550.7	5550.2	5550.2	5550.3	5550.1	5550.7	5550.2	5550.4	5550.1	5549.7	5549.9
20	5549.8	5550.7	5550.3	5550.2	5550.2	5550.2	5550.8	5550.2	5550.3	5550.0	5549.7	5549.9
21	5549.9	5550.7	5550.3	5550.2	5550.2	5550.2	5550.9	5550.2	5550.2	5550.0	5549.7	5549.8
22	5550.0	5550.7	5550.3	5550.2	5550.2	5550.2	5550.9	5550.1	5550.1	5550.0	5549.7	5549.8
23	5550.2	5550.6	5550.4	5550.2	5550.2	5550.3	5550.9	5550.1	5550.1	5550.0	5549.7	5549.8
24	5550.4	5550.6	5550.4	5550.2	5550.2	5550.4	5550.8	5550.1	5550.1	5550.0	5549.7	5549.8
25	5550.5	5550.6	5550.4	5550.2	5550.2	5550.5	5550.6	5550.2	5550.1	5550.0	5549.7	5549.8
26	5550.5	5550.5	5550.4	5550.2	5550.1	5550.6	5550.4	5550.2	5550.1	5550.0	5549.7	5549.8
27	5550.5	5550.5	5550.4	5550.2	5550.1	5550.6	5550.3	5550.3	5550.0	5550.0	5549.7	5549.8
28	5550.4	5550.4	5550.3	5550.1	5550.1	5550.6	5550.3	5550.6	5550.0	5549.9	5549.8	5549.8
29	5550.4	5550.4	5550.3	5550.1	5550.1	5550.7	5550.3	5550.7	5550.0	5549.9	5549.8	5549.8
30	5550.3	5550.4	5550.3	5550.1		5550.7	5550.4	5550.7	5550.1	5549.9	5549.8	5549.8
31	5550.3		5550.3	5550.2				5550.6		5549.9	5549.9	

USACE - Cherry Creek Storage

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	12324.8	12720.1	12836.8	12809.7	12710.3	12599.1	13161.0	13116.7	13055.9	12706.5	12448.5	12637.6
2	12321.5	12609.8	12800.7	12798.9	12741.9	12596.8	13131.1	13323.7	12906.0	12786.8	12430.4	12714.9
3	12319.1	12599.6	12773.3	12788.0	12735.2	12595.2	13070.2	13342.9	12907.0	12926.2	12413.9	12747.8
4	12318.5	12635.5	12759.2	12779.5	12716.3	12593.5	12997.4	13272.0	12865.8	13005.1	12398.8	12773.9
5	12318.5	12715.7	12742.3	12773.9	12692.8	12592.6	12918.5	13208.6	12818.0	13057.5	12388.9	12796.2
6	12318.5	12760.6	12719.5	12771.5	12670.2	12592.2	12828.1	13100.9	12769.4	13074.8	12384.9	12815.2
7	12336.2	12786.7	12700.8	12779.3	12647.5	12631.0	12730.9	12966.6	12773.1	13035.0	12382.9	12831.3
8	12364.7	12810.6	12691.6	12787.4	12628.5	12661.8	12639.1	12815.9	12909.0	12988.3	12380.8	12810.7
9	12376.7	12837.7	12686.5	12788.6	12628.2	12668.5	12590.4	12652.9	13013.1	12942.0	12379.4	12760.7
10	12385.1	12865.3	12688.5	12787.3	12647.4	12669.0	12585.9	12549.9	13047.7	12888.4	12379.4	12705.0
11	12391.0	12892.5	12704.7	12780.8	12678.3	12669.0	12584.4	12553.3	13026.5	12823.7	12381.8	12649.4
12	12394.2	12917.8	12723.8	12770.6	12706.8	12669.0	12585.3	12562.8	12974.8	12760.9	12384.5	12593.8
13	12397.0	12925.2	12729.0	12764.7	12734.3	12668.6	12591.0	12564.1	12926.1	12708.9	12384.8	12548.5
14	12399.9	12925.2	12736.2	12760.3	12757.5	12665.1	12597.6	12547.5	12886.5	12679.7	12381.2	12515.7
15	12402.8	12925.2	12780.0	12756.4	12772.4	12651.8	12601.0	12525.7	13077.9	12651.7	12376.1	12493.3
16	12405.8	12995.2	12775.5	12751.9	12784.3	12638.6	12605.2	12504.6	13140.8	12643.8	12370.8	12480.9
17	12410.4	13076.9	12769.2	12744.8	12796.2	12640.8	12786.2	12545.5	13074.4	12641.2	12363.8	12471.2
18	12416.7	13117.6	12762.8	12736.1	12799.9	12666.4	13020.2	12655.6	12999.6	12623.5	12356.8	12461.7
19	12423.8	13164.3	12770.9	12730.7	12773.1	12683.6	13193.0	12706.5	12905.0	12601.2	12350.6	12450.6
20	12432.0	13172.5	12801.3	12726.2	12759.9	12690.8	13265.8	12718.0	12806.0	12592.0	12346.1	12437.2
21	12446.4	13148.1	12823.8	12721.5	12753.1	12693.6	13352.2	12706.7	12714.8	12594.1	12342.9	12427.1
22	12533.2	13117.0	12842.5	12716.6	12745.6	12694.6	13350.9	12675.3	12656.6	12595.0	12339.5	12423.5
23	12723.4	13091.9	12856.8	12711.7	12737.6	12839.9	13345.1	12640.9	12636.8	12589.1	12336.4	12421.5
24	12912.1	13062.7	12867.7	12706.9	12727.9	12889.4	13271.4	12653.3	12641.1	12578.7	12334.8	12412.3
25	12977.1	13034.4	12873.6	12700.7	12705.8	13018.3	13109.3	12698.4	12638.7	12562.9	12334.8	12398.1
26	13002.9	13004.1	12871.2	12694.2	12681.0	13080.3	12900.1	12737.8	12617.0	12540.0	12337.2	12388.3
27	12988.0	12968.0	12862.6	12687.7	12656.2	13087.4	12792.1	12818.3	12579.6	12523.6	12346.9	12381.6
28	12936.3	12927.9	12853.2	12681.5	12631.5	13095.6	12791.2	13044.7	12566.5	12511.1	12356.8	12374.0
29	12882.3	12898.3	12842.3	12677.4	12607.3	13136.0	12790.0	13118.2	12593.2	12497.6	12366.7	12363.6
30	12827.7	12870.8	12831.5	12679.5		13154.5	12885.7	13118.5	12651.0	12484.1	12372.9	12351.0
31	12775.7		12820.6	12686.3				13087.9		12466.6	12457.7	

USACE - Cherry Creek Evaporation

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	3.9	4.9	2.7	0.6	0.8	2.0	3.1	6.1	4.8	7.2	7.8	6.0
2	4.0	3.2	1.5	0.6	0.8	3.5	3.3	4.1	3.8	4.7	8.0	6.4
3	4.0	6.9	2.0	0.6	0.8	1.9	2.8	3.0	4.5	6.4	7.6	5.3
4	6.0	4.5	0.9	0.6	0.8	1.8	2.1	3.1	4.2	8.0	7.7	5.6
5	5.4	3.4	1.3	0.6	0.8	2.6	1.4	2.9	4.5	10.0	9.7	8.1
6	4.2	4.8	1.4	0.6	0.8	1.5	4.5	2.6	4.9	7.0	8.6	7.4
7	3.1	3.9	1.4	0.6	0.8	2.5	4.0	2.4	5.6	7.4	5.2	4.2
8	4.6	2.5	1.0	0.6	0.8	1.7	2.2	2.3	5.5	8.8	7.0	5.8
9	4.7	3.4	1.5	0.6	0.8	2.2	2.4	4.4	5.7	10.0	8.6	6.0
10	4.2	4.9	2.0	0.6	0.8	2.7	2.5	3.3	6.0	7.7	6.7	9.4
11	4.2	5.5	1.7	0.6	0.8	2.4	2.0	2.6	7.4	9.8	6.3	2.7
12	5.8	3.5	1.6	0.6	0.8	2.5	1.7	4.1	7.7	10.0	7.2	6.2
13	7.6	2.7	1.6	0.6	0.8	2.5	2.0	4.5	4.5	9.6	8.1	9.2
14	5.1	2.0	1.4	0.6	0.8	4.6	1.6	4.2	5.3	8.9	10.1	7.2
15	4.5	2.7	3.4	0.6	0.8	6.5	2.0	3.6	10.6	8.8	9.8	8.1
16	5.9	3.0	3.0	0.6	0.8	5.5	3.6	3.0	9.7	8.0	8.1	7.8
17	6.8	4.0	3.2	0.6	0.8	3.9	5.8	3.1	8.8	7.2	9.1	7.8
18	4.9	5.3	0.7	0.6	0.8	3.6	4.6	3.0	5.7	7.4	8.3	7.8
19	4.0	3.9	0.7	0.6	0.8	3.7	2.6	4.7	8.5	6.6	7.8	6.4
20	3.6	3.0	0.7	0.6	0.8	3.5	2.9	3.5	6.4	6.9	8.4	6.6
21	3.8	3.2	0.7	0.6	0.8	1.7	2.6	3.7	5.1	6.6	8.1	5.6
22	3.7	1.8	0.7	0.6	0.8	4.0	2.4	5.4	7.7	7.1	7.3	6.4
23	3.1	1.7	0.7	0.6	0.8	4.6	2.8	4.9	8.2	8.2	7.4	4.5
24	4.8	1.8	0.7	0.6	0.8	3.1	3.7	5.0	6.9	7.4	9.0	11.0
25	5.1	1.8	0.7	0.6	0.8	3.0	3.5	3.4	7.5	8.5	6.4	8.3
26	3.9	3.0	0.7	0.6	0.8	3.3	4.1	4.3	8.1	9.6	7.3	6.8
27	4.1	2.5	0.7	0.6	0.8	4.3	4.6	3.5	7.7	8.2	6.7	6.2
28	5.8	1.9	0.7	0.6	0.8	2.9	4.3	5.5	7.3	7.5	6.6	4.3
29	4.8	1.6	0.7	0.6	0.8	1.7	3.7	5.0	7.1	6.3	6.7	5.2
30	4.1	2.6	0.7	0.6		3.2	3.0	4.6	6.6	7.2	7.4	5.4
31	4.5		0.7	0.6				4.9		9.5	5.4	

APPENDIX F – WATER QUALITY RESULTS

Cottonwood Creek Combined PRF Effectivess, WY2016 Loading Analysis

Total Nitrogen								
	CT-P1			CT-2			Δ	
Date	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Load (#/day)
3/16/2016	0.86	1.1	5.1	0	1.8	0.0	-0.9	-5.1
4/12/2016	3.4	0.87	16.0	5.22	1.3	35.2	1.8	19.2
5/11/2016	1.7	1.5	13.5	5.60	2.6	78.5	3.9	65.0
6/14/2016	13	1.7	112	17.0	1.8	162	4.5	50.7
7/12/2016	0.93	1.3	6.3	1.57	1.1	9.2	0.6	2.9
8/9/2016	0.94	1.3	6.5	3.73	0.95	19.2	2.8	12.7
9/13/2016	2.0	1.6	17.6	4.86	2.0	51.6	2.9	34.0

Total Phosphorus								
	CT-P1			CT-2			Δ	
Date	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Load (#/day)
3/16/2016	0.86	0.058	0.27	0	0.063	0	-0.9	-0.3
4/12/2016	3.4	0.061	1.1	5.22	0.050	1.4	1.8	0.3
5/11/2016	1.7	0.046	0.42	5.60	0.069	2.1	3.9	1.7
6/14/2016	13	0.185	12.5	17.0	0.075	6.9	4.5	-5.6
7/12/2016	0.93	0.031	0.16	1.57	0.033	0.28	0.6	0.1
8/9/2016	0.94	0.041	0.21	3.73	0.043	0.87	2.8	0.7
9/13/2016	2.0	0.078	0.84	4.86	0.067	1.8	2.9	0.9

Total Suspended Solids (TSS)								
	CT-P1			CT-2			Δ	
Date	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Load (#/day)
3/16/2016	0.86	16	74.2	0	21	0	-0.9	-74.2
4/12/2016	3.4	9.2	169	5.22	13	366	1.8	198
5/11/2016	1.7	3.0	27.2	5.60	14	423	3.9	395
6/14/2016	13	64	4329	17.0	9.2	844	4.5	-3485
7/12/2016	0.93	16	80.3	1.57	4.0	33.9	0.64	-46.3
8/9/2016	0.94	12	60.8	3.73	6.7	135	2.8	74.0
9/13/2016	2.0	21	225	4.86	20	524	2.9	299

McMurdo Gulch PRF Effectivess, WY2016 Loading Analysis

Total Nitrogen								
	MCM-1			MCM-2			Δ	
Date	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Load (#/day)
3/16/2016	0.2	0.45	0.49	0.2	0.22	0.24	0.0	-0.2
4/12/2016	0.2	0.42	0.45	0.4	0.54	1.17	0.2	0.71
5/11/2016	0.3	0.49	0.79	1	0.45	2.4	0.7	1.6
6/14/2016	1.946	0.926	9.7	5.910	1.6	52.0	4.0	42.2
7/12/2016	0.278	1.77	2.7	0.547	1.6	4.75	0.3	2.1
8/9/2016	0.194	0.491	0.51	0.578	0.58	1.80	0.4	1.3
9/13/2016	0.150	0.571	0.46	0.460	0.50	1.25	0.3	0.8

Total Phosphorus								
	MCM-1			MCM-2			Δ	
Date	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Load (#/day)
3/16/2016	0.2	0.281	0.30	0.2	0.211	0.23	0.0	-0.1
4/12/2016	0.2	0.398	0.43	0.4	0.284	0.61	0.2	0.18
5/11/2016	0.3	3.340	5.4	1	0.230	1.2	0.7	-4.2
6/14/2016	1.946	0.367	3.9	5.910	0.454	14	4.0	10.6
7/12/2016	0.278	0.524	0.79	0.547	0.371	1.1	0.3	0.31
8/9/2016	0.194	0.457	0.48	0.578	0.289	0.90	0.4	0.42
9/13/2016	0.150	0.439	0.36	0.460	0.310	0.77	0.3	0.41

Total Suspended Solids (TSS)								
	MCM-1			MCM-2			Δ	
Date	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Conc (mg/L)	Load (#/day)	Flow (cfs)	Load (#/day)
3/16/2016	0.2	1.0	1.1	0.2	1	1.1	0.0	0.00
4/12/2016	0.2	1.1	1.2	0.4	1	2.2	0.2	0.92
5/11/2016	0.3	1.0	1.6	1	1	5.4	0.7	3.8
6/14/2016	1.946	63.0	661	5.910	268	8543	4.0	7882
7/12/2016	0.278	5.3	7.9	0.547	1.6	4.7	0.3	-3.2
8/9/2016	0.194	2.1	2.2	0.578	0.5	1.6	0.4	-0.64
9/13/2016	0.150	1.7	1.4	0.460	2.5	6.2	0.3	4.8

APPENDIX G – PHYCOLOGY DATA

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Algae Analysis with Biovolume Estimates
Report and Data Set

Customer ID: 327

Tracking Code:	160001-327	**Sample ID:**	CCR - Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	3/16/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1432	*Aulacoseira*	*granulata*	.	.	.	straight	Vegetative	202.00	5.113	0.00	23,899.813	0.94
1210	*Navicula*	*spp*	.	.	.	.	Vegetative	24.00	20.451	0.01	6,938.944	0.27
1221	*Nitzschia*	*acicularis*	.	.	.	.	Vegetative	84.00	84.692	0.05	21,285.515	0.84
1293	*Stephanodiscus*	*niagarae*	.	.	.	.	Vegetative	28.00	20.451	0.01	176,300.571	6.97
Summary for Division ~ Bacillariophyta (4 detail records)							**Sum Total Bacillariophyta**		130.707	0.07	228,424.843	9.03

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	2.00	1,020.526	0.55	4,787.694	0.19
1000031	*Ankistrodesmus*	*falcatus*	.	.	.	straight	Vegetative	14.00	1,020.526	0.55	13,393.786	0.53
2080	*Chlamydomonas*	*spp*	.	.	.	.	Vegetative	8.67	169.385	0.09	79,496.670	3.14
2193	*Crucigenia*	*tetrapedia*	.	.	.	.	Vegetative	11.20	510.263	0.28	37,620.655	1.49
2861	*Monomastix*	*astigmata*	.	.	.	.	Vegetative	4.00	510.263	0.28	2,137.389	0.08
2031	*Monoraphidium*	*arcuatum*	.	.	.	monoraphidiod	Vegetative	21.00	6,633.416	3.60	127,553.962	5.04
8041	*Monoraphidium*	*capricornutum*	.	.	.	.	Vegetative	4.00	1,530.788	0.83	6,460.692	0.26
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	14.00	338.770	0.18	69,059.690	2.73

2484	*Scenedesmus*	*abundans*	.	.	.	.	Vegetative	12.53	1,530.788	0.83	30,641.485	1.21
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	4.00	84.692	0.05	709.519	0.03
8226	*Scenedesmus*	*intermedius*	.	.	.	.	Vegetative	16.00	510.263	0.28	10,259.446	0.41
2501	*Selenastrum*	*minutum*	.	.	.	.	Vegetative	8.00	1,530.788	0.83	107,796.128	4.26
2911	*Stichococcus*	*bacillaris*	.	.	.	.	Vegetative	2.40	510.263	0.28	923.372	0.04
2562	*Tetrastrum*	*heteracanthum*	.	.	.	.	Vegetative	30.00	84.692	0.05	5,392.330	0.21
2561	*Tetrastrum*	*staurogeniaeforme*	.	.	.	.	Vegetative	20.00	84.692	0.05	5,392.330	0.21
Summary for Division ~ Chlorophyta (15 detail records)							**Sum Total Chlorophyta**		16,070.115	8.71	501,625.148	19.83

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1472	*Chrysococcus*	*minutus*	.	.	.	.	Vegetative	8.00	84.692	0.05	2,561.360	0.10
1000637	*Kephyrion*	*gracile*	.	.	.	.	Vegetative	8.00	84.692	0.05	1,596.418	0.06
☑ 1570	*Ochromonas*	*spp*	.	.	.	.	Vegetative	4.80	19,389.986	10.51	1,085,678.289	42.91
9511	*Polygoniochloris*	*circularis*	.	.	.	.	Vegetative	6.40	510.263	0.28	42,361.354	1.67
Summary for Division ~ Chrysophyta (4 detail records)							**Sum Total Chrysophyta**		20,069.634	10.88	1,132,197.420	44.75

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	8.00	2,551.314	1.38	85,495.297	3.38
Summary for Division ~ Cryptophyta (1 detail record)							**Sum Total Cryptophyta**		2,551.314	1.38	85,495.297	3.38

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	*Chroococcaceae	*spp*	.	.	.	<1 um spherical	Vegetative	0.80	114,809.129	62.23	30,780.327	1.22

4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	20.00	84.692	0.05	886.899	0.04
1000424	*Cyanocatena*	*planctonica*	.	.	.	.	Vegetative	3.60	1,020.526	0.55	670.383	0.03
1000546	*Geitlerinema*	*spp*	.	.	.	.	Vegetative	70.00	84.692	0.05	4,656.209	0.18
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	4.00	510.263	0.28	683.956	0.03
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	12,756.570	6.91	5,129.417	0.20
Summary for Division ~ Cyanophyta (6 detail records)							**Sum Total Cyanophyta**		129,265.872	70.06	42,807.191	1.69

Division: Haptophyta

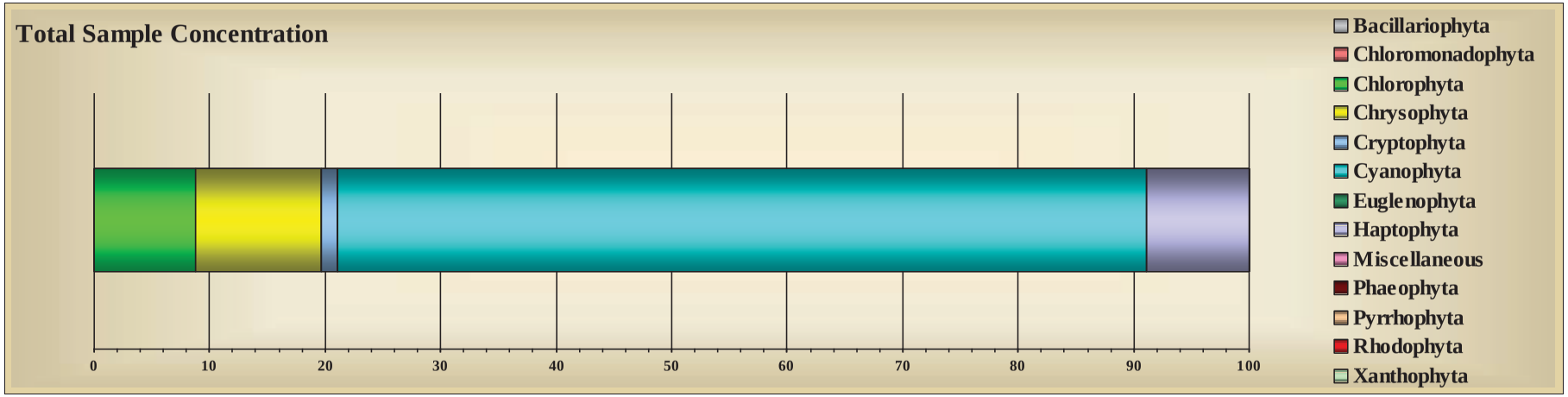
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1731	*Chrysochromulina*	*parva*	.	.	.	.	Vegetative	4.00	16,328.409	8.85	525,502.098	20.77
Summary for Division ~ Haptophyta (1 detail record)							**Sum Total Haptophyta**		16,328.409	8.85	525,502.098	20.77

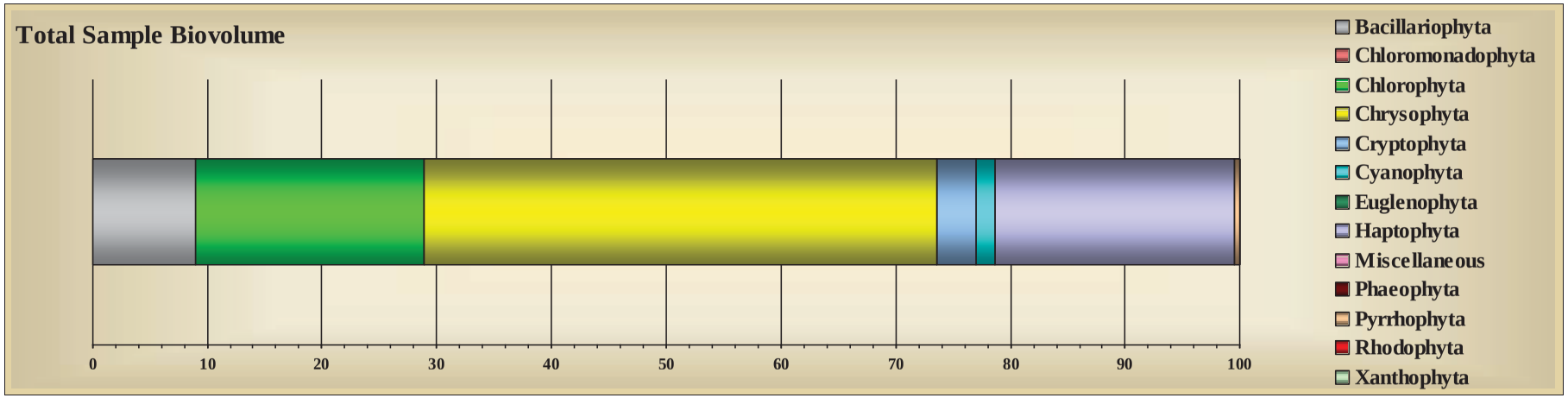
Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
6033	*Gymnodinium*	*sp. 2*	.	.	.	.	Vegetative	10.00	84.692	0.05	14,190.344	0.56
Summary for Division ~ Pyrrhophyta (1 detail record)							**Sum Total Pyrrhophyta**		84.692	0.05	14,190.344	0.56

Total Sample Concentration	Total Sample Biovolume
184,500.744	2,530,242.340
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





☑ = Identification is Uncertain
∗ = Family Level Identification

Tracking Code:	160003-327	**Sample ID:**	CCR - Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	4/12/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1210	*Navicula*	*spp*	.	.	.	.	Vegetative	32.00	20.451	0.01	25,699.793	1.46
1221	*Nitzschia*	*acicularis*	.	.	.	.	Vegetative	58.80	510.263	0.26	30,008.861	1.70
9818	*Stephanodiscus*	*medius*	.	.	.	.	Vegetative	12.00	84.692	0.04	57,470.893	3.26
1298	*Stephanodiscus*	*parvus*	.	.	.	.	Vegetative	6.40	255.131	0.13	26,264.170	1.49
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	56.00	255.131	0.13	20,573.796	1.17
Summary for Division ~ Bacillariophyta (5 detail records)							**Sum Total Bacillariophyta**		1,125.669	0.58	160,017.513	9.08

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	1.80	6,888.548	3.55	24,238.044	1.38
2035	*Ankistrodesmus*	*convolutus*	.	.	.	.	Vegetative	19.20	255.131	0.13	6,966.669	0.40
1000031	*Ankistrodesmus*	*falcatus*	.	.	.	straight	Vegetative	34.67	1,785.920	0.92	53,100.396	3.01
2080	*Chlamydomonas*	*spp*	.	.	.	.	Vegetative	4.40	2,041.051	1.05	74,593.889	4.23
2171	*Coelastrum*	*microporum*	.	.	.	.	Vegetative	12.00	169.385	0.09	14,367.723	0.82
2193	*Crucigenia*	*tetrapedia*	.	.	.	.	Vegetative	10.00	169.385	0.09	12,945.518	0.73
2031	*Monoraphidium*	*arcuatum*	.	.	.	monoraphidiod	Vegetative	19.20	18,879.723	9.73	398,433.906	22.61

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∗ = Family Level Identification

8041	*Monoraphidium*	*capricornutum*	.	.	.	.	Vegetative	4.00	1,020.526	0.53	7,931.729	0.45
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	3.80	1,785.920	0.92	16,368.133	0.93
2367	*Oocystis*	*pusilla*	.	.	.	.	Vegetative	2.00	510.263	0.26	769.476	0.04
2761	*Phacotus*	*lendneri*	.	.	.	.	Vegetative	16.00	20.451	0.01	4,687.642	0.27
2484	*Scenedesmus*	*abundans*	.	.	.	.	Vegetative	16.00	510.263	0.26	10,054.269	0.57
8399	*Scenedesmus*	*acutus*	.	.	.	.	Vegetative	15.33	254.077	0.13	22,834.598	1.30
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	4.00	1,020.526	0.53	5,654.120	0.32
2884	*Scenedesmus*	*quadricauda*	.	.	.	.	Vegetative	8.00	255.131	0.13	820.758	0.05
2501	*Selenastrum*	*minutum*	.	.	.	.	Vegetative	4.80	1,275.657	0.66	28,422.786	1.61
2981	*Spermatozopsis*	*exsultans*	.	.	.	.	Vegetative	8.00	255.131	0.13	4,924.521	0.28
2911	*Stichococcus*	*bacillaris*	.	.	.	.	Vegetative	3.20	510.263	0.26	2,188.670	0.12
2554	*Tetraedron*	*minimum*	.	.	.	.	Vegetative	8.00	255.131	0.13	32,006.948	1.82
2561	*Tetrastrum*	*staurogeniaeforme*	.	.	.	.	Vegetative	16.00	255.131	0.13	4,189.283	0.24
Summary for Division ~ Chlorophyta (20 detail records)							**Sum Total Chlorophyta**		38,117.613	19.64	725,499.079	41.17

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
☑ 1590	*Chromulina*	*spp*	.	.	.	.	Vegetative	1.60	255.131	0.13	547.180	0.03
1472	*Chrysococcus*	*minutus*	.	.	.	.	Vegetative	5.00	84.692	0.04	2,561.360	0.15
☑ 1570	*Ochromonas*	*spp*	.	.	.	.	Vegetative	4.80	6,888.548	3.55	385,701.497	21.89
9511	*Polygoniochloris*	*circularis*	.	.	.	.	Vegetative	5.60	255.131	0.13	14,138.132	0.80
Summary for Division ~ Chrysophyta (4 detail records)							**Sum Total Chrysophyta**		7,483.503	3.85	402,948.170	22.87

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3018	*Cryptomonas*	*lucens*	.	.	.	.	Vegetative	10.00	84.692	0.04	7,982.070	0.45

3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	9.20	1,020.526	0.53	34,198.119	1.94
Summary for Division ~ Cryptophyta (2 detail records)							**Sum Total**	**Cryptophyta**	1,105.218	0.57	42,180.189	2.39

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	*Chroococcaceae	*spp*	.	.	.	<1 um spherical	Vegetative	0.80	87,254.938	44.95	23,393.049	1.33
☑ 10220	*Anabaena*	*augstumalis*	.	.	.	.	Vegetative	32.00	84.692	0.04	85,142.061	4.83
1000424	*Cyanocatena*	*planctonica*	.	.	.	.	Vegetative	3.20	6,888.548	3.55	3,808.678	0.22
10651	*Cyanogranis*	*ferruginea*	.	.	.	.	Vegetative	12.00	255.131	0.13	1,340.716	0.08
1000546	*Geitlerinema*	*spp*	.	.	.	.	Vegetative	69.00	169.385	0.09	9,179.383	0.52
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.40	30,615.768	15.77	38,471.774	2.18
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	13,777.095	7.10	5,539.770	0.31
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.50	255.131	0.13	447.245	0.03
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total**	**Cyanophyta**	139,300.689	71.76	167,322.676	9.50

Division: Euglenophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
5047	*Trachelomonas*	*volvocina*	.	.	.	.	Vegetative	8.00	510.263	0.26	29,547.175	1.68
Summary for Division ~ Euglenophyta (1 detail record)							**Sum Total**	**Euglenophyta**	510.263	0.26	29,547.175	1.68

Division: Haptophyta

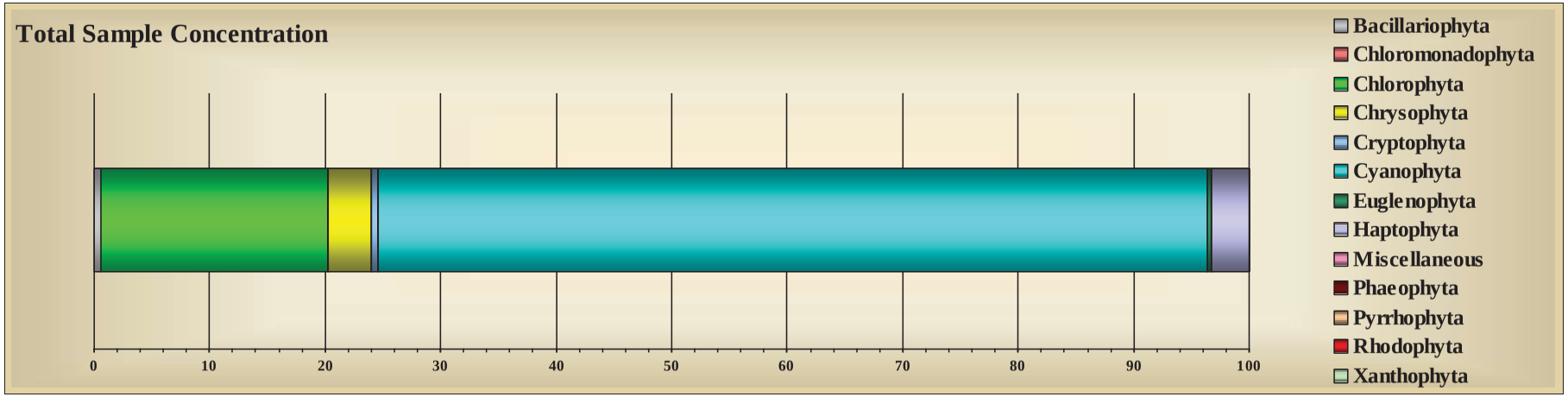
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1731	*Chrysochromulina*	*parva*	.	.	.	.	Vegetative	4.00	6,378.285	3.29	205,274.257	11.65
Summary for Division ~ Haptophyta (1 detail record)							**Sum Total**	**Haptophyta**	6,378.285	3.29	205,274.257	11.65

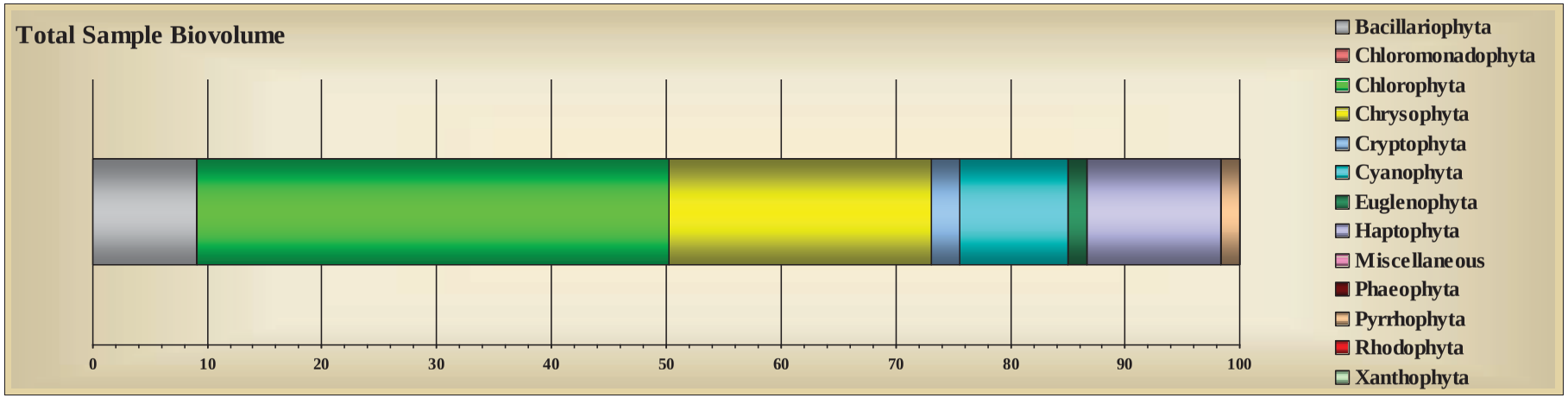
Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
6033	*Gymnodinium*	*sp. 2*	.	.	.	.	Vegetative	12.00	84.692	0.04	17,028.411	0.97
6044	*Peridinium*	*umbonatum*	.	.	.	.	Vegetative	16.00	20.451	0.01	12,335.900	0.70
Summary for Division ~ Pyrrhophyta (2 detail records)							**Sum Total Pyrrhophyta**		105.144	0.05	29,364.311	1.67

Total Sample Concentration	Total Sample Biovolume
194,126.383	1,762,153.369
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





☑ = Identification is Uncertain
* = Family Level Identification

Tracking Code:	160005-327	**Sample ID:**	CCR - Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	5/10/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1432	*Aulacoseira*	*granulata*	.	.	.	straight	Vegetative	216.00	2.556	0.00	6,938.655	0.44
☑ 1071	*Cyclotella*	*sp. 1*	.	.	.	.	Vegetative	4.69	4,209.668	1.64	201,565.221	12.72
1210	*Navicula*	*spp*	.	.	.	.	Vegetative	4.80	382.697	0.15	7,386.781	0.47
9118	*Nitzschia*	*linearis*	.	.	.	.	Vegetative	64.00	382.697	0.15	153,891.649	9.71
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	24.00	10.226	0.00	1,541.987	0.10
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	106.00	15.338	0.01	93,867.310	5.92
Summary for Division ~ Bacillariophyta (6 detail records)							**Sum Total Bacillariophyta**		5,003.182	1.95	465,191.602	29.35

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	2.40	11,480.913	4.47	105,261.602	6.64
2035	*Ankistrodesmus*	*convolutus*	.	.	.	.	Vegetative	8.00	42.346	0.02	456.763	0.03
2080	*Chlamydomonas*	*spp*	.	.	.	.	Vegetative	3.10	1,530.788	0.60	26,390.333	1.67
2197	*Crucigenia*	*apiculata*	.	.	.	.	Vegetative	16.00	382.697	0.15	55,400.992	3.50
2194	*Crucigenia*	*crucifera*	.	.	.	.	Vegetative	16.00	382.697	0.15	22,160.382	1.40
2193	*Crucigenia*	*tetrapedia*	.	.	.	.	Vegetative	8.80	765.394	0.30	47,025.819	2.97

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* = Family Level Identification

2211	*Dictyosphaerium*	*pulchellum*	.	.	.	.	Vegetative	10.00	2,678.880	1.04	51,851.323	3.27
2853	*Lagerheimia*	*quadriseta*	.	.	.	.	Vegetative	8.00	84.692	0.03	1,108.623	0.07
2031	*Monoraphidium*	*arcuatum*	.	.	.	monoraphidiod	Vegetative	22.67	3,826.971	1.49	84,788.455	5.35
8041	*Monoraphidium*	*capricornutum*	.	.	.	.	Vegetative	4.00	3,061.577	1.19	23,795.187	1.50
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	6.93	1,530.788	0.60	64,189.937	4.05
2367	*Oocystis*	*pusilla*	.	.	.	.	Vegetative	3.80	1,913.486	0.75	6,484.228	0.41
2389	*Pediastrum*	*boryanum*	.	longicorne	.	.	Vegetative	25.60	382.697	0.15	136,967.903	8.64
2761	*Phacotus*	*lendneri*	.	.	.	.	Vegetative	12.00	42.346	0.02	10,515.046	0.66
2484	*Scenedesmus*	*abundans*	.	.	.	.	Vegetative	14.67	1,148.091	0.45	16,081.659	1.01
8399	*Scenedesmus*	*acutus*	.	.	.	.	Vegetative	10.00	42.346	0.02	1,827.048	0.12
8303	*Scenedesmus*	*opoliensis*	.	carinatus	.	.	Vegetative	24.00	42.346	0.02	3,547.586	0.22
2884	*Scenedesmus*	*quadricauda*	.	.	.	.	Vegetative	8.00	382.697	0.15	1,923.627	0.12
2900	*Sphaerellopsis*	*spp*	.	.	.	.	Vegetative	20.00	127.039	0.05	42,571.031	2.69
2911	*Stichococcus*	*bacillaris*	.	.	.	.	Vegetative	2.40	382.697	0.15	692.529	0.04
2554	*Tetraedron*	*minimum*	.	.	.	.	Vegetative	8.00	382.697	0.15	48,010.422	3.03
8332	*Tetraedron*	*muticum*	.	.	.	.	Vegetative	9.60	382.697	0.15	37,620.655	2.37
2561	*Tetrastrum*	*staurogeniaeforme*	.	.	.	.	Vegetative	10.00	42.346	0.02	2,696.165	0.17

Summary for Division ~ Chlorophyta (23 detail records) **Sum Total Chlorophyta** 31,039.230 12.10 791,367.313 49.93

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1180	*Mallomonas*	*spp*	.	.	.	.	Vegetative	11.20	382.697	0.15	91,924.608	5.80
9511	*Polygoniochloris*	*circularis*	.	.	.	.	Vegetative	6.40	382.697	0.15	25,695.010	1.62

Summary for Division ~ Chrysophyta (2 detail records) **Sum Total Chrysophyta** 765.394 0.30 117,619.618 7.42

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3015	*Cryptomonas*	*erosa*	.	.	.	.	Vegetative	44.57	92.031	0.04	40,532.246	2.56
3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	8.00	1,530.788	0.60	51,297.178	3.24
Summary for Division ~ Cryptophyta (2 detail records)							**Sum Total Cryptophyta**		1,622.819	0.63	91,829.424	5.79

Division: Cyanophyta

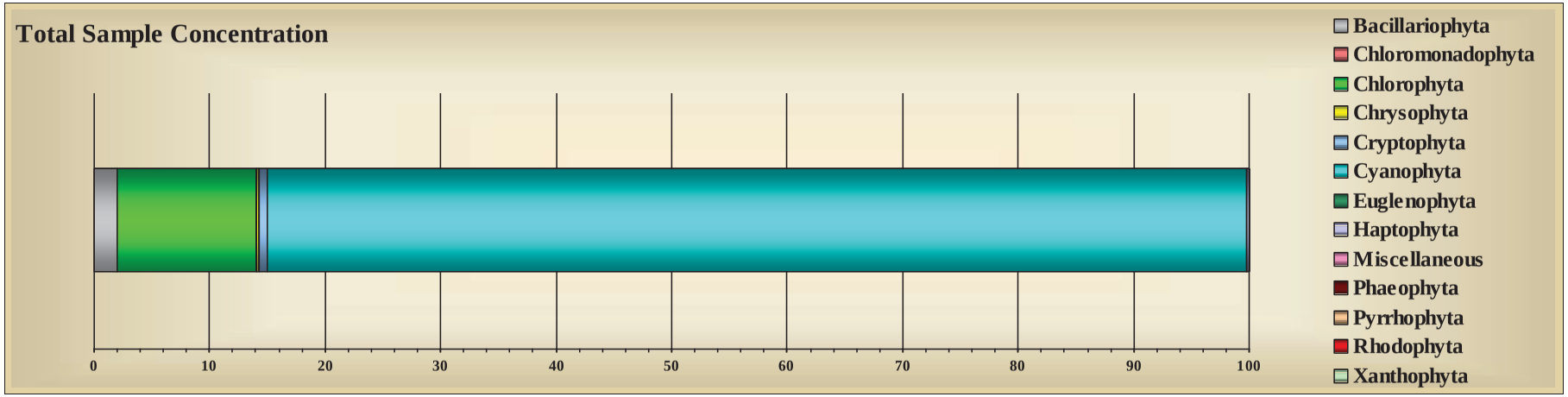
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	**Chroococcaceae*	*spp*	.	.	.	<1 um spherical	Vegetative	0.80	154,992.324	60.40	41,553.442	2.62
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	4.80	765.394	0.30	3,077.803	0.19
10651	*Cyanogranis*	*ferruginea*	.	.	.	.	Vegetative	4.40	1,530.788	0.60	3,418.863	0.22
10361	*Cyanonephron*	*styloides*	.	.	.	.	Vegetative	4.80	382.697	0.15	923.333	0.06
1000546	*Geitlerinema*	*spp*	.	.	.	.	Vegetative	200.00	42.346	0.02	14,966.380	0.94
4166	*Merismopedia*	*warmingiana*	.	.	.	.	Vegetative	4.00	382.697	0.15	1,206.644	0.08
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	2.53	5,740.456	2.24	7,614.716	0.48
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	53,577.593	20.88	21,543.550	1.36
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total Cyanophyta**		217,414.297	84.73	94,304.731	5.95

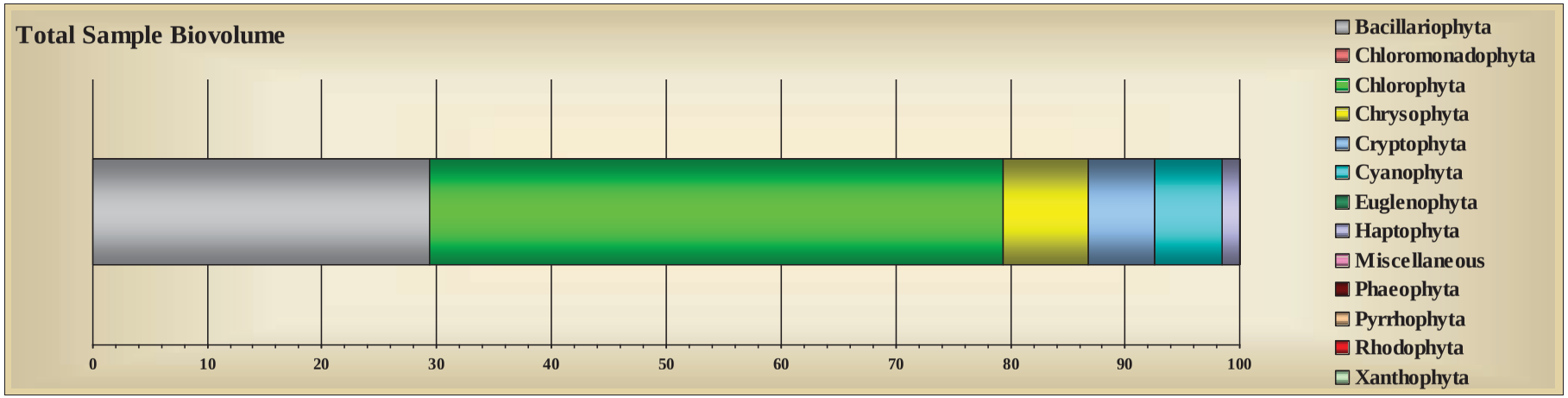
Division: Haptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1731	*Chrysochromulina*	*parva*	.	.	.	.	Vegetative	4.00	765.394	0.30	24,632.911	1.55
Summary for Division ~ Haptophyta (1 detail record)							**Sum Total Haptophyta**		765.394	0.30	24,632.911	1.55

Total Sample Concentration	Total Sample Biovolume
256,610.316	1,584,945.598
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





Tracking Code:	160007-327	**Sample ID:**	CCR-2 Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	5/24/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1021	*Asterionella*	*formosa*	.	.	.	.	Vegetative	144.00	2.556	0.00	12,900.829	0.73
1432	*Aulacoseira*	*granulata*	.	.	.	straight	Vegetative	430.00	10.225	0.01	77,738.638	4.42
☑ 1071	*Cyclotella*	*sp. 1*	.	.	.	.	Vegetative	5.07	1,530.788	0.80	100,337.361	5.71
9117	*Nitzschia*	*intermedia*	.	.	.	.	Vegetative	80.00	2.556	0.00	1,284.936	0.07
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	32.00	84.692	0.04	17,028.411	0.97
Summary for Division ~ Bacillariophyta (5 detail records)							**Sum Total Bacillariophyta**		1,630.819	0.85	209,290.175	11.91

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	2.00	1,530.788	0.80	9,028.284	0.51
1000031	*Ankistrodesmus*	*falcatus*	.	.	.	straight	Vegetative	8.00	255.131	0.13	1,231.137	0.07
2080	*Chlamydomonas*	*spp*	.	.	.	.	Vegetative	4.80	765.394	0.40	44,876.133	2.55
2195	*Crucigenia*	*quadrata*	.	.	.	.	Vegetative	14.00	254.077	0.13	34,880.294	1.98
2193	*Crucigenia*	*tetrapedia*	.	.	.	.	Vegetative	18.13	1,020.526	0.53	118,435.362	6.74
2211	*Dictyosphaerium*	*pulchellum*	.	.	.	.	Vegetative	5.60	3,061.577	1.60	32,810.612	1.87
2853	*Lagerheimia*	*quadriseta*	.	.	.	.	Vegetative	3.20	255.131	0.13	1,094.335	0.06

2031	*Monoraphidium*	*arcuatum*	.	.	.	monoraphidiod	Vegetative	16.00	1,020.526	0.53	15,784.878	0.90
8041	*Monoraphidium*	*capricornutum*	.	.	.	.	Vegetative	4.00	765.394	0.40	5,948.797	0.34
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	9.44	1,275.657	0.67	105,603.860	6.01
2761	*Phacotus*	*lendneri*	.	.	.	.	Vegetative	15.00	338.770	0.18	188,437.120	10.72
2484	*Scenedesmus*	*abundans*	.	.	.	.	Vegetative	10.00	84.692	0.04	2,394.618	0.14
102793	*Scenedesmus*	*acutus*	alternans	.	.	.	Vegetative	20.00	84.692	0.04	7,982.070	0.45
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	6.00	84.692	0.04	1,064.278	0.06
2501	*Selenastrum*	*minutum*	.	.	.	.	Vegetative	6.40	255.131	0.13	3,643.940	0.21
2554	*Tetraedron*	*minimum*	.	.	.	.	Vegetative	7.80	592.847	0.31	44,216.874	2.52
2561	*Tetrastrum*	*staurogeniaeforme*	.	.	.	.	Vegetative	10.00	84.692	0.04	2,378.653	0.14
Summary for Division ~ Chlorophyta (17 detail records)							**Sum Total Chlorophyta**		11,729.719	6.14	619,811.244	35.26

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
☑ 1590	*Chromulina*	*spp*	.	.	.	.	Vegetative	2.00	255.131	0.13	1,068.694	0.06
9511	*Polygoniochloris*	*circularis*	.	.	.	.	Vegetative	5.60	255.131	0.13	14,138.132	0.80
Summary for Division ~ Chrysophyta (2 detail records)							**Sum Total Chrysophyta**		510.263	0.27	15,206.826	0.87

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3015	*Cryptomonas*	*erosa*	.	.	.	.	Vegetative	18.00	254.077	0.13	133,566.622	7.60
3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	8.00	4,337.234	2.27	145,342.004	8.27
Summary for Division ~ Cryptophyta (2 detail records)							**Sum Total Cryptophyta**		4,591.311	2.40	278,908.626	15.87

Division: Cyanophyta

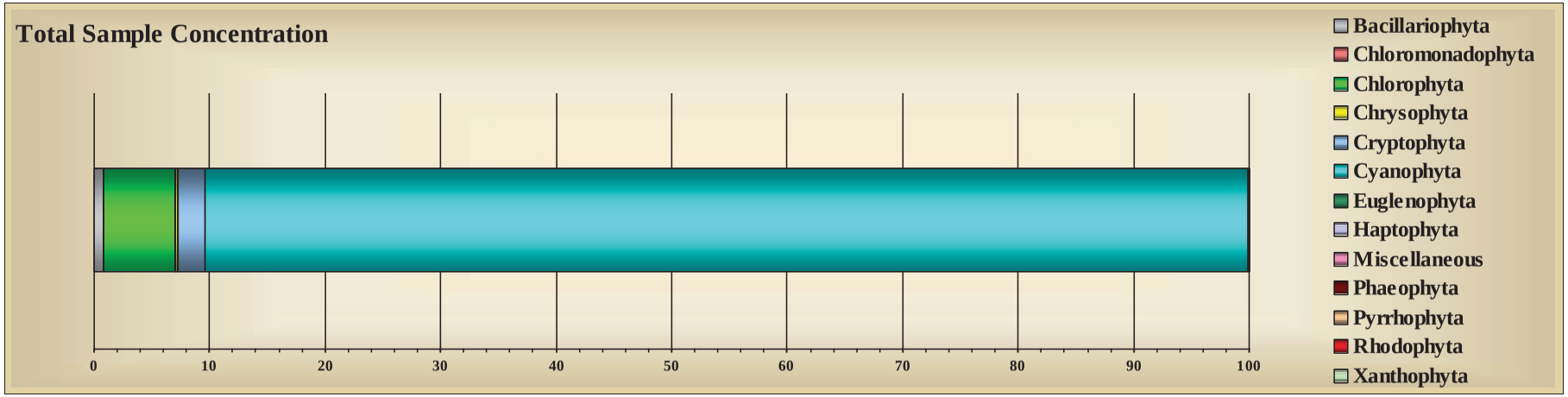
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	*Chroococcaceae	spp	.	.	.	<1 um spherical	Vegetative	0.80	126,290.042	66.14	33,858.360	1.93
☑ 4011	Anabaena	circinalis	.	.	.	.	Vegetative	102.67	254.077	0.13	565,432.530	32.17
4062	Aphanothece	nidulans	.	.	.	.	Vegetative	4.80	255.131	0.13	1,282.418	0.07
1000424	Cyanocatena	planctonica	.	.	.	.	Vegetative	9.33	2,296.183	1.20	6,435.281	0.37
10651	Cyanogranis	ferruginea	.	.	.	.	Vegetative	16.00	765.394	0.40	2,681.406	0.15
☑ 10361	Cyanonephron	styloides	.	.	.	.	Vegetative	9.60	255.131	0.13	2,462.273	0.14
4323	Synechococcus	sp. 1	.	.	.	< 1um ovoid	Vegetative	1.20	42,096.681	22.05	16,927.075	0.96
Summary for Division ~ Cyanophyta (7 detail records)							**Sum Total Cyanophyta**		172,212.639	90.20	629,079.343	35.79

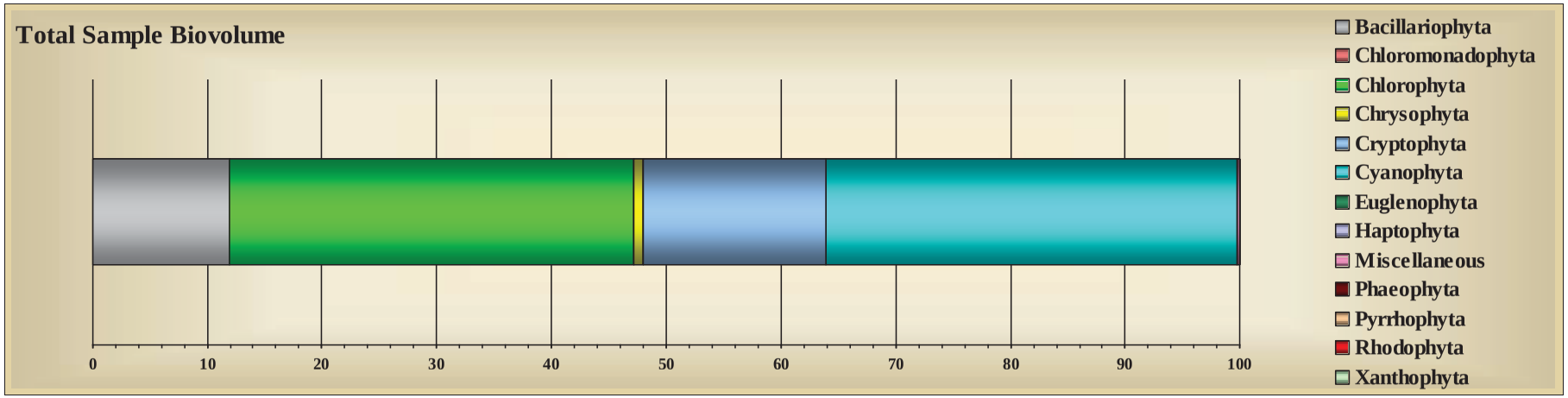
Division: Miscellaneous

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
7140	*.	spp	.	.	.	Microflagellate	Vegetative	4.00	255.131	0.13	5,471.701	0.31
Summary for Division ~ Miscellaneous (1 detail record)							**Sum Total Miscellaneous**		255.131	0.13	5,471.701	0.31

Total Sample Concentration	Total Sample Biovolume
190,929.881	1,757,767.916
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





☑ = Identification is Uncertain
* = Family Level Identification

Species List

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1021	Asterionella	formosa	.	.	.		Vegetative	Hass.
1432	Aulacoseira	granulata	.	.	.		Vegetative	(Ehrenberg) Simonsen
1071	Cyclotella	sp. 1	.	.	.		Vegetative	(Kutzing) de Brebisson
1210	Navicula	spp	.	.	.		Vegetative	Bory .
1221	Nitzschia	acicularis	.	.	.		Vegetative	(Kutzing) W. Smith
9117	Nitzschia	intermedia	.	.	.		Vegetative	Hantzsch
9118	Nitzschia	linearis	.	.	.		Vegetative	(C. Agardh) W. Sm.
9123	Nitzschia	palea	.	.	.		Vegetative	(K• tz.) W. Sm.
9818	Stephanodiscus	medius	.	.	.		Vegetative	Hakansson
1293	Stephanodiscus	niagarae	.	.	.		Vegetative	Ehrenberg
1298	Stephanodiscus	parvus	.	.	.		Vegetative	Stoermer & H†k.
1477	Synedra	filiformis	.	.	.		Vegetative	Grunow
1315	Synedra	ulna	.	.	.		Vegetative	(Nitzsch) Ehrenb.

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
2683	*Chlorococcaceae	spp	.	.	.		Vegetative	N/A
2035	Ankistrodesmus	convolutus	.	.	.		Vegetative	Corda
1000031	Ankistrodesmus	falcatus	.	.	.		Vegetative	(Corda) Ralfs
2080	Chlamydomonas	spp	.	.	.		Vegetative	Ehrenberg
2171	Coelastrum	microporum	.	.	.		Vegetative	Naeg
2197	Crucigenia	apiculata	.	.	.		Vegetative	(Lemmermann) Schmidle
2194	Crucigenia	crucifera	.	.	.		Vegetative	(Wolle) Collins
2195	Crucigenia	quadrata	.	.	.		Vegetative	C. Morren

2193	Crucigenia	tetrapedia	.	.	.	Vegetative	(Kirch.) W. West and G. S. West
2211	Dictyosphaerium	pulchellum	.	.	.	Vegetative	Wood
2853	Lagerheimia	quadriseta	.	.	.	Vegetative	(Lemmermann) G.M. Smith
2861	Monomastix	astigmata	.	.	.	Vegetative	Skuja
2031	Monoraphidium	arcuatum	.	.	.	Vegetative	(Corda) Ralfs
8041	Monoraphidium	capricornutum	.	.	.	Vegetative	(Printz) Nygaard
2363	Oocystis	parva	.	.	.	Vegetative	West & West
2367	Oocystis	pusilla	.	.	.	Vegetative	Hansgirg
2389	Pediastrum	boryanum	.	longicorne	.	Vegetative	Raciborski
2761	Phacotus	lendneri	.	.	.	Vegetative	Chodat
2484	Scenedesmus	abundans	.	.	.	Vegetative	(Kirchn.) Chodat
8399	Scenedesmus	acutus	.	.	.	Vegetative	Lagh. Chodat
102793	Scenedesmus	acutus	alternans	.	.	Vegetative	Hortobagyi 1941
2483	Scenedesmus	bijuga	.	.	.	Vegetative	(Turpin) Lagerh.
8226	Scenedesmus	intermedius	.	.	.	Vegetative	Chodat
8303	Scenedesmus	opoliensis	.	carinatus	.	Vegetative	Lemmermann
2884	Scenedesmus	quadricauda	.	.	.	Vegetative	(Turpin) Breb.
2501	Selenastrum	minutum	.	.	.	Vegetative	(Naegeli) Collins
2981	Spermatozopsis	exsultans	.	.	.	Vegetative	.
2900	Sphaerellopsis	spp	.	.	.	Vegetative	Korshikov
2911	Stichococcus	bacillaris	.	.	.	Vegetative	Nageli
2554	Tetraedron	minimum	.	.	.	Vegetative	(Braun) Hansgirg
8332	Tetraedron	muticum	.	.	.	Vegetative	(A. Braun) Hansgirg
2562	Tetrastrum	heteracanthum	.	.	.	Vegetative	(Nordstedt) Chodat
2561	Tetrastrum	staurogeniaeforme	.	.	.	Vegetative	(Schroeder) Lemm.

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1590	Chromulina	spp	.	.	.		Vegetative	Cienkowski
1472	Chrysococcus	minutus	.	.	.		Vegetative	(Fritsch) Nygaard .
1000637	Kephyrion	gracile	.	.	.		Vegetative	Pascher
1180	Mallomonas	spp	.	.	.		Vegetative	Perty
1570	Ochromonas	spp	.	.	.		Vegetative	Wyssotzki
9511	Polygoniochloris	circularis	.	.	.		Vegetative	Lemmermann

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
3015	Cryptomonas	erosa	.	.	.		Vegetative	Ehrenberg .
3018	Cryptomonas	lucens	.	.	.		Vegetative	Skuja .
3043	Rhodomonas	minuta	.	nannoplanctica	.		Vegetative	Skuja

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
4282	*Chroococcaceae	spp	.	.	.		Vegetative	N/A
10220	Anabaena	augstumalis	.	.	.		Vegetative	Schmidle
4011	Anabaena	circinalis	.	.	.		Vegetative	Rabenhorst
4054	Aphanocapsa	delicatissima	.	.	.		Vegetative	West & West
4062	Aphanothece	nidulans	.	.	.		Vegetative	P. Richter
1000424	Cyanocatena	planctonica	.	.	.		Vegetative	Hindak
10651	Cyanogranis	ferruginea	.	.	.		Vegetative	Hindak
10361	Cyanonephron	styloides	.	.	.		Vegetative	Hickel
1000546	Geitlerinema	spp	.	.	.		Vegetative	(Skuja) Anagnostidis 2001
4166	Merismopedia	warmingiana	.	.	.		Vegetative	Lagerheim
4321	Synechococcus	elongatus	.	.	.		Vegetative	Nageli

4323	Synechococcus	sp. 1	.	.	.		Vegetative	Nageli
4285	Synechocystis	spp	.	.	.		Vegetative	N/A

Division: Euglenophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
5047	Trachelomonas	volvocina	.	.	.		Vegetative	Ehmb

Division: Haptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1731	Chrysochromulina	parva	.	.	.		Vegetative	Lackey

Division: Miscellaneous

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
7140	*.	spp	.	.	.		Vegetative	N/A

Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
6033	Gymnodinium	sp. 2	.	.	.		Vegetative	Stein
6044	Peridinium	umbonatum	.	.	.		Vegetative	Stein

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Algae Analysis with Biovolume Estimates
Report and Data Set

Customer ID: 327

Tracking Code:	160009-327	**Sample ID:**	CCR-2 Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	6/14/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1021	*Asterionella*	*formosa*	.	.	.	.	Vegetative	128.00	1.278	0.00	3,762.742	0.03
1000830	*Aulacoseira*	*granulata*	.	angustissima	.	straight	Vegetative	317.60	3,061.577	8.96	9,436,634.990	78.27
1432	*Aulacoseira*	*granulata*	.	.	.	straight	Vegetative	540.00	42.346	0.12	646,547.557	5.36
1152	*Fragilaria*	*crotonensis*	.	.	.	.	Vegetative	71.00	84.692	0.25	1,122,544.915	9.31
9124	*Nitzschia*	*recta*	.	.	.	.	Vegetative	52.00	170.088	0.50	80,023.647	0.66
Summary for Division ~ Bacillariophyta (5 detail records)							**Sum Total Bacillariophyta**		3,359.981	9.83	11,289,513.850	93.63

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	2.13	340.175	1.00	2,431.879	0.02
2080	*Chlamydomonas*	*spp*	.	.	.	.	Vegetative	4.00	170.088	0.50	5,878.891	0.05
8041	*Monoraphidium*	*capricornutum*	.	.	.	.	Vegetative	4.00	85.044	0.25	660.977	0.01
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	10.40	510.263	1.49	83,525.529	0.69
2389	*Pediastrum*	*boryanum*	.	longicorne	.	.	Vegetative	47.00	42.346	0.12	6,059.922	0.05
2381	*Pediastrum*	*duplex*	.	.	.	.	Vegetative	60.00	169.385	0.50	177,099.724	1.47
2761	*Phacotus*	*lendneri*	.	.	.	.	Vegetative	12.00	85.044	0.25	22,119.356	0.18

☑ = Identification is Uncertain
* = Family Level Identification

2484	*Scenedesmus*	*abundans*	.	.	.	.	Vegetative	13.47	255.131	0.75	6,132.874	0.05
8399	*Scenedesmus*	*acutus*	.	.	.	.	Vegetative	12.00	42.346	0.12	1,008.026	0.01
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	24.50	42.346	0.12	5,620.707	0.05
8226	*Scenedesmus*	*intermedius*	.	.	.	.	Vegetative	8.00	85.044	0.25	547.172	0.00
8308	*Scenedesmus*	*serratus*	.	.	.	.	Vegetative	1.60	85.044	0.25	45.601	0.00
2491	*Schroederia*	*judayi*	.	.	.	.	Vegetative	20.27	340.175	1.00	5,958.067	0.05
2530	*Staurastrum*	*spp*	.	.	.	.	Vegetative	84.00	85.044	0.25	252,792.659	2.10
2561	*Tetrastrum*	*staurogeniaeforme*	.	.	.	.	Vegetative	4.00	85.044	0.25	346.545	0.00
Summary for Division ~ Chlorophyta (15 detail records)							**Sum Total**	**Chlorophyta**	2,422.518	7.09	570,227.927	4.73

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
☑ 1590	*Chromulina*	*spp*	.	.	.	.	Vegetative	2.40	1,530.788	4.48	11,080.153	0.09
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total**	**Chrysophyta**	1,530.788	4.48	11,080.153	0.09

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3015	*Cryptomonas*	*erosa*	.	.	.	.	Vegetative	15.20	170.088	0.50	45,962.295	0.38
3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	8.00	2,126.095	6.22	71,246.080	0.59
Summary for Division ~ Cryptophyta (2 detail records)							**Sum Total**	**Cryptophyta**	2,296.183	6.72	117,208.376	0.97

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	**Chroococcaceae*	*spp*	.	.	.	<1 um spherical	Vegetative	0.80	22,196.432	64.92	5,950.863	0.05
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	16.00	85.044	0.25	1,567.417	0.01

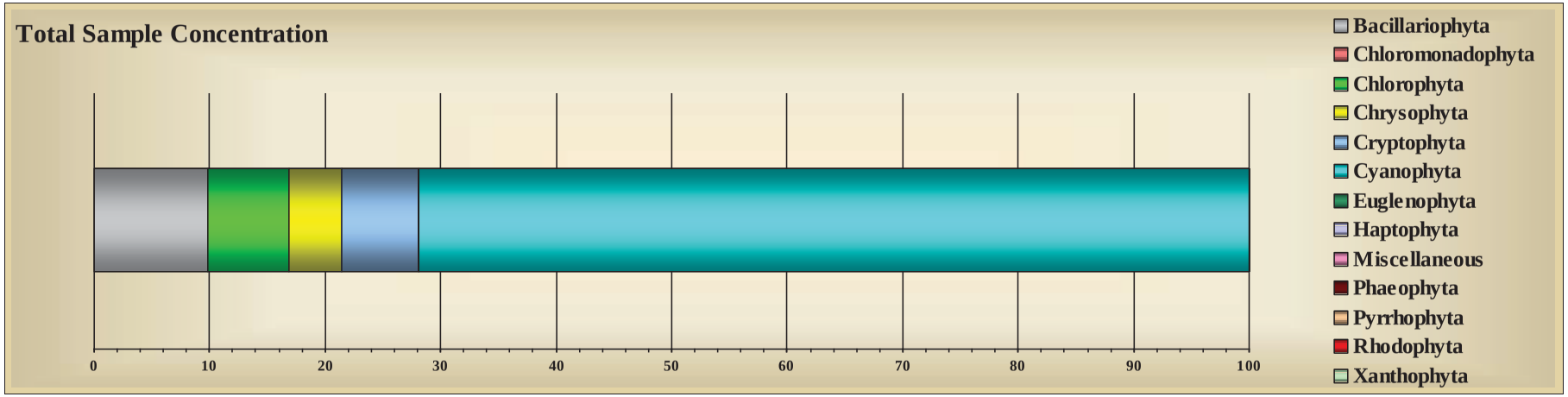
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	2,296.183	6.72	923.295	0.01
Summary for Division ~ Cyanophyta (3 detail records)							**Sum Total**	**Cyanophyta**	24,577.658	71.89	8,441.575	0.07

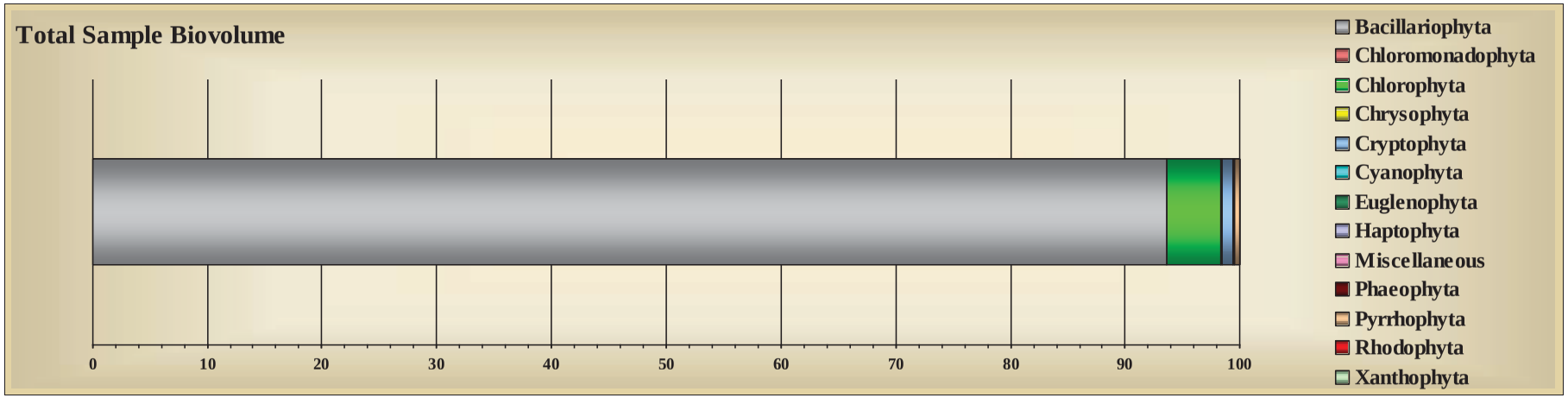
Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
6011	*Ceratium*	*hirundinella*	.	.	.	.	Vegetative	200.00	1.278	0.00	60,734.650	0.50
Summary for Division ~ Pyrrhophyta (1 detail record)							**Sum Total**	**Pyrrhophyta**	1.278	0.00	60,734.650	0.50

Total Sample Concentration	Total Sample Biovolume
34,188.407	12,057,206.530
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





☑ = Identification is Uncertain
✻ = Family Level Identification

Tracking Code:	160011-327	**Sample ID:**	CCR-2 Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	6/28/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1432	*Aulacoseira*	*granulata*	.	.	.	straight	Vegetative	120.00	42.346	0.02	83,146.548	0.94
☑ 1522	*Cyclostephanos*	*tholiformis*	.	.	.	.	Vegetative	5.27	4,762.453	2.67	338,572.767	3.83
1071	*Cyclotella*	*sp. 1*	.	.	.	.	Vegetative	4.16	680.350	0.38	20,409.423	0.23
1152	*Fragilaria*	*crotonensis*	.	.	.	.	Vegetative	66.00	42.346	0.02	482,915.149	5.47
1210	*Navicula*	*spp*	.	.	.	.	Vegetative	5.20	1,190.613	0.67	19,869.072	0.22
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	30.00	42.346	0.02	4,489.916	0.05
Summary for Division ~ Bacillariophyta (6 detail records)							**Sum Total Bacillariophyta**		6,760.455	3.78	949,402.874	10.75

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	2.27	1,870.964	1.05	13,145.390	0.15
2687	**Chlorococcaceae*	*spp*	.	.	.	> 1 um ovoid	Vegetative	2.40	170.088	0.10	547.172	0.01
2071	*Characium*	*limneticum*	.	.	.	.	Vegetative	50.00	42.346	0.02	12,096.312	0.14
2080	*Chlamydomonas*	*spp*	.	.	.	.	Vegetative	4.16	1,020.526	0.57	69,172.143	0.78
2171	*Coelastrum*	*microporum*	.	.	.	.	Vegetative	8.00	42.346	0.02	8,514.205	0.10
2194	*Crucigenia*	*crucifera*	.	.	.	.	Vegetative	17.60	170.088	0.10	30,778.320	0.35

☑ = Identification is Uncertain
* = Family Level Identification

2195	*Crucigenia*	*quadrata*	.	.	.	.	Vegetative	16.00	170.088	0.10	10,868.189	0.12
2193	*Crucigenia*	*tetrapedia*	.	.	.	.	Vegetative	9.60	170.088	0.10	9,405.164	0.11
2211	*Dictyosphaerium*	*pulchellum*	.	.	.	.	Vegetative	9.60	680.350	0.38	14,803.676	0.17
2031	*Monoraphidium*	*arcuatum*	.	.	.	monoraphidiod	Vegetative	18.00	42.346	0.02	462.014	0.01
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	8.96	2,381.226	1.33	514,267.030	5.82
2381	*Pediastrum*	*duplex*	.	.	.	.	Vegetative	39.60	510.263	0.29	279,791.326	3.17
2761	*Phacotus*	*lendneri*	.	.	.	.	Vegetative	13.60	4,252.190	2.38	812,456.579	9.20
2484	*Scenedesmus*	*abundans*	.	.	.	.	Vegetative	10.40	340.175	0.19	5,129.706	0.06
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	32.80	340.175	0.19	14,249.225	0.16
8303	*Scenedesmus*	*opoliensis*	.	carinatus	.	.	Vegetative	12.00	170.088	0.10	2,279.871	0.03
2554	*Tetraedron*	*minimum*	.	.	.	.	Vegetative	5.60	170.088	0.10	7,467.526	0.08
2561	*Tetrastrum*	*staurogeniaeforme*	.	.	.	.	Vegetative	6.40	170.088	0.10	2,845.293	0.03
Summary for Division ~ Chlorophyta (18 detail records)							**Sum Total Chlorophyta**		12,713.521	7.12	1,808,279.141	20.47

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
☑ 1590	*Chromulina*	*spp*	.	.	.	.	Vegetative	2.40	510.263	0.29	3,693.384	0.04
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total Chrysophyta**		510.263	0.29	3,693.384	0.04

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3015	*Cryptomonas*	*erosa*	.	.	.	.	Vegetative	14.67	127.039	0.07	202,833.232	2.30
3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	8.00	9,184.730	5.14	307,783.068	3.48
Summary for Division ~ Cryptophyta (2 detail records)							**Sum Total Cryptophyta**		9,311.769	5.21	510,616.300	5.78

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	*Chroococcaceae	spp	.	.	.	<1 um spherical	Vegetative	0.80	114,809.129	64.27	30,780.327	0.35
4041	Aphanizomenon	flos-aquae	.	.	.	.	Vegetative	200.00	42.346	0.02	59,865.515	0.68
4054	Aphanocapsa	delicatissima	.	.	.	.	Vegetative	4.00	170.088	0.10	1,424.926	0.02
1000424	Cyanocatena	planctonica	.	.	.	.	Vegetative	4.80	340.175	0.19	1,752.753	0.02
4166	Merismopedia	warmingiana	.	.	.	.	Vegetative	4.00	170.088	0.10	350.551	0.00
4323	Synechococcus	sp. 1	.	.	.	< 1um ovoid	Vegetative	1.20	33,167.082	18.57	13,336.484	0.15
Summary for Division ~ Cyanophyta (6 detail records)							**Sum Total Cyanophyta**		148,698.907	83.24	107,510.555	1.22

Division: Haptophyta

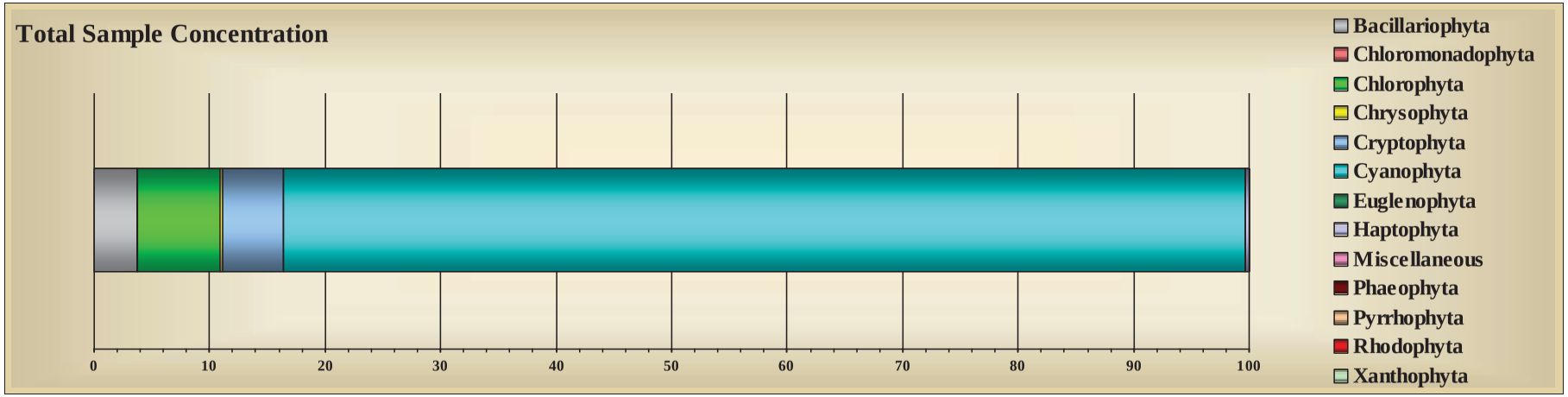
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1731	Chrysochromulina	parva	.	.	.	.	Vegetative	4.00	510.263	0.29	16,421.941	0.19
Summary for Division ~ Haptophyta (1 detail record)							**Sum Total Haptophyta**		510.263	0.29	16,421.941	0.19

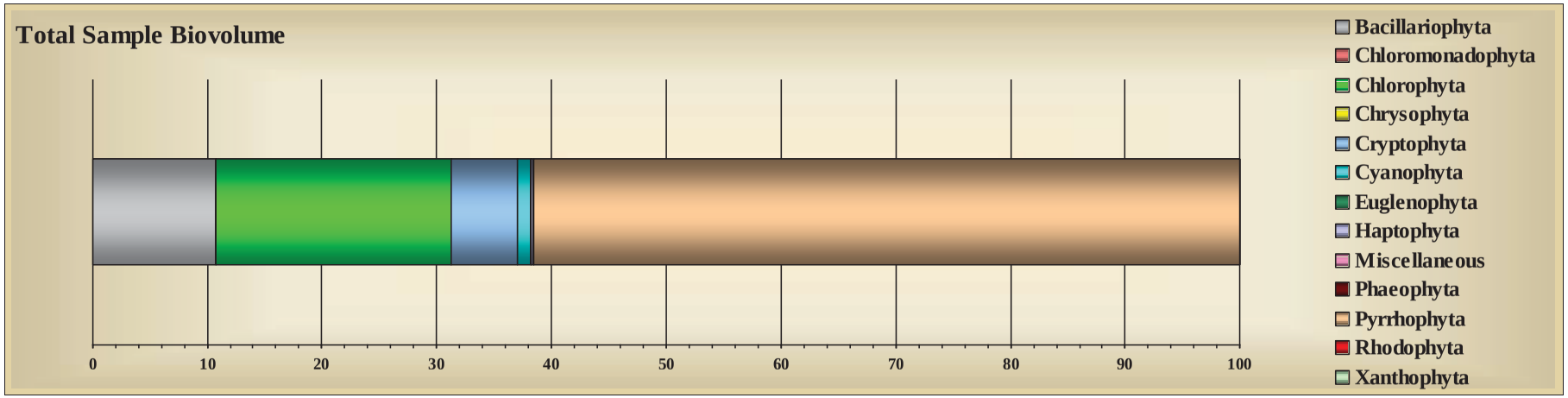
Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
6011	Ceratium	hirundinella	.	.	.	.	Vegetative	160.00	127.039	0.07	5,437,385.134	61.56
Summary for Division ~ Pyrrhophyta (1 detail record)							**Sum Total Pyrrhophyta**		127.039	0.07	5,437,385.134	61.56

Total Sample Concentration	Total Sample Biovolume
178,632.216	8,833,309.329
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





☑ = Identification is Uncertain
∗ = Family Level Identification

Species List

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1021	Asterionella	formosa	.	.	.		Vegetative	Hass.
1432	Aulacoseira	granulata	.	.	.		Vegetative	(Ehrenberg) Simonsen
1000830	Aulacoseira	granulata	.	angustissima	.		Vegetative	(Otto Müller) Simonsen
1522	Cyclostephanos	tholiformis	.	.	.		Vegetative	Stoermer H†k. & Theriot
1071	Cyclotella	sp. 1	.	.	.		Vegetative	(Kutzing) de Brebisson
1152	Fragilaria	crotonensis	.	.	.		Vegetative	Kitton
1210	Navicula	spp	.	.	.		Vegetative	Bory .
9123	Nitzschia	palea	.	.	.		Vegetative	(K• tz.) W. Sm.
9124	Nitzschia	recta	.	.	.		Vegetative	Hantzsch

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
2683	*Chlorococcaceae	spp	.	.	.		Vegetative	N/A
2687	*Chlorococcaceae	spp	.	.	.		Vegetative	(Brandt) Beijerinck
2071	Characium	limneticum	.	.	.		Vegetative	Lemmermann
2080	Chlamydomonas	spp	.	.	.		Vegetative	Ehrenberg
2171	Coelastrum	microporum	.	.	.		Vegetative	Naeg
2194	Crucigenia	crucifera	.	.	.		Vegetative	(Wolle) Collins
2195	Crucigenia	quadrata	.	.	.		Vegetative	C. Morren
2193	Crucigenia	tetrapedia	.	.	.		Vegetative	(Kirch.) W. West and G. S. West
2211	Dictyosphaerium	pulchellum	.	.	.		Vegetative	Wood
2031	Monoraphidium	arcuatum	.	.	.		Vegetative	(Corda) Ralfs
8041	Monoraphidium	capricornutum	.	.	.		Vegetative	(Printz) Nygaard
2363	Oocystis	parva	.	.	.		Vegetative	West & West

2389	Pediastrum	boryanum	.	longicorne	.		Vegetative	Raciborski
2381	Pediastrum	duplex	.	.	.		Vegetative	West and West
2761	Phacotus	lendneri	.	.	.		Vegetative	Chodat
2484	Scenedesmus	abundans	.	.	.		Vegetative	(Kirchn.) Chodat
8399	Scenedesmus	acutus	.	.	.		Vegetative	Lagh. Chodat
2483	Scenedesmus	bijuga	.	.	.		Vegetative	(Turpin) Lagerh.
8226	Scenedesmus	intermedius	.	.	.		Vegetative	Chodat
8303	Scenedesmus	opoliensis	.	carinatus	.		Vegetative	Lemmermann
8308	Scenedesmus	serratus	.	.	.		Vegetative	(Corda) Bohlin
2491	Schroederia	judayi	.	.	.		Vegetative	G. M. Smith
2530	Staurastrum	spp	.	.	.		Vegetative	Meyen
2554	Tetraedron	minimum	.	.	.		Vegetative	(Braun) Hansgirg
2561	Tetrastrum	staurogeniaeforme	.	.	.		Vegetative	(Schroeder) Lemm.

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1590	Chromulina	spp	.	.	.		Vegetative	Cienkowski

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
3015	Cryptomonas	erosa	.	.	.		Vegetative	Ehrenberg .
3043	Rhodomonas	minuta	.	nannoplanctica	.		Vegetative	Skuja

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
4282	*Chroococcaceae	spp	.	.	.		Vegetative	N/A
4041	Aphanizomenon	flos-aquae	.	.	.		Vegetative	(L.) Ralfs
4054	Aphanocapsa	delicatissima	.	.	.		Vegetative	West & West
4062	Aphanothece	nidulans	.	.	.		Vegetative	P. Richter

1000424	Cyanocatena	planctonica	.	.	.		Vegetative	Hindak
4166	Merismopedia	warmingiana	.	.	.		Vegetative	Lagerheim
4323	Synechococcus	sp. 1	.	.	.		Vegetative	Nageli

Division: Haptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1731	Chrysochromulina	parva	.	.	.		Vegetative	Lackey

Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
6011	Ceratium	hirundinella	.	.	.		Vegetative	Dujardin

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info@phycotech.com - www.phycotech.com

Algae Analysis with Biovolume Estimates

Report and Data Set

Customer ID: 327

Tracking Code:	160013-327	**Sample ID:**	CCR-2 Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	7/12/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1522	*Cyclostephanos*	*tholiformis*	.	.	.	.	Vegetative	4.80	2,551.314	0.76	110,802.035	1.97
9856	*Cyclotella*	*atomus*	.	.	.	.	Vegetative	4.67	3,061.577	0.91	127,319.650	2.26
1076	*Cyclotella*	*meneghiniana*	.	.	.	.	Vegetative	10.40	510.263	0.15	225,399.966	4.00
1153	*Fragilaria*	*capucina*	.	.	.	.	Vegetative	64.00	1.704	0.00	16,447.183	0.29
1152	*Fragilaria*	*crotonensis*	.	.	.	.	Vegetative	88.00	6.817	0.00	94,607.851	1.68
9458	*Navicula*	*cf. lacunolaciniata*	.	.	.	.	Vegetative	5.60	510.263	0.15	11,490.557	0.20
9126	*Nitzschia*	*subacicularis*	.	.	.	.	Vegetative	40.00	84.692	0.03	11,973.106	0.21
9818	*Stephanodiscus*	*medius*	.	.	.	.	Vegetative	9.60	510.263	0.15	177,283.154	3.15
Summary for Division ~ Bacillariophyta (8 detail records)							**Sum Total Bacillariophyta**		7,236.893	2.16	775,323.501	13.76

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	2.73	3,061.577	0.91	39,071.230	0.69
1000031	*Ankistrodesmus*	*falcatus*	.	.	.	straight	Vegetative	42.50	169.385	0.05	10,509.731	0.19
2080	*Chlamydomonas*	*spp*	.	.	.	.	Vegetative	7.71	1,185.693	0.35	779,958.299	13.84
2194	*Crucigenia*	*crucifera*	.	.	.	.	Vegetative	10.00	84.692	0.03	5,986.549	0.11

2195	*Crucigenia*	*quadrata*	.	.	.	.	Vegetative	30.00	84.692	0.03	12,873.242	0.23
2193	*Crucigenia*	*tetrapedia*	.	.	.	.	Vegetative	6.00	84.692	0.03	5,420.312	0.10
2191	*Crucigenia*	*truncata*	.	.	.	.	Vegetative	8.00	84.692	0.03	2,128.548	0.04
8011	*Deasonia*	*Gigantica*	.	.	.	.	Vegetative	8.00	510.263	0.15	136,792.577	2.43
2211	*Dictyosphaerium*	*pulchellum*	.	.	.	.	Vegetative	10.00	338.770	0.10	6,516.774	0.12
2031	*Monoraphidium*	*arcuatum*	.	.	.	monoraphidiod	Vegetative	16.40	423.462	0.13	9,464.246	0.17
8041	*Monoraphidium*	*capricornutum*	.	.	.	.	Vegetative	4.00	2,041.051	0.61	15,863.458	0.28
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	8.40	2,041.051	0.61	277,141.685	4.92
2387	*Pediastrum*	*tetras*	.	tetraodon	.	.	Vegetative	12.00	84.692	0.03	6,443.777	0.11
2761	*Phacotus*	*lendneri*	.	.	.	.	Vegetative	12.00	1,020.526	0.30	65,857.374	1.17
2440	*Pteromonas*	*spp*	.	.	.	.	Vegetative	12.00	84.692	0.03	12,345.600	0.22
8101	*Pyramichlamys*	*dissecta*	.	.	.	.	Vegetative	16.00	84.692	0.03	35,475.859	0.63
2462	*Quadrigula*	*lacustris*	.	.	.	.	Vegetative	40.00	84.692	0.03	6,385.653	0.11
2484	*Scenedesmus*	*abundans*	.	.	.	.	Vegetative	13.00	254.077	0.08	9,245.892	0.16
8399	*Scenedesmus*	*acutus*	.	.	.	.	Vegetative	20.00	1,020.526	0.30	94,084.091	1.67
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	11.00	254.077	0.08	18,137.042	0.32
8226	*Scenedesmus*	*intermedius*	.	.	.	.	Vegetative	12.00	84.692	0.03	787.563	0.01
8303	*Scenedesmus*	*opoliensis*	.	carinatus	.	.	Vegetative	14.00	510.263	0.15	8,070.776	0.14
2491	*Schroederia*	*judayi*	.	.	.	.	Vegetative	30.00	84.692	0.03	1,596.418	0.03
2900	*Sphaerellopsis*	*spp*	.	.	.	.	Vegetative	36.00	84.692	0.03	19,156.967	0.34
2551	*Tetraedron*	*caudatum*	.	.	.	.	Vegetative	6.00	84.692	0.03	1,760.297	0.03
2554	*Tetraedron*	*minimum*	.	.	.	.	Vegetative	7.00	84.692	0.03	7,289.473	0.13

Summary for Division ~ Chlorophyta (26 detail records) **Sum Total Chlorophyta** 13,931.721 4.16 1,588,363.430 28.19

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1611	*Stichogloea*	*olivacea*	.	.	.	.	Vegetative	20.80	510.263	0.15	157,585.020	2.80

Summary for Division ~ Chrysophyta (1 detail record)								**Sum Total**	**Chrysophyta**	510.263	0.15	157,585.020	2.80

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	8.00	3,061.577	0.91	102,594.356	1.82
Summary for Division ~ Cryptophyta (1 detail record)								**Sum Total**	**Cryptophyta**	3,061.577	0.91	102,594.356	1.82

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	**Chroococcaceae*	*spp*	.	.	.	<1 um spherical	Vegetative	0.80	199,002.490	59.39	53,352.568	0.95
☑ 4011	*Anabaena*	*circinalis*	.	.	.	.	Vegetative	42.00	254.077	0.08	322,730.987	5.73
4041	*Aphanizomenon*	*flos-aquae*	.	.	.	.	Vegetative	71.60	338.770	0.10	352,701.003	6.26
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	17.40	2,551.314	0.76	37,404.304	0.66
4062	*Aphanothece*	*nidulans*	.	.	.	.	Vegetative	17.60	1,020.526	0.30	9,985.843	0.18
1000424	*Cyanocatena*	*planctonica*	.	.	.	.	Vegetative	8.00	12,756.570	3.81	42,455.140	0.75
10651	*Cyanogranis*	*ferruginea*	.	.	.	.	Vegetative	12.00	2,551.314	0.76	10,055.239	0.18
4113	*Dactylococcopsis*	*irregularis*	.	.	.	.	Vegetative	20.00	84.692	0.03	276.504	0.00
4166	*Merismopedia*	*warmingiana*	.	.	.	.	Vegetative	8.00	84.692	0.03	88.690	0.00
4172	*Pseudanabaena*	*limnetica*	.	.	.	.	Vegetative	80.00	84.692	0.03	11,973.106	0.21
4321	*Synechococcus*	*elongatus*	.	.	.	.	Vegetative	4.00	1,020.526	0.30	2,137.389	0.04
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	86,744.675	25.89	34,880.034	0.62
Summary for Division ~ Cyanophyta (12 detail records)								**Sum Total**	**Cyanophyta**	306,494.337	91.47	878,040.805	15.58

Division: Euglenophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
5020	*Euglena*	*spp*	.	.	.	.	Vegetative	20.00	84.692	0.03	13,480.825	0.24
5030	*Phacus*	*spp*	.	.	.	.	Vegetative	30.00	84.692	0.03	63,856.546	1.13
Summary for Division ~ Euglenophyta (2 detail records)							**Sum Total Euglenophyta**		169.385	0.05	77,337.370	1.37

Division: Haptophyta

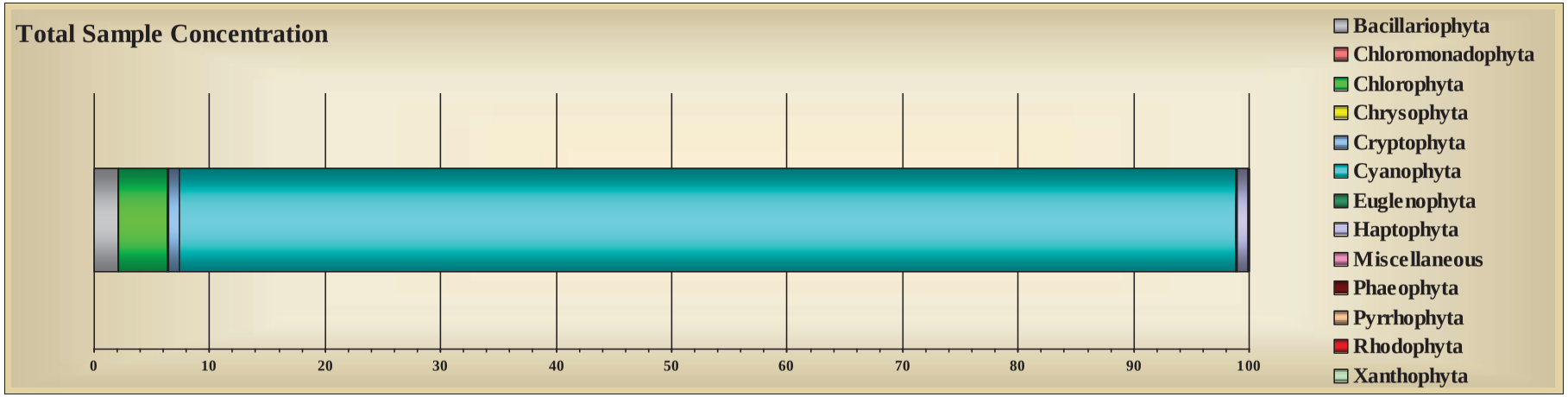
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1731	*Chrysochromulina*	*parva*	.	.	.	.	Vegetative	4.00	3,061.577	0.91	98,531.644	1.75
Summary for Division ~ Haptophyta (1 detail record)							**Sum Total Haptophyta**		3,061.577	0.91	98,531.644	1.75

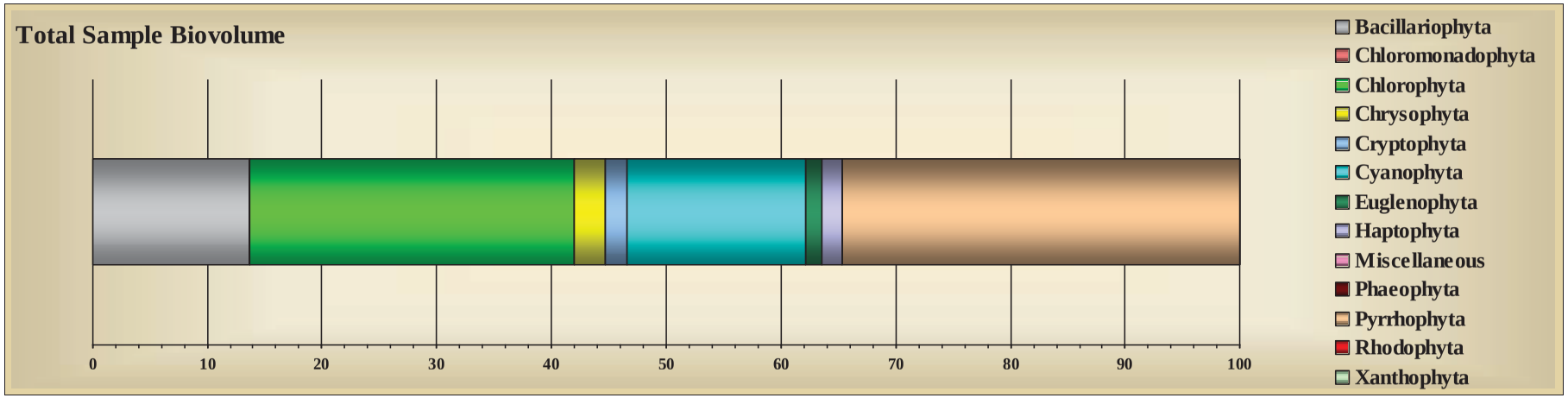
Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
6011	*Ceratium*	*hirundinella*	.	.	.	.	Vegetative	128.00	3.408	0.00	113,885.320	2.02
6033	*Gymnodinium*	*sp. 2*	.	.	.	.	Vegetative	16.00	84.692	0.03	51,085.240	0.91
6034	*Gymnodinium*	*sp. 3*	.	.	.	.	Vegetative	8.00	254.077	0.08	19,156.959	0.34
6044	*Peridinium*	*umbonatum*	.	.	.	.	Vegetative	34.00	254.077	0.08	1,773,083.511	31.47
Summary for Division ~ Pyrrhophyta (4 detail records)							**Sum Total Pyrrhophyta**		596.255	0.18	1,957,211.030	34.73

Total Sample Concentration	Total Sample Biovolume
335,062.007	5,634,987.156
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





Tracking Code:	160015-327	**Sample ID:**	CCR-2 - Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	7/26/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1432	*Aulacoseira*	*granulata*	.	.	.	straight	Vegetative	187.00	42.346	0.06	142,912.286	3.11
1071	*Cyclotella*	*sp. 1*	.	.	.	.	Vegetative	5.00	42.346	0.06	2,078.664	0.05
1220	*Nitzschia*	*spp*	.	.	.	.	Vegetative	80.00	0.852	0.00	6,852.993	0.15
9818	*Stephanodiscus*	*medius*	.	.	.	.	Vegetative	12.00	42.346	0.06	28,735.446	0.63
Summary for Division ~ Bacillariophyta (4 detail records)							**Sum Total Bacillariophyta**		127.891	0.18	180,579.390	3.93

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	6.00	84.692	0.12	9,578.479	0.21
2060	*Carteria*	*spp*	.	.	.	.	Vegetative	16.00	169.385	0.23	354,247.757	7.71
2080	*Chlamydomonas*	*spp*	.	.	.	.	Vegetative	6.63	423.462	0.58	106,902.108	2.33
8011	*Deasonia*	*Gigantica*	.	.	.	.	Vegetative	20.00	42.346	0.06	177,379.302	3.86
2031	*Monoraphidium*	*arcuatum*	.	.	.	monoraphidiod	Vegetative	20.00	42.346	0.06	1,212.782	0.03
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	8.00	42.346	0.06	2,838.067	0.06
☑ 8101	*Pyramichlamys*	*dissecta*	.	.	.	.	Vegetative	16.00	7,961.084	10.94	3,334,730.722	72.60
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	12.00	42.346	0.06	9,578.484	0.21

2554	*Tetraedron*	*minimum*	.	.	.	.	Vegetative	6.67	127.039	0.17	9,576.167	0.21
Summary for Division ~ Chlorophyta (9 detail records)							**Sum Total**	**Chlorophyta**	8,935.046	12.28	4,006,043.868	87.21

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1000035	**Chrysocapsaceae*	*spp*	.	.	.	>1 um spherical	Vegetative	5.00	42.346	0.06	2,771.550	0.06
Summary for Division ~ Chrysophyta (1 detail record)							**Sum Total**	**Chrysophyta**	42.346	0.06	2,771.550	0.06

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3015	*Cryptomonas*	*erosa*	.	.	.	.	Vegetative	30.00	42.346	0.06	65,186.894	1.42
3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	8.00	2,041.051	2.81	68,396.237	1.49
Summary for Division ~ Cryptophyta (2 detail records)							**Sum Total**	**Cryptophyta**	2,083.397	2.86	133,583.131	2.91

Division: Cyanophyta

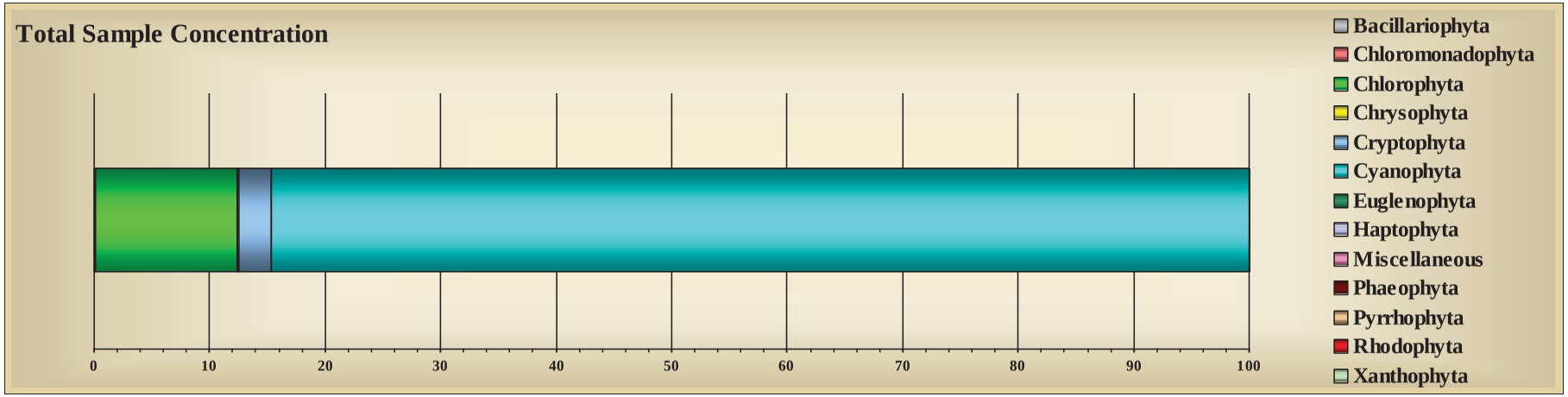
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	**Chroococcaceae*	*spp*	.	.	.	<1 um spherical	Vegetative	0.80	48,474.965	66.62	12,996.138	0.28
☑ 10222	*Anabaena*	*crassa*	.	.	.	.	Vegetative	180.00	1.704	0.00	25,942.690	0.56
4041	*Aphanizomenon*	*flos-aquae*	.	.	.	.	Vegetative	340.00	42.346	0.06	180,926.888	3.94
10651	*Cyanogranis*	*ferruginea*	.	.	.	.	Vegetative	4.80	1,530.788	2.10	402.138	0.01
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	11,480.913	15.78	4,616.475	0.10
Summary for Division ~ Cyanophyta (5 detail records)							**Sum Total**	**Cyanophyta**	61,530.717	84.56	224,884.329	4.90

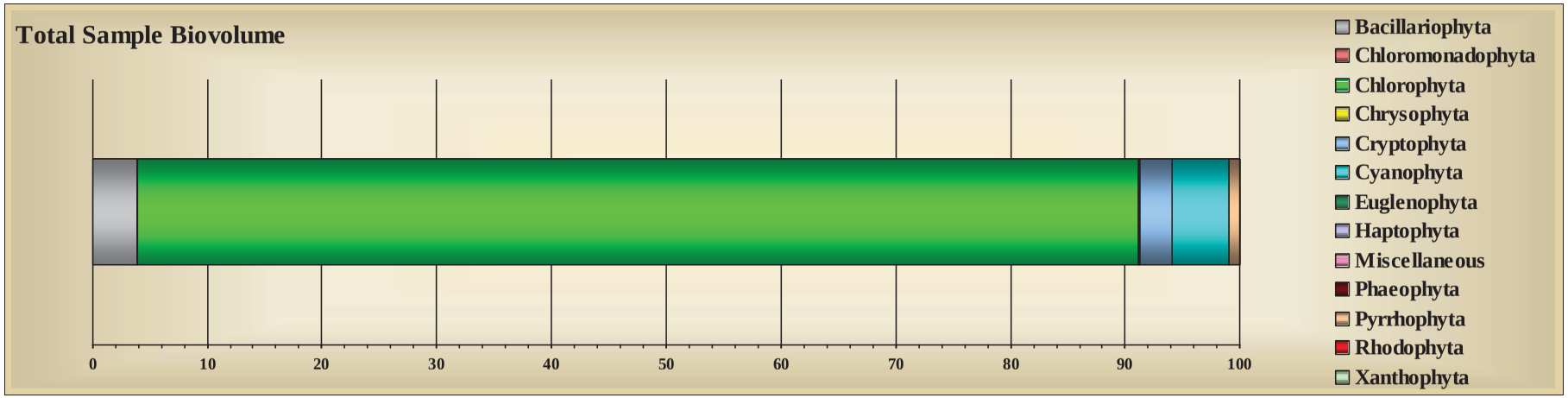
Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
6011	*Ceratium*	*hirundinella*	.	.	.	.	Vegetative	128.00	0.852	0.00	20,073.558	0.44
6033	*Gymnodinium*	*sp. 2*	.	.	.	.	Vegetative	16.00	42.346	0.06	25,542.620	0.56
Summary for Division ~ Pyrrhophyta (2 detail records)							**Sum Total Pyrrhophyta**		43.198	0.06	45,616.178	0.99

Total Sample Concentration	Total Sample Biovolume
72,762.596	4,593,478.446
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





Species List

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1432	Aulacoseira	granulata	.	.	.		Vegetative	(Ehrenberg) Simonsen
1522	Cyclostephanos	tholiformis	.	.	.		Vegetative	Stoermer H†k. & Theriot
9856	Cyclotella	atomus	.	.	.		Vegetative	Hust.
1076	Cyclotella	meneghiniana	.	.	.		Vegetative	Kutzing
1071	Cyclotella	sp. 1	.	.	.		Vegetative	(Kutzing) de Brebisson
1153	Fragilaria	capucina	.	.	.		Vegetative	Desm.
1152	Fragilaria	crotonensis	.	.	.		Vegetative	Kitton
9458	Navicula	cf. lacunolaciniata	.	.	.		Vegetative	Lange-Bertalot & Bonik
1220	Nitzschia	spp	.	.	.		Vegetative	Hassall
9126	Nitzschia	subacicularis	.	.	.		Vegetative	Hust.
9818	Stephanodiscus	medius	.	.	.		Vegetative	Hakansson

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
2683	*Chlorococcaceae	spp	.	.	.		Vegetative	N/A
1000031	Ankistrodesmus	falcatus	.	.	.		Vegetative	(Corda) Ralfs
2060	Carteria	spp	.	.	.		Vegetative	(Carter) Diesing
2080	Chlamydomonas	spp	.	.	.		Vegetative	Ehrenberg
2194	Crucigenia	crucifera	.	.	.		Vegetative	(Wolle) Collins
2195	Crucigenia	quadrata	.	.	.		Vegetative	C. Morren
2193	Crucigenia	tetrapedia	.	.	.		Vegetative	(Kirch.) W. West and G. S. West
2191	Crucigenia	truncata	.	.	.		Vegetative	G. M. Smith
8011	Deasonia	Gigantica	.	.	.		Vegetative	(Deason) Ettl et Komarek
2211	Dictyosphaerium	pulchellum	.	.	.		Vegetative	Wood

2031	Monoraphidium	arcuatum	.	.	.		Vegetative	(Corda) Ralfs
8041	Monoraphidium	capricornutum	.	.	.		Vegetative	(Printz) Nygaard
2363	Oocystis	parva	.	.	.		Vegetative	West & West
2387	Pediastrum	tetras	.	tetraodon	.		Vegetative	(Corda) Rabenhorst
2761	Phacotus	lendneri	.	.	.		Vegetative	Chodat
2440	Pteromonas	spp	.	.	.		Vegetative	Seligo .
8101	Pyramichlamys	dissecta	.	.	.		Vegetative	(Tiffana) Ettl
2462	Quadrigula	lacustris	.	.	.		Vegetative	(Chodat) G.M. Smith
2484	Scenedesmus	abundans	.	.	.		Vegetative	(Kirchn.) Chodat
8399	Scenedesmus	acutus	.	.	.		Vegetative	Lagh. Chodat
2483	Scenedesmus	bijuga	.	.	.		Vegetative	(Turpin) Lagerh.
8226	Scenedesmus	intermedius	.	.	.		Vegetative	Chodat
8303	Scenedesmus	opoliensis	.	carinatus	.		Vegetative	Lemmermann
2491	Schroederia	judayi	.	.	.		Vegetative	G. M. Smith
2900	Sphaerellopsis	spp	.	.	.		Vegetative	Korshikov
2551	Tetraedron	caudatum	.	.	.		Vegetative	(Corda) Hansgirg
2554	Tetraedron	minimum	.	.	.		Vegetative	(Braun) Hansgirg

Division: Chrysophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1000035	*Chrysocapsaceae	spp	.	.	.		Vegetative	N/A
1611	Stichogloea	olivacea	.	.	.		Vegetative	Chodat

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
3015	Cryptomonas	erosa	.	.	.		Vegetative	Ehrenberg .
3043	Rhodomonas	minuta	.	nannoplanctica	.		Vegetative	Skuja

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
4282	*Chroococcaceae	spp	.	.	.		Vegetative	N/A
4011	Anabaena	circinalis	.	.	.		Vegetative	Rabenhorst
10222	Anabaena	crassa	.	.	.		Vegetative	Lemmermann
4041	Aphanizomenon	flos-aquae	.	.	.		Vegetative	(L.) Ralfs
4054	Aphanocapsa	delicatissima	.	.	.		Vegetative	West & West
4062	Aphanothece	nidulans	.	.	.		Vegetative	P. Richter
1000424	Cyanocatena	planctonica	.	.	.		Vegetative	Hindak
10651	Cyanogranis	ferruginea	.	.	.		Vegetative	Hindak
4113	Dactylococcopsis	irregularis	.	.	.		Vegetative	Hansgirg
4166	Merismopedia	warmingiana	.	.	.		Vegetative	Lagerheim
4172	Pseudanabaena	limnetica	.	.	.		Vegetative	Lemmermann
4321	Synechococcus	elongatus	.	.	.		Vegetative	Nageli
4323	Synechococcus	sp. 1	.	.	.		Vegetative	Nageli

Division: Euglenophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
5020	Euglena	spp	.	.	.		Vegetative	Ehrenberg
5030	Phacus	spp	.	.	.		Vegetative	Dujardin .

Division: Haptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1731	Chrysochromulina	parva	.	.	.		Vegetative	Lackey

Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
6011	Ceratium	hirundinella	.	.	.		Vegetative	Dujardin
6033	Gymnodinium	sp. 2	.	.	.		Vegetative	Stein

6034	Gymnodinium	sp. 3	.	.	.	Vegetative	Stein
6044	Peridinium	umbonatum	.	.	.	Vegetative	Stein

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info@phycotech.com - www.phycotech.com

Algae Analysis with Biovolume Estimates
Report and Data Set

Customer ID: 327

Tracking Code:	160017-327	**Sample ID:**	CCR-2 - Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	8/9/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1431	*Aulacoseira*	*ambigua*	.	.	.	.	Vegetative	300.00	42.346	0.02	102,170.480	1.30
1432	*Aulacoseira*	*granulata*	.	.	.	straight	Vegetative	320.00	296.423	0.17	1,595,138.803	20.30
1523	*Cyclostephanos*	*damasii*	.	.	.	.	Vegetative	21.20	254.077	0.14	967,267.080	12.31
1522	*Cyclostephanos*	*tholiformis*	.	.	.	.	Vegetative	7.00	190.558	0.11	27,238.816	0.35
9856	*Cyclotella*	*atomus*	.	.	.	.	Vegetative	6.40	4,319.311	2.41	466,791.427	5.94
1076	*Cyclotella*	*meneghiniana*	.	.	.	.	Vegetative	7.60	6,097.851	3.40	1,084,283.930	13.80
9361	*Cyclotella*	*pseudostelligera*	.	.	.	.	Vegetative	7.20	1,524.463	0.85	235,630.729	3.00
1071	*Cyclotella*	*sp. 1*	.	.	.	.	Vegetative	1.60	42.346	0.02	136.228	0.00
1210	*Navicula*	*spp*	.	.	.	.	Vegetative	5.50	84.692	0.05	1,413.490	0.02
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	50.00	84.692	0.05	11,973.106	0.15
9123	*Nitzschia*	*palea*	.	.	.	.	Vegetative	32.00	42.346	0.02	19,156.963	0.24
9818	*Stephanodiscus*	*medius*	.	.	.	.	Vegetative	16.67	423.462	0.24	777,364.790	9.89
1298	*Stephanodiscus*	*parvus*	.	.	.	.	Vegetative	8.00	84.692	0.05	17,028.411	0.22
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	80.00	42.346	0.02	7,622.314	0.10
Summary for Division ~ Bacillariophyta (14 detail records)								**Sum Total Bacillariophyta**	13,529.608	7.53	5,313,216.564	67.60

☑ = Identification is Uncertain
∗ = Family Level Identification

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	*Chlorococcaceae	spp	.	.	.	2-9.9 um spherical	Vegetative	2.80	1,715.021	0.96	25,682.263	0.33
1000031	Ankistrodesmus	falcatus	.	.	.	straight	Vegetative	20.00	42.346	0.02	798.209	0.01
2080	Chlamydomonas	spp	.	.	.	.	Vegetative	9.11	762.231	0.42	530,208.165	6.75
2171	Coelastrum	microporum	.	.	.	.	Vegetative	40.00	84.692	0.05	363,272.814	4.62
2175	Coelastrum	pseudomicroporum	.	.	.	.	Vegetative	10.00	211.731	0.12	31,928.264	0.41
2180	Cosmarium	spp	.	.	.	.	Vegetative	4.00	42.346	0.02	354.759	0.00
2194	Crucigenia	crucifera	.	.	.	.	Vegetative	18.00	84.692	0.05	10,642.758	0.14
2211	Dictyosphaerium	pulchellum	.	.	.	.	Vegetative	10.00	42.346	0.02	2,362.799	0.03
1000526	Golenkeniopsis	parvula	.	.	.	.	Vegetative	20.00	42.346	0.02	1,419.034	0.02
1000538	Monomastix	minuta	.	.	.	.	Vegetative	5.00	42.346	0.02	886.899	0.01
2031	Monoraphidium	arcuatum	.	.	.	monoraphidiod	Vegetative	15.00	84.692	0.05	1,732.544	0.02
8041	Monoraphidium	capricornutum	.	.	.	.	Vegetative	4.00	719.885	0.40	5,622.879	0.07
2363	Oocystis	parva	.	.	.	.	Vegetative	9.33	127.039	0.07	21,462.899	0.27
2371	Pandorina	morum	.	.	.	.	Vegetative	56.00	42.346	0.02	227,045.509	2.89
2761	Phacotus	lendneri	.	.	.	.	Vegetative	12.00	423.462	0.24	105,150.458	1.34
8101	Pyramichlamys	dissecta	.	.	.	.	Vegetative	6.40	2,456.079	1.37	65,843.302	0.84
2484	Scenedesmus	abundans	.	.	.	.	Vegetative	12.80	423.462	0.24	6,407.825	0.08
8399	Scenedesmus	acutus	.	.	.	.	Vegetative	18.00	84.692	0.05	21,896.562	0.28
2483	Scenedesmus	bijuga	.	.	.	.	Vegetative	14.67	127.039	0.07	26,429.510	0.34
8226	Scenedesmus	intermedius	.	.	.	.	Vegetative	12.00	127.039	0.07	2,128.557	0.03
8303	Scenedesmus	opoliensis	.	carinatus	.	.	Vegetative	16.00	84.692	0.05	2,139.634	0.03
8308	Scenedesmus	serratus	.	.	.	.	Vegetative	5.00	42.346	0.02	997.757	0.01
2551	Tetraedron	caudatum	.	.	.	.	Vegetative	8.00	42.346	0.02	339.807	0.00
2561	Tetrastrum	staurogeniaeforme	.	.	.	.	Vegetative	16.00	42.346	0.02	5,520.931	0.07
Summary for Division ~ Chlorophyta (24 detail records)							**Sum Total Chlorophyta**		7,897.565	4.40	1,460,274.137	18.58

☑ = Identification is Uncertain
∗ = Family Level Identification

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3015	*Cryptomonas*	*erosa*	.	.	.	.	Vegetative	16.80	550.501	0.31	350,962.705	4.47
3041	*Rhodomonas*	*minuta*	.	.	.	.	Vegetative	12.00	42.346	0.02	3,991.035	0.05
3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	3.20	762.231	0.42	1,634.758	0.02
Summary for Division ~ Cryptophyta (3 detail records)							**Sum Total Cryptophyta**		1,355.078	0.75	356,588.498	4.54

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	**Chroococcaceae*	*spp*	.	.	.	<1 um spherical	Vegetative	0.80	135,857.469	75.65	36,423.387	0.46
4011	*Anabaena*	*circinalis*	.	.	.	.	Vegetative	88.00	1.278	0.00	16,119.884	0.21
4041	*Aphanizomenon*	*flos-aquae*	.	.	.	.	Vegetative	76.00	169.385	0.09	161,769.929	2.06
4082	*Chroococcus*	*limneticus*	.	.	.	.	Vegetative	16.00	42.346	0.02	11,352.277	0.14
1000424	*Cyanocatena*	*planctonica*	.	.	.	.	Vegetative	8.00	1,913.486	1.07	2,011.073	0.03
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	17,221.369	9.59	6,924.713	0.09
☑ 4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.50	1,206.866	0.67	2,132.654	0.03
Summary for Division ~ Cyanophyta (7 detail records)							**Sum Total Cyanophyta**		156,412.199	87.10	236,733.917	3.01

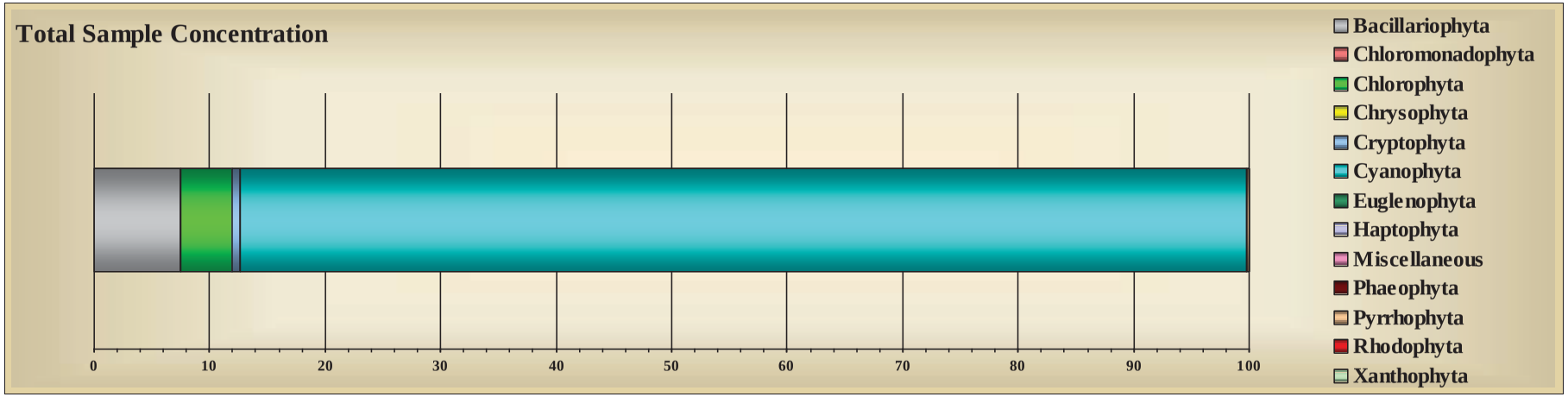
Division: Pyrrhophyta

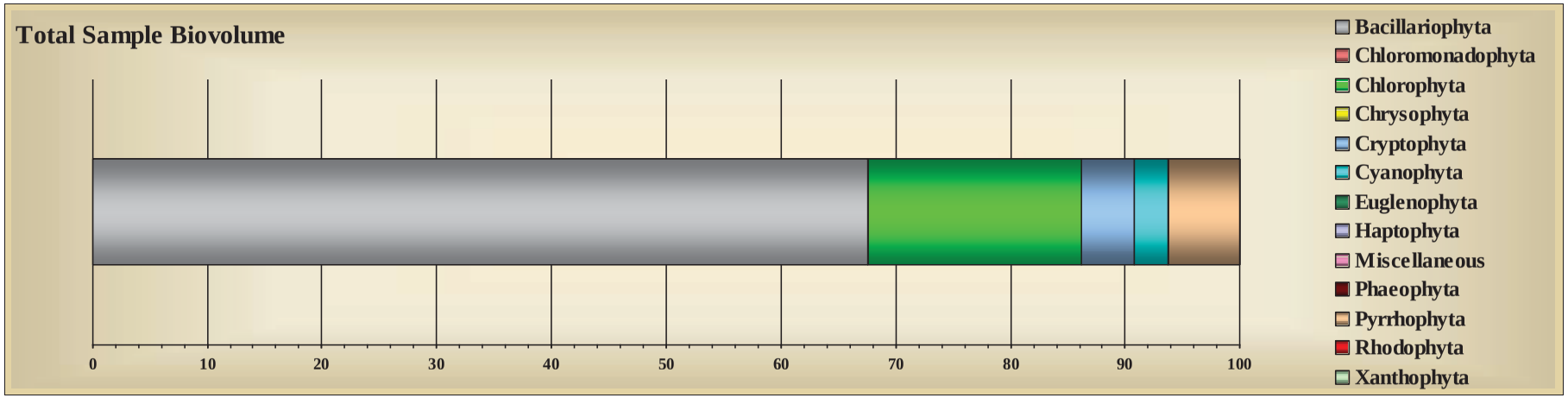
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
6033	*Gymnodinium*	*sp. 2*	.	.	.	.	Vegetative	13.33	254.077	0.14	99,332.421	1.26
6040	*Peridinium*	*spp*	.	.	.	.	Vegetative	12.00	42.346	0.02	8,514.205	0.11
6041	*Peridinium*	*cinctum*	.	.	.	.	Vegetative	28.00	84.692	0.05	384,558.329	4.89
Summary for Division ~ Pyrrhophyta (3 detail records)							**Sum Total Pyrrhophyta**		381.116	0.21	492,404.956	6.27

☑ = Identification is Uncertain
* = Family Level Identification

Total Sample Concentration	Total Sample Biovolume
179,575.565	7,859,218.071
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





Tracking Code:	160019-327	**Sample ID:**	CCR-2 - Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	8/23/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1432	*Aulacoseira*	*granulata*	.	.	.	straight	Vegetative	208.00	3.408	0.00	55,680.567	1.12
1522	*Cyclostephanos*	*tholiformis*	.	.	.	.	Vegetative	6.40	1,020.526	1.06	112,935.954	2.28
9856	*Cyclotella*	*atomus*	.	.	.	.	Vegetative	4.00	2,551.314	2.65	74,665.989	1.51
1076	*Cyclotella*	*meneghiniana*	.	.	.	.	Vegetative	6.40	255.131	0.27	26,264.170	0.53
1108	*Diatoma*	*vulgaris*	.	vulgaris	.	.	Vegetative	208.00	0.852	0.00	41,117.957	0.83
1152	*Fragilaria*	*crotonensis*	.	.	.	.	Vegetative	52.00	2.556	0.00	25,971.130	0.52
1221	*Nitzschia*	*acicularis*	.	.	.	.	Vegetative	72.00	255.131	0.27	13,850.242	0.28
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	46.40	255.131	0.27	74,380.956	1.50
9818	*Stephanodiscus*	*medius*	.	.	.	.	Vegetative	10.00	127.039	0.13	49,887.931	1.01
1477	*Synedra*	*filiformis*	.	.	.	.	Vegetative	72.00	255.131	0.27	73,477.842	1.48
1315	*Synedra*	*ulna*	.	.	.	.	Vegetative	140.00	84.692	0.09	189,710.928	3.83
Summary for Division ~ Bacillariophyta (11 detail records)							**Sum Total Bacillariophyta**		4,810.913	5.00	737,943.667	14.88

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	1.68	1,785.920	1.86	4,560.346	0.09

☑ = Identification is Uncertain
✻ = Family Level Identification

2687	*Chlorococcaceae	spp	.	.	.	> 1 um ovoid	Vegetative	2.40	255.131	0.27	461.686	0.01
2080	Chlamydomonas	spp	.	.	.	.	Vegetative	5.20	1,530.788	1.59	68,983.754	1.39
2110	Chlorogonium	spp	.	.	.	.	Vegetative	14.00	84.692	0.09	4,469.962	0.09
1000012	Closterium	spp	.	.	.	straight	Vegetative	72.00	255.131	0.27	78,792.510	1.59
2180	Cosmarium	spp	.	.	.	.	Vegetative	10.00	42.346	0.04	5,543.104	0.11
2194	Crucigenia	crucifera	.	.	.	.	Vegetative	24.00	255.131	0.27	12,824.307	0.26
2193	Crucigenia	tetrapedia	.	.	.	.	Vegetative	14.00	84.692	0.09	6,235.053	0.13
1000072	Dictyosphaerium	chlorelloides	.	.	.	.	Vegetative	16.00	0.852	0.00	210.800	0.00
2211	Dictyosphaerium	pulchellum	.	.	.	.	Vegetative	18.00	255.131	0.27	8,888.778	0.18
2031	Monoraphidium	arcuatum	.	.	.	monoraphidiod	Vegetative	14.40	510.263	0.53	7,590.414	0.15
8041	Monoraphidium	capricornutum	.	.	.	.	Vegetative	4.00	6,123.154	6.37	47,590.374	0.96
2363	Oocystis	parva	.	.	.	.	Vegetative	10.80	1,020.526	1.06	599,698.595	12.09
2381	Pediastrum	duplex	.	.	.	.	Vegetative	50.00	42.346	0.04	40,617.008	0.82
2761	Phacotus	lendneri	.	.	.	.	Vegetative	13.07	1,530.788	1.59	378,630.862	7.63
8101	Pyramichlamys	dissecta	.	.	.	.	Vegetative	16.00	2,806.445	2.92	1,175,561.029	23.70
2484	Scenedesmus	abundans	.	.	.	.	Vegetative	10.67	254.077	0.26	3,370.206	0.07
8399	Scenedesmus	acutus	.	.	.	.	Vegetative	13.80	42.346	0.04	4,536.115	0.09
2483	Scenedesmus	bijuga	.	.	.	.	Vegetative	16.00	42.346	0.04	7,095.172	0.14
8303	Scenedesmus	opoliensis	.	carinatus	.	.	Vegetative	6.40	510.263	0.53	2,667.450	0.05
8308	Scenedesmus	serratus	.	.	.	.	Vegetative	4.00	84.692	0.09	709.519	0.01
2900	Sphaerellopsis	spp	.	.	.	.	Vegetative	9.60	255.131	0.27	19,698.134	0.40
Summary for Division ~ Chlorophyta (22 detail records)							**Sum Total Chlorophyta**		17,772.195	18.48	2,478,735.177	49.98

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3015	Cryptomonas	erosa	.	.	.	.	Vegetative	12.00	84.692	0.09	17,028.411	0.34
3043	Rhodomonas	minuta	.	nannoplanctica	.	.	Vegetative	8.00	3,316.708	3.45	111,143.886	2.24

Summary for Division ~ Cryptophyta (2 detail records)	**Sum Total Cryptophyta**	3,401.401	3.54	128,172.296	2.58

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	*Chroococcaceae	spp	.	.	.	<1 um spherical	Vegetative	0.80	56,128.907	58.35	15,048.160	0.30
☑ 4011	Anabaena	circinalis	.	.	.	.	Vegetative	54.00	510.263	0.53	1,297,333.816	26.16
4041	Aphanizomenon	flos-aquae	.	.	.	.	Vegetative	60.00	42.346	0.04	31,928.273	0.64
4054	Aphanocapsa	delicatissima	.	.	.	.	Vegetative	8.00	510.263	0.53	5,877.819	0.12
4062	Aphanothece	nidulans	.	.	.	.	Vegetative	4.80	255.131	0.27	2,735.851	0.06
1000424	Cyanocatena	planctonica	.	.	.	.	Vegetative	5.00	1,530.788	1.59	1,508.286	0.03
10651	Cyanogranis	ferruginea	.	.	.	.	Vegetative	4.00	255.131	0.27	410.379	0.01
4166	Merismopedia	warmingiana	.	.	.	.	Vegetative	8.00	42.346	0.04	66.517	0.00
4172	Pseudanabaena	limnetica	.	.	.	.	Vegetative	61.33	765.394	0.80	82,515.387	1.66
4321	Synechococcus	elongatus	.	.	.	.	Vegetative	2.40	1,020.526	1.06	1,282.393	0.03
4323	Synechococcus	sp. 1	.	.	.	< 1um ovoid	Vegetative	1.20	8,929.599	9.28	3,590.592	0.07

Summary for Division ~ Cyanophyta (11 detail records)	**Sum Total Cyanophyta**	69,990.695	72.76	1,442,297.472	29.08

Division: Euglenophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
5020	Euglena	spp	.	.	.	.	Vegetative	20.00	42.346	0.04	15,431.997	0.31
5040	Trachelomonas	spp	.	.	.	.	Vegetative	20.00	84.692	0.09	74,094.880	1.49

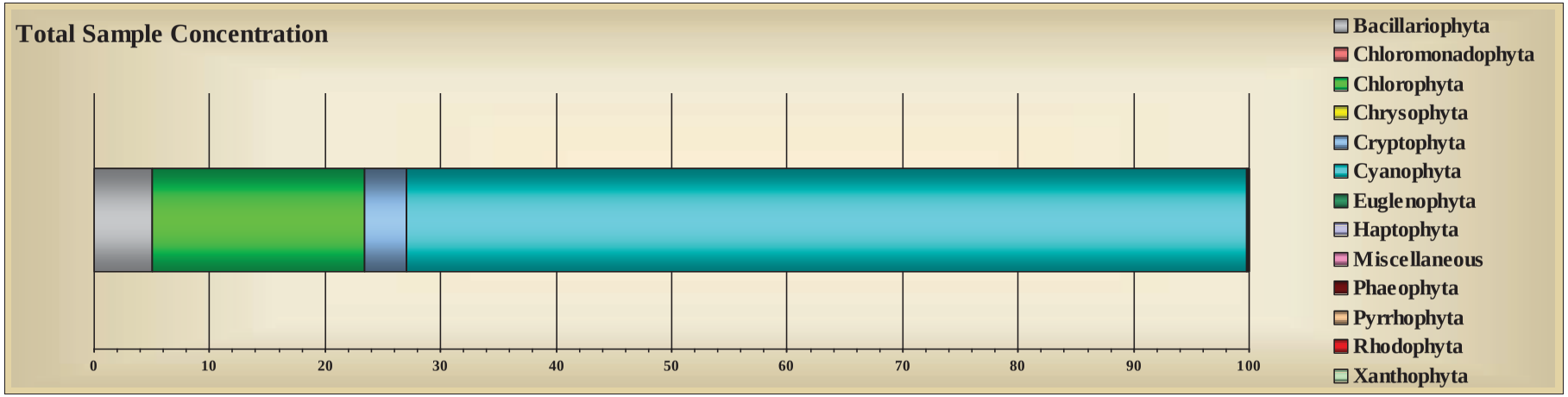
Summary for Division ~ Euglenophyta (2 detail records)	**Sum Total Euglenophyta**	127.039	0.13	89,526.878	1.81

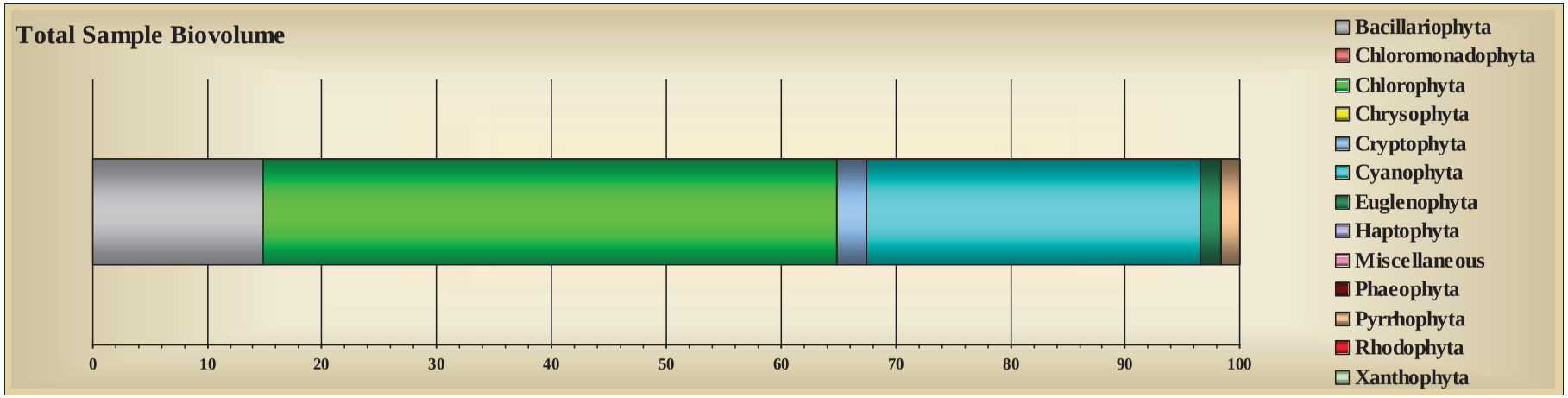
Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
6011	*Ceratium*	*hirundinella*	.	.	.	.	Vegetative	96.00	0.852	0.00	22,906.129	0.46
6033	*Gymnodinium*	*sp. 2*	.	.	.	.	Vegetative	13.00	84.692	0.09	32,637.792	0.66
6040	*Peridinium*	*spp*	.	.	.	.	Vegetative	40.00	2.556	0.00	27,411.972	0.55
Summary for Division ~ Pyrrhophyta (3 detail records)							**Sum Total Pyrrhophyta**		88.101	0.09	82,955.892	1.67

Total Sample Concentration	Total Sample Biovolume
96,190.343	4,959,631.381
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





☑ = Identification is Uncertain
* = Family Level Identification

Species List

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1431	Aulacoseira	ambigua	.	.	.		Vegetative	(Grunow) Simonsen
1432	Aulacoseira	granulata	.	.	.		Vegetative	(Ehrenberg) Simonsen
1523	Cyclostephanos	damasii	.	.	.		Vegetative	(Hustedt) Stoermer & Hakansson
1522	Cyclostephanos	tholiformis	.	.	.		Vegetative	Stoermer H†k. & Theriot
9856	Cyclotella	atomus	.	.	.		Vegetative	Hust.
1076	Cyclotella	meneghiniana	.	.	.		Vegetative	Kutzing
9361	Cyclotella	pseudostelligera	.	.	.		Vegetative	(Hustedt) Houk and Klee
1071	Cyclotella	sp. 1	.	.	.		Vegetative	(Kutzing) de Brebisson
1108	Diatoma	vulgaris	.	vulgaris	.		Vegetative	Bory
1152	Fragilaria	crotonensis	.	.	.		Vegetative	Kitton
1210	Navicula	spp	.	.	.		Vegetative	Bory .
1221	Nitzschia	acicularis	.	.	.		Vegetative	(Kutzing) W. Smith
1222	Nitzschia	gracilis	.	.	.		Vegetative	Hantzsch
9123	Nitzschia	palea	.	.	.		Vegetative	(K• tz.) W. Sm.
9818	Stephanodiscus	medius	.	.	.		Vegetative	Hakansson
1298	Stephanodiscus	parvus	.	.	.		Vegetative	Stoermer & H†k.
1477	Synedra	filiformis	.	.	.		Vegetative	Grunow
1315	Synedra	ulna	.	.	.		Vegetative	(Nitzsch) Ehrenb.

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
2687	*Chlorococcaceae	spp	.	.	.		Vegetative	(Brandt) Beijerinck
2683	*Chlorococcaceae	spp	.	.	.		Vegetative	N/A
1000031	Ankistrodesmus	falcatus	.	.	.		Vegetative	(Corda) Ralfs

2080	Chlamydomonas	spp	.	.	.	Vegetative	Ehrenberg
2110	Chlorogonium	spp	.	.	.	Vegetative	Dang.
1000012	Closterium	spp	.	.	.	Vegetative	.
2171	Coelastrum	microporum	.	.	.	Vegetative	Naeg
2175	Coelastrum	pseudomicroporum	.	.	.	Vegetative	Kors
2180	Cosmarium	spp	.	.	.	Vegetative	Corda
2194	Crucigenia	crucifera	.	.	.	Vegetative	(Wolle) Collins
2193	Crucigenia	tetrapedia	.	.	.	Vegetative	(Kirch.) W. West and G. S. West
1000072	Dictyosphaerium	chlorelloides	.	.	.	Vegetative	(Naumann) Komarek
2211	Dictyosphaerium	pulchellum	.	.	.	Vegetative	Wood
1000526	Golenkeniopsis	parvula	.	.	.	Vegetative	(Woronichin) Korschikov 1953
1000538	Monomastix	minuta	.	.	.	Vegetative	.
2031	Monoraphidium	arcuatum	.	.	.	Vegetative	(Corda) Ralfs
8041	Monoraphidium	capricornutum	.	.	.	Vegetative	(Printz) Nygaard
2363	Oocystis	parva	.	.	.	Vegetative	West & West
2371	Pandorina	morum	.	.	.	Vegetative	(O. Muller) Bory De St Vincent
2381	Pediastrum	duplex	.	.	.	Vegetative	West and West
2761	Phacotus	lendneri	.	.	.	Vegetative	Chodat
8101	Pyramichlamys	dissecta	.	.	.	Vegetative	(Tiffana) Ettl
2484	Scenedesmus	abundans	.	.	.	Vegetative	(Kirchn.) Chodat
8399	Scenedesmus	acutus	.	.	.	Vegetative	Lagh. Chodat
2483	Scenedesmus	bijuga	.	.	.	Vegetative	(Turpin) Lagerh.
8226	Scenedesmus	intermedius	.	.	.	Vegetative	Chodat
8303	Scenedesmus	opoliensis	.	carinatus	.	Vegetative	Lemmermann
8308	Scenedesmus	serratus	.	.	.	Vegetative	(Corda) Bohlin
2900	Sphaerellopsis	spp	.	.	.	Vegetative	Korshikov
2551	Tetraedron	caudatum	.	.	.	Vegetative	(Corda) Hansgirg

2561	Tetrastrum	staurogeniaeforme	.	.	.		Vegetative	(Schroeder) Lemm.

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
3015	Cryptomonas	erosa	.	.	.		Vegetative	Ehrenberg .
3041	Rhodomonas	minuta	.	.	.		Vegetative	Skuja
3043	Rhodomonas	minuta	.	nannoplanctica	.		Vegetative	Skuja

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
4282	*Chroococcaceae	spp	.	.	.		Vegetative	N/A
4011	Anabaena	circinalis	.	.	.		Vegetative	Rabenhorst
4041	Aphanizomenon	flos-aquae	.	.	.		Vegetative	(L.) Ralfs
4054	Aphanocapsa	delicatissima	.	.	.		Vegetative	West & West
4062	Aphanothece	nidulans	.	.	.		Vegetative	P. Richter
4082	Chroococcus	limneticus	.	.	.		Vegetative	Lemm
1000424	Cyanocatena	planctonica	.	.	.		Vegetative	Hindak
10651	Cyanogranis	ferruginea	.	.	.		Vegetative	Hindak
4166	Merismopedia	warmingiana	.	.	.		Vegetative	Lagerheim
4172	Pseudanabaena	limnetica	.	.	.		Vegetative	Lemmermann
4321	Synechococcus	elongatus	.	.	.		Vegetative	Nageli
4323	Synechococcus	sp. 1	.	.	.		Vegetative	Nageli
4285	Synechocystis	spp	.	.	.		Vegetative	N/A

Division: Euglenophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
5020	Euglena	spp	.	.	.		Vegetative	Ehrenberg
5040	Trachelomonas	spp	.	.	.		Vegetative	Ehrenberg .

Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
6011	Ceratium	hirundinella	.	.	.		Vegetative	Dujardin
6033	Gymnodinium	sp. 2	.	.	.		Vegetative	Stein
6040	Peridinium	spp	.	.	.		Vegetative	Ehrenberg
6041	Peridinium	cinctum	.	.	.		Vegetative	(O. F. M• ller) Ehrenberg

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Algae Analysis with Biovolume Estimates
Report and Data Set

Customer ID: 327

Tracking Code:	160021-327	**Sample ID:**	CCR-2 - Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	9/13/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1432	*Aulacoseira*	*granulata*	.	.	.	straight	Vegetative	512.00	15.338	0.08	316,479.777	12.58
1522	*Cyclostephanos*	*tholiformis*	.	.	.	.	Vegetative	5.92	453.567	2.24	43,135.258	1.71
1071	*Cyclotella*	*sp. 1*	.	.	.	.	Vegetative	4.80	226.784	1.12	9,849.070	0.39
1152	*Fragilaria*	*crotonensis*	.	.	.	.	Vegetative	82.00	22.155	0.11	287,311.728	11.42
☑ 9818	*Stephanodiscus*	*medius*	.	.	.	.	Vegetative	15.40	226.784	1.12	342,243.597	13.60
Summary for Division ~ Bacillariophyta (5 detail records)							**Sum Total Bacillariophyta**		944.626	4.67	999,019.430	39.70

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	4.20	850.438	4.20	69,657.335	2.77
2687	**Chlorococcaceae*	*spp*	.	.	.	> 1 um ovoid	Vegetative	12.00	56.696	0.28	22,798.763	0.91
2021	*Actinastrum*	*hantzschii*	.	.	.	.	Vegetative	17.60	56.696	0.28	2,407.550	0.10
2035	*Ankistrodesmus*	*convolutus*	.	.	.	.	Vegetative	16.00	113.392	0.56	2,917.558	0.12
1000031	*Ankistrodesmus*	*falcatus*	.	.	.	straight	Vegetative	20.00	56.696	0.28	170.989	0.01
100285	*Asterococcus*	*limnecticus*	.	.	.	.	Vegetative	10.40	56.696	0.28	26,264.173	1.04
2071	*Characium*	*limneticum*	.	.	.	.	Vegetative	50.00	24.910	0.12	5,534.261	0.22

2080	*Chlamydomonas*	*spp*	.	.	.	.	Vegetative	5.07	283.479	1.40	20,979.682	0.83
2171	*Coelastrum*	*microporum*	.	.	.	.	Vegetative	11.20	56.696	0.28	3,283.020	0.13
2175	*Coelastrum*	*pseudomicroporum*	.	.	.	.	Vegetative	17.60	56.696	0.28	6,566.045	0.26
2180	*Cosmarium*	*spp*	.	.	.	.	Vegetative	9.60	56.696	0.28	6,566.045	0.26
2194	*Crucigenia*	*crucifera*	.	.	.	.	Vegetative	51.73	170.088	0.84	119,636.504	4.75
2195	*Crucigenia*	*quadrata*	.	.	.	.	Vegetative	9.60	113.392	0.56	5,303.467	0.21
2193	*Crucigenia*	*tetrapedia*	.	.	.	.	Vegetative	20.00	56.696	0.28	13,933.576	0.55
☑ 2211	*Dictyosphaerium*	*pulchellum*	.	.	.	.	Vegetative	17.60	113.392	0.56	15,234.440	0.61
2323	*Kirchneriella*	*lunaris*	.	.	.	.	Vegetative	12.00	56.696	0.28	1,359.873	0.05
2853	*Lagerheimia*	*quadriseta*	.	.	.	.	Vegetative	4.80	56.696	0.28	683.962	0.03
2031	*Monoraphidium*	*arcuatum*	.	.	.	monoraphidiod	Vegetative	15.00	396.871	1.96	5,808.367	0.23
8041	*Monoraphidium*	*capricornutum*	.	.	.	.	Vegetative	4.00	623.655	3.08	4,847.168	0.19
2340	*Mougeotia*	*spp*	.	.	.	.	Vegetative	200.00	24.910	0.12	62,604.459	2.49
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	11.12	566.959	2.80	90,997.432	3.62
2371	*Pandorina*	*morum*	.	.	.	.	Vegetative	96.00	1.704	0.01	14,049.549	0.56
2761	*Phacotus*	*lendneri*	.	.	.	.	Vegetative	16.00	396.871	1.96	232,499.014	9.24
8101	*Pyramichlamys*	*dissecta*	.	.	.	.	Vegetative	16.00	510.263	2.52	213,738.369	8.49
2480	*Scenedesmus*	*spp*	.	.	.	.	Vegetative	9.60	56.696	0.28	4,650.949	0.18
2484	*Scenedesmus*	*abundans*	.	.	.	.	Vegetative	12.00	24.910	0.12	208.682	0.01
102793	*Scenedesmus*	*acutus*	alternans	.	.	.	Vegetative	20.00	24.910	0.12	2,347.668	0.09
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	6.40	113.392	0.56	3,890.992	0.15
8303	*Scenedesmus*	*opoliensis*	.	carinatus	.	.	Vegetative	8.00	56.696	0.28	474.975	0.02
2884	*Scenedesmus*	*quadricauda*	.	.	.	.	Vegetative	11.20	56.696	0.28	121.596	0.00
8301	*Scenedesmus*	*verrucosus*	.	.	.	.	Vegetative	9.60	113.392	0.56	10,943.402	0.43
2492	*Schroederia*	*setigera*	.	.	.	.	Vegetative	40.00	56.696	0.28	2,735.853	0.11
2641	*Sphaerocystis*	*schroeteri*	.	.	.	.	Vegetative	9.60	56.696	0.28	2,918.244	0.12
2551	*Tetraedron*	*caudatum*	.	.	.	.	Vegetative	18.00	113.392	0.56	14,253.942	0.57
2552	*Tetraedron*	*gracile*	.	.	.	.	Vegetative	24.00	24.910	0.12	4,141.878	0.16
2554	*Tetraedron*	*minimum*	.	.	.	.	Vegetative	6.00	24.910	0.12	1,345.114	0.05

2561	*Tetrastrum*	*staurogeniaeforme*	.	.	.	.	Vegetative	8.00	56.696	0.28	473.076	0.02
Summary for Division ~ Chlorophyta (37 detail records)							**Sum Total Chlorophyta**		5,537.269	27.37	996,347.969	39.60

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3015	*Cryptomonas*	*erosa*	.	.	.	.	Vegetative	21.12	283.479	1.40	235,146.416	9.34
3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	6.40	963.830	4.76	32,298.223	1.28
Summary for Division ~ Cryptophyta (2 detail records)							**Sum Total Cryptophyta**		1,247.309	6.17	267,444.639	10.63

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	**Chroococcaceae*	*spp*	.	.	.	<1 um spherical	Vegetative	0.80	7,653.942	37.83	2,052.022	0.08
4054	*Aphanocapsa*	*delicatissima*	.	.	.	.	Vegetative	4.00	113.392	0.56	356.232	0.01
1000424	*Cyanocatena*	*planctonica*	.	.	.	.	Vegetative	6.67	1,304.005	6.45	2,855.249	0.11
10651	*Cyanogranis*	*ferruginea*	.	.	.	.	Vegetative	11.33	1,530.788	7.57	7,733.543	0.31
107710	*Planktothrix*	*agardhii*	.	.	.	.	Vegetative	280.00	24.910	0.12	49,301.013	1.96
4191	*Pseudanabaena*	*mucicola*	.	.	.	.	Vegetative	9.60	170.088	0.84	1,282.427	0.05
4323	*Synechococcus*	*sp. 1*	.	.	.	< 1um ovoid	Vegetative	1.20	340.175	1.68	136.784	0.01
4285	*Synechocystis*	*spp*	.	.	.	>1 um spherical	Vegetative	1.50	113.392	0.56	198.776	0.01
1000513	*Synechocystis*	*spp*	.	.	.	>=2 um spherical	Vegetative	2.00	907.134	4.48	3,799.802	0.15
Summary for Division ~ Cyanophyta (9 detail records)							**Sum Total Cyanophyta**		12,157.825	60.10	67,715.847	2.69

Division: Euglenophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
5020	*Euglena*	*spp*	.	.	.	.	Vegetative	32.00	1.704	0.01	3,654.930	0.15

5030	*Phacus*	*spp*	.	.	.	.	Vegetative	25.60	56.696	0.28	62,255.814	2.47
5040	*Trachelomonas*	*spp*	.	.	.	.	Vegetative	16.00	56.696	0.28	17,509.447	0.70
Summary for Division ~ Euglenophyta (3 detail records)							**Sum Total Euglenophyta**		115.096	0.57	83,420.190	3.32

Division: Haptophyta

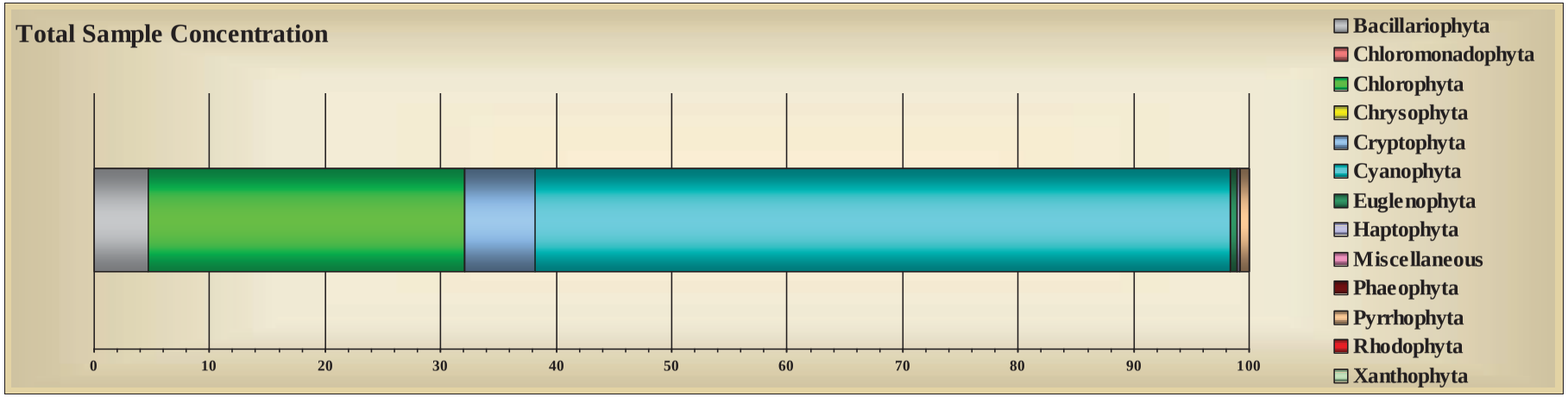
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1731	*Chrysochromulina*	*parva*	.	.	.	.	Vegetative	4.00	56.696	0.28	1,824.660	0.07
Summary for Division ~ Haptophyta (1 detail record)							**Sum Total Haptophyta**		56.696	0.28	1,824.660	0.07

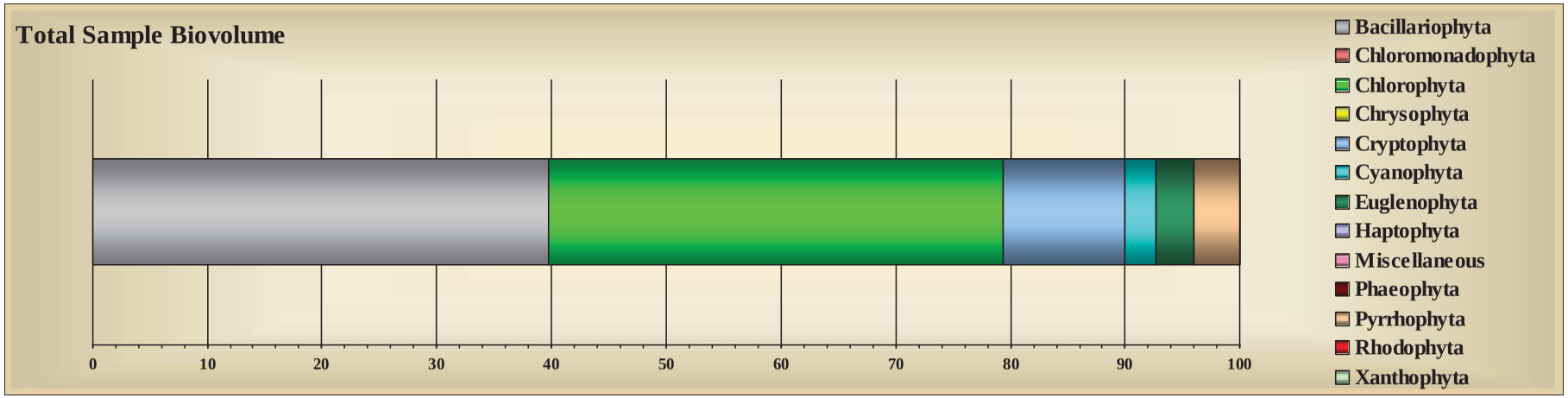
Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
6011	*Ceratium*	*hirundinella*	.	.	.	.	Vegetative	120.00	1.704	0.01	30,438.710	1.21
6033	*Gymnodinium*	*sp. 2*	.	.	.	.	Vegetative	13.60	170.088	0.84	70,106.196	2.79
Summary for Division ~ Pyrrhophyta (2 detail records)							**Sum Total Pyrrhophyta**		171.792	0.85	100,544.906	4.00

Total Sample Concentration	Total Sample Biovolume
20,230.613	2,516,317.642
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





Tracking Code:	160023-327	**Sample ID:**	CCR-2 - Photic Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	9/27/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Photic Composite	**Preservative:**	Lugols
Report Notes:	.				

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
1432	*Aulacoseira*	*granulata*	.	.	.	straight	Vegetative	120.00	21.173	0.02	13,303.447	0.35
1522	*Cyclostephanos*	*tholiformis*	.	.	.	.	Vegetative	8.00	318.914	0.25	64,121.504	1.71
9856	*Cyclotella*	*atomus*	.	.	.	.	Vegetative	4.80	318.914	0.25	13,850.254	0.37
1076	*Cyclotella*	*meneghiniana*	.	.	.	.	Vegetative	12.00	21.173	0.02	14,367.723	0.38
9361	*Cyclotella*	*pseudostelligera*	.	.	.	.	Vegetative	4.80	318.914	0.25	13,850.254	0.37
1071	*Cyclotella*	*sp. 1*	.	.	.	.	Vegetative	4.00	1,594.571	1.24	40,075.880	1.07
1152	*Fragilaria*	*crotonensis*	.	.	.	.	Vegetative	58.00	11.503	0.01	84,420.306	2.25
1222	*Nitzschia*	*gracilis*	.	.	.	.	Vegetative	52.00	21.173	0.02	3,891.259	0.10
9818	*Stephanodiscus*	*medius*	.	.	.	.	Vegetative	14.00	637.829	0.49	729,382.203	19.43
Summary for Division ~ Bacillariophyta (9 detail records)							**Sum Total Bacillariophyta**		3,264.165	2.53	977,262.831	26.03

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
2683	**Chlorococcaceae*	*spp*	.	.	.	2-9.9 um spherical	Vegetative	2.40	637.829	0.49	4,616.730	0.12
2687	**Chlorococcaceae*	*spp*	.	.	.	> 1 um ovoid	Vegetative	12.00	21.173	0.02	8,514.207	0.23
2080	*Chlamydomonas*	*spp*	.	.	.	.	Vegetative	7.60	1,275.657	0.99	353,041.898	9.40

2162	*Closterium*	*moniliferum*	.	.	.	.	Vegetative	80.00	21.173	0.02	9,891.255	0.26
2171	*Coelastrum*	*microporum*	.	.	.	.	Vegetative	10.00	21.173	0.02	5,676.138	0.15
2197	*Crucigenia*	*apiculata*	.	.	.	.	Vegetative	8.00	42.346	0.03	2,394.622	0.06
2194	*Crucigenia*	*crucifera*	.	.	.	.	Vegetative	16.00	637.829	0.49	28,854.659	0.77
2195	*Crucigenia*	*quadrata*	.	.	.	.	Vegetative	12.00	42.346	0.03	4,573.388	0.12
2031	*Monoraphidium*	*arcuatum*	.	.	.	monoraphidiod	Vegetative	13.87	956.743	0.74	9,462.951	0.25
8041	*Monoraphidium*	*capricornutum*	.	.	.	.	Vegetative	4.00	318.914	0.25	2,478.665	0.07
2363	*Oocystis*	*parva*	.	.	.	.	Vegetative	8.00	318.914	0.25	9,233.492	0.25
2761	*Phacotus*	*lendneri*	.	.	.	.	Vegetative	14.40	956.743	0.74	432,189.302	11.51
8101	*Pyramichlamys*	*dissecta*	.	.	.	.	Vegetative	16.00	3,508.057	2.72	1,469,451.286	39.14
2480	*Scenedesmus*	*spp*	.	.	.	.	Vegetative	26.00	42.346	0.03	5,498.759	0.15
2484	*Scenedesmus*	*abundans*	.	.	.	.	Vegetative	12.00	127.039	0.10	3,591.927	0.10
8399	*Scenedesmus*	*acutus*	.	.	.	.	Vegetative	8.00	21.173	0.02	784.021	0.02
2483	*Scenedesmus*	*bijuga*	.	.	.	.	Vegetative	4.80	318.914	0.25	2,308.365	0.06
8226	*Scenedesmus*	*intermedius*	.	.	.	.	Vegetative	16.00	21.173	0.02	147.668	0.00
8303	*Scenedesmus*	*opoliensis*	.	carinatus	.	.	Vegetative	8.00	318.914	0.25	4,616.762	0.12
2491	*Schroederia*	*judayi*	.	.	.	.	Vegetative	30.00	21.173	0.02	554.310	0.01
2551	*Tetraedron*	*caudatum*	.	.	.	.	Vegetative	10.00	21.173	0.02	402.736	0.01
2561	*Tetrastrum*	*staurogeniaeforme*	.	.	.	.	Vegetative	8.00	21.173	0.02	594.663	0.02
Summary for Division ~ Chlorophyta (22 detail records)							**Sum Total Chlorophyta**		9,671.975	7.50	2,358,877.803	62.83

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
3015	*Cryptomonas*	*erosa*	.	.	.	.	Vegetative	20.00	127.039	0.10	101,993.105	2.72
3043	*Rhodomonas*	*minuta*	.	nannoplanctica	.	.	Vegetative	8.00	956.743	0.74	32,060.736	0.85
Summary for Division ~ Cryptophyta (2 detail records)							**Sum Total Cryptophyta**		1,083.781	0.84	134,053.841	3.57

Division: Cyanophyta

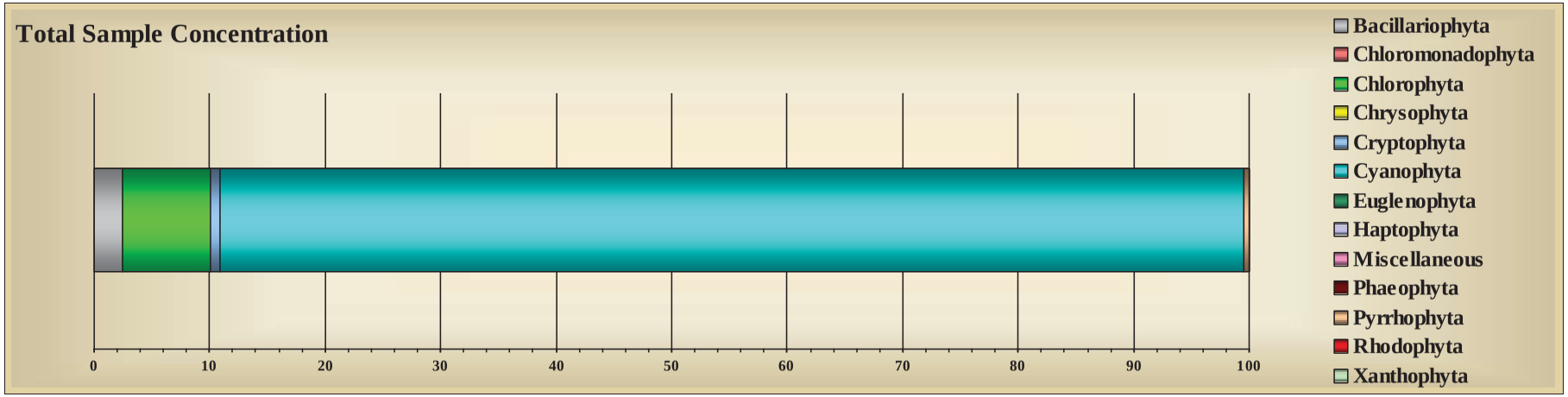
Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
4282	*Chroococcaceae	spp	.	.	.	<1 um spherical	Vegetative	0.80	77,815.076	60.37	20,862.222	0.56
4046	Cuspidothrix	issatschenkoi	.	.	.	.	Vegetative	320.00	21.173	0.02	47,892.411	1.28
1000424	Cyanocatena	planctonica	.	.	.	.	Vegetative	4.80	2,870.228	2.23	4,524.915	0.12
10651	Cyanogranis	ferruginea	.	.	.	.	Vegetative	9.92	3,826.971	2.97	19,526.737	0.52
107710	Planktothrix	agardhii	.	.	.	.	Vegetative	240.00	21.173	0.02	35,919.308	0.96
4323	Synechococcus	sp. 1	.	.	.	< 1um ovoid	Vegetative	1.20	28,064.454	21.77	11,284.717	0.30
4285	Synechocystis	spp	.	.	.	>1 um spherical	Vegetative	1.50	956.743	0.74	1,677.170	0.04
1000513	Synechocystis	spp	.	.	.	>=2 um spherical	Vegetative	1.60	637.829	0.49	1,367.951	0.04
Summary for Division ~ Cyanophyta (8 detail records)							**Sum Total Cyanophyta**		114,213.646	88.61	143,055.430	3.81

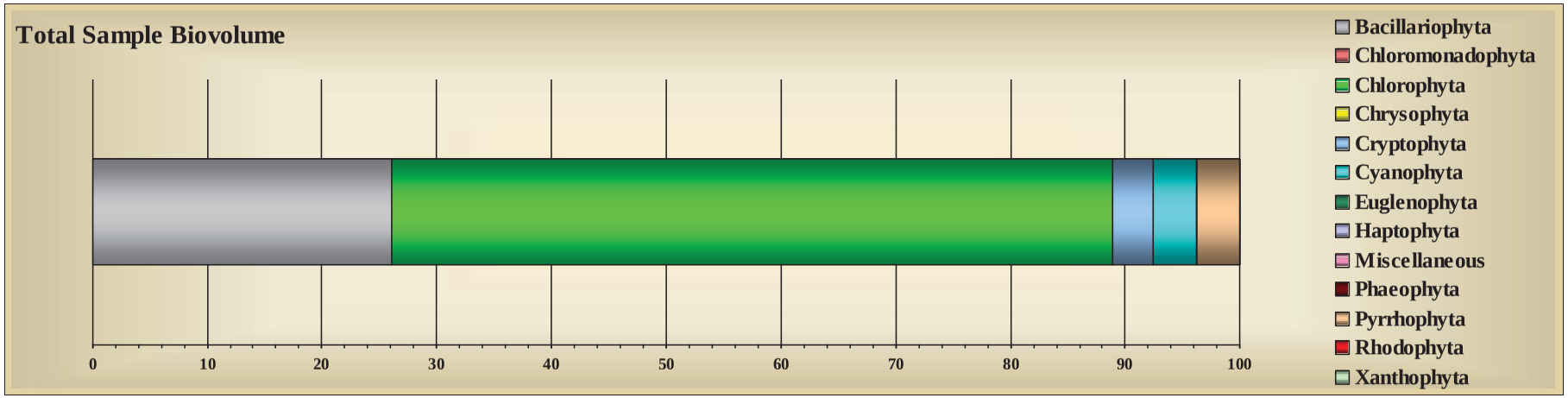
Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	GALD µm	Count NU/ml	Relative Count	Total Biovolume µm^3 /ml	Relative Total Biovolume
6033	Gymnodinium	sp. 2	.	.	.	.	Vegetative	10.00	21.173	0.02	3,547.586	0.09
6034	Gymnodinium	sp. 3	.	.	.	.	Vegetative	4.00	318.914	0.25	3,419.813	0.09
6044	Peridinium	umbonatum	.	.	.	.	Vegetative	12.80	318.914	0.25	134,056.720	3.57
Summary for Division ~ Pyrrhophyta (3 detail records)							**Sum Total Pyrrhophyta**		659.002	0.51	141,024.119	3.76

Total Sample Concentration	Total Sample Biovolume
128,892.569	3,754,274.024
NU/ml	µm^3 /ml

SUMMARY GRAPHICS





☑ = Identification is Uncertain
* = Family Level Identification

Species List

Division: Bacillariophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1432	Aulacoseira	granulata	.	.	.		Vegetative	(Ehrenberg) Simonsen
1522	Cyclostephanos	tholiformis	.	.	.		Vegetative	Stoermer H†k. & Theriot
9856	Cyclotella	atomus	.	.	.		Vegetative	Hust.
1076	Cyclotella	meneghiniana	.	.	.		Vegetative	Kutzing
9361	Cyclotella	pseudostelligera	.	.	.		Vegetative	(Hustedt) Houk and Klee
1071	Cyclotella	sp. 1	.	.	.		Vegetative	(Kutzing) de Brebisson
1152	Fragilaria	crotonensis	.	.	.		Vegetative	Kitton
1222	Nitzschia	gracilis	.	.	.		Vegetative	Hantzsch
9818	Stephanodiscus	medius	.	.	.		Vegetative	Hakansson

Division: Chlorophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
2683	*Chlorococcaceae	spp	.	.	.		Vegetative	N/A
2687	*Chlorococcaceae	spp	.	.	.		Vegetative	(Brandt) Beijerinck
2021	Actinastrum	hantzschii	.	.	.		Vegetative	Lagerheim
2035	Ankistrodesmus	convolutus	.	.	.		Vegetative	Corda
1000031	Ankistrodesmus	falcatus	.	.	.		Vegetative	(Corda) Ralfs
100285	Asterococcus	limnecticus	.	.	.		Vegetative	G. M. Smith
2071	Characium	limneticum	.	.	.		Vegetative	Lemmermann
2080	Chlamydomonas	spp	.	.	.		Vegetative	Ehrenberg
2162	Closterium	moniliferum	.	.	.		Vegetative	(Bory) Ehrenberg
2171	Coelastrum	microporum	.	.	.		Vegetative	Naeg
2175	Coelastrum	pseudomicroporum	.	.	.		Vegetative	Kors
2180	Cosmarium	spp	.	.	.		Vegetative	Corda

2197	Crucigenia	apiculata	.	.	.	Vegetative	(Lemmermann) Schmidle
2194	Crucigenia	crucifera	.	.	.	Vegetative	(Wolle) Collins
2195	Crucigenia	quadrata	.	.	.	Vegetative	C. Morren
2193	Crucigenia	tetrapedia	.	.	.	Vegetative	(Kirch.) W. West and G. S. West
2211	Dictyosphaerium	pulchellum	.	.	.	Vegetative	Wood
2323	Kirchneriella	lunaris	.	.	.	Vegetative	(Kirchner) Moebius
2853	Lagerheimia	quadriseta	.	.	.	Vegetative	(Lemmermann) G.M. Smith
2031	Monoraphidium	arcuatum	.	.	.	Vegetative	(Corda) Ralfs
8041	Monoraphidium	capricornutum	.	.	.	Vegetative	(Printz) Nygaard
2340	Mougeotia	spp	.	.	.	Vegetative	Kisselew
2363	Oocystis	parva	.	.	.	Vegetative	West & West
2371	Pandorina	morum	.	.	.	Vegetative	(O. Muller) Bory De St Vincent
2761	Phacotus	lendneri	.	.	.	Vegetative	Chodat
8101	Pyramichlamys	dissecta	.	.	.	Vegetative	(Tiffana) Ettl
2480	Scenedesmus	spp	.	.	.	Vegetative	Meyen
2484	Scenedesmus	abundans	.	.	.	Vegetative	(Kirchn.) Chodat
8399	Scenedesmus	acutus	.	.	.	Vegetative	Lagh. Chodat
102793	Scenedesmus	acutus	alternans	.	.	Vegetative	Hortobagyi 1941
2483	Scenedesmus	bijuga	.	.	.	Vegetative	(Turpin) Lagerh.
8226	Scenedesmus	intermedius	.	.	.	Vegetative	Chodat
8303	Scenedesmus	opoliensis	.	carinatus	.	Vegetative	Lemmermann
2884	Scenedesmus	quadricauda	.	.	.	Vegetative	(Turpin) Breb.
8301	Scenedesmus	verrucosus	.	.	.	Vegetative	Roll
2491	Schroederia	judayi	.	.	.	Vegetative	G. M. Smith
2492	Schroederia	setigera	.	.	.	Vegetative	(Schroeder) Lemmermann
2641	Sphaerocystis	schroeteri	.	.	.	Vegetative	Chodat
2551	Tetraedron	caudatum	.	.	.	Vegetative	(Corda) Hansgirg

2552	Tetraedron	gracile	.	.	.		Vegetative	(Reinsch) Hansgrig
2554	Tetraedron	minimum	.	.	.		Vegetative	(Braun) Hansgirg
2561	Tetrastrum	staurogeniaeforme	.	.	.		Vegetative	(Schroeder) Lemm.

Division: Cryptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
3015	Cryptomonas	erosa	.	.	.		Vegetative	Ehrenberg .
3043	Rhodomonas	minuta	.	nannoplanctica	.		Vegetative	Skuja

Division: Cyanophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
4282	*Chroococcaceae	spp	.	.	.		Vegetative	N/A
4054	Aphanocapsa	delicatissima	.	.	.		Vegetative	West & West
4046	Cuspidothrix	issatschenkoi	.	.	.		Vegetative	(Usachev) Rajaniemi, Komárek, Willame, Hrouzek,
1000424	Cyanocatena	planctonica	.	.	.		Vegetative	Hindak
10651	Cyanogranis	ferruginea	.	.	.		Vegetative	Hindak
107710	Planktothrix	agardhii	.	.	.		Vegetative	(Gomont) Anag. and Komar
4191	Pseudanabaena	mucicola	.	.	.		Vegetative	Naumann & Huber-Pestalozzi
4323	Synechococcus	sp. 1	.	.	.		Vegetative	Nageli
1000513	Synechocystis	spp	.	.	.		Vegetative	.
4285	Synechocystis	spp	.	.	.		Vegetative	N/A

Division: Euglenophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
5020	Euglena	spp	.	.	.		Vegetative	Ehrenberg
5030	Phacus	spp	.	.	.		Vegetative	Dujardin .
5040	Trachelomonas	spp	.	.	.		Vegetative	Ehrenberg .

Division: Haptophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
1731	Chrysochromulina	parva	.	.	.		Vegetative	Lackey

Division: Pyrrhophyta

Taxa ID	Genus	Species	Subspecies	Variety	Form	PhysiState	Structure	Authority
6011	Ceratium	hirundinella	.	.	.		Vegetative	Dujardin
6033	Gymnodinium	sp. 2	.	.	.		Vegetative	Stein
6034	Gymnodinium	sp. 3	.	.	.		Vegetative	Stein
6044	Peridinium	umbonatum	.	.	.		Vegetative	Stein

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Zooplankton Analysis with Biomass Estimates

Report and Data Set

Customer ID: 327

Tracking Code:	160002-327	**Sample ID:**	CCR - Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	3/16/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.12	63.164	38.64	4.996	3.62
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	63.164	38.64	4.996	3.62

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.70	74.311	45.45	93.493	67.82
☑ 1000412	*Diacyclops*	*thomasi*	.	.	Adults	Whole Animal	0.97	14.862	9.09	39.315	28.52
Summary for Order ~ Cyclopoida (2 detail records)						**Sum Total**	**Cyclopoida**	89.173	54.55	132.808	96.33

☑ = Identification is Uncertain
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Phylum: Rotifera

Order: Bdelloida

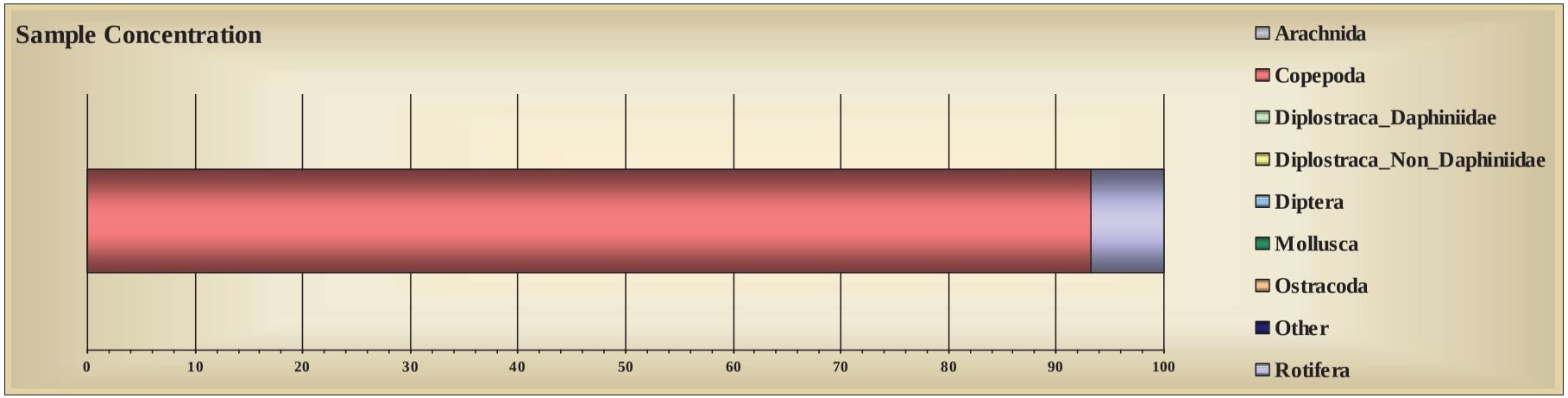
	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
☑	1000752	*Rotaria*	*spp*	.	.	.	Whole Animal	0.10	3.716	2.27	0.027	0.02
	Summary for Order ~ Bdelloida (1 detail record)						**Sum Total Bdelloida**		3.716	2.27	0.027	0.02

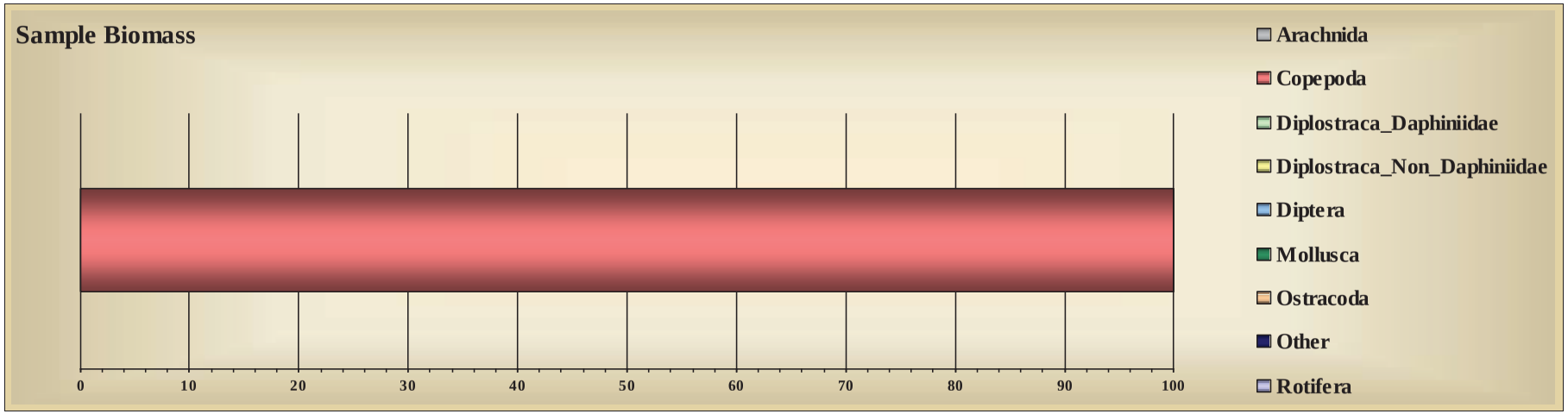
Order: Ploima

	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
	125281	*Keratella*	*cochlearis*	.	.	.	Whole Animal	0.16	7.431	4.55	0.030	0.02
	Summary for Order ~ Ploima (1 detail record)						**Sum Total Ploima**		7.431	4.55	0.030	0.02

Total Sample Concentration	Total Sample Cell Concentration
163.484	137.861

SUMMARY GRAPHICS





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Tracking Code:	160004-327	**Sample ID:**	CCR - Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	4/12/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.13	14.756	40.54	1.444	2.84
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	14.756	40.54	1.444	2.84

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.75	8.854	24.32	13.168	25.88
☑ 1000412	*Diacyclops*	*thomasi*	.	.	Adults	Whole Animal	1.10	9.837	27.03	36.208	71.17
Summary for Order ~ Cyclopoida (2 detail records)						**Sum Total**	**Cyclopoida**	18.691	51.35	49.376	97.06

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Phylum: Rotifera

Order: Bdelloida

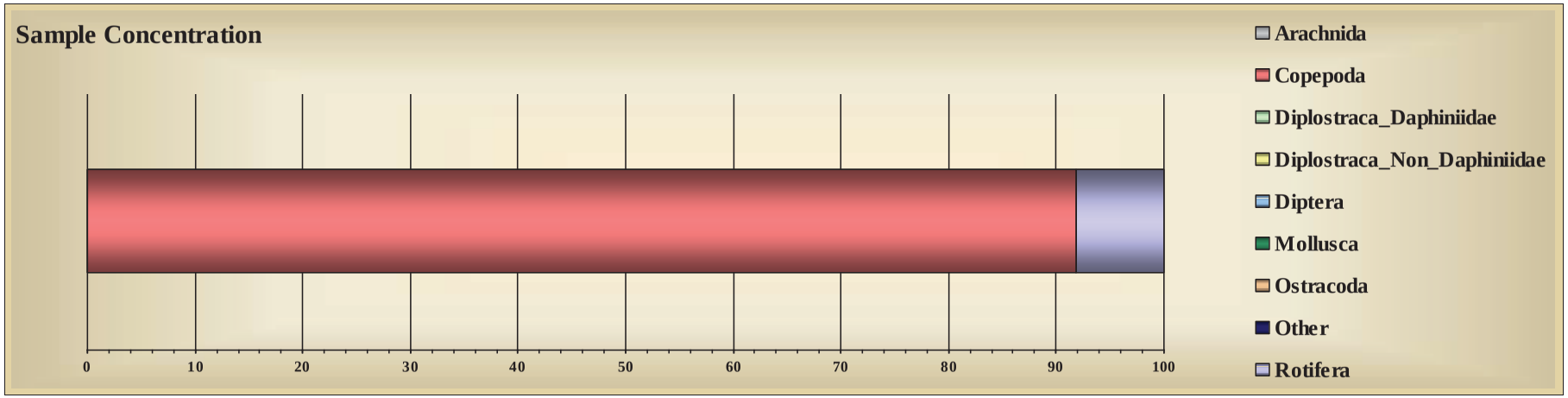
	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
☑	1000752	*Rotaria*	*spp*	.	.	.	Whole Animal	0.19	0.984	2.70	0.015	0.03
	Summary for Order ~ Bdelloida (1 detail record)						**Sum Total Bdelloida**		0.984	2.70	0.015	0.03

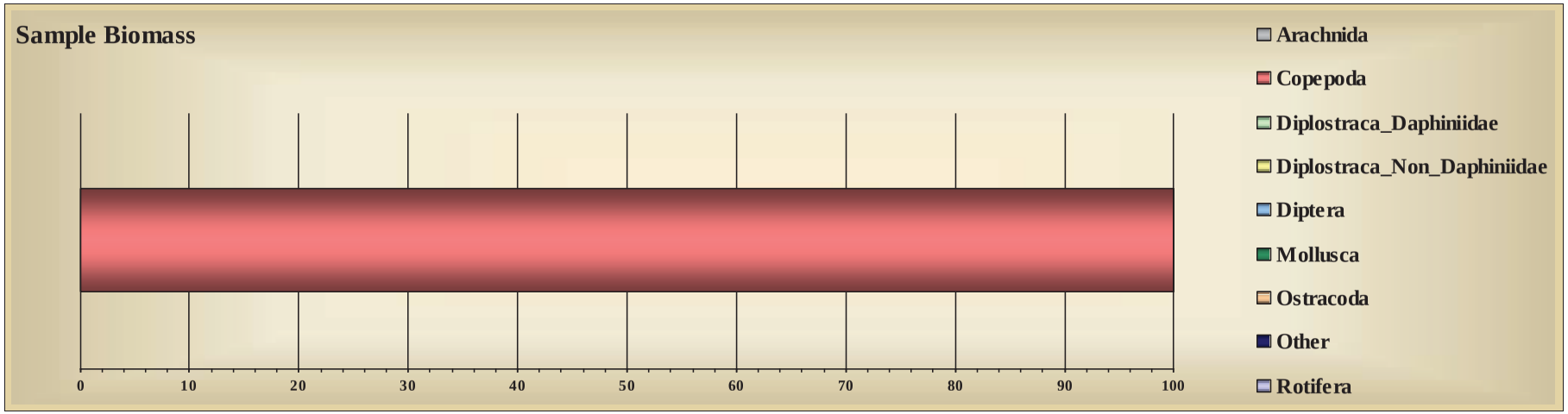
Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
125278	*Kellicottia*	*longispina*	.	.	.	Whole Animal	0.48	0.984	2.70	0.024	0.05
125281	*Keratella*	*cochlearis*	.	.	.	Whole Animal	0.23	0.984	2.70	0.015	0.03
Summary for Order ~ Ploima (2 detail records)						**Sum Total Ploima**		1.967	5.41	0.039	0.08

Total Sample Concentration	Total Sample Cell Concentration
36.398	50.873

SUMMARY GRAPHICS





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Tracking Code:	160006-327	**Sample ID:**	CCR - Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	5/10/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.14	192.090	48.37	21.827	7.84
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	192.090	48.37	21.827	7.84

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
☑ 1000412	*Diacyclops*	*thomasi*	.	.	Adults	Whole Animal	0.96	11.082	2.79	30.166	10.83
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.60	160.691	40.47	138.515	49.74
Summary for Order ~ Cyclopoida (2 detail records)						**Sum Total**	**Cyclopoida**	171.773	43.26	168.681	60.58

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Phylum: Arthropoda

Order: Diplostraca

	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
☑	1000879	*Daphnia*	*mendotae*	.	.	Female	Whole Animal	0.89	14.776	3.72	56.919	20.44
	1000145	*Ceriodaphnia*	*reticulata*	.	.	.	Whole Animal	0.48	5.541	1.40	12.313	4.42
	Summary for Order ~ Diplostraca (2 detail records)						**Sum Total Diplostraca**		20.317	5.12	69.233	24.86

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
104165	*Bosmina*	*longirostris*	.	.	.	Whole Animal	0.39	7.388	1.86	7.721	2.77
Summary for Order ~ Diplostraca (1 detail record)						**Sum Total Diplostraca**		7.388	1.86	7.721	2.77

Phylum: Rotifera

Order: Bdelloida

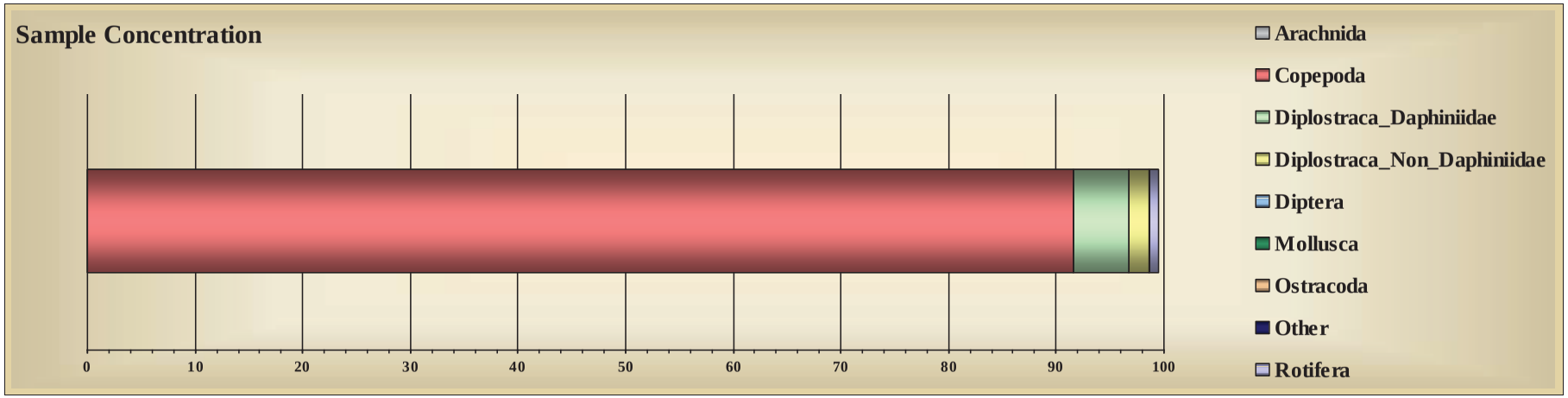
	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
☑	1000752	*Rotaria*	*spp*	.	.	.	Whole Animal	0.10	1.847	0.47	0.014	0.00
	Summary for Order ~ Bdelloida (1 detail record)						**Sum Total Bdelloida**		1.847	0.47	0.014	0.00

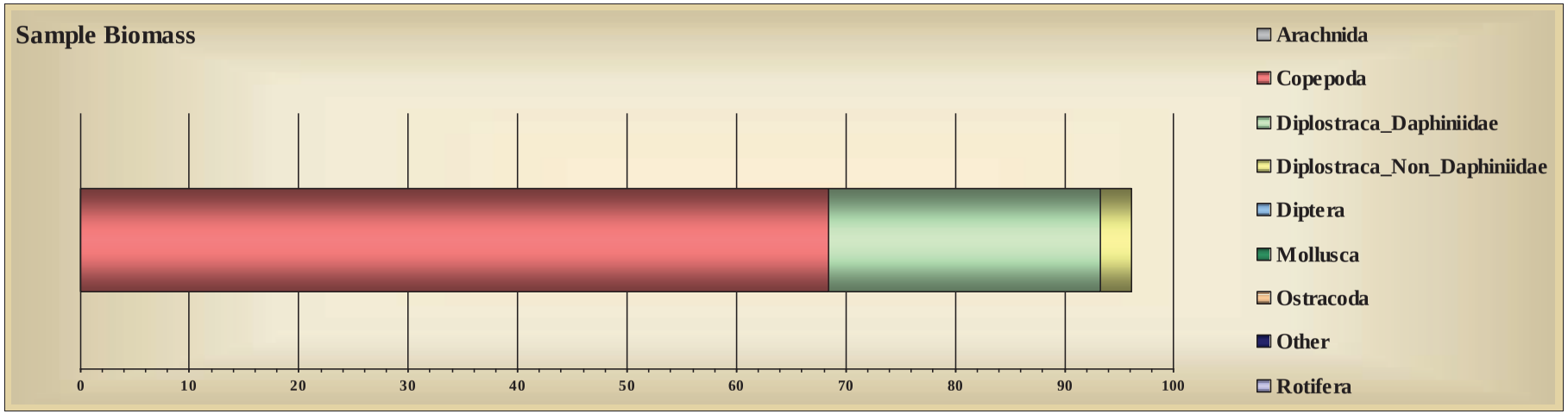
Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
125281	*Keratella*	*cochlearis*	.	.	.	Whole Animal	0.18	1.847	0.47	0.009	0.00
Summary for Order ~ Ploima (1 detail record)						**Sum Total Ploima**		1.847	0.47	0.009	0.00

Total Sample Concentration	Total Sample Cell Concentration
395.262	267.484

SUMMARY GRAPHICS





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Tracking Code:	160008-327	**Sample ID:**	CCR-2 Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	5/24/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.17	92.147	24.11	14.101	3.61
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	92.147	24.11	14.101	3.61

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
100212	*Leptodiaptomus*	*ashlandi*	.	.	Adults	Whole Animal	1.15	5.420	1.42	22.024	5.64
Summary for Order ~ Calanoida (1 detail record)						**Sum Total**	**Calanoida**	5.420	1.42	22.024	5.64

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.53	195.136	51.06	120.714	30.89
Summary for Order ~ Cyclopoida (1 detail record)						**Sum Total**	**Cyclopoida**	195.136	51.06	120.714	30.89

Phylum: Arthropoda

Order: Diplostraca

	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
☑	1000879	*Daphnia*	*mendotae*	.	.	Female	Whole Animal	0.81	54.204	14.18	158.434	40.55
	1000149	*Daphnia*	*retrocurva*	.	.	Female	Whole Animal	0.82	13.551	3.55	61.625	15.77
	Summary for Order ~ Diplostraca (2 detail records)						**Sum Total Diplostraca**		67.755	17.73	220.059	56.32

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
104165	*Bosmina*	*longirostris*	.	.	.	Whole Animal	0.36	16.261	4.26	13.817	3.54
Summary for Order ~ Diplostraca (1 detail record)						**Sum Total Diplostraca**		16.261	4.26	13.817	3.54

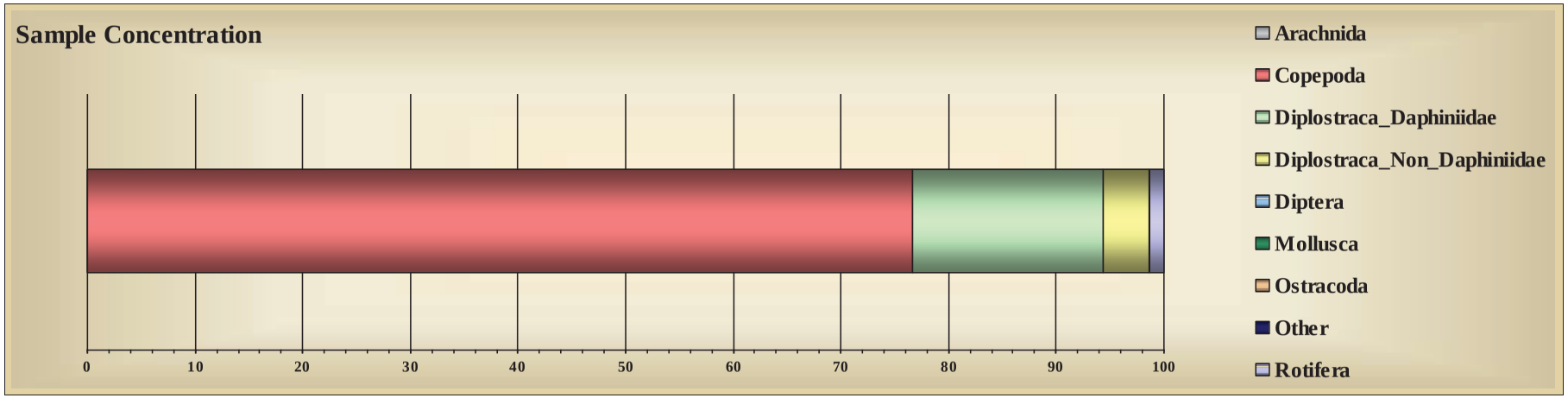
Phylum: Rotifera

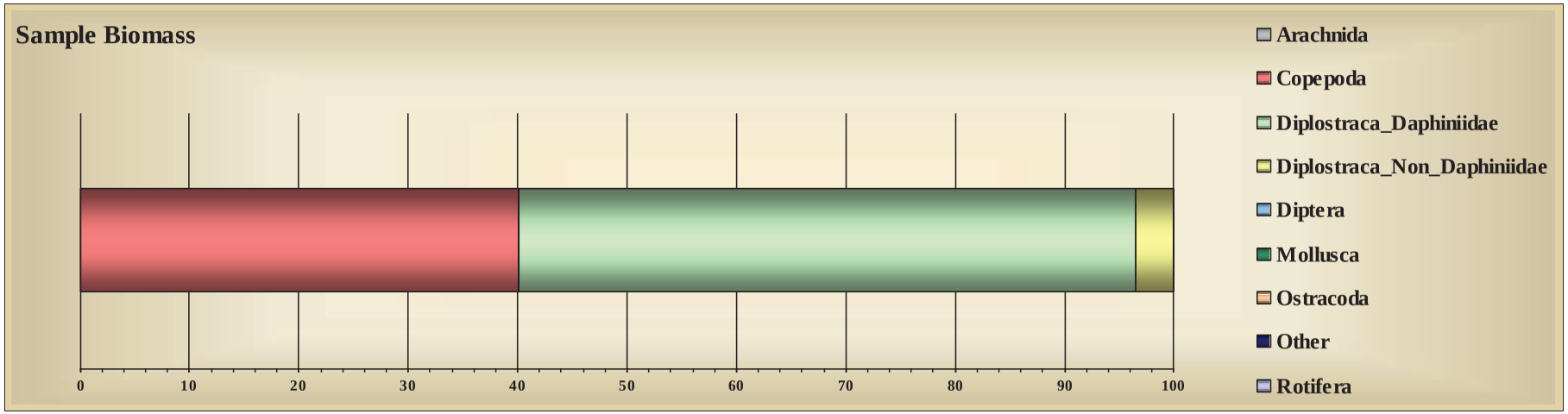
Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
125281	*Keratella*	*cochlearis*	.	.	.	Whole Animal	0.17	5.420	1.42	0.027	0.01
Summary for Order ~ Ploima (1 detail record)						**Sum Total Ploima**		5.420	1.42	0.027	0.01

Total Sample Concentration	Total Sample Cell Concentration
382.141	390.742

SUMMARY GRAPHICS





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Species List

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000531	*.	spp	.	.	.	NI-NVI	Whole Animal	Sars, 1903

Order: Bdelloida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000752	Rotaria	spp	.	.	.	.	Whole Animal	.

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
100212	Leptodiaptomus	ashlandi	.	.	.	Adults	Whole Animal	Marsh, 1893

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000248	*.	spp	.	.	.	CI-CV	Whole Animal	Burmeister, 1834
1000412	Diacyclops	thomasi	.	.	.	Adults	Whole Animal	S. A. Forbes, 1882

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000145	Ceriodaphnia	reticulata	.	.	.	.	Whole Animal	Mean of C. lacustris, C. quadrangula and C. reticula
1000149	Daphnia	retrocurva	.	.	.	Female	Whole Animal	Forbes, 1882
1000879	Daphnia	mendotae	.	.	.	Female	Whole Animal	Birge
104165	Bosmina	longirostris	.	.	.	.	Whole Animal	O. F. Mueller, 1785

Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
125278	Kellicottia	longispina	.	.	.	.	Whole Animal	Kellicott 1879)
125281	Keratella	cochlearis	.	.	.	.	Whole Animal	(Gosse 1851)

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Zooplankton Analysis with Biomass Estimates

Report and Data Set

Customer ID: 327

Tracking Code:	160010-327	**Sample ID:**	CCR-2 Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	6/14/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.15	77.626	13.73	10.266	1.53
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	77.626	13.73	10.266	1.53

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000344	*.	*spp*	.	.	CI-CIV	Whole Animal	0.64	22.179	3.92	31.799	4.72
100212	*Leptodiaptomus*	*ashlandi*	.	.	Adults	Whole Animal	1.15	13.862	2.45	56.322	8.37
Summary for Order ~ Calanoida (2 detail records)						**Sum Total**	**Calanoida**	36.041	6.37	88.120	13.09

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.48	19.406	3.43	9.672	1.44
1000412	*Diacyclops*	*thomasi*	.	.	Adults	Whole Animal	1.25	2.772	0.49	13.527	2.01
Summary for Order ~ Cyclopoida (2 detail records)						**Sum Total**	**Cyclopoida**	22.179	3.92	23.198	3.45

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Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000879	*Daphnia*	*mendotae*	.	.	Female	Whole Animal	0.98	55.447	9.80	513.557	76.31
Summary for Order ~ Diplostraca (1 detail record)						**Sum Total**	**Diplostraca**	55.447	9.80	513.557	76.31

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000240	*Daphnia*	*sp.*	.	.	Neonates	Whole Animal	0.24	2.772	0.49	0.890	0.13
104165	*Bosmina*	*longirostris*	.	.	.	Whole Animal	0.42	22.179	3.92	31.025	4.61
Summary for Order ~ Diplostraca (2 detail records)						**Sum Total**	**Diplostraca**	24.951	4.41	31.915	4.74

Phylum: Protozoa

Order: Arcellinida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000425	*Difflugia*	*spp*	.	.	.	Whole Animal	0.08	2.772	0.49	0.500	0.07
Summary for Order ~ Arcellinida (1 detail record)						**Sum Total**	**Arcellinida**	2.772	0.49	0.500	0.07

Phylum: Rotifera

Order: Floscularíaceae

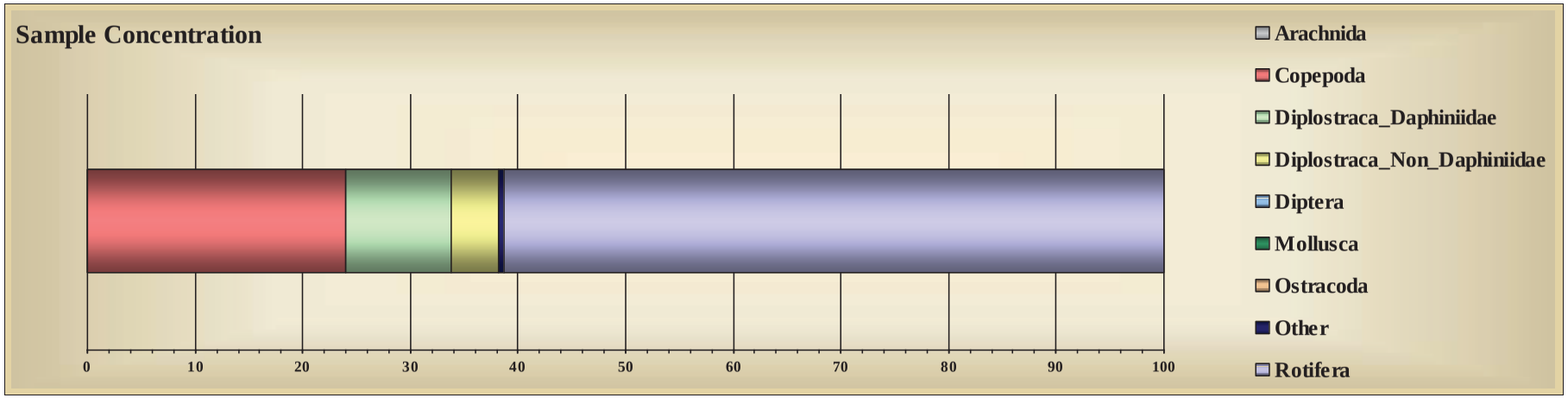
Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
125572	*Conochilus*	*unicornis*	.	.	.	Whole Animal	0.12	2.772	0.49	0.012	0.00
Summary for Order ~ Floscularíaceae (1 detail record)						**Sum Total Floscularíaceae**		2.772	0.49	0.012	0.00

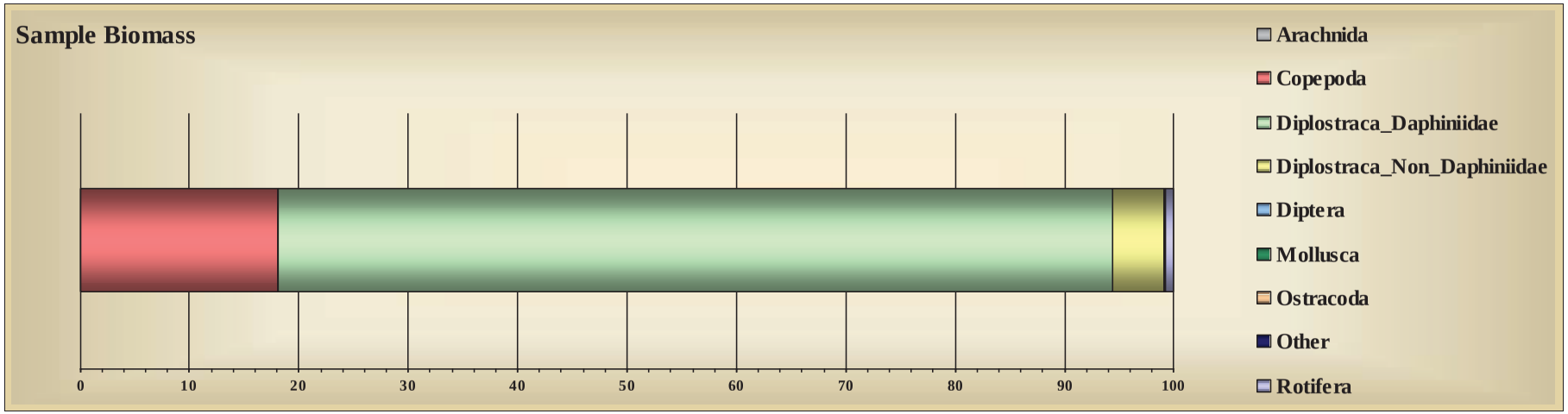
Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
126145	*Polyarthra*	*dolichoptera*	.	.	.	Whole Animal	0.11	2.772	0.49	0.091	0.01
125327	*Brachionus*	*calyciflorus*	.	.	.	Whole Animal	0.16	2.772	0.49	0.145	0.02
125406	*Keratella*	*quadrata*	.	.	.	Whole Animal	0.31	8.317	1.47	3.047	0.45
125281	*Keratella*	*cochlearis*	.	.	.	Whole Animal	0.17	329.909	58.33	2.151	0.32
Summary for Order ~ Ploima (4 detail records)						**Sum Total Ploima**		343.771	60.78	5.434	0.81

Total Sample Concentration	Total Sample Cell Concentration
565.558	673.002

SUMMARY GRAPHICS





☑ = Identification is Uncertain
* = Family Level Identification
^ = Subclass Level Identification

Tracking Code:	160012-327	**Sample ID:**	CCR-2 Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	6/28/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	0
System Name:	Cherry Creek	**Site:**	CCR-2 Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.15	136.130	47.65	16.398	8.07
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	136.130	47.65	16.398	8.07

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
100212	*Leptodiaptomus*	*ashlandi*	.	.	Adults	Whole Animal	1.12	5.752	2.01	21.790	10.72
Summary for Order ~ Calanoida (1 detail record)						**Sum Total**	**Calanoida**	5.752	2.01	21.790	10.72

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.29	1.917	0.67	0.238	0.12
Summary for Order ~ Cyclopoida (1 detail record)						**Sum Total**	**Cyclopoida**	1.917	0.67	0.238	0.12

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000879	*Daphnia*	*mendotae*	.	.	Female	Whole Animal	1.18	9.587	3.36	124.370	61.19
Summary for Order ~ Diplostraca (1 detail record)						**Sum Total**	**Diplostraca**	9.587	3.36	124.370	61.19

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
104165	*Bosmina*	*longirostris*	.	.	.	Whole Animal	0.30	70.941	24.83	35.444	17.44
Summary for Order ~ Diplostraca (1 detail record)						**Sum Total**	**Diplostraca**	70.941	24.83	35.444	17.44

Phylum: Rotifera

Order: Flosculariaceae

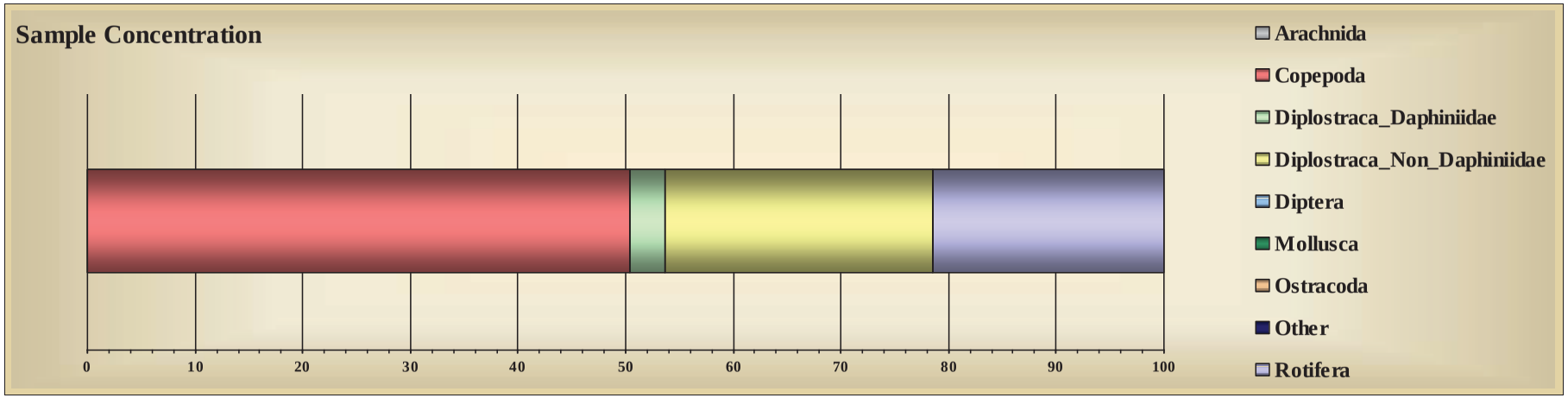
	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
	125572	*Conochilus*	*unicornis*	.	.	.	Whole Animal	0.10	13.421	4.70	0.049	0.02
☑	1000556	*Ptygura*	*spp*	.	.	.	Whole Animal	0.14	13.421	4.70	0.042	0.02
	Summary for Order ~ Flosculariaceae (2 detail records)						**Sum Total Flosculariaceae**		26.843	9.40	0.091	0.04

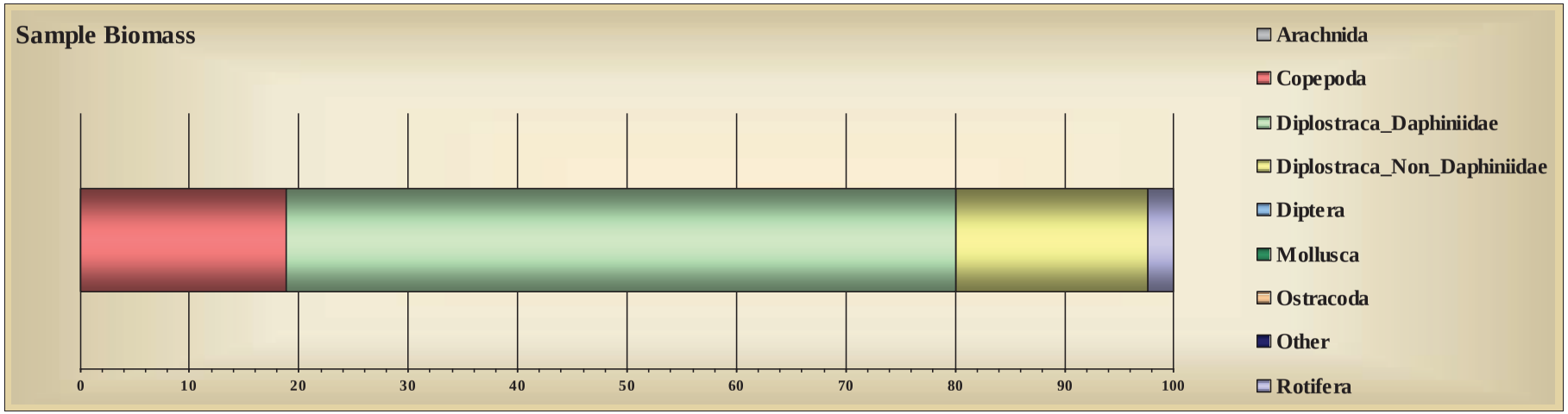
Order: Ploima

	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
	126164	*Synchaeta*	*pectinata*	.	.	.	Whole Animal	0.23	3.835	1.34	0.538	0.26
☑	125304	*Asplanchna*	*girodi*	.	.	.	Whole Animal	0.48	3.835	1.34	3.648	1.80
	125281	*Keratella*	*cochlearis*	.	.	.	Whole Animal	0.19	23.008	8.05	0.130	0.06
	125406	*Keratella*	*quadrata*	.	.	.	Whole Animal	0.28	3.835	1.34	0.597	0.29
	Summary for Order ~ Ploima (4 detail records)						**Sum Total Ploima**		34.512	12.08	4.914	2.42

Total Sample Concentration	Total Sample Cell Concentration
285.682	203.245

SUMMARY GRAPHICS





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Species List

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000531	*.	spp	.	.	.	NI-NVI	Whole Animal	Sars, 1903

Order: Arcellinida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000425	Difflugia	spp	.	.	.	.	Whole Animal	Unknown

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000344	*.	spp	.	.	.	CI-CIV	Whole Animal	Sars, 1903
100212	Leptodiaptomus	ashlandi	.	.	.	Adults	Whole Animal	Marsh, 1893

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000248	*.	spp	.	.	.	CI-CV	Whole Animal	Burmeister, 1834
1000412	Diacyclops	thomasi	.	.	.	Adults	Whole Animal	S. A. Forbes, 1882

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000240	Daphnia	sp.	.	.	.	Neonates	Whole Animal	O. F. Mueller, 1785
1000879	Daphnia	mendotae	.	.	.	Female	Whole Animal	Birge
104165	Bosmina	longirostris	.	.	.	.	Whole Animal	O. F. Mueller, 1785

Order: Flosculariaceae

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000556	Ptygura	spp	.	.	.	.	Whole Animal	.
125572	Conochilus	unicornis	.	.	.	.	Whole Animal	Rousselet 1892

Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
125281	Keratella	cochlearis	.	.	.	.	Whole Animal	(Gosse 1851)
125304	Asplanchna	girodi	.	.	.	.	Whole Animal	De Geurne 1888
125327	Brachionus	calyciflorus	.	.	.	.	Whole Animal	Pallas 1766
125406	Keratella	quadrata	.	.	.	.	Whole Animal	(O. F. Muller 1786)
126145	Polyarthra	dolichoptera	.	.	.	.	Whole Animal	Idelson 1925
126164	Synchaeta	pectinata	.	.	.	.	Whole Animal	Ehrenberg 1832

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Zooplankton Analysis with Biomass Estimates

Report and Data Set

Customer ID: 327

Tracking Code:	160014-327	**Sample ID:**	CCR-2 Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	7/12/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	6
System Name:	Cherry Creek	**Site:**	CCR-2 Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.17	25.497	38.60	4.108	15.43
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	25.497	38.60	4.108	15.43

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
100212	*Leptodiaptomus*	*ashlandi*	.	.	Adults	Whole Animal	1.20	3.477	5.26	15.748	59.16
Summary for Order ~ Calanoida (1 detail record)						**Sum Total**	**Calanoida**	3.477	5.26	15.748	59.16

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
104165	*Bosmina*	*longirostris*	.	.	.	Whole Animal	0.26	15.067	22.81	5.766	21.66
Summary for Order ~ Diplostraca (1 detail record)						**Sum Total**	**Diplostraca**	15.067	22.81	5.766	21.66

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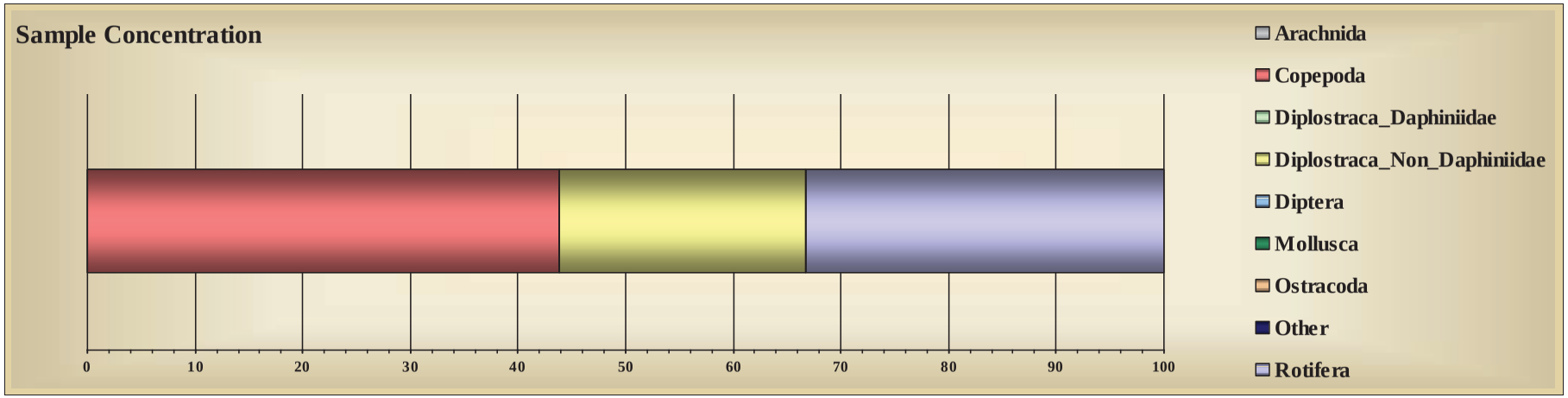
Phylum: **Rotifera**

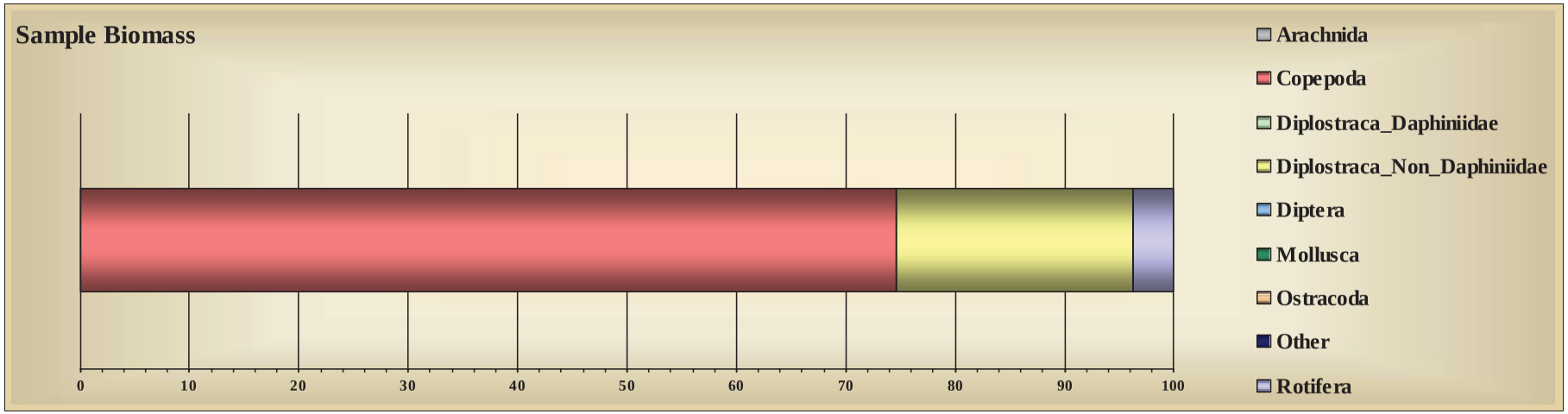
Order: **Ploima**

	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
	125327	*Brachionus*	*calyciflorus*	.	.	.	Whole Animal	0.16	11.590	17.54	0.630	2.37
☑	1000423	*Gastropus*	*spp*	.	.	.	Whole Animal	0.10	1.159	1.75	0.021	0.08
	125406	*Keratella*	*quadrata*	.	.	.	Whole Animal	0.24	1.159	1.75	0.240	0.90
	126145	*Polyarthra*	*dolichoptera*	.	.	.	Whole Animal	0.08	1.159	1.75	0.015	0.06
☑	126164	*Synchaeta*	*pectinata*	.	.	.	Whole Animal	0.10	6.954	10.53	0.092	0.35
	Summary for Order ~ Ploima (5 detail records)						**Sum Total Ploima**		22.021	33.33	0.998	3.75

Total Sample Concentration	Total Sample Cell Concentration
66.061	26.620

SUMMARY GRAPHICS





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Tracking Code:	160016-327	**Sample ID:**	CCR-2 Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	7/26/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	6
System Name:	Cherry Creek	**Site:**	CCR-2 Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.13	85.533	12.02	8.306	1.48
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	85.533	12.02	8.306	1.48

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000271	*Tropocyclops*	*prasinus*	.	.	.	Whole Animal	0.67	10.264	1.44	16.434	2.92
1000412	*Diacyclops*	*thomasi*	.	.	Adults	Whole Animal	1.12	10.264	1.44	41.194	7.32
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.55	30.792	4.33	24.202	4.30
Summary for Order ~ Cyclopoida (3 detail records)						**Sum Total**	**Cyclopoida**	51.320	7.21	81.829	14.55

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000879	*Daphnia*	*mendotae*	.	.	Female	Whole Animal	1.15	3.421	0.48	39.710	7.06
1000316	*Daphnia*	*lumholtzi*	.	.	.	Whole Animal	1.54	3.421	0.48	126.315	22.46
104312	*Daphnia*	*retrocurva*	.	.	Female w eggs	Whole Animal	0.96	3.421	0.48	20.327	3.61
Summary for Order ~ Diplostraca (3 detail records)						**Sum Total Diplostraca**		10.264	1.44	186.351	33.13

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
104165	*Bosmina*	*longirostris*	.	.	.	Whole Animal	0.32	396.874	55.77	269.020	47.83
1000144	*Chydorus*	*sphaericus*	.	.	Female	Whole Animal	0.34	3.421	0.48	5.561	0.99
Summary for Order ~ Diplostraca (2 detail records)						**Sum Total Diplostraca**		400.295	56.25	274.581	48.82

Phylum: Rotifera

Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
☑ 126164	*Synchaeta*	*pectinata*	.	.	.	Whole Animal	0.29	6.843	0.96	1.889	0.34
125306	*Asplanchna*	*priodonta*	.	.	.	Whole Animal	0.43	6.843	0.96	2.267	0.40
125327	*Brachionus*	*calyciflorus*	.	.	.	Whole Animal	0.15	143.696	20.19	6.198	1.10
125337	*Brachionus*	*havanaensis*	.	.	.	Whole Animal	0.29	3.421	0.48	0.981	0.17
125281	*Keratella*	*cochlearis*	.	.	.	Whole Animal	0.19	3.421	0.48	0.026	0.00
Summary for Order ~ Ploima (5 detail records)						**Sum Total Ploima**		164.224	23.08	11.360	2.02

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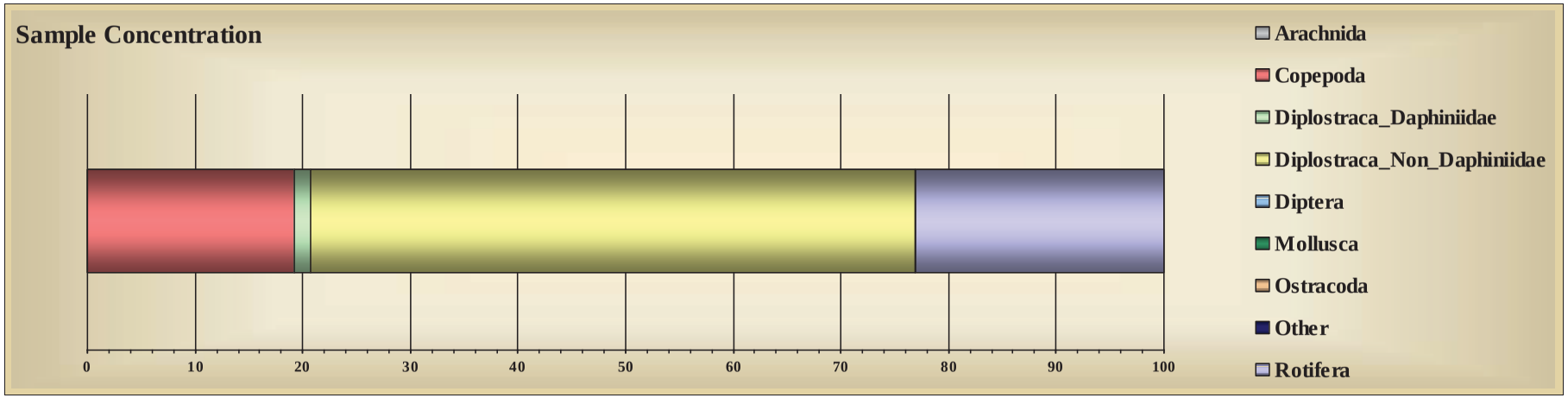
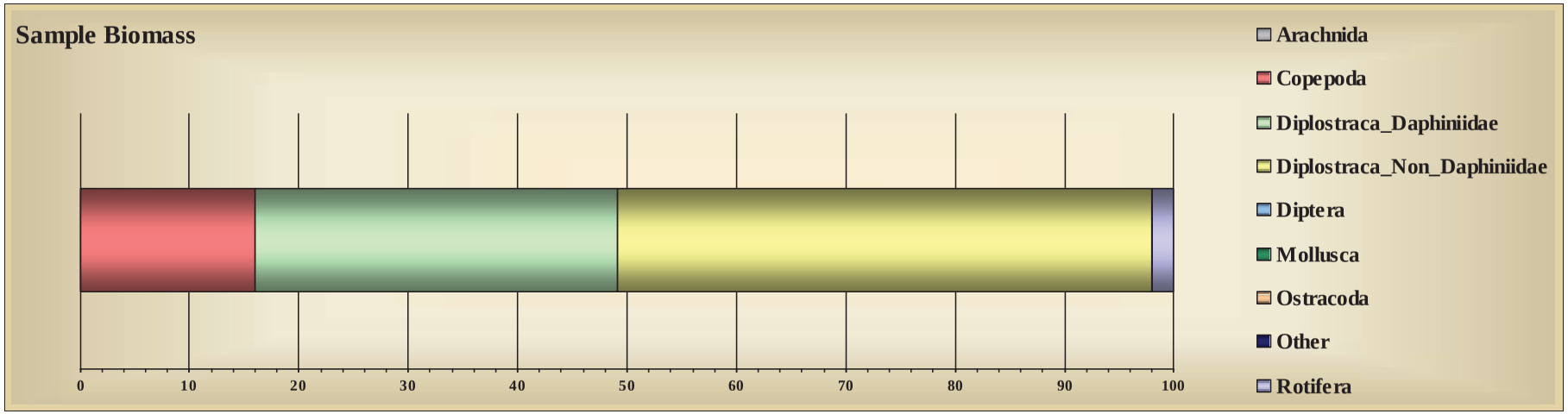
Total Sample Concentration	Total Sample Cell Concentration
711.636	562.427

SUMMARY GRAPHICS





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Species List

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000531	*.	spp	.	.	.	NI-NVI	Whole Animal	Sars, 1903

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
100212	Leptodiaptomus	ashlandi	.	.	.	Adults	Whole Animal	Marsh, 1893

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000248	*.	spp	.	.	.	CI-CV	Whole Animal	Burmeister, 1834
1000271	Tropocyclops	prasinus	.	.	.	.	Whole Animal	Fischer, 1860
1000412	Diacyclops	thomasi	.	.	.	Adults	Whole Animal	S. A. Forbes, 1882

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000144	Chydorus	sphaericus	.	.	.	Female	Whole Animal	(O. F. Mueller, 1785)
1000316	Daphnia	lumholtzi	.	.	.	.	Whole Animal	Sars
1000879	Daphnia	mendotae	.	.	.	Female	Whole Animal	Birge
104165	Bosmina	longirostris	.	.	.	.	Whole Animal	O. F. Mueller, 1785
104312	Daphnia	retrocurva	.	.	.	Female w eggs	Whole Animal	Forbes, 1882

Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000423	Gastropus	spp	.	.	.	.	Whole Animal	.
125281	Keratella	cochlearis	.	.	.	.	Whole Animal	(Gosse 1851)
125306	Asplanchna	priodonta	.	.	.	.	Whole Animal	Gosse 1850
125327	Brachionus	calyciflorus	.	.	.	.	Whole Animal	Pallas 1766

125337	Brachionus	havanaensis	.	.	.	.	Whole Animal	Rousselet 1913
125406	Keratella	quadrata	.	.	.	.	Whole Animal	(O. F. Muller 1786)
126145	Polyarthra	dolichoptera	.	.	.	.	Whole Animal	Idelson 1925
126164	Synchaeta	pectinata	.	.	.	.	Whole Animal	Ehrenberg 1832

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Zooplankton Analysis with Biomass Estimates

Report and Data Set

Customer ID: 327

Tracking Code:	160018-327	**Sample ID:**	CCR-2 Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	8/9/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	6
System Name:	Cherry Creek	**Site:**	CCR-2 Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.19	266.438	61.78	49.703	34.44
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	266.438	61.78	49.703	34.44

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000344	*.	*spp*	.	.	CI-CIV	Whole Animal	0.45	27.095	6.28	20.847	14.45
100212	*Leptodiaptomus*	*ashlandi*	.	.	Adults	Whole Animal	0.96	2.258	0.52	5.705	3.95
Summary for Order ~ Calanoida (2 detail records)						**Sum Total**	**Calanoida**	29.353	6.81	26.552	18.40

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.43	40.643	9.42	14.691	10.18
Summary for Order ~ Cyclopoida (1 detail record)						**Sum Total**	**Cyclopoida**	40.643	9.42	14.691	10.18

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000879	*Daphnia*	*mendotae*	.	.	Female	Whole Animal	0.67	2.258	0.52	11.249	7.80
1000149	*Daphnia*	*retrocurva*	.	.	Female	Whole Animal	0.38	2.258	0.52	0.949	0.66
Summary for Order ~ Diplostraca (2 detail records)						**Sum Total Diplostraca**		4.516	1.05	12.198	8.45

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
104165	*Bosmina*	*longirostris*	.	.	.	Whole Animal	0.31	76.770	17.80	40.369	27.97
Summary for Order ~ Diplostraca (1 detail record)						**Sum Total Diplostraca**		76.770	17.80	40.369	27.97

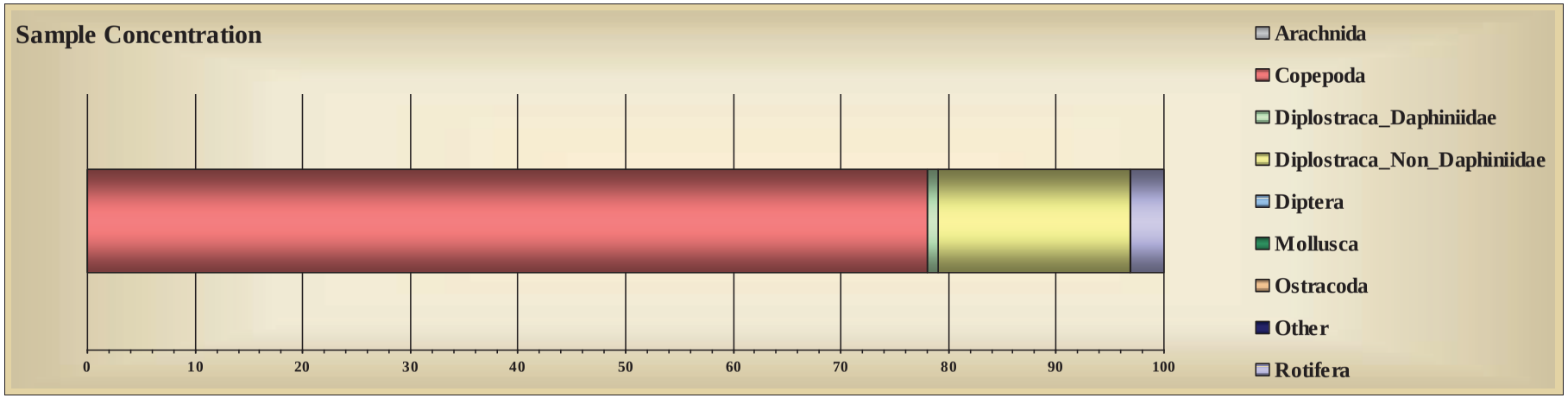
Phylum: Rotifera

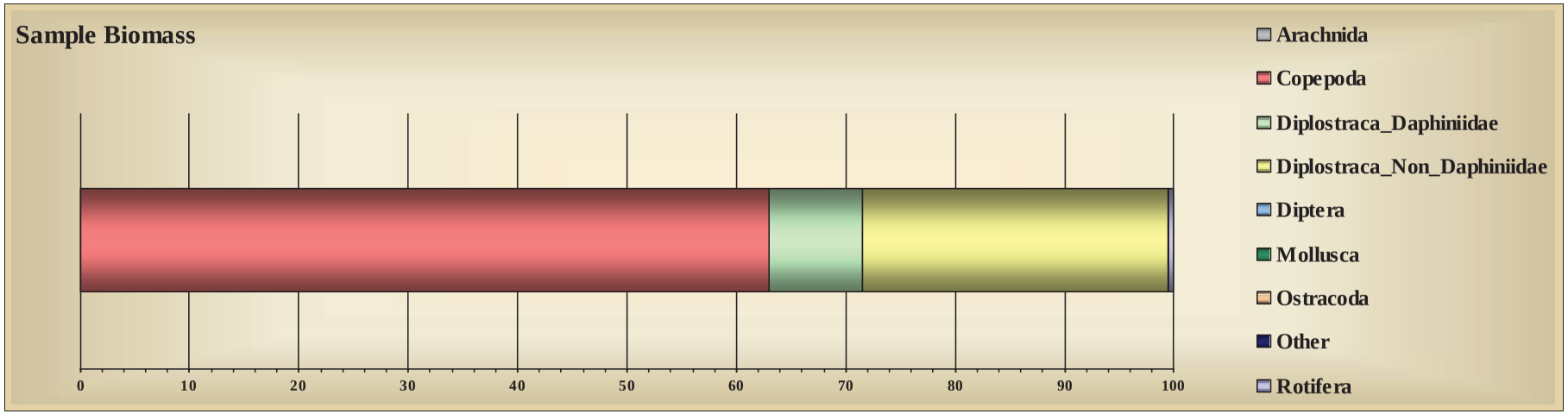
Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
131850	*Trichocerca*	*spp*	.	.	.	Whole Animal	0.06	2.258	0.52	0.010	0.01
125406	*Keratella*	*quadrata*	.	.	.	Whole Animal	0.29	2.258	0.52	0.468	0.32
125327	*Brachionus*	*calyciflorus*	.	.	.	Whole Animal	0.14	9.032	2.09	0.321	0.22
Summary for Order ~ Ploima (3 detail records)						**Sum Total Ploima**		13.548	3.14	0.799	0.55

Total Sample Concentration	Total Sample Cell Concentration
431.268	144.313

SUMMARY GRAPHICS





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Tracking Code:	160020-327	**Sample ID:**	CCR-2 Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	8/23/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	6
System Name:	Cherry Creek	**Site:**	CCR-2 Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.13	84.500	26.03	8.523	2.73
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	84.500	26.03	8.523	2.73

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
100212	*Leptodiaptomus*	*ashlandi*	.	.	Adults	Whole Animal	1.03	26.684	8.22	82.447	26.43
1000344	*.	*spp*	.	.	CI-CIV	Whole Animal	0.48	15.566	4.79	13.522	4.33
Summary for Order ~ Calanoida (2 detail records)						**Sum Total**	**Calanoida**	42.250	13.01	95.969	30.76

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000412	*Diacyclops*	*thomasi*	.	.	Adults	Whole Animal	0.77	2.224	0.68	3.215	1.03
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.42	17.789	5.48	6.569	2.11
Summary for Order ~ Cyclopoida (2 detail records)						**Sum Total**	**Cyclopoida**	20.013	6.16	9.784	3.14

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Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000149	*Daphnia*	*retrocurva*	.	.	Female	Whole Animal	0.85	24.460	7.53	101.260	32.46
Summary for Order ~ Diplostraca (1 detail record)						**Sum Total**	**Diplostraca**	24.460	7.53	101.260	32.46

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000240	*Daphnia*	*sp.*	.	.	Neonates	Whole Animal	0.39	24.460	7.53	28.694	9.20
104165	*Bosmina*	*longirostris*	.	.	.	Whole Animal	0.32	93.394	28.77	62.599	20.07
Summary for Order ~ Diplostraca (2 detail records)						**Sum Total**	**Diplostraca**	117.855	36.30	91.293	29.26

Phylum: Rotifera

Order: Bdelloida

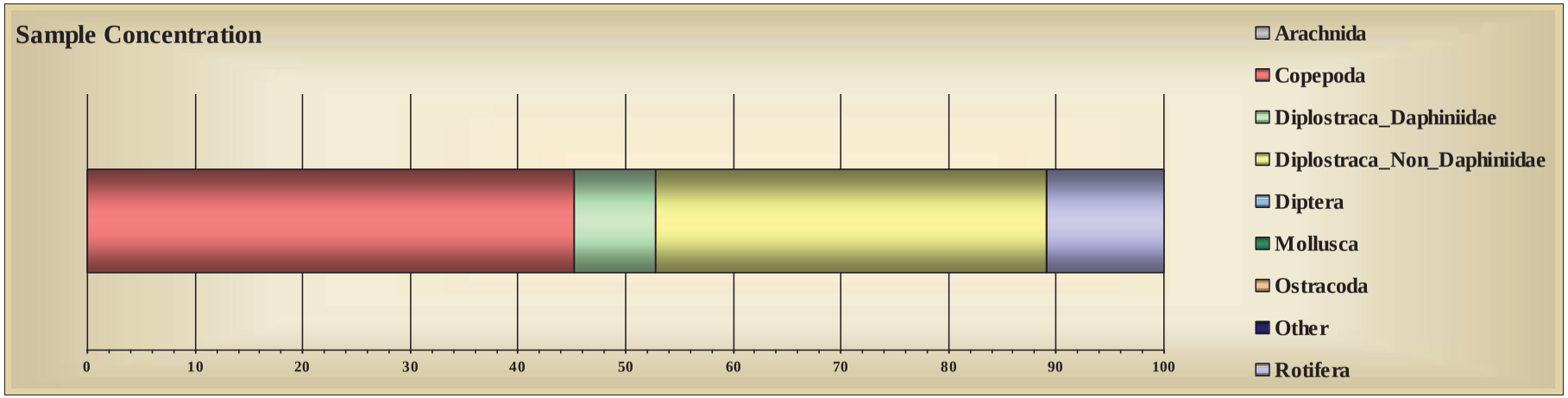
	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
☑	1000752	*Rotaria*	*spp*	.	.	.	Whole Animal	0.14	2.224	0.68	0.025	0.01
	Summary for Order ~ Bdelloida (1 detail record)						**Sum Total Bdelloida**		2.224	0.68	0.025	0.01

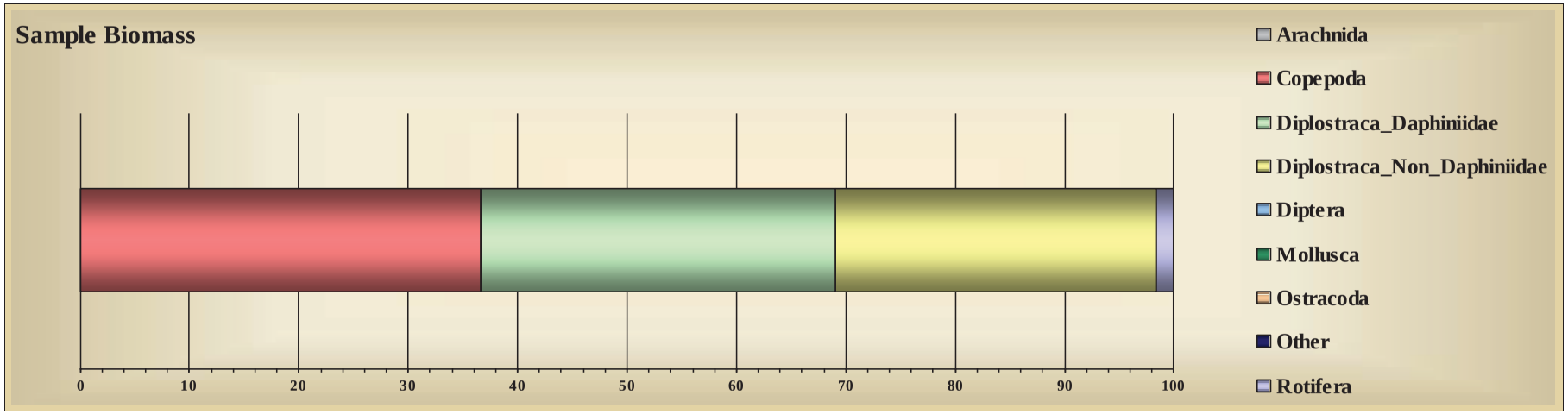
Order: Ploima

	Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
	125281	*Keratella*	*cochlearis*	.	.	.	Whole Animal	0.15	2.224	0.68	0.006	0.00
☑	125304	*Asplanchna*	*girodi*	.	.	.	Whole Animal	0.31	6.671	2.05	3.482	1.12
	125327	*Brachionus*	*calyciflorus*	.	.	.	Whole Animal	0.17	24.460	7.53	1.631	0.52
	Summary for Order ~ Ploima (3 detail records)						**Sum Total Ploima**		33.355	10.27	5.119	1.64

Total Sample Concentration	Total Sample Cell Concentration
324.656	311.973

SUMMARY GRAPHICS





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Species List

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000531	*.	spp	.	.	.	NI-NVI	Whole Animal	Sars, 1903

Order: Bdelloida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000752	Rotaria	spp	.	.	.	.	Whole Animal	.

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000344	*.	spp	.	.	.	CI-CIV	Whole Animal	Sars, 1903
100212	Leptodiaptomus	ashlandi	.	.	.	Adults	Whole Animal	Marsh, 1893

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000248	*.	spp	.	.	.	CI-CV	Whole Animal	Burmeister, 1834
1000412	Diacyclops	thomasi	.	.	.	Adults	Whole Animal	S. A. Forbes, 1882

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000149	Daphnia	retrocurva	.	.	.	Female	Whole Animal	Forbes, 1882
1000240	Daphnia	sp.	.	.	.	Neonates	Whole Animal	O. F. Mueller, 1785
1000879	Daphnia	mendotae	.	.	.	Female	Whole Animal	Birge
104165	Bosmina	longirostris	.	.	.	.	Whole Animal	O. F. Mueller, 1785

Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
125281	Keratella	cochlearis	.	.	.	.	Whole Animal	(Gosse 1851)
125304	Asplanchna	girodi	.	.	.	.	Whole Animal	De Geurne 1888

125327	Brachionus	calyciflorus	.	.	.	.	Whole Animal	Pallas 1766
125406	Keratella	quadrata	.	.	.	.	Whole Animal	(O. F. Muller 1786)
131850	Trichocerca	spp	.	.	.	.	Whole Animal	Lamarck, 1901

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Zooplankton Analysis with Biomass Estimates

Report and Data Set

Customer ID: 327

Tracking Code:	160022-327	**Sample ID:**	CCR-2 Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	9/13/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	6
System Name:	Cherry Creek	**Site:**	CCR-2 Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.22	70.749	23.27	18.692	3.12
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	70.749	23.27	18.692	3.12

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000344	*.	*spp*	.	.	CI-CIV	Whole Animal	0.80	7.527	2.48	15.700	2.62
100212	*Leptodiaptomus*	*ashlandi*	.	.	Adults	Whole Animal	1.06	15.053	4.95	49.680	8.29
Summary for Order ~ Calanoida (2 detail records)						**Sum Total**	**Calanoida**	22.580	7.43	65.380	10.91

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.54	6.021	1.98	4.403	0.73
1000412	*Diacyclops*	*thomasi*	.	.	Adults	Whole Animal	1.01	3.011	0.99	8.640	1.44
Summary for Order ~ Cyclopoida (2 detail records)						**Sum Total**	**Cyclopoida**	9.032	2.97	13.043	2.18

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Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000316	*Daphnia*	*lumholtzi*	.	.	.	Whole Animal	1.06	25.590	8.42	398.666	66.54
1000149	*Daphnia*	*retrocurva*	.	.	Female	Whole Animal	0.61	12.042	3.96	19.273	3.22
Summary for Order ~ Diplostraca (2 detail records)						**Sum Total Diplostraca**		37.633	12.38	417.939	69.76

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
104165	*Bosmina*	*longirostris*	.	.	.	Whole Animal	0.33	111.392	36.63	78.595	13.12
Summary for Order ~ Diplostraca (1 detail record)						**Sum Total Diplostraca**		111.392	36.63	78.595	13.12

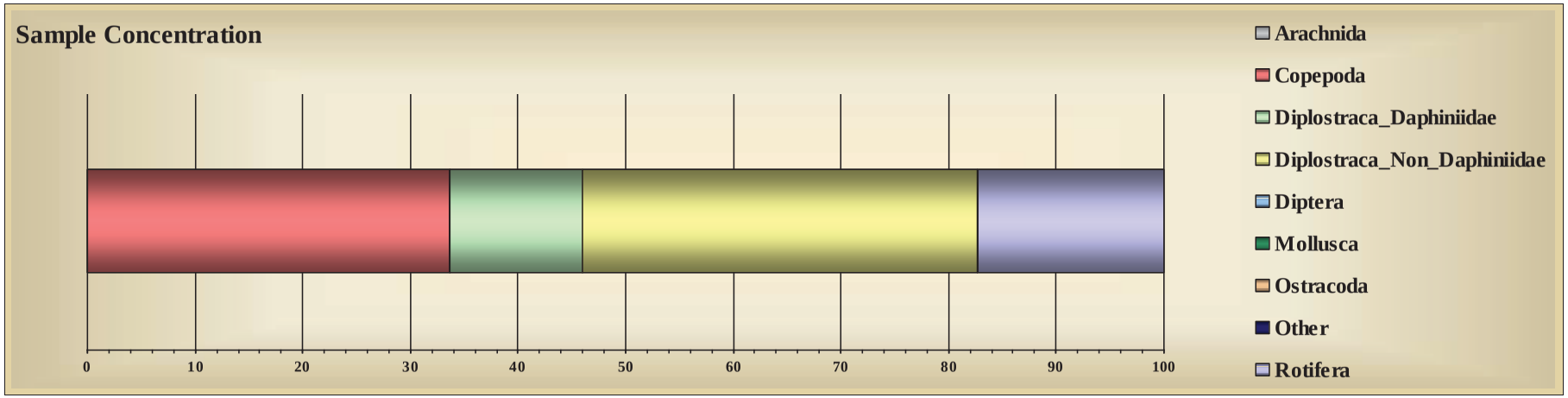
Phylum: Rotifera

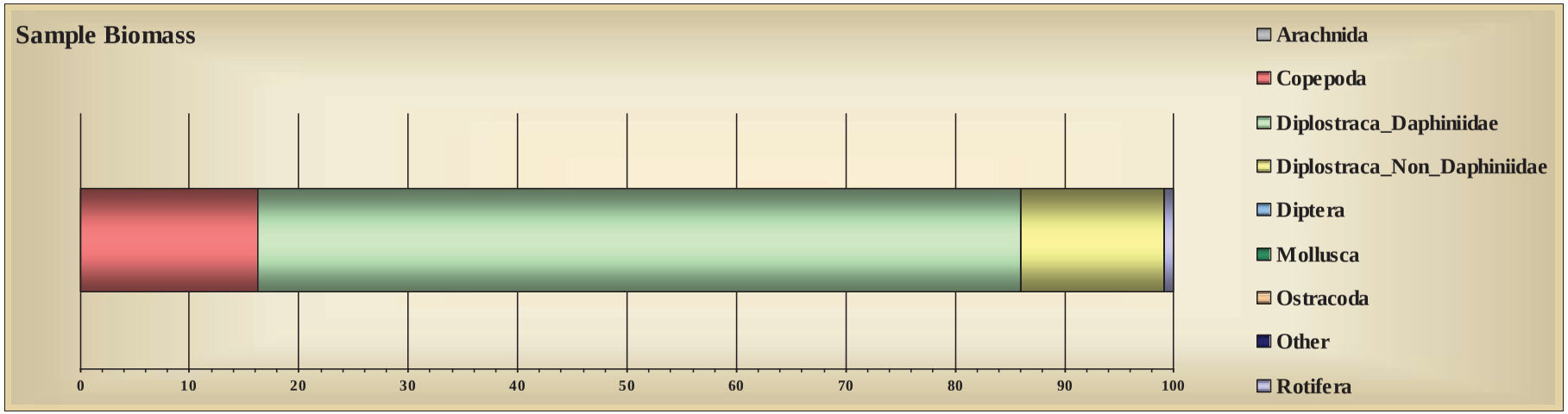
Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
125281	*Keratella*	*cochlearis*	.	.	.	Whole Animal	0.18	3.011	0.99	0.014	0.00
125304	*Asplanchna*	*girodi*	.	.	.	Whole Animal	0.38	4.516	1.49	2.992	0.50
125327	*Brachionus*	*calyciflorus*	.	.	.	Whole Animal	0.16	45.159	14.85	2.454	0.41
Summary for Order ~ Ploima (3 detail records)						**Sum Total Ploima**		52.686	17.33	5.460	0.91

Total Sample Concentration	Total Sample Cell Concentration
304.071	599.107

SUMMARY GRAPHICS





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Tracking Code:	160024-327	**Sample ID:**	CCR-2 Composite	**Replicate:**	1
Customer ID:	327	**Sample Date:**	9/27/2016	**Sample Level:**	Composite
Job ID:	1	**Station:**	.	**Sample Depth:**	6
System Name:	Cherry Creek	**Site:**	CCR-2 Composite	**Preservative:**	Ethanol
Report Notes:	.				

Phylum: Arthropoda

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000531	*.	*spp*	.	.	NI-NVI	Whole Animal	0.15	96.056	32.52	12.170	4.38
Summary for Order ~ ^Copepoda (1 detail record)						**Sum Total**	**^Copepoda**	96.056	32.52	12.170	4.38

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000344	*.	*spp*	.	.	CI-CIV	Whole Animal	0.38	2.867	0.97	1.685	0.61
100212	*Leptodiaptomus*	*ashlandi*	.	.	Adults	Whole Animal	1.08	10.036	3.40	35.188	12.66
Summary for Order ~ Calanoida (2 detail records)						**Sum Total**	**Calanoida**	12.903	4.37	36.873	13.26

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000248	*.	*spp*	.	.	CI-CV	Whole Animal	0.46	12.903	4.37	5.601	2.01
1000412	*Diacyclops*	*thomasi*	.	.	Adults	Whole Animal	1.06	1.434	0.49	4.603	1.66
Summary for Order ~ Cyclopoida (2 detail records)						**Sum Total**	**Cyclopoida**	14.337	4.85	10.204	3.67

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Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
1000316	*Daphnia*	*lumholtzi*	.	.	.	Whole Animal	1.44	2.867	0.97	89.335	32.13
1000149	*Daphnia*	*retrocurva*	.	.	Female	Whole Animal	0.90	8.602	2.91	43.514	15.65
Summary for Order ~ Diplostraca (2 detail records)						**Sum Total Diplostraca**		11.469	3.88	132.849	47.78

Phylum: Arthropoda

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
104165	*Bosmina*	*longirostris*	.	.	.	Whole Animal	0.33	127.597	43.20	85.209	30.65
Summary for Order ~ Diplostraca (1 detail record)						**Sum Total Diplostraca**		127.597	43.20	85.209	30.65

Phylum: Rotifera

Order: Flosculariaceae

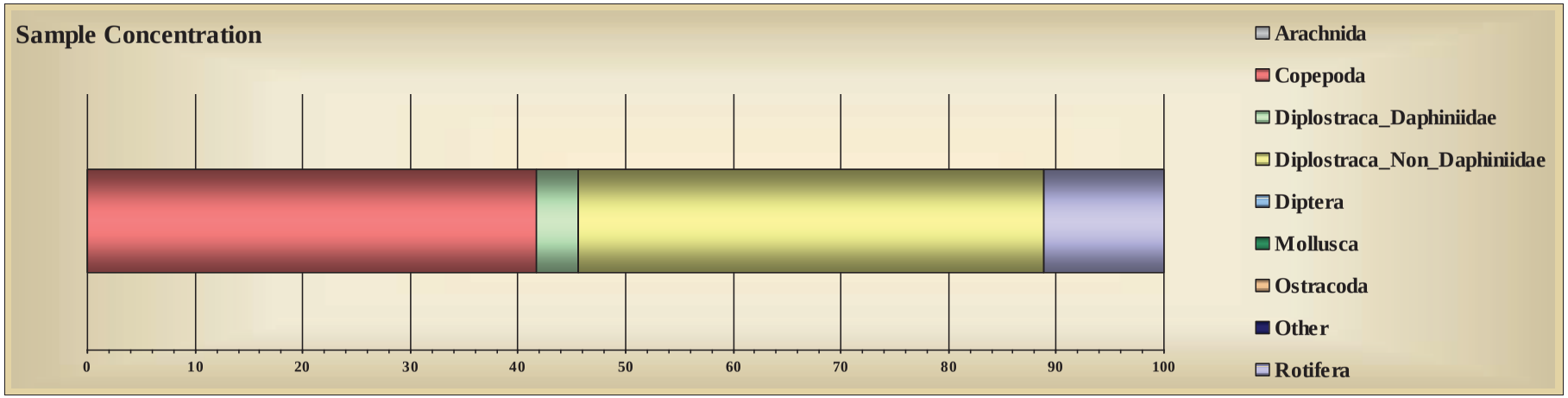
Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
125572	*Conochilus*	*unicornis*	.	.	.	Whole Animal	0.10	21.505	7.28	0.124	0.04
Summary for Order ~ Flosculariaceae (1 detail record)						**Sum Total Flosculariaceae**		21.505	7.28	0.124	0.04

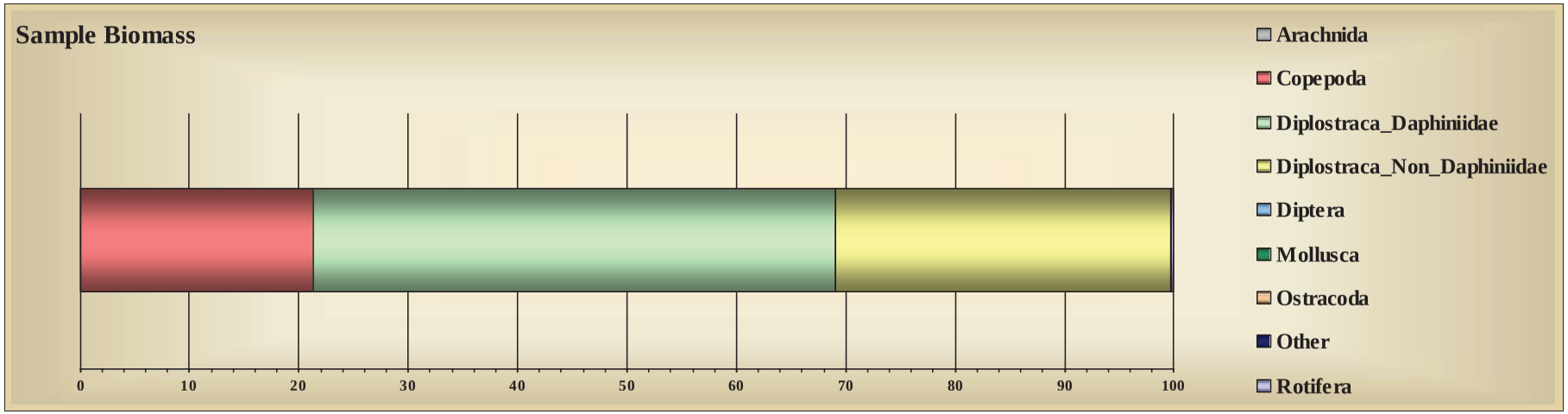
Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Morph	Structure	Length mm	Concentration Animals / L	Relative Concentratio	Total Biomass µg / L	Relative Total Biomass
125304	*Asplanchna*	*girodi*	.	.	.	Whole Animal	0.38	1.434	0.49	0.000	0.00
125327	*Brachionus*	*calyciflorus*	.	.	.	Whole Animal	0.17	10.036	3.40	0.596	0.21
Summary for Order ~ Ploima (2 detail records)						**Sum Total Ploima**		11.469	3.88	0.596	0.21

Total Sample Concentration	Total Sample Cell Concentration
295.336	278.024

SUMMARY GRAPHICS





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Species List

Order: ^Copepoda

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000531	*.	spp	.	.	.	NI-NVI	Whole Animal	Sars, 1903

Order: Calanoida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000344	*.	spp	.	.	.	CI-CIV	Whole Animal	Sars, 1903
100212	Leptodiaptomus	ashlandi	.	.	.	Adults	Whole Animal	Marsh, 1893

Order: Cyclopoida

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000248	*.	spp	.	.	.	CI-CV	Whole Animal	Burmeister, 1834
1000412	Diacyclops	thomasi	.	.	.	Adults	Whole Animal	S. A. Forbes, 1882

Order: Diplostraca

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
1000149	Daphnia	retrocurva	.	.	.	Female	Whole Animal	Forbes, 1882
1000316	Daphnia	lumholtzi	.	.	.	.	Whole Animal	Sars
104165	Bosmina	longirostris	.	.	.	.	Whole Animal	O. F. Mueller, 1785

Order: Flosculariaceae

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
125572	Conochilus	unicornis	.	.	.	.	Whole Animal	Rousselet 1892

Order: Ploima

Taxa ID	Genus	Species	Subspecies	Variety	Form	Morph	Structure	Authority
125281	Keratella	cochlearis	.	.	.	.	Whole Animal	(Gosse 1851)
125304	Asplanchna	girodi	.	.	.	.	Whole Animal	De Geurne 1888
125327	Brachionus	calyciflorus	.	.	.	.	Whole Animal	Pallas 1766