Loveland Water and Power
Source Water Protection Plan

Larimer County, Colorado
July 2021

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For the Community Water Provider:
City of Loveland
PWSID#135485

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Cover Photo: City of Loveland Diversion on Big Thompson River. Photo taken by Amanda Simmons May 2021.

This Source Water Protection Plan is a planning document and there is no legal requirement to implement the recommendations herein. Actions on public lands will be subject to federal, state and county policies and procedures. Action on private land may require compliance with county land use codes, building codes, local covenants and permission from the landowner. This SWPP for the City of Loveland was developed using version 16.09.09 of the Colorado Rural Water Association's Source Water Protection Plan Template.

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COMMON ACRONYMS

ANS	Aquatic Nuisance Species
BMP	Best Management Practice
BAER	Burned Area Emergency Response
CDPHE	Colorado Department of Public Health and Environment
CRWA	Colorado Rural Water Association
DRMS	Division for Reclamation and Mining Safety
EPA	Environmental Protection Agency
GIS	Geographic Information System
HAB	Harmful Algal Blooms
LWP	Loveland Water and Power
MGD	Million Gallons per Day
NRCS	Natural Resource Conservation Service
OEM	Office of Emergency Management
PSOC	Potential Source of Contamination
PWS	Public Water System
PWSID	Public Water System Identification
RMNP	Rocky Mountain National Park
SWAA	Source Water Assessment Area
SWAP	Source Water Assessment and Protection
SWPA	Source Water Protection Area
SWPP	Source Water Protection Plan
USFS	United States Forest Service
WFDSS	Wildland Fire Decision Support System

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EXECUTIVE SUMMARY

The City of Loveland values a clean, high quality drinking water supply and decided to work collaboratively with area stakeholders to develop a source water protection plan (SWPP). The source water protection planning effort consisted of public planning meetings with stakeholders including water operators, local and federal governments, and agency representatives during the months of January 2021 through July 2021. Colorado Rural Water Association (CRWA) was instrumental in this effort by providing technical assistance in the development of this SWPP.

The City of Loveland obtains its drinking water primarily from two surface water sources. Sources include: 1) Big Thompson River (approximately 60%) and 2) Colorado-Big Thompson Project (CB-T)/Grand Lake via the Alva B. Adams Tunnel (approximately 40%). Source Water Protection Areas (SWPAs) were identified to help the City of Loveland focus its source water protection measures to reduce source water susceptibility to contamination. The SWPAs are made of up three tiers:

- Zone 1 is defined as a 1,000-foot-wide band on either side of the Big Thompson River.
- Zone 2 extends 1/4 mile beyond each side of the boundary of zone 1 (2,320 feet from the stream).
- Zone 3 is made up by the remainder of the Source Water Assessment Area (SWAA) area up to the Big Thompson watershed boundaries.
- Area of Interest (AOI): Is the remainder of the SWAA including the Glacier Creek Watershed and the Western Slope C-BT watershed.

The Steering Committee developed best management practices (BMP) to reduce the risks from the potential contaminant sources and other issues of concern. The best management practices are centered on the themes of building partnerships with community members, businesses, and local decision makers; raising awareness of the value of protecting community drinking water supplies; and empowering local communities to become stewards of their drinking water supplies by taking actions to protect their water sources.

The following list highlights the highest priority potential contaminant sources and/or issues of concern and their associated best management practices. Each BMP was given a score of 1-5. These scores represent a combination of ease and necessity. Thus, BMPs that were deemed both easy and necessary received a score of 1. While the scores provide some degree of relative importance (e.g. a BMP with a score of 1 was considered to be more important than a BMP with a score of 3), BMPs with the same score were considered to be equally important.

Wildfire Best Management Practice Recommendations:

1) Work with the Big Thompson Watershed Coalition, Northern Water, and other appropriate partners to identify and implement appropriate forest management practices.
1) Continue to join/participate in post-fire workgroups and wildfire discussions particularly as they relate to water quality impacts to C-BT supplied water.
1) Continue to monitor water quality changes post wildfire.
1) Provide a copy of the SWPP to USFS, CSFS, and other agencies involved in fire management for consideration during fire mitigation, suppression, and post wildfire planning.
3) Develop a water quality preparedness document, identify gaps, and remedy as appropriate.

4) Maintain fire safe areas around intake locations and treatment facilities.
5) Consider utilizing the Wildland Fire Decision Support System (WFDSS) for pre-planning of a wildfire event.

Algal Blooms Best Management Practice Recommendations

1) Maintain current technologies (i.e. Solarbees) and investigate other potential technologies.
1) Develop an algal bloom response plan.
1) Investigate further algaecide treatments.
1) Monitor non-point nutrient discharges including nitrogen and phosphorus.
3) Investigate/implement nutrient reduction via fish stocking-trophic cascade and other methods.
4) Investigate/implement utilizing wetland on Green Ridge Glade for nutrient reduction.
5) Contact other municipalities for tips/methods for algae control.
5) Continue public outreach concerning taste and odor.

Transportation and Road Spills Best Management Practice Recommendations

1) Determine the process of reviewing construction permits and obtain option to comment.
1) Confirm spills/accidents contact list with Larimer County Office of Emergency Management.
1) Create a Spill Response Plan.
1) Routinely meet with appropriate emergency response organizations to discuss the potential water quality impacts and contact information for appropriate LWP staff in the event of a road spill.
5) Communicate with CDOT and Larimer County Transportation to keep informed on road maintenance practices and schedules within the SWPA including: grading, the application of magnesium chloride, and dust abatement activities along with the BMPs utilized during these activities.
5) Create/update emergency call down system.

Security/Vandalism/Cybersecurity

1) Take part in water specific cybersecurity training through EPA and DHS; visit Cybersecurity Best Management Practices for water sector- including the vulnerability self-assessment tool.
1) Create cybersecurity incident response protocol.
1) Review existing water specific cybersecurity with the Information Technology Department to identify gaps and areas for improvement including a National Institute of Standards and Technology audit.
2) Install fencing, activated lighting, and security cameras intake locations.
3) Install Drinking Water Protection Area signs (7) within the watershed and water treatment and supply facilities.
4) Install no trespassing signs.

Flooding Best Management Practices

1) Utilize current process to notify the public in case of a catastrophic event.
3) Create an Emergency Response Protocol for the river corridor.
3) Develop a plan outlining process and criteria for switching water supply sources, if necessary, to continue to provide drinking water to customers.
3) Identify supply lines within the flood risk zone and create a preemptive shut off/ isolation plan in the event that they are damaged by a flood.
3) Create a plan to distribute drinking water in the event that safe drinking water cannot be provided to portions of the distribution area or the entire distribution area.
3) Create a water restriction plan to implement in the event of a major transmission line outage.

The Steering Committee recognizes that the usefulness of this SWPP lies in its implementation and will begin to execute these best management practices upon completion of this Plan.

This Plan is a living document that is meant to be updated to address any changes that will inevitably occur. The Steering Committee will review this Plan at a frequency of once every one to five years or if circumstances change resulting in the development of new water sources and source water protection areas, or if new risks are identified.

1. INTRODUCTION

Source water protection is a proactive approach to preventing the pollution of lakes, rivers, streams, and groundwater that serve as sources of drinking water. For generations, water quality was taken for granted and still today many people assume that their water sources are naturally protected. However, as water moves through and over the ground, contaminants may be picked up and carried to a drinking water supply.

While a single catastrophic event may wipe out a drinking water source, the cumulative impact of minor contaminant releases over time can also result in the degradation of a drinking water source. Contamination can occur via discrete (point source) and dispersed (nonpoint source) sources (Figure 1). A discrete source contaminant originates from a single point, while a dispersed source contaminant originates from diffuse sources over a broader area. According to the US Environmental Protection Agency, nonpoint source pollution is the leading cause of water quality degradation (Ground Water Protection Council, 2007).

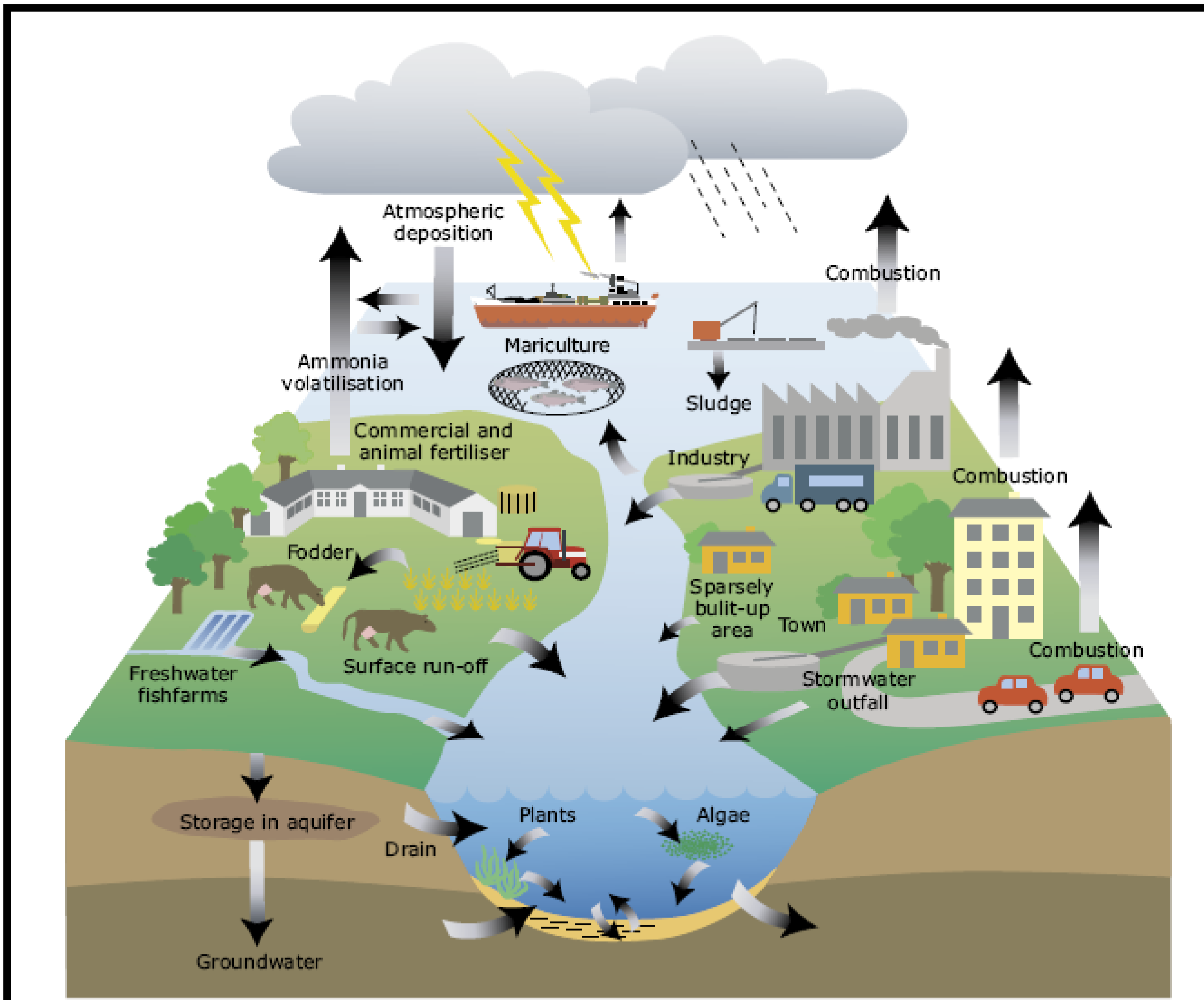


Figure 1. Overview of the aquatic nitrogen cycle and sources of pollution with nitrogen (European Environment Agency, 2020).

The City of Loveland recognizes the potential for contamination of its drinking water sources and realizes that the development of this SWPP is the first step in protecting this valuable resource. Proactive planning is essential to protect the long-term integrity of the drinking water supply and to limit costs and liabilities. This SWPP demonstrates the City of Loveland's commitment to reducing risks to the drinking water supply.

1.1 Purpose of the SWPP

The SWPP is a tool for the City of Loveland to ensure clean and high-quality drinking water sources for current and future generations. This SWPP is designed to:

- Create an awareness of the community's drinking water sources and the potential risks to surface water and/or groundwater quality within the watershed;
- Encourage education and voluntary solutions to alleviate pollution risks;
- Promote management practices to protect and enhance the drinking water supply;
- Provide for a comprehensive action plan in case of an emergency that threatens or disrupts the community water supply.

Developing and implementing source water protection measures at the local level (i.e. county and municipal) will complement existing regulatory protection measures implemented at the state and federal governmental levels by filling protection gaps that can only be addressed at the local level.

1.2 Background of Colorado's SWAP Program

Source water assessment and protection came into existence in 1996 as a result of Congressional reauthorization and amending of the Safe Drinking Water Act. These amendments required each state to develop a source water assessment and protection (SWAP) program. The Water Quality Control Division, an agency of the Colorado Department of Public Health and Environment (CDPHE), assumed the responsibility of developing Colorado's SWAP program and integrated it with the Colorado Wellhead Protection Program.

Colorado's SWAP program is an iterative, two-phased process designed to assist public water systems in preventing potential contamination of their untreated drinking water supplies. The two phases include the Assessment Phase and the Protection Phase as depicted in the upper and lower portions of Figure 2, respectively.

Figure 2. Source Water Assessment and Protection Phases

1.2.1 Source Water Assessment Phase

The Assessment Phase for all public water systems was completed in 2004 and consisted of four primary elements:

1. Delineating the source water assessment area for each of the drinking water sources;
2. Conducting a contaminant source inventory to identify potential sources of contamination within each of the source water assessment areas;
3. Conducting a susceptibility analysis to determine the potential susceptibility of each public drinking water source to the different sources of contamination;
4. Reporting the results of the source water assessment to the public water systems and the general public.

A Source Water Assessment Report was provided to each public water system in Colorado in 2004 that outlines the results of this Assessment Phase.

1.2.2 Source Water Protection Phase

The Protection Phase is a non-regulatory, ongoing process in which all public water systems have been encouraged to voluntarily employ preventative measures to protect their water supply from the potential sources of contamination to which it may be most susceptible. The Protection Phase can be used to take action to avoid unnecessary treatment or replacement costs associated with potential contamination of the untreated water supply. Source water protection begins when local decision makers use the source water assessment results and other pertinent information as a starting point to develop a protection plan. As depicted in the lower portion of Figure 2, the source water protection phase for all public water systems consists of four primary elements:

1. Involving local stakeholders in the planning process.
2. Developing a comprehensive protection plan for all of their drinking water sources.
3. Implementing the protection plan on a continuous basis to reduce the risk of potential contamination of the drinking water sources; and
4. Monitoring the effectiveness of the protection plan and updating it accordingly as future assessment results indicate.

The water system and the community recognize that the Safe Drinking Water Act grants no statutory authority to the CDPHE or to any other state or federal agency to force the adoption or implementation of source water protection measures. This authority rests solely with local communities and local governments.

The source water protection phase is an ongoing process as indicated in Figure 2. The SWAP program is expected to evolve and incorporate any new assessment information provided by the public water supply systems and update the protection plan accordingly.

2. SOURCE WATER SETTING

2.1 Location and Description

The City of Loveland was founded in 1877 along the Colorado Central Railroad near its crossing of the Big Thompson River. It was named for William A.H. Loveland, the president of the Colorado Central Railroad. For the first half of the 20th Century the town had an agriculturally based economy and produced sugar beets and sour cherries. The City is located 46 miles north of Denver and is a home rule municipality in Larimer County Colorado.

Loveland Water and Power (LWP) is a municipally owned utility providing Loveland customers power, water, wastewater, and broadband services. LWP serves approximately 26,000 homes and businesses within a 33 square mile territory.

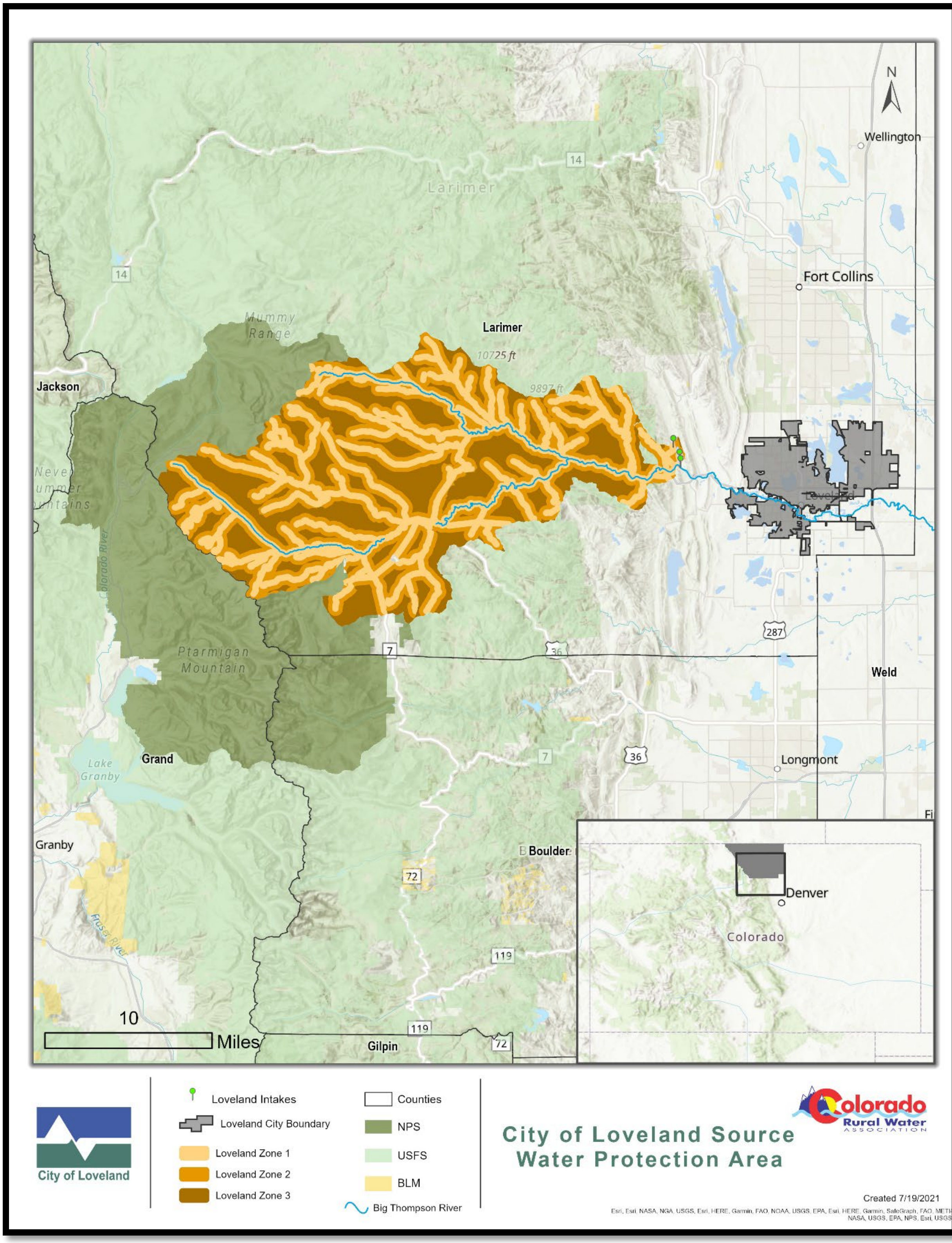


Figure 3. City of Loveland Boundaries with intake locations.

2.2 Hydrologic Setting

The City of Loveland utilizes two surface water sources for its water supply. These sources are the Big Thompson River and C-BT Project/Grand Lake via the Alva B. Adams Tunnel.

2.2.1 Colorado-Big Thompson Project

The C-BT is the largest trans-mountain water diversion project in Colorado. West of the Continental Divide, runoff from the headwaters of the Colorado River is collected in Granby Reservoir, Shadow Mountain Reservoir, and Grand Lake. Granby Reservoir also receives water pumped from Willow Creek Reservoir and Windy Gap Reservoir. When East Slope delivery requirements are greater than the direct runoff to Grand Lake, water is pumped from Granby Reservoir to Shadow Mountain Reservoir where it flows by gravity into Grand Lake. From there, the 13-mile long Alva B. Adams Tunnel transports the water under the Continental Divide to the East Slope. Once the water reaches the East Slope, it is used to generate electricity as it falls almost half a mile through five power plants on its way to Colorado's Front Range. Lake Estes, Carter Lake, Horsetooth Reservoir, Mary's Lake, Flatiron Reservoir, and Boulder Reservoir store C-BT water. The C-BT Project provides water for agricultural, municipal, and industrial uses (Northern Colorado Water Conservancy District, n.d.).

The C-BT system includes over 1,000 square miles of watershed area, which is comprised of primarily forested, mountain terrain as well as some developed areas around the Towns of Grand Lake and Estes Park. Approximately 40% of the City water supply is delivered via the C-BT project. Due to the diligent source water protection planning efforts of Northern Water, the City has decided to partner with them by supporting their efforts to protect the C-BT watersheds.

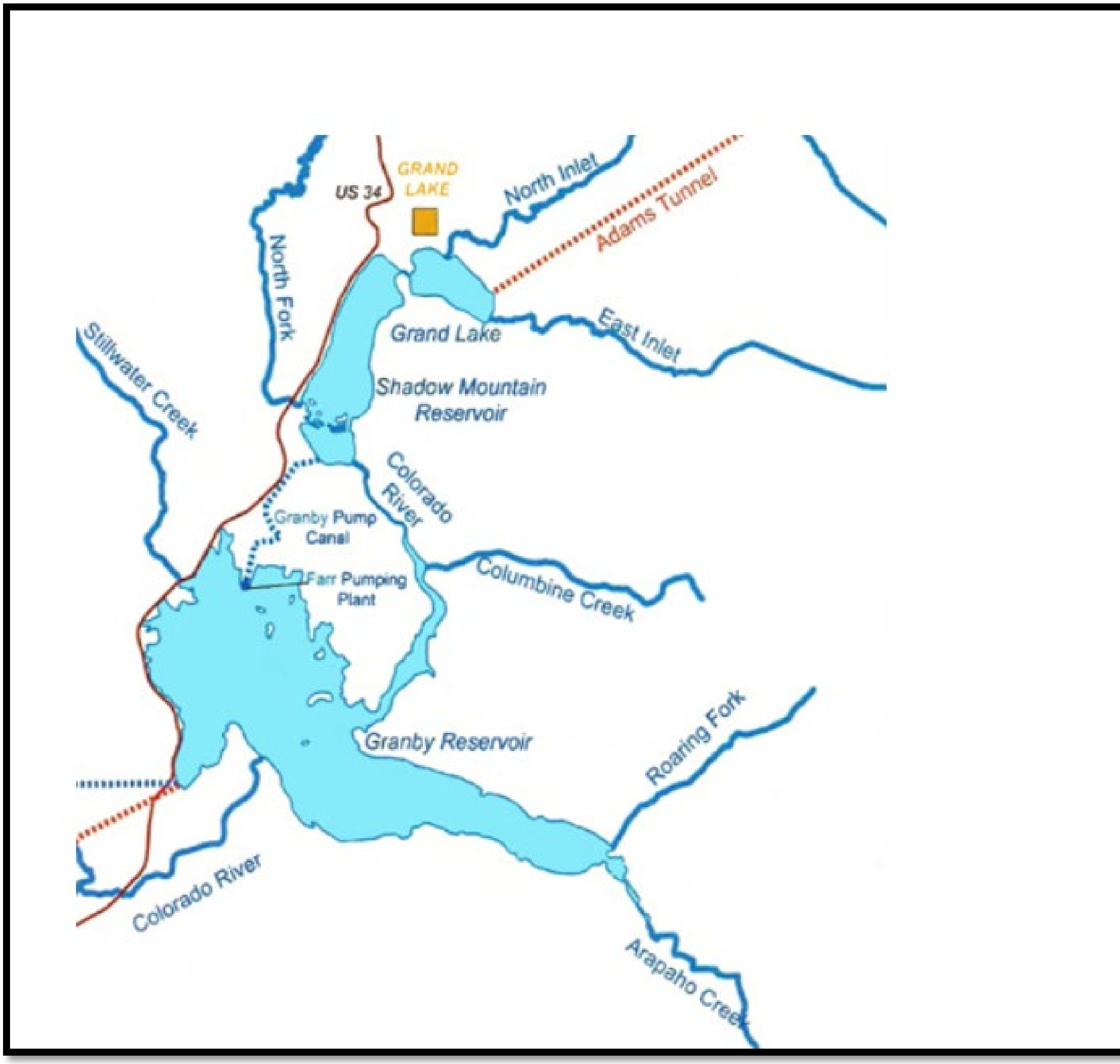


Figure 4. Colorado-Big Thompson Project, Map courtesy Bureau of Reclamation

2.2.2 Big Thompson Watershed

The Big Thompson watershed is a Front Range watershed that begins at the continental divide within Rocky Mountain National Park and ends at the start of the western edge of the plains where it meets the South Platte River. The Big Thompson Watershed is approximately 532,347 acres and is substantially forested with 253,076 total watershed acres of forest vegetation type, specifically Lodgepole and Ponderosa Pine (NRCS 2010). The portion of the watershed above the Loveland drinking water intake represents the vast majority of the forested area. Although some of the land within the Big Thompson watershed is owned by the City of Loveland, the Town of Estes Park, Larimer County, the State of Colorado, private landowners, the National Park Service, and others, the majority of the land is owned by the United States Forest Service. The City of Loveland is fortunate that a large portion of the Big Thompson River is relatively undeveloped, which reduces, although clearly does not eliminate, the likelihood and severity of source water contamination.

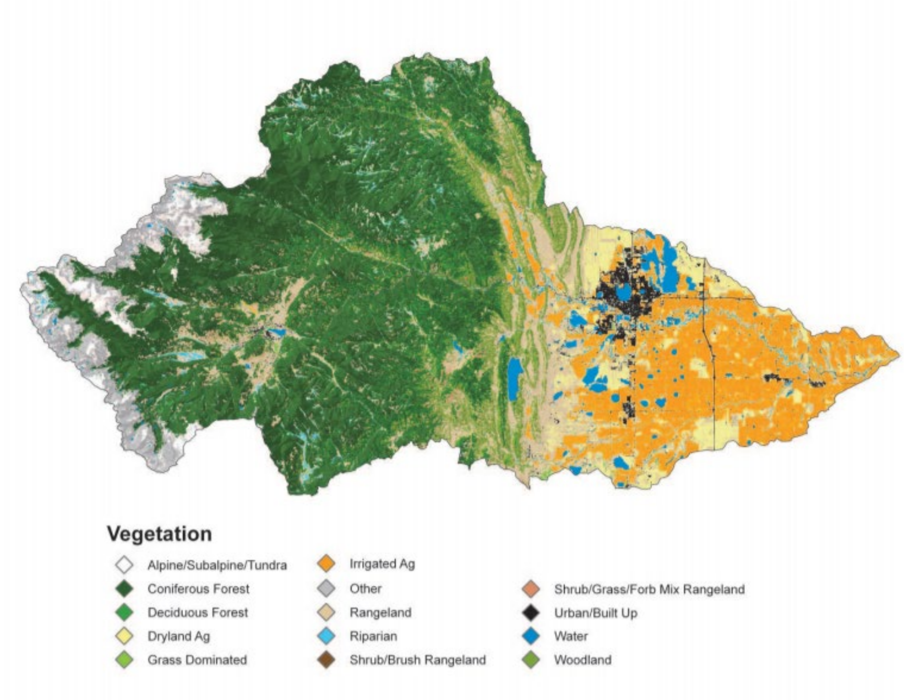


Figure 5. Big Thompson Vegetation Source NRCS Rapid Assessment

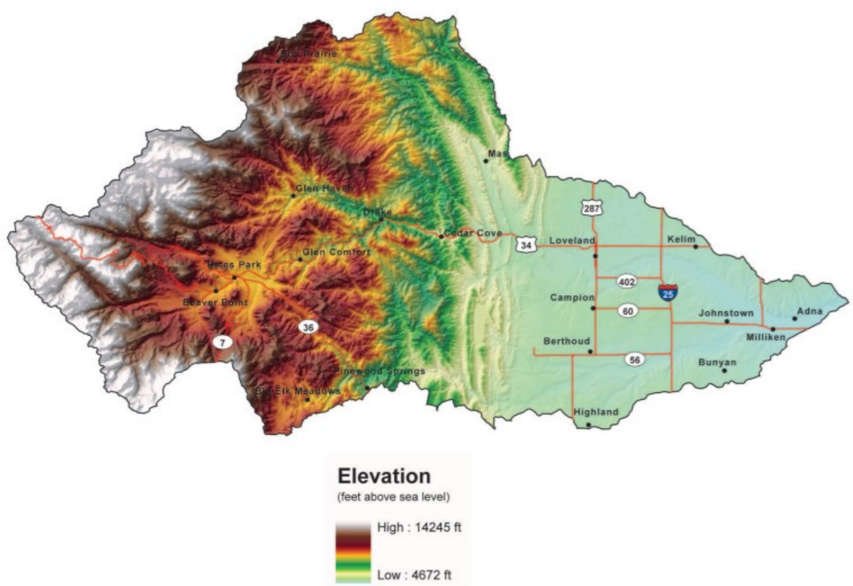


Figure 6: Elevation within Big Thompson Watershed

3. DRINKING WATER SUPPLY OPERATIONS

3.1 Water Supply and Infrastructure

Figure 7. Loveland Water and Power Big Thompson River intake structure.

Figure 8. Loveland Water and Power Big Thompson River intake structure.

Figure 9. Loveland Water and Power Big Thompson River intake structure.

Figure 10. Loveland Water and Power Hansen Feeder Canal intake structure.

Figure 11. Big Thompson River control structure (foreground) and Home Supply Canal control structure (background).

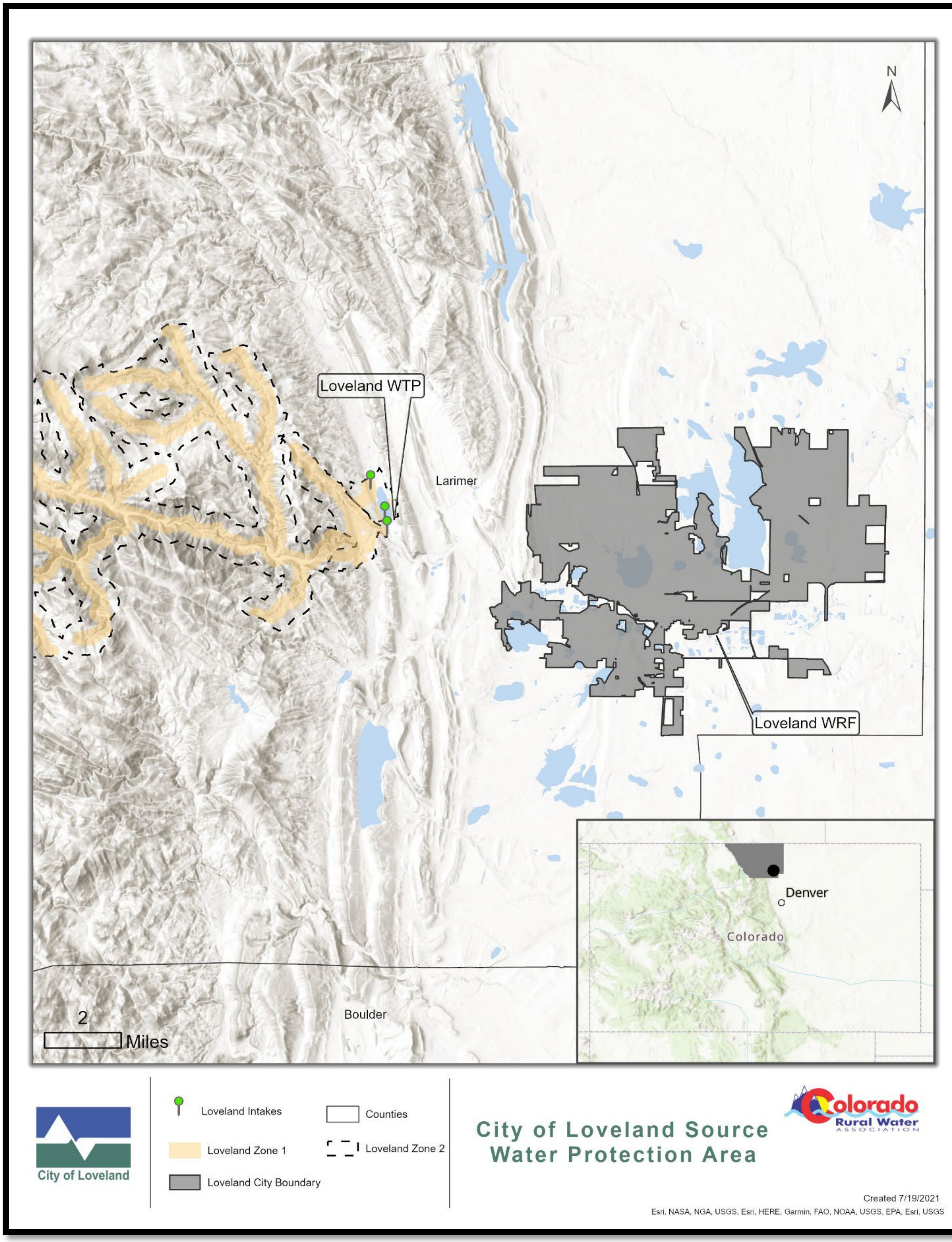


Figure 12. Locations of Loveland Water and Power source water intakes relative to the source water protectin area and Loveland city limits.

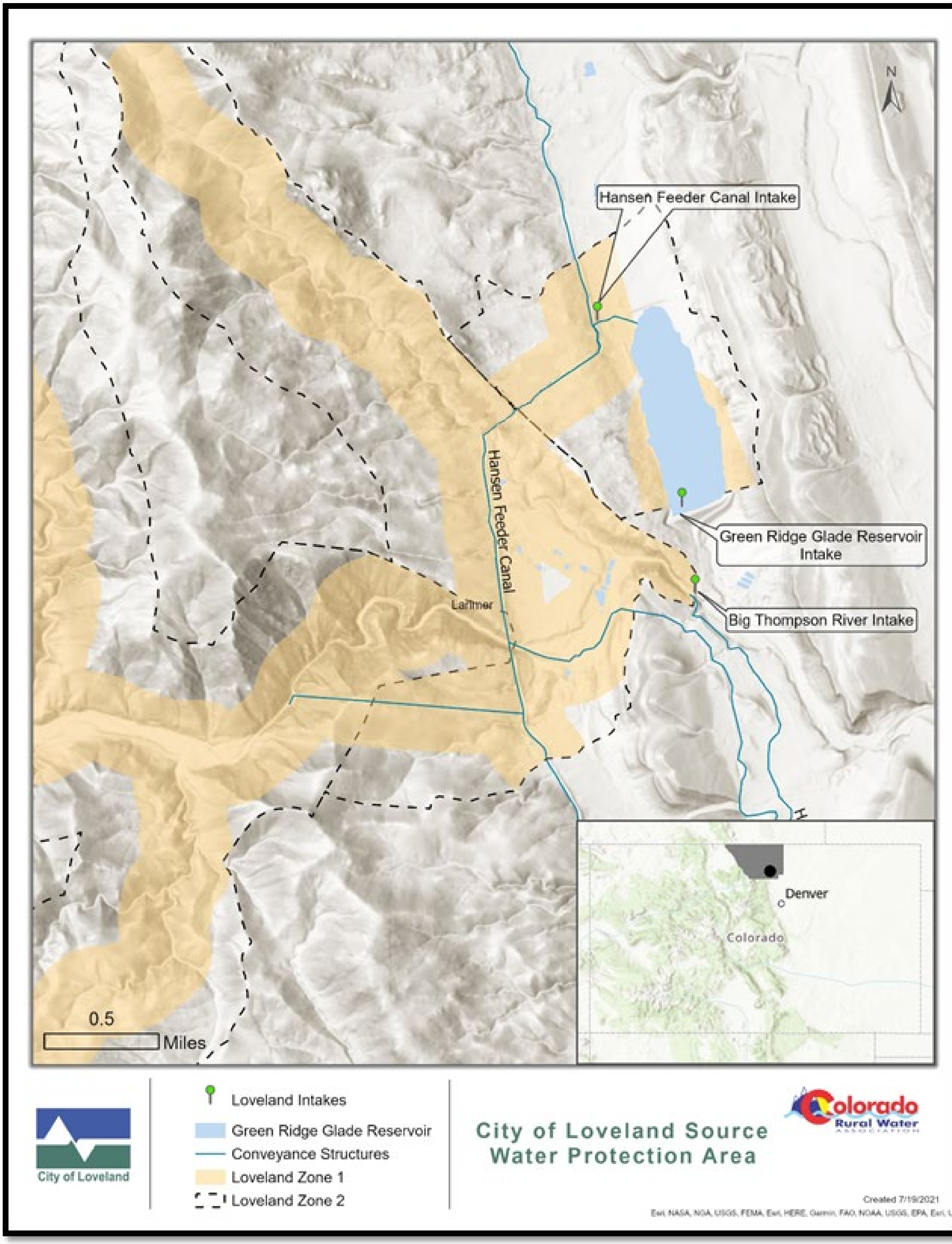


Figure 13. Loveland Water and Power source water intake locations.

3.2 Water Supply Demand Analysis

The City of Loveland serves an estimated 28,000 potable water connections and approximately 81,000 residents and other users within its service area annually. The water system has the current capacity to produce 38 million gallons per day (MGD). Current estimates indicate that the average daily demand during summer months is approximately 20 MGD and 7 MGD during the winter months. The peak demand during the summer can reach as high as 27 MGD.

The City of Loveland is fortunate to have infrastructure and water rights that allow numerous routes to the water treatment plant (WTP) and includes water from both the Big Thompson River and the CB-T (Figure 14). The diversity of routes provides substantial opportunity to adjust and avoid areas that may experience reduced water quality for whatever reason. In addition, Loveland Water and Power is in the process of installing a reservoir bypass line that will allow water to flow directly from the Hansen Feeder Canal to the WTP which will provide the opportunity to continue to use CB-T water if there is a water quality issue in Green Ridge Glade Reservoir. If all of the established sources of water become unavailable, water interconnect infrastructure exists that allows Loveland Water and Power to receive water from other municipalities and water districts (*i.e.*, Fort Collins-Loveland Water District, Little Thompson Water District, and the City of Greeley). However, the capacity of the interconnect infrastructure is only large enough to meet baseline or winter water demands. Although Loveland Water and Power has substantial flexibility in water delivery, the potential financial and water supply risks related to the long-term disablement of the community's main water sources is a principle concern to the Steering Committee. As a result, the Steering Committee believes the development and implementation of a robust SWPP for Loveland Water and Power can help to reduce the risks posed by potential contamination.

4. SWPP DEVELOPMENT

The Colorado Rural Water Association's (CRWA) Source Water Protection Specialist, Amanda Simmons, helped facilitate the source water protection planning process. The goal of CRWA's Source Water Protection Program is to assist public water systems in minimizing or eliminating potential risks to drinking water supplies through the development and implementation of SWPPs.

The SWPP effort consisted of a series of public planning meetings and individual meetings. Information discussed at the meetings helped the City of Loveland develop an understanding of the issues affecting source water protection for the community. The Steering Committee then made recommendations for best management practices to be incorporated into the SWPP. In addition to the planning meetings, data and other information pertaining to Source Water Protection Area was gathered via public documents, internet research, phone calls, emails and field trips to the protection area. A summary of the meetings is represented below.

Table 1. Planning Meetings

Date	Location	Purpose of Meeting
January 12, 2021	Virtual	First SWPP Workshop - Introduction on Colorado's Source Water Protection Program. Presentation about The City of Loveland's water sources. Review CDPHE's Source Water Assessment Areas and potential contaminant source inventory. Discuss timeline for completion of SWPP.
February 12, 2021	Virtual	Second SWPP Workshop – Develop Source Water Protection Areas, discuss nearby SWAP efforts and special presentation- Northern Water
March 12, 2021	Virtual	Third SWPP Workshop – Discuss PSOCS, special presentations by CDOT and DREAMS
April 16, 2021	Virtual	Fourth SWPP Workshop – Discuss PSOCS, wildfire
May 20, 2021	Virtual	Fifth SWPP Workshop – Prioritize BMP's
June 25, 2021	Virtual	Sixth SWPP Workshop – Develop BMP action plan

4.1 Stakeholder Participation in the Planning Process

Local stakeholder participation is vitally important to the overall success of Colorado's SWAP program. Source water protection was founded on the concept that informed citizens, equipped with fundamental knowledge about their drinking water source and the threats to it, will be the most effective advocates for protecting this valuable resource.

The City of Loveland's SWPP process attracted interest and participation from 28 stakeholders including representatives from 17 different organizations including neighboring water operators, local, state, and federal governments, as well as agency representatives. Planning meetings were held during the months of January 2021 through July 2021. All Stakeholder meetings were held virtually due to 2020's COVID-19 pandemic. Stakeholders were notified of meetings via emails and phone calls.

A Steering Committee to help develop the SWPP was formed from the stakeholder group. The Steering Committee's role in the planning process was to advise the City of Loveland in the identification and prioritization of potential contaminant sources as well as management approaches that can be voluntarily implemented to reduce the risks of potential contamination of the untreated source water. All Steering Committee members attended at least one meeting and contributed to planning efforts from their areas of experience and expertise. Their representation provided diversity and led to the creation of a thorough SWPP. The City of Loveland and the Colorado Rural Water Association are very appreciative of the participation and expert input from the following participants.

Table 2: Stakeholders and Steering Committee Members

Stakeholder	Title	Affiliation	Steering Committee Member
Tim Bohling	Water Quality Supervisor	Loveland Water and Power	X
Andy Fayram	Source Water Monitoring Coordinator	Loveland Water and Power	X
Erica McDaniel	Water Quality Scientist II	Loveland Water and Power	X
Kimberly Mihelich	Source Water Specialist	Northern Water	X
Paige Richardson	Utility Business Analyst	Loveland Water and Power	X
Marilyn Hilgenberg	Open lands and Trails Division Manager	City of Loveland-Parks and Recreation	
Chris Carlson	Stormwater Manager	City of Loveland-Public Works	
Roger Berg	Water Division Manager	Loveland Water and Power	
Joe Bernosky	Director of Water and Power	Loveland Water and Power	
Cree Goodwin	Utility Application Service Manager	Loveland Water and Power	
Mark Thomas	Manager	North Front Range Water Quality Planning Association	
Derek Turner	Assistant City Attorney II	City of Loveland	
Courtney Gutman	Director	Big Thompson Watershed Coalition	X
Amanda Simmons	Source Water Specialist	Colorado Rural Water Association	X
Lori Hodges	Director	Larimer County Office of Emergency Management	
Katie Donahue	Canyon Lakes District Ranger	United States Forest Service	
Jen Petrzelka	Water Resources Operations Manager	City of Greeley	
Danny Basch	Facilities Manager	Rocky Mountain National Park	
Deb Callahan	Lab & Water Quality Supervisor	Town of Estes Park	
Andrew Straub Heidke	Water Resources Administrator II	City of Greeley	
Kristen Hughes	Source Water Specialist	Colorado Department of Health and Environment	X
Erica Crosby	Senior Environmental Protection Specialist	Colorado Division of Reclamation, Mining and Safety	
Jeremy Reineke P.G	Senior Environmental Protection Specialist	Colorado Division of Reclamation, Mining and Safety	
Nick Schipanski	Region 4 Environmental Project Manager and Water Pollution Control Manager	Colorado Department of Transportation	

Stakeholder	Title	Affiliation	Steering Committee Member
Nina Cudahy	Deputy Director of Operations and Maintenance	City of Greeley	
Mallory Hiss	Source Water Specialist	Colorado Rural Water Association	X
Paul Hempel	Source Water Specialist	Colorado Rural Water Association	X
Matt Marshall	Forest Program Director	Big Thompson Conservation District	

4.2 Development and Implementation Grant

The City of Loveland has been awarded a $5,000 Development and Implementation Grant from the CDPHE. This funding is available to public water systems and representative stakeholders committed to developing and implementing a source water protection plan. A one-to-one financial match (cash or in-kind) is required. The state approved this grant for the City of Loveland on December 10, 2020; it expires on December 10, 2022. The City of Loveland intends on utilizing the grant funds to implement management approaches that are identified in this Plan.

4.3 Source Water Assessment Report Review

The City of Loveland and the Steering Committee reviewed the Source Water Assessment Report. These Assessment results were used as a starting point to guide the development of appropriate management approaches to protect the source waters of the City of Loveland from potential contamination. A copy of the Source Water Assessment Report for the City of Loveland can be obtained by contacting the City or by downloading a copy from the CDPHE's SWAP program website located at: https://www.colorado.gov/cdphe/source-water-assessment-and-protection-swap.

4.4 Defining the Source Water Protection Area

A source water protection area is the surface and subsurface areas within which contaminants are reasonably likely to reach a water source. The purpose of delineating a source water protection area is to determine the recharge area that supplies water to a public water source. Delineation is the process used to identify and map the area around a pumping well that supplies water to the well or spring, or to identify and map the drainage basin that supplies water to a surface water intake. The size and shape of the area depends on the characteristics of the aquifer and the well, or the watershed. The source water assessment area that was delineated as part of the City of Loveland's Source Water Assessment Report provides the basis for understanding where the community's source water and potential contaminant threats originate and where the community has chosen to implement its source water protection measures in an attempt to manage the susceptibility of their source water to potential contamination.

After carefully reviewing their Source Water Assessment Report and the CDPHE's delineation of the Source Water Assessment Area for each of the city's sources, the Steering Committee chose to modify it before accepting it as their Source Water Protection Area for this SWPP.

The revised SWPAs are divided into three tiers, which helped guide the potential contaminant source inventory and risk assessment determination during development of this Plan. The theory behind this is that the closer the potential contaminant is to a drinking water intake, the quicker it can reach the intake, thus causing impairments and disruptions to the water system. The tiers will also help to guide the implementation of best management practices upon completion of this Plan. The City of Loveland's Source Water Protection Areas are defined as:

- Zone 1 is defined as a 1,000-foot-wide band on either side of the Big Thompson River.
- Zone 2 extends 1/4 mile beyond each side of the boundary of zone 1 (2,320 feet from the stream).
- Zone 3 is made up by the remainder of the SWAA area up to the Big Thompson watershed boundaries.
- Area of Interest (AOI): Is the remainder of the SWAA including the Glacier Creek Watershed and the Western Slope C-BT watershed.

The Source Water Protection Areas are illustrated in the following map.

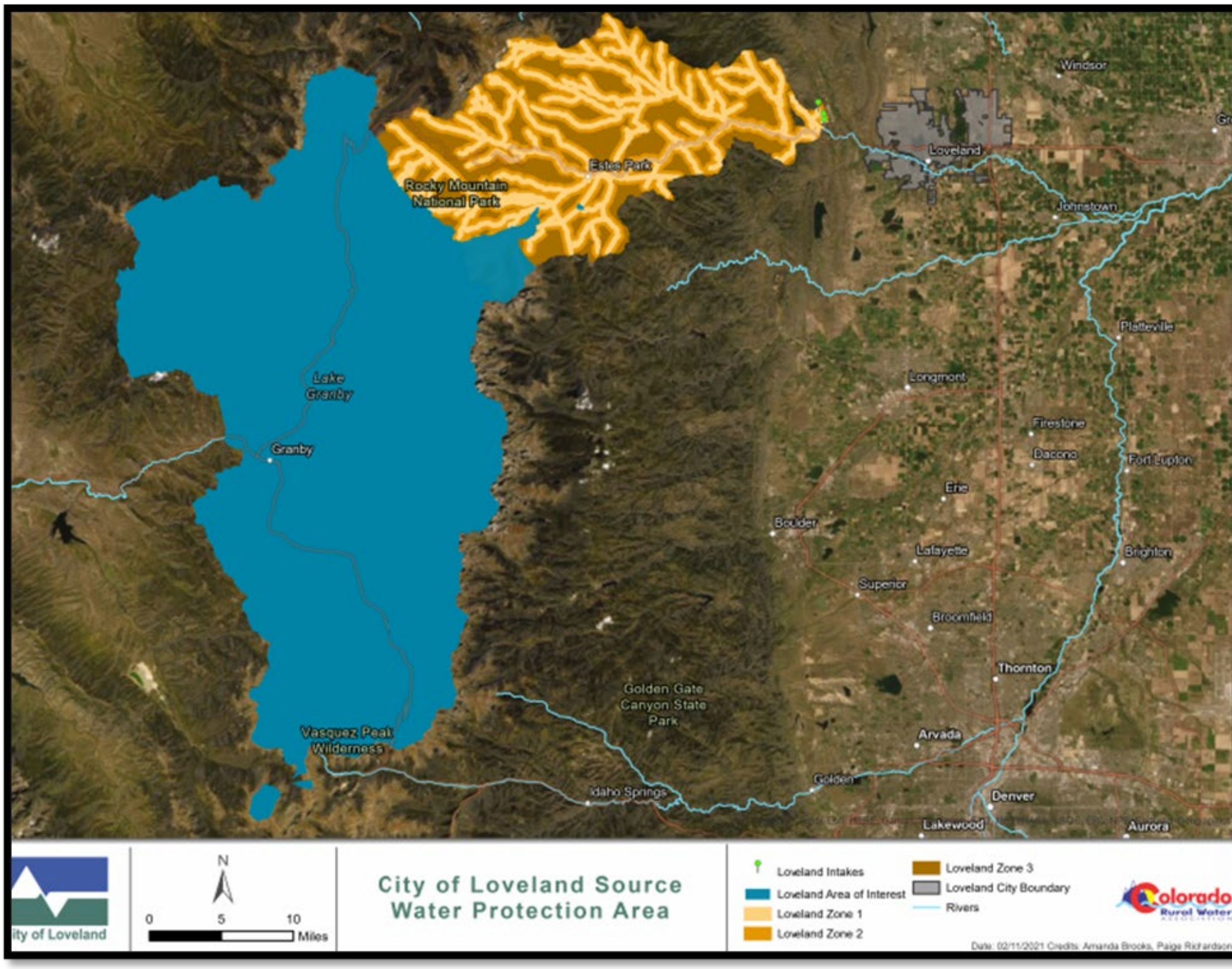


Figure 14. City of Loveland Source Water Protection Area.

4.5 Inventory of Potential Contaminant Sources and Other Issues of Concern

In 2001 – 2002, as part of the Source Water Assessment Report, a contaminant source inventory was conducted by the CDPHE to identify selected potential sources of contamination that might be present within the source water assessment areas. Discrete and dispersed contaminant sources were inventoried using selected state and federal regulatory databases, land use / land cover and transportation maps of Colorado. The contaminant inventory was completed by mapping the potential contaminant sources with the aid of a Geographic Information System (GIS).

The City of Loveland was asked by CDPHE to 1) review the inventory information, 2) field-verify selected information about existing and new contaminant sources, and 3) provide feedback on the accuracy of the inventory. Through this SWPP, the City of Loveland is reporting its findings to the CDPHE.

After much consideration, discussion, and input from local stakeholders, LWP and the Steering Committee developed a more accurate and current inventory of contaminant sources located within the Source Water Protection Area and other issues of concern that may affect the City of Loveland's drinking water sources.[1] In addition to the discrete and dispersed contaminant sources identified in the contaminant source inventory, the Steering Committee also identified other issues of concern that may impact the City of Loveland's drinking water sources. Upon completion of this contaminant source inventory, the City of Loveland has decided to adopt it in place of the original contaminant source inventory provided by the CDPHE:

The City of Loveland's
Potential Sources of Contamination (PSOC) Master List

- Wildfire
- Algal Blooms
- Stormwater, Transportation, and Road Spills
- Security/Vandalism/Cybersecurity
- Big Thompson/Road 34 Rehabilitation
- Residential Practices
- Floods
- Onsite Wastewater Treatment Systems (OWTS)
- PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)
- Active/Historic Mining
- Storage tanks
- EPA Regulated Facilities

A more in-depth discussion on each PSOC/issue of concern can be found in Chapter 5 "DISCUSSION OF POTENTIAL CONTAMINANT SOURCES AND ISSUES OF CONCERN."

[1] The information contained in this Plan is limited to that available from public records at the time that the Plan was written. Other potential contaminant sites or threats to the water supply may exist in the Source Water Protection Area that are not identified in this Plan. Furthermore, identification of a site as a "potential contaminant site" should not be interpreted as one that will necessarily cause contamination of the water supply.

4.6 Risk Assessment & Level of Control of Potential Contaminant Sources and Other Issues of Concern

After developing a contaminant source inventory and list of issues of concern that is more accurate, complete, and current, the City of Loveland assessed the risk level and level of control of each item. The level of risk for each contaminant source is a measure of the water source's potential exposure to contamination. The City of Loveland utilized CRWA's *SWAP Risk Assessment Matrix* (Figure 15), which calculates the level of risk by estimating the following:

- **Probability of Impact** – The risk to the source waters increases as the relative probability of damage or loss increases. The probability of impact is determined by evaluating the number of contaminant sources, the migration potential or proximity to the water source, and the historical data. The following descriptions provide a framework to estimate the relative probability that damage or loss would occur within one to ten years.
    - **Certain**: >95% probability of impact
    - **Likely**: >70% to <95% probability of impact
    - **Possible**: >30% to <70% probability of impact
    - **Unlikely**: >5% to <30% probability of impact
    - **Rare**: <5% probability of impact

- **Impact to the Public Water System** – The risk to the source waters increases as the impact to the water system increases. The impact is determined by evaluating the human health concerns and potential volume of the contaminant source. CDPHE developed information tables to assist with this evaluation. The following descriptions provide a framework to estimate the impact to the public water system.
    - **Catastrophic** - irreversible damage to the water source(s). Events could require new treatment technologies and/or the replacement of existing water source(s).
    - **Major** - substantial damage to the water source(s). Events could result in a loss of use for an extended period of time and/or the need for new treatment technologies.
    - **Significant** - moderate damage to the water source(s). Events could result in a loss of use for an extended period of time and/or the need for increased monitoring and/or maintenance activities.
    - **Minor** - minor damage resulting in minimal, recoverable, or localized efforts. Events could result in temporarily shutting off an intake or well and/or the issuance of a boil order.
    - **Insignificant** - damage that may be too small or unimportant to be worth consideration but may need to be observed for worsening conditions. Events could result in the development of administrative procedures to maintain awareness of changing conditions.

Risk

Probability of Impact	Insignificant	Minor	Significant	Major	Catastrophic
Certain	Low	Moderate	High	Very High	Very High
Likely	Low	Moderate	High	High	Very High
Possible	Low	Moderate	Moderate	High	High
Unlikely	Very Low	Low	Moderate	Moderate	Moderate
Rare	Very Low	Very Low	Low	Low	Low

Impact to Water System

Figure 15. CRWA's SWAP Risk Assessment Matrix

The level of water system control describes the ability of the water system to take measures to prevent contamination or minimize impact. A potential contaminant source that falls within a water system's jurisdiction (*i.e.*, direct control), may be of higher priority since they can take direct measures to prevent contamination or minimize the impact.

- **Direct Control** – The water system can take direct measures to prevent.
- **Indirect Control** – The water system cannot directly control the issue but can work with another person or entity to take measures to prevent.
- **No Control** – The PSOC or issue of concern is outside the control of the public water system and other entities.

The City of Loveland and the Steering Committee ranked the potential contaminant source inventory and issues of concern in the following way:

Table 3. Risk of Assessment and Control Level of Potential Contaminant Sources & Issues of Concern

Potential Contaminant Source or Issue of Concern	Probability of Impact (Rare, Unlikely, Possible, Likely, Certain)	Impact to Water System (Insignificant, Minor, Significant, Major, Catastrophic)	Risk (Very Low, Low, Intermediate, High, Very High)	Priority Ranking
Wildfire	Certain	Significant	High	1
Algal Blooms	Likely	Significant	High	1
Stormwater, Transportation, and Road spills	Likely	Minor	Moderate	2
Security/Vandalism/Cybersecurity	Possible	Significant	Moderate	2
Big Thompson/Road 34 Rehabilitation	Possible	Significant	Moderate	3
OWTS	Rare	Minor	Very Low	3
PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)	Rare	Catastrophic	Low	4
Residential Practices	Possible	Insignificant	Low	4
Active/Historic Mining	Rare	Minor	Very Low	4
Storage Tanks	Rare	Minor	Very Low	4
EPA Regulated Facilities	Rare	Minor	Very Low	4
Floods	Possible	Major	High	1

4.7 Identifying Best Management Practices

Best Management Practices (BMPs) are the actions that can be taken within the Source Water Protection Area to help reduce the potential risks of contamination to the community's source waters. The Steering Committee reviewed and discussed several possible best management practices that could be implemented within the Source Water Protection Area to help reduce the potential risks of contamination to the community's source water. The Steering Committee established a "common sense" approach in identifying and selecting the most feasible source water management activities to implement locally. The best management practices were obtained from multiple sources including: Environmental Protection Agency, Colorado Department of Public Health and Environment, Natural Resources Conservation Service, and other SWPPs.

The Steering Committee recommends that the best management practices listed in Table 6 be considered for implementation.

5. DISCUSSION OF POTENTIAL CONTAMINANT SOURCES AND ISSUES OF CONCERN

The following section provides a brief description of potential contaminant sources and issues of concern that have been identified in this plan, describes the way in which they threaten the water source(s) and outlines best management practices.

5.1 Wildfire

Priority Ranking: High

Wildland fire and its aftermath within the Big Thompson Watershed is among one of the highest potential sources of contamination for the City of Loveland source waters. Wildland fires have the potential to severely affect water quality through a number of mechanisms including increases in soil erosion, flooding, and debris flows for years post event (US EPA , 2017). Rocky Mountain National Park, Big Thompson Watershed Coalition, and Big Thompson Conservation District staff were present during the City of Loveland source water protection planning process to discuss the current forest management and wildfire mitigation practices in place throughout the watershed.

The Big Thompson Phase 1 Watershed Assessment, completed in 2010 prioritized sixth level sub watersheds based upon their hazards for generating flooding, debris flows, and increased sediment yields following wildfires that may have an impact on water supplies. The assessment methods are described by the Front Range Watershed Protection Data Refinement Work Group (2009), and the hazard ranking components included: wildfire hazard, flooding/debris flow hazard, and soil erodibility. (JW Associates 2010). Indeed, the Miller Fork watershed (Category 5, Figure 16) was burned in the Cameron Peak Fire in 2020. In 2021, rain events caused substantial flooding in this watershed and increased turbidities in the Big Thompson River that originated in this watershed. The increased turbidities forced Loveland Water and Power to shut down the river intake and rely on Green Glade Reservoir several times during the summer of 2021.

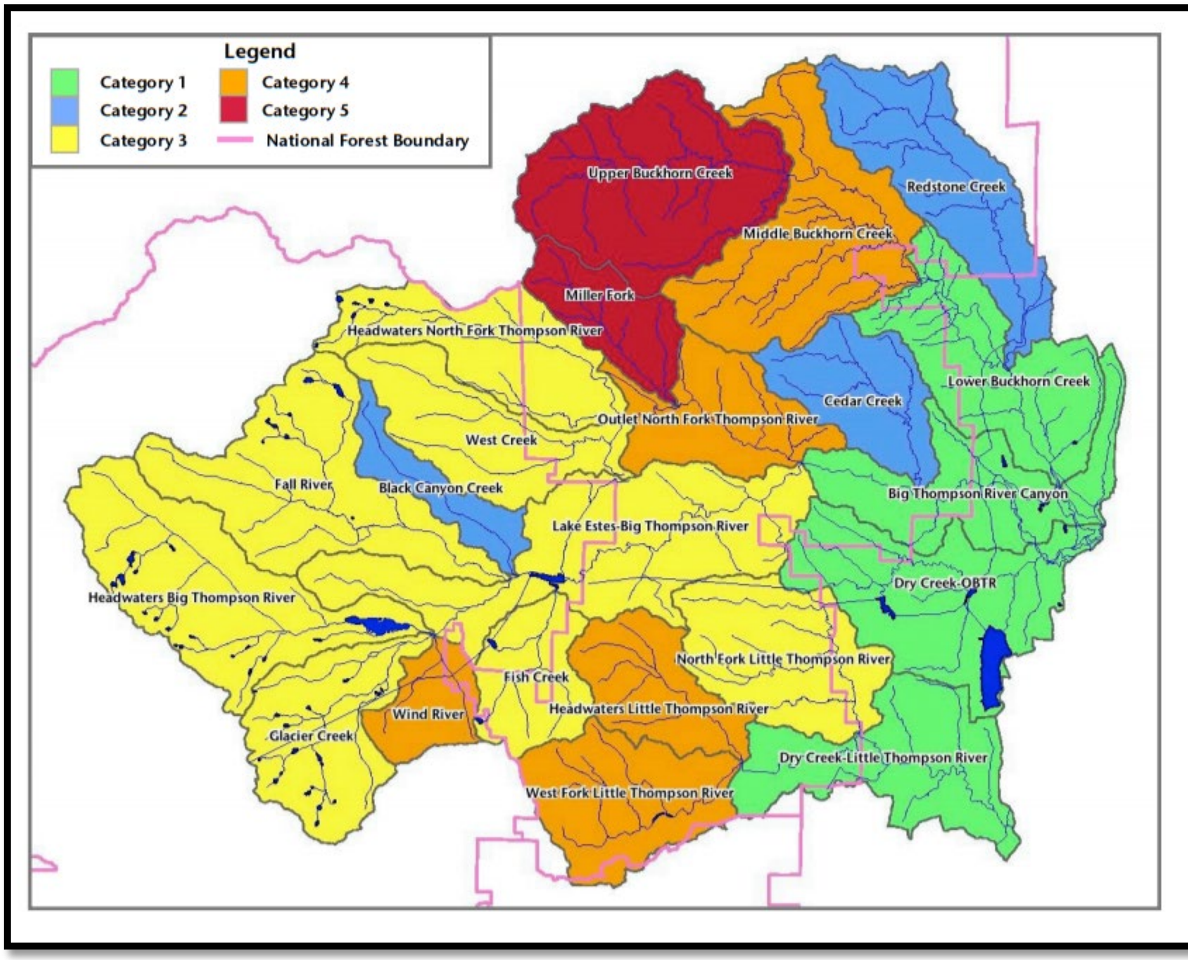


Figure 16. Big Thompson Watershed Wildfire Hazard Ranking. Source JW Associates

5.1.1 <u>2020 East Troublesome Fire</u>

The East Troublesome Fire began on October 14, 2020 northeast of Kremmling in Grand County, Colo. in the Arapaho National Forest. Wide-spread drought, beetle-killed trees, and red flag weather conditions combined to produce unprecedented, wind-driven, active fire behavior (InciWeb). A winter storm from October 24-26 ultimately slowed the fire. The fire was declared contained on Nov. 30, 2020. In total this fire burned 192,457 acres. Post wildfire impacts to drinking water quality could occur in water delivered through the C-BT.

Grand County and Northern Water are partnering and collaborating with other critical partners including Middle Park Conservation District, the Three Lakes Watershed Association, the Colorado River Water Conservation District and more than 40 other federal, state and local organizations, to ensure the most efficient and effective coordination of emergency watershed restoration efforts in areas of Grand County affected by the East Troublesome Fire of October 2020.

5.1.2 <u>2020 Cameron Peak Fire</u>

The Cameron Peak Fire was first reported on August 13, 2020 25 miles east of Walden, Colo and 15 miles southwest of Red Feather Lakes. The fire was declared 100% contained on December 2, 2020 and was the largest in recorded Colorado history, burning 208,913 acres. The majority of the fire occurred in the Cache la Poudre River watershed but approximately 60,000 acres within the Big Thompson River watershed were burned during a short period of severe fire growth that occurred between October 13 and 18 caused by 70 mile per hour winds. The fire burned over 68,000 acres during this short time period.

According to the Cameron Peak Fire Risk Assessment conducted by Larimer County, the two primary areas of concern with regard to negative impacts on water quality in the Big Thompson River watershed include the upper portion of the Buckhorn Creek watershed and the North Fork of the Big Thompson River watershed (particularly the Miller Fork/Black Creek areas). Although the Buckhorn Creek watershed has the potential to negatively impact water quality in the Big Thompson River, its confluence with the Big Thompson River is located below the drinking water intake for the Loveland Water Treatment Plant and as such any fire related impacts to this portion of the watershed will not affect drinking water quality. However, heavy monsoon rains in July 2021 did cause substantial water quality impacts in the form of elevated turbidity at the drinking water intake. This increase was caused by flooding in the Miller Folk/Black Creek area of the North Fork of the Big Thompson River watershed.

Larimer County and the City of Greeley are partnering and collaborating with other critical partners including Coalition for the Poudre River Watershed, and the Big Thompson River Coalition among others to plan and implement coordination of emergency watershed restoration efforts associated with this fire.

Given the increase in the prevalence of large fires in Colorado in recent decades, it is likely that the Big Thompson River watershed will continue to be at high risk for future fires.

Wildfire Best Management Practices Recommendations

1) Work with the Big Thompson Watershed Coalition, Northern Water, and other appropriate partners to identify and implement appropriate forest management practices.
1) Continue to join/participate in post-fire workgroups and wildfire discussions particularly as they relate to water quality impacts to C-BT supplied water.
1) Continue to monitor to water quality changes post wildfire.
1) Provide a copy of the SWPP to USFS, CSFS and other agencies involved in fire management for consideration during fire mitigation, suppression, and post wildfire planning.
3) Develop water quality preparedness document, identify gaps, and remedy as appropriate.
4) Maintain fire safe areas around intake locations and treatment facilities.
5) Consider utilizing the Wildland Fire Decision Support System (WFDSS) for pre-planning of a wildfire event.

5.2 Algal Blooms

Priority Ranking: High

Blue-green algae (also known as cyanobacteria) are photosynthetic bacteria that are common and native to waters found in all states, including Colorado. Large algal blooms can occur when water temperatures are warm and nutrient levels are elevated. These blooms commonly occur in warm lentic waterbodies throughout Colorado. While most blue-green algae are harmless, they can cause taste and odor issues in drinking water and some may produce toxic compounds called cyanotoxins.

Nutrients such as nitrogen and phosphorus feed blue-green algae blooms that can cause the water to taste or smell bad. Taste and odor are not regulated but create customer concerns about water quality and safety. Most complaints water utilities receive are about taste and odor, and these issues can last for prolonged periods. In addition to taste and odor problems, toxic algae can create a public health risk when they produce toxins (CDPHE 2020).

Figure 17. Example harmful algal bloom. Photo (EPA n.d.)

Reducing nutrient loading, especially nitrogen and phosphorus, reduces the risk of harmful algal blooms and associated cyanotoxins that impact drinking water. Local efforts to reduce nutrient loading include experimentation with cover crops, changes in manure application for agricultural purposes, and the restoration of wetlands within the watershed.

Figure 18. Green Ridge Glade Reservoir

In late 2016, LWP performed an Algae Mitigation Assessment. As a result of the mitigation study, LWP implemented several strategies to help reduce algae related taste and odor.

- LWP installed four SolarBee mixers in Green Ridge Glade Reservoir. A fifth was installed summer 2017.
- In 2017, Water Quality staff completed a powdered activated carbon optimization study to improve in-plant taste and odor removal.
- Water Quality staff increased taste and odor monitoring at the intake structure to the Loveland Water Treatment Plant.
- LWP has contracted with a lake management company to apply algaecide to Green Ridge Glade Reservoir in the event of an unforeseen bloom.

It is important to note that while these strategies will reduce the intensity and duration of taste and odor events, the possibility of future taste and odor events has not been eliminated.

Algal Blooms Best Management Practices

1) Maintain current technologies (i.e. Solarbees) and investigate other potential technologies,
1) Develop algal bloom response plan.
1) Investigate further algaecide treatments.
1) Monitor non-point nutrient discharges including nitrogen and phosphorus.
3) Investigate/implement nutrient reduction via fish stocking-trophic cascade.
3) Investigate/implement utilizing wetland on Green Ridge Glad for nutrient reduction.
5) Contact other municipalities for tips/methods for algae control.
5) Continue public outreach concerning taste and odor.

5.3 Stormwater, Transportation, and Roads

Priority Ranking: Moderate

Traffic accidents sometimes lead to the spread of hazardous compounds to the environment and accidental spills of hazardous compounds on roads in the vicinity of vulnerable objects such as water supplies pose a serious threat to water quality (Olofsson, Rasul & Lundmark 2017). The USEPA considers this type of nonpoint source pollution, storm water runoff, to be one of the most significant sources of contamination of the nation's waters.

Some of the principal contaminants found in storm water runoff include heavy metals, toxic chemicals, organic compounds, pesticides and herbicides, pathogens, nutrients, sediments, salts, and other de-icing compounds. Some of these substances are carcinogenic; others can lead to reproductive, developmental, or other health problems that are associated with long-term exposure. Pathogens can cause illness, even from short-term exposure that can be fatal to some people. (USEPA, 2001)

The application rate for magnesium chloride on an annual basis varies by location. The amount of precipitation and runoff at high elevation in Colorado also varies greatly from year to year and site to site. The expected dilution on the roadway, although approximate, suggests a first level of screening for the concentrations of substances in the de-icer. As a rule of thumb, it is undesirable for any constituent of undiluted de-icer to exceed by a factor of 500 or more the allowable concentration of that material in Colorado surface waters, as set by the Colorado Water Quality Control Commission under review by the USEPA. This rule of thumb serves as a means of evaluating concentrations of substances in the de-icer. The rule of thumb is probably conservative in that it is based on chronic standards, which are much more stringent than acute standards. After leaving the roadway, de-icer is further diluted by snowmelt.

Stormwater, Transportation, and Roads

1) Determine process of review of construction permits and obtain option to comment.
1) Confirm spills/accidents contact list with Larimer County Office of Emergency Management.
1) Create Spill Response Plan.
1) Routinely meet with appropriate emergency response organizations to discuss the potential water quality impacts and contact information for appropriate LWP staff in the event of a road spill.
5) Communicate with CDOT and Larimer County Transportation to keep informed on road maintenance practices and schedules within the SWPA including: grading, the application of magnesium chloride and dust abatement activities along with the BMPs utilized during these activities.
5) Create/update emergency call down system.

5.4 Security, Vandalism, Cybersecurity

Priority Ranking: Moderate

5.4.1 Security and Vandalism

Maintaining secure access at drinking water security and treatment facilities is critical for drinking water safety. Maintaining secure locks, appropriate lighting, and operable cameras at intake locations help maintain a secure facility.

5.4.2 Cybersecurity

Implementing cybersecurity best practices is critical for water and wastewater utilities. Cyber-attacks are a growing threat to critical infrastructure sectors, including water and wastewater systems. Many critical infrastructure facilities have experienced cybersecurity incidents that led to the disruption of a business process or critical operation.

According to the US EPA Water Sector Cybersecurity Briefing, cyber-attacks on water or wastewater utility business enterprise or process control systems can cause significant harm, such as:

- Upset treatment and conveyance processes by opening and closing valves, overriding alarms or disabling pumps or other equipment;
- Deface the utility's website or compromise the email system;
- Steal customers' personal data or credit card information from the utility's billing system; and
- Install malicious programs like ransomware, which can disable business enterprise or process control operations. These attacks can: compromise the ability of water and wastewater utilities to provide clean and safe water to customers, erode customer confidence, and result in financial and legal liabilities.

Security, Vandalism, Cybersecurity Best Management Practices

1) Take part in water specific cybersecurity training through EPA and DHS: visit Cybersecurity Best Management Practices for water sector- including the vulnerability self-assessment tool.
1) Create cybersecurity incident response protocol.
1) Review existing water specific cybersecurity with the Information Technology Department to identify gaps and areas for improvement including a National Institute of Standards and Technology audit.
2) Install fencing, activated lighting, and security cameras intake locations.
3) Install Drinking Water Protection Area signs (7) within the watershed and water treatment and supply facilities.
4) Install no trespassing signs.

5.5 Big Thompson/Road 34 Rehabilitation

Priority Ranking: Moderate

US Highway 34, managed by the Colorado Department of Transportation (CDOT), runs along the Big Thompson River through the Big Thompson Canyon and is the primary route for visitors to access Rocky Mountain National Park. In 2013, a large flood in the Big Thompson River severely damaged US Highway 34. A large effort to rebuild the highway was completed in 2019. Although, CDOT and the associated contractors were generally careful, there were a number of events and activities that negatively impacted drinking water quality and aquatic communities in the Big Thompson River. Continued impacts from these activities are possible although the magnitude and frequency is likely to continue to decline over time.

In addition, non-profit organizations such as the Big Thompson Watershed Coalition often undertake river and watershed restoration projects. While these projects are absolutely helpful in the long term with regard to protecting and improving water quality in the Big Thompson River, they may create short term declines in water quality (such as increased turbidity) during constructions.

Big Thompson/Road 34 Rehabilitation Best Management Practices

1) Continue to communicate post rehabilitation status (new plantings etc.)
3) Continue to participate in BTWC board meetings

5.6 Onsite Wastewater Treatment Facilities

Priority Ranking: Very Low

Onsite wastewater treatment systems are located throughout the SWPA on properties not connected to municipal wastewater treatment facilities. OWTS are most commonly referred to as septic systems, which are a type of OWTS consisting of a tank that collects sewage and allows solids to settle and greases/fats to float, before discharging liquid to a leach field for final filtration and treatment by soil (Figure 19). The tanks must be regularly maintained and inspected to ensure that they are properly functioning. Nonfunctioning, or inadequately maintained OWTS can contribute a variety of contaminants to groundwater, including bacteria, pathogens, nutrients, organic matter, and pharmaceuticals and household products.

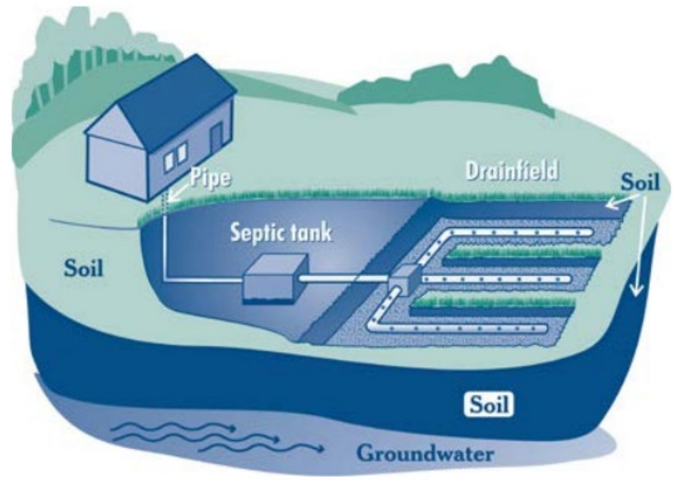


Figure 19. General Septic System Process

Onsite Wastewater Treatment Systems Best Management Practices

5) Work with Larimer County staff to develop a GIS layer of septic failure occurrence within the SWPA.
5) Work with Larimer County and CRWA to conduct an on-site septic system maintenance demonstration for homeowners at selected sites.
5) If needed, purchase a sludge monitoring device for shared use by homeowners so they can evaluate the scum levels in their septic tanks.
5) Discuss septic maintenance outreach with public libraries.

5.7 Per- and polyfluoroalkyl substances (PFAS)

Priority Ranking: Very Low

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that includes PFOA, PFOS, GenX, and many other chemicals. PFAS have been manufactured and used in a variety of industries around the globe, including in the United States, since the 1940s. PFOA and PFOS have been the most extensively produced and studied of these chemicals. Both chemicals are very persistent in the environment and in the human body – meaning they don't break down and they can accumulate over time.

Drinking water can be a source of exposure in communities where these chemicals have contaminated water supplies. Such contamination is typically localized and associated with a specific facility, for example,

- an industrial facility where PFAS were produced or used to manufacture other products, or
- an oil refinery, airfield, or other location at which PFAS were used for firefighting.

The most recent monitoring of these compounds in the Big Thompson watershed occurred in April 2020 and all were found to be absent or non-detectable. Loveland's risk of exposure to these compounds is considered relatively low; There are no large industrial users or chemical manufacturers and there have not been any forest fires that have required the use of compounds that may contain PFAS in the Big Thompson watershed. However, given the potential negative impacts of these compounds, Loveland Water and Power continues PFAS specific monitoring efforts

Per- and Polyfluoroalkyl Substances Best Management Practices

1) Continue participation in and funding of the Compounds of Emerging Concern workgroup sponsored by Northern Water.
2) Participate in volunteer monitoring activities as sponsored by CDPHE and incorporate PFAS sampling into Loveland Source Water Monitoring Program.

5.8 Residential Practices

Priority Ranking: Low

A variety of residential practices have the potential to impact downstream water quality. For example, runoff on residential properties can carry pet waste, soaps and detergents from car washing, lawn fertilizers, oil and gas from driveways, and winter salt and sand applications. These contaminants can enter storm drains and eventually reach source water supplies without prior treatment. Windblown garbage from open trash receptacles can litter neighborhoods and waterways. Improper disposal of pharmaceuticals and oil and grease down sink drains may be inadequately treated at WWTFs before discharging into source water supplies.

Residential Practices Best Management Activities

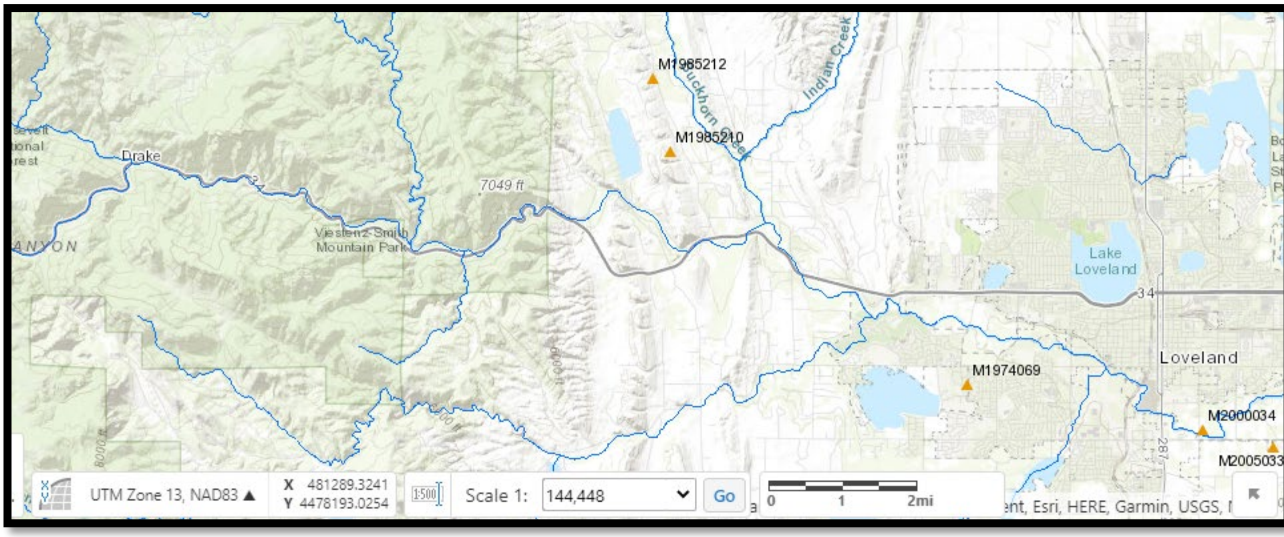
1) Include education and outreach material in utility bills.
3) Conduct education and outreach to elementary school children via classroom presentations
4) Develop a public education campaign for residents within the city that explains the benefits of implementing best management practices to protect the community drinking water supply.
5) Write editorials/articles for the Loveland Herald.
5) Have local primary school students participate in a children's water festival.

5.9 Active/Historic Mining

Priority Ranking: Very Low

5.9.1 <u>Active Mines</u>

Active and inactive mining operations have a potential to contaminate drinking water supplies from either point source discharges or nonpoint source discharges from run-off over waste rock or tailing piles. Acidic, metal-laden water emanating from inactive mines and waste rock piles has a potential to impair aquatic life in surface water. Current mining permit data from the Colorado Division of Mines, Reclamations, and Safety show two mining permits within the City's SWPA.



Active Construction Permit			
Permit ID	**Name**	**Mine Type**	**Commodity**
M1985212	Arkins Park Quarries	Surface	Sandstone
M1985210	Rocky Road Quarry	Surface	Sandstone

5.9.2 <u>Historic Mining</u>

Known and unknown abandoned mines are common throughout historical mining districts. Erica Crosby and Jeremy Reineke with the Colorado Division of Reclamation, Mining and Safety presented to the City's Source Water Steering Committee regarding abandoned mines in the vicinity and the low threat they have to the City's drinking water.

Active/Historic Mining Best Management Practices

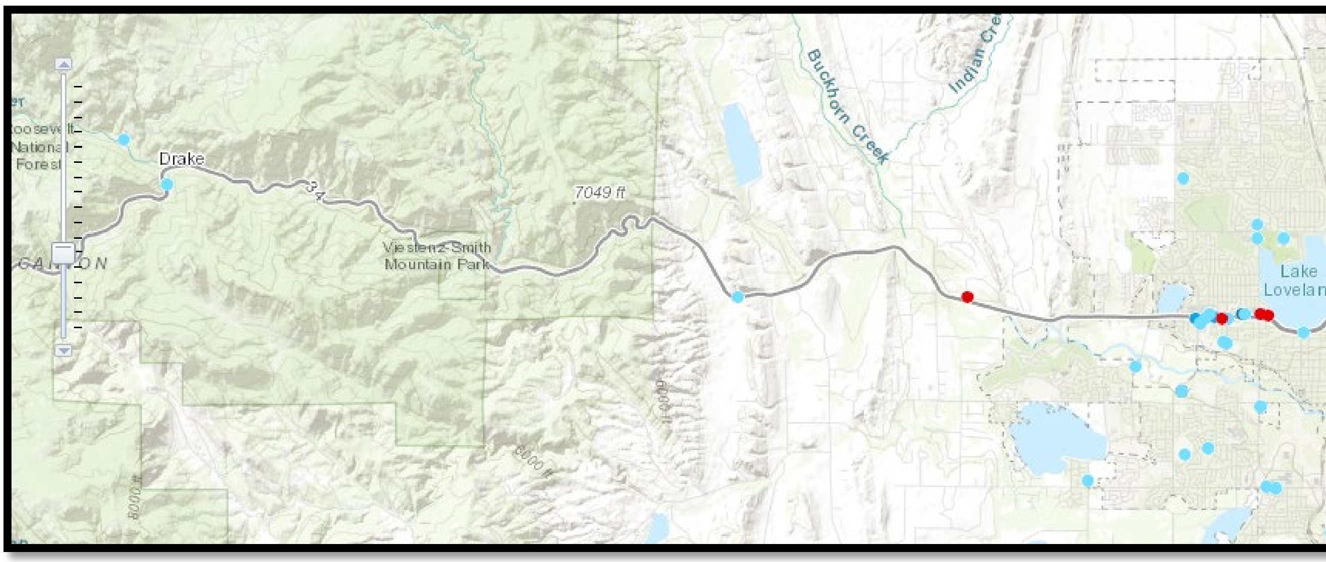
1) Obtain GIS locations of active and historic mines in the watershed from Colorado Geological Survey
3) Maintain a current database of abandoned mines and mine tailing locations.

5.10 Storage Tanks

Priority Level: Very Low

Information concerning aboveground storage tanks (AST) and underground storage tanks (UST) within the Source Water Protection Area were obtained via the Colorado Department of Labor and Employment Division of Oil and Public Safety's database via their Colorado Storage Tank Information (COSTIS) website at http://costis.cdle.state.co.us.

The COSTIS database includes storage tank facility locations, history of petroleum release events, contact information for remediation, and status of events dating back to 1986. According to the COSTIS website, there are3 closed events within the City's SWPA. See Table X below for more information.



Site Name	Event ID	Status	Address	Closure Date
Trans-Western Express Ltd	5765	Closed	8906 E US Hwy 34 Loveland, CO 80537	2/14/1996
CDOT Drake	2373	Closed	1600 Big Thompson Canyon Drake, CO 80515	4/27/1999
CDOW North Thompson Rearing Unit	1871	Closed	¼ mi W of Drake	2/12/1990

Storage Tanks Best Management Practices

1) Obtain and maintain database/GIS locations of storage tank locations within SWPA.
2) Monitor for violations/leak incidents.

5.11 EPA Regulated Facilities

Priority Level: Very Low

There are EPA-regulated facilities that include stationary air emission sources, facilities with direct discharge permits under the National Pollutant Discharge Elimination System, generators and handlers of hazardous waste regulated under the Resource Conservation and Recovery Act, and public drinking water systems regulated under the Safe Drinking Water Act (United States Environmental Protection Agency, 2019). Improper storage and disposal of chemicals from these facilities can reach ground or surface water through a number of pathways. If substances from these businesses are accidentally or intentionally discharged into sewers, contamination of ground and surface waters can occur (US Environmental Protection Agency,
2001).

Figure 20. US EPA regulated facilities within proximity to SWPA Zones 1-3 (Source https://echo.epa.gov/facilities/facility-search)

EPA Regulated Facilities Best Management Practices

1) Routinely communicate with other NPDES holders with regard to known and unexpected changes to discharge quality.
3) Distribute education and outreach material to businesses and industries that explains how to properly store and dispose of oils/greases, toxic, and hazardous waste to protect water quality.
3) Maintain database of regulated facilities and any violations within key areas of the SWPA.

5.12 Flooding

Floods are the most common and widespread of all natural disasters, except fire, according to the Federal Emergency Management Agency. Most communities have experienced some degree of flooding following heavy rain or spring and winter thaws.

Floods pose a particular threat to drinking water systems because floodwaters often carry biological and chemical contaminants that can make consumers sick. Contaminants may include bacteria, viruses, protozoa, or petroleum products from fuel spills in nearby areas. If source water or any part of the water distribution system flood, these contaminants can end up at consumer taps.

Increased water flow during a flood often makes rivers and streams murky. Elevated turbidity in source water can make it difficult to treat water from the Big Thompson River. If that occurs, the water system may have to rely on other water sources which are more expensive, may have water quality challenges of their own, and may be logistically challenging to obtain.

Either way, the water system will have to ask customers to conserve water. That request can confuse customers when flooding or heavy rains make it look like there is water everywhere. Even if the water system can overcome high turbidity, the change in disinfection levels may cause taste or odor problems in the treated water (Washington State Department of Health, 2010).

Debris from floods is caused by structural inundation and high-velocity water flow. As soon as flood waters recede, people begin to dispose of flood-damaged household items. Mud, sediment, sandbags, and other reinforcing materials also add to the volume of debris needing management, as do materials from demolished and dismantled houses. Surface water intakes run the risk of becoming damaged or blocked because of debris flows.

In September, 2013, the front range and plains of eastern Colorado suffered through a catastrophic flooding event. The historic flooding impacted more than 24 counties and more than 2,000 square miles. The floods took 10 lives, and forced the evacuation of more than 18,000 residents, while causing an estimated $3 billion in damage, including $1.7 billion to the state's infrastructure, $623 million to housing and $555 billion to the state's economy (State of Colorado). Although this storm caused 25-200 year flooding events (Yochum 2015), these events are actually occurring on a more frequent basis due to recent changes in the climate of Northcentral Colorado.

Of particular interest to Loveland Water and Power was the flooding that occurred in the Big Thompson River and its associated tributaries. The Big Thompson River watershed experienced some of the most severe flooding with 100-200 year flooding events (Yochum 2015) which resulted in severe damage to Highway 34, which is the primary route to Rocky Mountain National Park, and the destruction of the Idylwilde Dam. In subsequent years, the Idylwilde Dam was entirely removed and Highway 34 was repaired and improved but these activities were extremely costly and disruptive.

Flooding Best Management Practices

1) Utilize current process to notify the public in case of a catastrophic event.
3) Create an Emergency Response Protocol for the river corridor.
3) Develop a plan outlining process and criteria for switching water supply sources, if necessary, to continue to provide drinking water to customers.
3) Identify supply lines within the flood risk zone and create a preemptive shut off/ isolation plan in the event that they are damaged by a flood.
3) Create a plan to distribute drinking water in the event that safe drinking water cannot be provided to portions of the distribution area or the entire distribution area.
3) Create a water restriction plan to implement in the event of a major transmission line outage.

6. SOURCE WATER BEST MANAGEMENT PRACTICES

The following table lists the best management practices and their priority rating recommended by the Steering Committee to be considered for implementation.

Table 4: Source Water Protection Best Management Practices

Issues	Best Management Practices and Relative Priorities
Wildfire	1) Work with Big Thompson Watershed Coalition, Northern Water, and other appropriate partners to identify and implement appropriate forest management practices. 1) Continue to join/participate in post-fire workgroups and wildfire discussions particulary as they relate to water quality impacts to C-BT supplied water. 1) Continue to monitori water quality changes post wildfire. 1) Provide a copy of the SWPP to USFS, CSFS, and other agencies involved in fire management for consideration during fire mitigation, suppression, and post-wildfire planning. 3) Develop water quality preparedness document, identify gaps, and remedy as appropriate. 4) Maintain firesafe areas around intake locations and treatment facilities. 5) Consider utilizing the Wildland Fire Decision Support System (WFDUSS) for pre-planning of a wildfire event.

Issues	Best Management Practices and Relative Priorities
Algal Blooms	1) Maintain current technologies (i.e. Solarbees) and investigate other potential technologies. 1) Develop algal bloom response plan. 1) Investigate further algacide treatments. 3) Investigate/implement nutrient reduction via fish stocking-trophic cascade. 3) Investigate/implement utilizing wetland on Green Glade Reservoir for nutrient reduction. 5) Contact other municipalities for tips/methods for algae control. 5) Continue public outreach concerning taste and odor.
Stormwater, Transportation, and Roads	1) Determine process of review of construction permits and obtain option to comment. 1) Confirm spills/accidents contact list with Larimer County Office of Emergency Management. 1) Create spill response plan. 5) Communicate with CDOT and Larimer County Transportation to keep informed on road maintenance practices and schedules within the SWPA including: grading, the application of magnesium chloride, and dust abatement activities along with the BMPs utilized during these activities 5) Create/update emergency call down system.
Security, Vandalism, Cybersecurity	1) Take part in water specific cybersercurity training through EPA and DHS; visit Cybersecurity Best

Issues	Best Management Practices and Relative Priorities
	Management Practices for water sector – including the vulnerability self-assessment tool. 1) Create cybersecurity incident reponse protocol. 1) Review existing water specific cybersecurity with Information Technology Department to identify gaps and areas for improvement including a National Institute of Standards and Technology audit. 2) Install fencing, activated lighting, and security cameras at intake locations. 3) Install Drinking Water Protection Area signs (7) within the watershed and water treatment and supply facilities. 4) Install "No Trespassing" signs.
Big Thompson/Road 34 Rehabilitation	1) Continue to communicate post-rehabilitation status (new plantings etc.) 3) Continue to participate in BTWC board meetings
Onsite Wastewater Treatment Facilities	5) Work with Larimer County staff to develop a GIS layer of septic failure occurrence within the SWPA. 5) Work with Larimer County and CRWA to conduct an on-site septic system maintenance demonstration for homeowners at selected sites. 5) If needed, purchase a sludge monitoring device for shared use by homeowners so they can evaluate the scum levels in their septic tanks. 5) Discuss septic maintenance outreach with public libraries.

Issues	Best Management Practices and Relative Priorities
Per- and Polyfluoroalkyl Substances	1) Continue participation in and funding of Compounds of Emerging Concern Workgroup sponsored by Northern Water. 2) Participate in volunteer monitoring activities as sponsored by CDPHE and incorporate PFAS sampling into Loveland Source Water Monitoring Program.
Residential Practices	1) Include education and outreach material in utility bills. 3) Conduct education and outreach to elementary school children via classroom presentations. 4) Develop a public outreach campaign for residents within the city that explains the benefits of implementing best management practices to protect drinking water supply. 5) Write editorials/articles for the Loveland Herald. 5) Have local primary school students participate in a children's water festival.
Active/Historic Mining	1) Obtain GIS locations of active and historic mines in the watershed from Colorado Geological Survey. 3) Maintain a current database of abandoned mines and mine tailing locations.
Storage Tanks	1) Obtain and maintain database/GIS locations of storage tank locations within the SWPA.

Issues	Best Management Practices and Relative Priorities
	2) Monitor for violations/leak incidents.
EPA Regulated Facilities	3) Distribute education and outreach material to businesses and industries that explains how to properly store and dispose of oils/greases, toxic, and hazardous waste to protect water quality. 3) Maintain database of regulated facilities and any violations within key areas of the SWPA.
Flooding	2) Utilize current process to notify the public in case of a catastrophic event. 4) Create an Emergency Response Protocol for the river corridor. 4) Develop plan outlining process and criteria for switching water supply sources, if necessary, to continue to provide drinking water to customers. 4) Identify supply lines within the flood risk zone and create a preemptive shut off/ isolation plan in the event that they are damaged by a flood. 4) Create a plan to distribute drinking water in the event that safe drinking water cannot be provided to portions of the distribution area or the entire distribution area. 4) Create a water restriction plan to implement in the event of a major transmission line outage.

7. EVALUATING EFFECTIVENESS OF SWPP

The City of Loveland is committed to evaluating the effectiveness of the various source water BMPs that have been implemented. The purpose of this evaluation is to determine if the various source water BMPs are being achieved and if not, what adjustments to the SWPP will be taken in order to achieve the intended outcomes. It is further recommended that this Plan be reviewed at a frequency of once every one to five years or if circumstances change resulting in the development of new water sources and source water protection areas, or if new risks are identified.

The City of Loveland is committed to a mutually beneficial partnership with the CDHPE in making future refinements to their source water assessment and revising the SWPP accordingly based on any major refinements.

8. REFERENCES

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9. APPENDICES[2]

A. Source Water Assessment Report

B. Source Water Assessment Report Appendices

C. CRWA's SWAP Risk Assessment Matrix

D. Table A-1 Discrete Contaminant Types

E. Table A-2 Discrete Contaminant Types (SIC Related)

F. Table B-1 Dispersed Contaminant Types

G. Table C-1 Contaminants Associated with Common PSOC's

H. Inventory of EPA-Regulated Facilities SWPA

[2] All appendices are located on the CD version of this SWPP.