

# **Town of Buena Vista Source Water Protection Plan**

**PWSID-CO0108300**

**P.O. Box 2002  
Buena Vista, Co. 81211  
Chaffee County, Colorado  
Plan date May 10, 2016**

*Never doubt that a small group of thoughtful, committed citizens  
can change the world; indeed, it's the only thing that ever does.*

– Benjamin Franklin

Prepared by RG Water Works, LLC

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## **EXECUTIVE SUMMARY**

The potential financial and water supply risks related to the possible contamination of one or more of the Town of Buena Vista's water sources are of concern to the Upper Arkansas River Source Water Protection Plan Steering Committee. As a result, the committee believes the development and implementation of a Source Water Protection Plan (SWPP) for the Town of Buena Vista and Chaffee County can help reduce the risks posed by potential contamination to vital water source(s). This SWPP was developed to prioritize source water protection concerns and to identify local source water best management practices (BMP's) that can be implemented to protect source water. The source water assessment results supplied by the Colorado Department of Public Health and Environment were used as a starting point in developing the SWPP.

The Upper Arkansas River SWPP Steering Committee recommends adopting a source water protection area(s) that is larger than the source water assessment area(s) defined by the Colorado Department of Public Health and Environment. The source water protection area defines the region where the Town of Buena Vista and Chaffee County has chosen to implement source water protection measures, in an attempt to manage the susceptibility of their source water to potential contamination.

The Upper Arkansas River SWPP Steering Committee adopted a two-step strategy recommended by the Colorado Department of Public Health and Environment for prioritizing the water sources and potential contaminant sources on which source water protection measures will be focused. The first step of the strategy prioritizes the water sources based on their total susceptibility and/or physical setting vulnerability scores/ratings, while the second step prioritizes the potential contaminant sources based on (1) their prevalence to, (2) the potential threat they pose, or (3) how prevalent and threatening the potential contaminant sources are. In applying this strategy, the committee recommends focusing source water protection measures on Cottonwood Creek drainages, the primary location of Buena Vista's watersheds. Development which utilizes individual and commercial waste water systems and septic adsorption fields, and Forest Service potential activities, represent the most prevalent, most threatening, most prevalent and threatening discrete contaminant sources. Stormwater erosion, recreational uses, forest insect infestations (the Mountain Pine and Spruce Beetles), wildfire and the possible resulting surface erosion represent the most prevalent, most threatening, most prevalent and threatening dispersed contaminant sources contained in the source water protection areas of Buena Vista.

The Upper Arkansas River SWPP Steering Committee reviewed and discussed several possible source water management approaches that could be implemented within the source water protection area(s). These BMP's may help reduce the risks of likely contamination from the prioritized potential contaminant sources. By voluntarily implementing source water management approaches, the Town of Buena Vista and Chaffee County are able to apply an additional level of protection to the drinking water supply. The Upper Arkansas River SWPP Steering Committee established certain acceptance criteria as part of identifying and selecting the most feasible source water management approaches to implement locally. The Upper Arkansas River SWPP Steering Committee recommends the following list of source water management tools be implemented by the Town of Buena Vista, where applicable, in the source water protection area(s): Identification of contaminants of concern, review of new projects, emergency preparedness, and public education.

The Upper Arkansas River SWPP Steering Committee estimates that cost in time and materials will be determined based on practice chosen. Funding to cover these costs will come from several sources including CDPHE, EPA, and the Town of Buena Vista. Implementation of these management approaches is expected to begin in 2016 and will be ongoing following their establishment.

## INTRODUCTION

### Protection Plan Process Guidance

The following table has been supplied as a reference document to effectively plan and develop a source water protection plan for your public water supply system. This table is an overview of the planning process and more detailed instructions are provided in each section throughout the document.

#### PROCESS STEPS FOR PLANNING

Objective	Task	Output	Responsible Party
Develop protection plan	Review SWAP assessment results	Report of findings & recommendations	PWS, Staff, Water Advisory Board
	Report findings to decision makers	Formal presentation to decision makers	PWS, Staff, Water Advisory Board
	Advocate for developing protection plan	Formal endorsement of decision makers	PWS, Staff, Water Advisory Board
	Explore feasibility of partnering with other PWSs in watershed (if applicable)	Determination of partnering with other PWSs	Staff, Water Advisory Board
	Appoint citizen steering committee to advise	Citizen Steering committee	Staff, Decision Makers
	Decide on process to follow	Planning Process	Staff, Steering Committee, Decision Makers
	Develop schedule for planning process	Planning Schedule	Steering Committee, Staff
	Decide on public involvement & notice process	Public involvement & notice process	Steering Committee, Staff
	Produce and distribute plan	Protection Plan	Staff, Steering Committee

### Public Participation and Steering Committee Establishment

Public participation has been 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 state successfully used voluntary citizen advisory groups in the development of both the wellhead protection and source water assessment and protection program plans.

The state recommends that the public water supplier or any other well-suited local interest group take the lead in organizing public participation in the local source water protection planning effort. Effective public participation requires a well-organized effort to raise public awareness, to identify groups and individuals interested in helping, and to define and implement the necessary planning tasks. The Steering Committee has adopted this public participation principle and is encouraging the involvement of all types of stakeholders – individuals, groups, organizations and local decision-makers affected by or concerned with the community’s drinking water – in the local source water protection planning and implementation effort. The Steering Committee believes that local support and acceptance of the plan is more likely where local stakeholders have been actively recruited and encouraged to participate in the development and implementation of the protection plan.

## **Steering Committee and Participants**

The Town of Buena Vista in conjunction with the Upper Arkansas River SWPP appointed a steering committee to advise them on the design and development of the source water protection plan for Buena Vista's water supply. The table below lists the members of the Upper Arkansas River SWPP Steering Committee that was established for the Town of Buena Vista.

### **Steering Committee**

<b>Name</b>	<b>Role/Responsibility</b>	<b>Title</b>	<b>Affiliation</b>
Brandy Reitter	Administration	Town Administrator	Town of Buena Vista
Greg Maggard	Water Department Supervisor	Public Works Director	Town of Buena Vista
Rich Landreth	Administration	Public Works Director	Town of Buena Vista
Roy Gertson	SWPP Preparation	Consultant /Operator	RG Water Works, LLC

### **Other Participants**

The source water protection planning process attracted interest and participation from other key entities. Input by these entities was greatly appreciated and was instrumental in developing and accepting the source water protection plan. These participants and agencies will also be involved with management of this SWPP, they include:

Buena Vista Town Council

Buena Vista Water Advisory Board

Chaffee County Commissioners

Chaffee County Planning & Zoning

Dylan Eiler, Colorado Rural Water Association

Jeff Ollinger, - UAACOG

John Duggan, Colorado Department of Public Health and Environment

U.S. Forest Service

Colorado Division of Parks & Wildlife

Dave Kelly, Local Irrigator, Retired Water Commissioner

Division Water Resources District 2

Upper Arkansas Water Conservancy District

Jord Gertson, Sourcewater Consulting LLC

## Protection Plan Development Process

The source water protection planning effort consisted of a structured process of work group meetings followed by public meetings. The Upper Arkansas River SWPP Steering Committee's recommendations were developed from these work group meetings that were convened to establish the goals and objectives of the protection plan, evaluate the source water assessment results and establish protection priorities, and evaluate source water management approaches. Ultimately, the Upper Arkansas River SWPP Steering Committee's recommendations were incorporated into a draft source water protection plan and presented at public meetings for comment and discussion. A summary of the public meetings that were held is presented below:

### Public Meetings

<b>Date</b>	<b>Location</b>	<b>Purpose/Description</b>
Feb. 9, 2016	Buena Vista Community Center	Meeting to Discuss Draft Source Water Protection Plan
Feb. 17, 2016	Buena Vista Public Works Department	Meeting to Discuss Draft Source Water Protection Plan
May 10, 2016	Buena Vista Community Center	Meeting to Approve Final Source Water Protection Plan

The general public was notified of the public meeting schedule – location, dates and times via local newspapers, community or PWS web page, and fliers posted in public places prior to each meeting.

### **Purpose of Source Water Protection Plan Development**

The Town of Buena Vista and Chaffee County recognize the potential financial and water supply risks related to the potential contamination of one or more of the community's water sources. In an effort to address the potential problems that could affect their untreated source water, the Town of Buena Vista, with guidance from the WQCD, CRWA, and the Buena Vista Water Advisory Board, appointed the Upper Arkansas River SWPP Steering Committee. The Upper Arkansas River SWPP Steering Committee advised the Town of Buena Vista in identifying local source water management approaches that can be voluntarily implemented to reduce the risks of potential contamination of the untreated source water.

The primary goal for developing and implementing source water management approaches is to apply an additional level of protection to the drinking water supply. Preventative measures at the local level (i.e., county and municipal level) may aid in the protection of source water. These BMP's 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.

The SWPP identifies the source water protection area. The area where Buena Vista and the community have chosen to implement source water protection measures. In addition, the protection plan establishes a strategy for prioritizing the water sources and potential contaminant sources to which the source water management approaches will be applied. The strategy is based on the source water assessment results for the Town of Buena Vista, which were used as a starting point from which these priorities were identified. The SWPP also identifies the source water best management practices and associated tasks that will be implemented within the source water protection area(s). In addition, the expected outcome of the tasks, how achievements are measured and the proposed schedule and costs for implementation. The funding source(s) to sustain these approaches and tasks are also identified. Finally, as a companion to the SWPP, a Source Water Protection Ordinance has been adopted by the Town of Buena Vista. An emergency response plan or contingency plan will also be independently developed by the Town of Buena Vista as part of the overall source water management effort. The emergency response plan

lays out a coordinated plan for responding rapidly, effectively, and efficiently to any emergency incident that threatens or disrupts the community water supply.

## OVERVIEW OF COLORADO'S SWAP PROGRAM

Source water assessment and protection came into existence in 1996 as a result of Congressional reauthorization and amendment of the Safe Drinking Water Act. The 1996 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, assumed the responsibility of developing Colorado's SWAP program. The SWAP program protection plan will be integrated with the existing Colorado Wellhead Protection Program that was established in amendments made to the federal Safe Drinking Water Act (SDWA, Section 1428) in 1986. Wellhead protection is a preventative concept that aims to protect public groundwater wells from contamination. The Wellhead Protection Program and the SWAP program have similar goals and will combine protection efforts in one merged program plan.

Colorado's SWAP program is an iterative, two-phased process (Figure 1) 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 1, respectively.

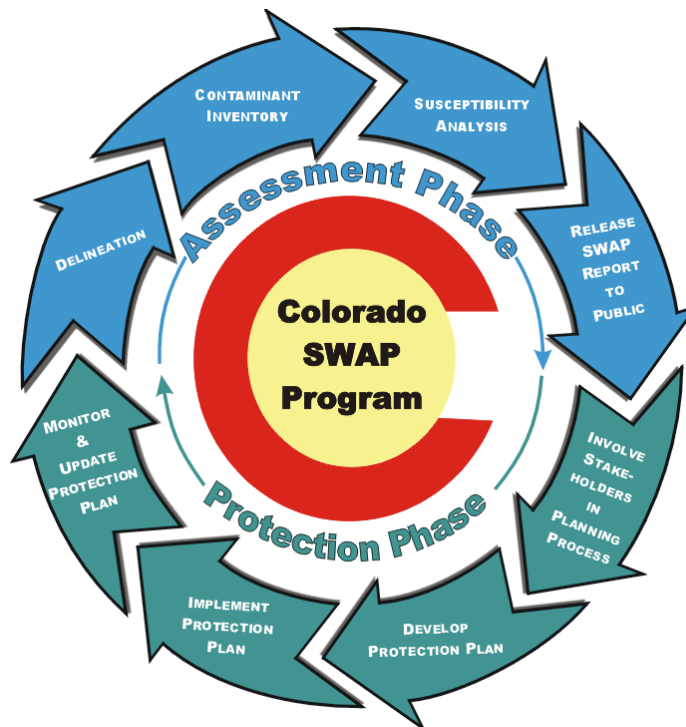


Figure 1. Source Water Assessment and Protection Process

### Source Water Assessment Phase

As depicted in the upper portion of Figure 1, the Assessment Phase for all public water systems consists of four primary elements.

1. Delineating the source water assessment area for each drinking water source;

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 and;
4. Reporting the results of the source water assessment to the public water systems and the general public.

The Assessment Phase involves understanding where the Town of Buena Vista's source water comes from, what contaminant sources potentially threaten the water source(s), and how susceptible each water source is to potential contamination. The susceptibility of an individual water source is analyzed by examining the properties of its physical setting and potential contaminant source threats. The resulting analysis calculations are used to report an estimate of how susceptible each water source is to potential contamination.

## **Source Water Protection Phase**

The Protection Phase is a voluntary, ongoing process in which the Town of Buena Vista has been encouraged to voluntarily employ preventive 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 1, 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 Colorado Department of Public Health and Environment 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 governments. The evolution of the SWAP program is to incorporate any new assessment information provided by the public water supply systems and update the protection plan accordingly.

## **WATER SUPPLY SETTING**

### **Hydrogeographic and Water Quality Setting**

The Town of Buena Vista supplies drinking water to the residents of Buena Vista and the surrounding unincorporated area of Chaffee County, Colorado. The Town of Buena Vista has a population of 2662 and is an economic mix of predominantly a tourist based community, commercial businesses, and larger employee based School District R-31, Sangre de Cristo Electric Association, and Colorado Department of Corrections.

The source water for the Town includes both surface water and ground water, all contained within the top twelve (12) miles of the Cottonwood Creek Watershed, westerly to the Continental Divide. Buena Vista's employees enjoy direct physical daily contact with the Cottonwood Creek watershed area.

The Town's currently active ground water and surface water supply is Cottonwood Creek, West of Buena Vista in the Collegiate Peaks Mountain Range. This includes South, Middle, and North Cottonwood Creek drainages. The Collegiate Peaks Wilderness is also located in the source water areas. The Town holds active water rights in the



Cottonwood Creek Drainages of Middle and North Cottonwood Creeks. Buena Vista's surface sources are considered to be high elevation mountain "pristine" sources.

Buena Vista's groundwater sources include an Infiltration Gallery and one well adjacent to Cottonwood Creek. These sources are connected to the Cottonwood Creek Alluvium aquifer and tributary to the Arkansas River. Buena Vista has recently drilled a non-potable well in the Buena Vista River Park adjacent to the Arkansas River. This well is not included in this Protection Plan, as it is used only for irrigation of the River Park sports fields and landscape. This well could be designed as a potable source of Arkansas water that would increase Buena Vista's redundancy of sources, and not be related to any problems that may occur in the Cottonwood Creek source water.

Elevation within Buena Vista's source water area ranges from 8,000 feet near the Arkansas to over 14,000 feet at the Continental Divide West of Buena Vista. The climate within the source water area(s) is generally mountain arid with an average annual precipitation of 23 inches.

The water quality of the untreated source water is measured against various use classifications and water quality standards that are established and periodically re-assessed by the Colorado Department of Public Health and Environment and the Water Quality Control Commission for Colorado's rivers and streams. Currently, some of the stream segments located above Buena Vista's intake(s) are classified to protect drinking water use. For the stream segments with a drinking water use classification, drinking water standards have been established for Cottonwood Creek. These stream standards are a reflection of known water quality conditions, as well as historic land uses within the Buena Vista's watershed. Drinking water classifications and associated water quality standards provide public water systems and communities with a mechanism for monitoring and protecting the quality of their source water.

## **Drinking Water Supply Operation**

The current water supply consists of an infiltration gallery (alluvial horizontal well), one vertical groundwater well, and one surface water treatment plant, all of which are located west of Buena Vista. The raw water diverted from Cottonwood Creek is sent to the Water Treatment Plant for treatment. The Water Treatment Plant has the maximum capacity to treat 2.9 million gallons of drinking water per day. Treated water is stored in three ground level storage tank(s) prior to distributing the drinking water to the Town's customers. Buena Vista's finished water storage tanks have a combined capacity of 2.520 million gallons. Including transmission lines, Buena Vista has approximately 20 miles of distribution pipelines.

## **Water Supply Demands/Analysis**

The Buena Vista water system serves 1621 connections and approximately 2662 residents and other temporary visitors to Buena Vista. The water system currently has the capacity of meeting a peak (i.e., maximum) daily demand of 0.940 million gallons per day. Current estimates indicate that the average daily demand by the water system's customers is approximately 0.470 million gallons per day, and that the average peak daily demand is approximately 1.233 million gallons per day. Using these estimates, the water system has a surplus average daily capacity of 2.43 million gallons per day and a surplus average peak daily demand capacity of 1.66 million gallons per day. Using the surplus estimates above, Buena Vista has evaluated its ability to meet the average daily demand and the average peak daily demand of its customers in the event the water supply from one or more of its water sources becomes disabled for an extended period of time due to potential contamination. The evaluation indicated that Buena Vista is able to meet the average daily demand of its customers if as few as one of the water sources became disabled for an extended period of time. The evaluation also indicated that Buena Vista will be able to meet the average peak daily demand of its customers if as few as one of the water sources became disabled for an extended period of time. The ability of Buena Vista to meet either of these demands for an extended period of time is also affected by the amount of treated water the water system has in storage at the time a water source(s) becomes disabled. The Town currently is only operating the Infiltration Gallery and Well #2. The Surface Water Treatment Plant is off line and can be operational as demand or loss of the Gallery due to potential groundwater contamination.

Buena Vista recognizes that potential contamination of its ground water source(s) could potentially result in having to treat the ground water and/or abandon the water source if treatment proves to be ineffective or too costly. To understand the potential financial costs associated with such an accident, Buena Vista evaluated what it might cost to replace one of its water sources (i.e., replacement of the intake structure and the associated infrastructure) if this occurs. The evaluation did not attempt to estimate treatment costs, which can be variable depending on the type of contaminant(s) that need(s) to be treated. The evaluation indicated that it could cost anywhere from 3 to 9 million dollars in today's dollars to replace one of its water sources.

The potential financial and water supply risks related to the long-term disablement of one or more of the community's water sources are a serious concern to the Upper Arkansas River SWPP Steering Committee. As a result, the Steering Committee believes the development and implementation of a Source Water Protection Plan for Buena Vista and Chaffee County will help to reduce the risks posed by potential contamination of its water sources. The adopted Town of Buena Vista Water Resources Master Plan dated October 2014 states "the Town's water shed protection plan should be modified to include the entire watershed and a source water protection plan developed through the CDPHE process".

### **Growth and Land Use Projections**

The latest 2012 census information indicated a population of 2662 people in the Buena Vista service area. Based on the latest and previous census information, the Town of Buena Vista and Chaffee County has been experiencing a leveling in growth within the community over the last 20 years. Future projections by the Colorado Office of Demographics, estimates that Buena Vista's population will increase by nearly 16 % by 2030, an average of 1.2% per year.

Currently, the Town of Buena Vista estimates that 94% of the land area within the proposed source water protection area is undeveloped Public lands. Land ownership in the area is 6 % Private ownership.

The Town of Buena Vista has approved a Watershed Protection District, which includes certain protective components that can be administered by the Town of Buena Vista. A special land use/zoning component is already in effect encompassing the District boundaries. However, if other properties are identified in the SWPP and not in the existing Protection District land use/zoning regulations could be proposed and presented to Chaffee County Commissioners.

### **SOURCE WATER ASSESSMENT RESULTS**

The Colorado Department of Public Health and Environment assumed the lead role in conducting the source water assessments for public water systems in Colorado. Buena Vista received their source water assessment report in November 2004 for Groundwater Sources and March 2007 for their Surface Water Sources and has reviewed the report, along with the Upper Arkansas River SWPP Steering Committee. Buena Vista and the Upper Arkansas River SWPP Steering Committee are committed to using these assessment results as a starting point to guide the development of appropriate management approaches to protect their source water from potential contamination. A copy of the source water assessment summary report for the Town of Buena Vista can be obtained by contacting the Town or by downloading a copy from the Colorado Department of Public Health and Environment's SWAP program web site located at: <https://www.colorado.gov/pacific/cdphe/source-water-assessment-and-protection-swap>. The following sections provide a brief summary of the main findings from the three component phases of the assessment.

### **Source Water Assessment Area Delineation**

#### **Surface Water Systems**

The source water assessment area(s) for Buena Vista's one surface water source consists of approximately 69,911 acres or a 109 square mile area draining the Cottonwood Creek Watershed. The Colorado Department of Public

Health and Environment provided Buena Vista with a draft map of their source water assessment area(s) and asked them to voluntarily review and comment on its accuracy. Included in the appendix is a map of the source water assessment areas as part of the source water protection plan. The delineated source water assessment area(s) not only provides the basis for understanding where the community's source water and potential contaminant threats originate, but it also provides the basis for establishing the source water protection area under this source water protection plan. Further discussion is provided in a later section on the source water protection area that was established under this plan.

### **Ground Water Systems**

The source water assessment area(s) for Buena Vista's Infiltration Gallery is located in specified areas overlying the Cottonwood Creek Aquifer. A system map is included in the appendix. The delineated source water assessment areas not only provide the basis for understanding where the community's source water and potential contaminant threats originate, but also provide the basis for establishing the source water protection area(s) under this source water protection plan. Further discussion is provided in a later section on the source water protection area(s) that was established under this plan.

### **Contaminant Source Inventory**

**The information contained in this "Plan" is limited to that available from public records and the water supplier. Other "potential contaminant sites" or threats to the water supply may exist in the source water assessment areas that are not identified in this "Plan". Identification of a site as a "potential contaminant site" should not be interpreted as one that will necessarily cause contamination of the water supply.**

The contaminant source inventory was conducted to identify whether or not selected potential sources of contamination might be present within the source water assessment area(s). The Colorado Department of Public Health and Environment inventoried discrete contaminant sources using selected state and federal regulatory databases. Dispersed contaminant sources were inventoried using recent land use/ land cover and transportation maps of Colorado, along with selected state regulatory databases. The contaminant inventory was completed by mapping the potential contaminant sources with the aid of a Geographic Information System (GIS).

The Colorado Department of Public Health and Environment provided Buena Vista with a draft map, a summary of the discrete contaminant sources mapped within their source water assessment area(s), and a summary of the dispersed contaminant sources inventoried within the source water assessment area(s). The Town was asked to voluntarily review the inventory information, field verify selected information about existing and new discrete contaminant sources, and provide feedback on the accuracy of the inventory.

### **Discrete Potential Sources of Contamination**

The contaminant source inventory results for Buena Vista indicate the following types of discrete contaminant sources were identified within the source water assessment areas for all of the Cottonwood Creek Aquifer sources analyzed:

Existing/Future abandoned Mine Sites (including tailings)

Permitted waste water discharge

### **Dispersed Potential Sources of Contamination**

The contaminant source inventory results for Buena Vista indicate the following types of dispersed contaminant sources were identified within the source water assessment area(s) for all of the Cottonwood Creek Aquifer analyzed:

#### Land Uses:

- Evergreen Forest (beetle kill activity)
- Deciduous Forest
- Pasture / Hay
- Mixed Forest

#### Other Types:

- Road Miles (County and Forest Roads)
- Septic Systems
- Recreational uses
- Wildlife populations

### Source Water Protection Priority Strategy and Susceptibility Analysis

After reviewing the source water assessment results for Buena Vista, the Upper Arkansas River SWPP Steering Committee adopted the two-step strategy recommended by the Colorado Department of Public Health and Environment for prioritizing the water sources and potential contaminant sources on which source water protection measures will be focused.

The strategy calls for water sources with total susceptibility ratings or physical setting vulnerability ratings of Moderately High or High to be prioritized as the first step in the process. A Moderately High or High total susceptibility rating indicates that the water source is proportionately more susceptible to potential contamination overall when compared to other similar types of water sources around the state. Higher total susceptibility ratings most typically result for water sources with highly vulnerable physical settings and a source water assessment area containing several potential contaminant sources that pose a significant threat to potential contamination. A Moderately High or High physical setting rating indicates a diminished ability of the physical setting of the source water assessment area to buffer contaminant concentrations in the source water below acceptable levels and, therefore, is more vulnerable to potential contamination. Even in cases where few if any potential contaminant sources are currently present, a water source with a highly vulnerable physical setting could be very susceptible to future contamination depending on the type of potential contaminant source(s) that might be introduced.

The strategy also outlines three options for prioritizing discrete and dispersed potential contaminant sources for source water protection measures as the second step of the process. These options include prioritizing source water protection measures based on:

1. **Most prevalent contaminant sources.** Under this option, protection measures would be focused on the discrete and dispersed contaminant sources that occur most frequently in the water system's source water protection area(s), regardless of the individual susceptibility ratings they may have received.
2. **Most threatening contaminant sources.** Under this option, protection measures would be focused on the individual discrete and dispersed contaminant sources in the water system's source water protection area(s) to which the water source(s) is most susceptible. The most threatening contaminant sources are defined as any potential contaminant source receiving a Moderately High or High individual susceptibility rating.
3. **Most prevalent and threatening contaminant sources.** Under this option, protection measures would be focused on the most frequently occurring discrete and dispersed contaminant sources in the water system's source water protection area(s) that received a Moderately High or High individual susceptibility rating.

In applying this strategy, the Steering Committee recommends focusing source water protection measures on Cottonwood Creek Drainages and the most prevalent, most threatening, most prevalent and threatening discrete

contaminant sources and the most prevalent, most threatening, most prevalent and threatening dispersed contaminant sources contained in the source water protection area(s) for this water source(s).

Table 1 below outlines the water sources that the community and the Steering Committee feel should be prioritized based on the assessment susceptibility results. The potential contaminant sources for each water source are listed in Table 1 according to the adopted priority strategy (most prevalent and threatening).

**Table 1- Source Water Protection Priority Strategy and Susceptibility**

Source ID	108300 - 003	CO0108300- 002	CO0108300- 004					
Source Name	Cottonwood	Gallery	Well #2					
Source Type	SW	GW	GW					
Total Susceptibility	Moderate	Moderate High	Moderate High					
Physical Setting Vulnerability	Moderate	Moderate High	Moderate					
<b>Most Prevalent and Threatening Discrete Contaminant Sources</b>								
Permitted Wastewater Discharge	1							
Existing Abandoned Mine Sites	6							
Commercial Tourist Facility	4							
TOTAL	<b>11</b>							
<b>Most Prevalent and Threatening Dispersed Contaminant Sources</b>								
Low Intensity Residential	X	X	X					
Gravel pit	X							
Pasture/Hay	X	X	X					
Deciduous Forest	X	X	X					
Evergreen Forest	X	X	X					
Mixed Forest	X	X	X					
Septic Systems	X	X	X					
Road Miles	X	X	X					
TOTAL	<b>8</b>	<b>7</b>	<b>7</b>					

**Susceptibility Analysis**

The susceptibility analysis provides a screening-level evaluation of the likelihood that a potential contamination problem could occur rather than an indication that a potential contamination problem has

**or will occur. The analysis is NOT a reflection of the current quality of the untreated source water, nor is it a reflection of the quality of the treated drinking water that is supplied to the public.**

The susceptibility analysis was conducted by the Colorado Department of Public Health and Environment to identify how susceptible an untreated water source could be to contamination from potential sources of contamination inventoried within its source water assessment area. The analysis looked at the susceptibility posed by individual potential contaminant sources and the collective or total susceptibility posed by all of the potential contaminant sources in the source water assessment area. The Colorado Department of Public Health and Environment developed a susceptibility analysis model for surface water sources and ground water sources under the influence of surface water, and another model for ground water sources. Both models provided an objective analysis based on the best available information at the time of the analysis. The Colorado Department of Public Health and Environment provided Buena Vista with a final source water assessment report and supporting analysis information.

Table 1 presents the priority strategy and the susceptibility analysis results for selected water sources for Buena Vista. The table(s) summarizes the total susceptibility and physical setting vulnerability results, and the individual susceptibility results for the discrete and dispersed contaminant sources associated with each of the water sources that have been prioritized for source water protection measures under this plan. As a starting point, these water sources have been prioritized based on the source water protection priority strategy recommended by the Steering Committee. The priority strategy was discussed previously in the section titled *Source Water Protection Priority Strategy and Susceptibility*.

## **SOURCE WATER PROTECTION MEASURES**

### **Defining the Source Water Protection Area(s)**

The source water protection area defines either the watershed region or the surficial region overlying the local aquifer 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. Maps have been provided in the appendix.

### **Identifying the Categories of Contaminants for Discrete Contaminant Sources**

The most common categories of contaminants that are most likely associated with the most prevalent and threatening discrete contaminant sources identified in Table 1 include:

#### **Acute Health Concern Contaminants:**

- Microorganisms
- Nitrate/Nitrite
- Pesticides
- Semi-volatile organic compounds (SVOCs)
- Volatile organic compounds (VOCs)
- Lead
- Ammonia or nitric acid

Acute health concern contaminants include individual contaminants and categories of constituents that pose the most serious immediate health concerns resulting from short-term exposure to the constituent. Many of these acute health concern contaminants are classified as potential cancer-causing (i.e., carcinogenic) constituents or have a Maximum Contaminant Level Goal (MCLG) set at zero (0).

#### **Chronic Health Concern Contaminants:**

- Herbicides
- Pesticides

- Volatile organic compounds (VOCs)
- Non-metal inorganic compounds
- Metals – Primary Drinking Water (other than lead)
- Turbidity
- Other inorganic compounds
- Other organic compounds (Endocrine disruptors)

Chronic health concern contaminants include categories of constituents that pose potential serious health concerns due to long-term exposure to the constituent. Most of these chronic health concern contaminants include the remaining primary drinking water contaminants.

Aesthetic Concern Contaminants:

- Secondary drinking water contaminants

Aesthetic contaminants include the secondary drinking water contaminants, which do not pose serious health concerns, but cause aesthetic problems such as odor, taste or appearance.

The groups of acute, chronic and aesthetic concern contaminants are analogous to the Class A, Class B and Class C contaminant hazards, respectively, that were used in the Colorado Department of Public Health and Environment's source water assessment. Table B-1 in Exhibit C is provided as a reference to further define specific contaminants in relationship to potential sources of contamination.

### **Identifying the Categories of Contaminants for Dispersed Contaminant Sources**

The most common categories of contaminants that are most likely associated with the most prevalent and threatening dispersed contaminant sources identified in Table 1 include:

Acute Health Concern Contaminants:

- Microorganisms
- Nitrate/Nitrite
- Pesticides
- Semi-volatile organic compounds (SVOCs)
- Volatile organic compounds (VOCs)
- Lead
- Ammonia or nitric acid

Acute health concern contaminants include individual contaminants and categories of constituents that pose the most serious immediate health concerns resulting from short-term exposure to the constituent. Many of these acute health concern contaminants are classified as potential cancer-causing (i.e., carcinogenic) constituents or have a Maximum Contaminant Level Goal (MCLG) set at zero (0).

Chronic Health Concern Contaminants:

- Herbicides
- Pesticides
- Volatile organic compounds (VOCs)
- Non-metal inorganic compounds
- Metals – Primary Drinking Water (other than lead)
- Radionuclides
- Turbidity
- Other inorganic compounds
- Other organic compounds (Endocrine disruptors)

Chronic health concern contaminants include categories of constituents that pose potential serious health concerns due to long-term exposure to the constituent. Most of these chronic health concern contaminants include the remaining primary drinking water contaminants.

Aesthetic Concern Contaminants:

- Secondary drinking water contaminants

Aesthetic contaminants include the secondary drinking water contaminants, which do not pose serious health concerns, but cause aesthetic problems such as odor, taste or appearance.

The groups of acute, chronic and aesthetic concern contaminants are analogous to the Class A, Class B and Class C contaminant hazards, respectively, that were used in the Colorado Department of Public Health and Environment's source water assessment. Table B-1 in Exhibit C is provided as a reference to further define specific contaminants in relationship to potential sources of contamination.

### **Source Water Protection Area Management and Commitment**

The Upper Arkansas River SWPP Steering Committee reviewed and discussed several possible source water management approaches that could be implemented within the source water protection area(s) to help reduce the potential risks of potential contamination of the community's source water. The purpose of voluntarily implementing source water management approaches is to apply an additional level of protection to the drinking water supply by taking preventive measures at the local level (i.e., county and municipal level) to protect the source water. These local preventive measures will compliment regulatory protection measures already being implemented at the state and federal governmental levels by filling protection gaps that can only be addressed at the local level. The Upper Arkansas River SWPP Steering Committee is confident that applying these management approaches is a cost-effective and common sense approach in helping to reduce the risks of costly service disruptions resulting from potential contamination of the source water.

The Upper Arkansas River SWPP Steering Committee established certain acceptance criteria as part of identifying and selecting the most feasible source water management approaches to implement locally. The Upper Arkansas River SWPP Steering Committee recommends the following table (Table 2) of source water Best Management Practices to be implemented by the Town of Buena Vista and Chaffee County Planning Commission, where applicable in the source water protection area(s). The list is prioritized in the order of importance to the Upper Arkansas River SWPP Steering Committee. In order to provide some resources for defining applicable best management approaches, the following websites were identified:

[www.cabmphandbooks.com](http://www.cabmphandbooks.com), [www.npscolorado.com](http://www.npscolorado.com), [www.epa.gov/watertrain/](http://www.epa.gov/watertrain/),  
[www.epa.gov/safewater/dwa/electronic/ematerials.html#SWP](http://www.epa.gov/safewater/dwa/electronic/ematerials.html#SWP), [www.epa.gov/owow/nps/forestrygmt/](http://www.epa.gov/owow/nps/forestrygmt/)



**Table 2. Source Water Protection Priorities and Best Management Practices**

Issue #	Priority Issue	Best Management Practices	Water Sources Applied	Implementation Responsibility	Implementation Schedule	Estimated Cost	Funding Sources
1	<p><b>Transportation and Spills</b> - Incorporate our transportation and spills risk expert's insight on best management practices (BMPs) to minimize potential threats and impacts to source water and the overall watershed. Here are a few suggested BMP's to include in your source water protection plans.</p>	<p>Develop and distribute laminate handout with identified areas for Public Water Systems (PWSs) concerns, source water intakes, key storm-water outfalls, as well as a priority emergency contact list including Town of Buena Vista, Chaffee County Fire Protection District and Colorado Department of Public Health and Environment, Chaffee County Emergency Management information for response and follow up to a spill event and remediation.</p> <p>Establish community procedures for acceptable follow-up that identify the entity responsible for clean-up and the remediation of a site.</p> <p>Establish a clear and effective chain of communication so that information can be relayed quickly and concisely between first responders, dispatch officials, and public water providers. Use the reverse 911 system to alert private water users when a spill has occurred.</p> <p>Address road related storm-water erosion issues, use of dust suppression, and eradicating of noxious weeds.</p> <p>Install signage at the road entries of Buena Vista's Source Water Protection areas.</p>	SW & GW sources	<p>Town of Buena Vista, Buena Vista Police Department, Dispatch, Chaffee County Sheriff, Colorado State Patrol, CDOT, CDPHE, U.S. Forest Service, Colorado Division of Parks and Wildlife</p> <p>Town Buena Vista, Chaffee County Emergency Management, CDPHE, Other federal and state agencies</p> <p>Town Buena Vista, Chaffee County Emergency Management, CDPHE, Other federal and state agencies</p> <p>Chaffee County, CDOT, Private Entities (e.g., Ranchers, Mining Claims), USFS, Soil Conservation District, NRCS</p> <p>Town BV, CDPHE, Chaffee County Roads,</p>	<p>Design/Print &amp; Distribute Water Shed Laminate Cards TBD</p> <p>Standard Operating Procedure TBD</p> <p>Communication Protocol TBD</p> <p>Standard Operation Procedure TBD</p> <p>Obtain signs and permission for installation TBD</p>	<p>\$1,000</p> <p>Town BV In-kind</p> <p>Town BV In-kind</p> <p>Town BV In-kind</p> <p>Town BV In-kind,</p>	<p>Town BV, CDPHE Implementation Grant Funding</p>

Issue #	Priority Issue	Best Management Practices	Water Sources Applied	Implementation Responsibility	Implementation Schedule	Estimated Cost	Funding Sources
2	<p><b>Onsite Wastewater Treatment Systems</b> - Incorporate our onsite wastewater treatment system (OWTS) expert's insight on best management practices (BMPs) to minimize potential threats and impacts to source water and the overall watershed. Here are a few suggested BMP's to include in your source water protection plans.</p>	<p>Develop a GIS layer with septic systems identified along with prioritizing which OWTS are the most immediate threat (Zone 1 or 1,000 ft. for 5 miles upstream may be considered).</p> <p>Share GIS layer with the county to identify sensitivity areas, buffer zones, and protection areas related to OWTS's.</p> <p>Use public outreach to educate specific OWTS owners about how to maintain and check their systems. Consider sending this information out in the water utility billing (ex: Are you aware that not operating your septic system properly could affect your drinking water quality?)</p> <p>Coordination on adoption of new state OWTS regulations and add language to county plans to address threats to drinking water from OWTS.</p> <p>Consider septic pumping rebates or "sludge judge" monitoring in sensitivity zones.</p>	SW & GW sources	Town of Buena Vista  Chaffee County	Ongoing	Town BV in kind	BV budget, Grants

Issue #	Priority Issue	Best Management Practices	Water Sources Applied	Implementation Responsibility	Implementation Schedule	Estimated Cost	Funding Sources
3	<b>Forest Health / Wildfire BMP's</b> - Incorporate our wildfire risk expert's insight on best management practices to minimize water quality impacts to source water. Here are a few suggested BMP's to include in your source water protection plans.	<p>Water providers should evaluate the priority zones of concern in the Arkansas wildfire risk assessment <a href="http://www.jw-associates.org/Projects/UpperArk">http://www.jw-associates.org/Projects/UpperArk</a> and further identify areas with overlapping public water system concerns (areas to reduce fire intensity near PWS infrastructure/close to streams, intake locations, high potential sediment yield areas, places to implement sediment retention structures, etc.)</p> <p>Improve coordination with USFS by establishing direct contacts and incorporate any potential restoration concerns with the BAER (Burn Area Emergency Rehabilitation) team prior to a fire occurring.</p> <p>Provide the USFS with all relevant information (plans/shape files) regarding the source water protection area, areas of concern, potential thinning/fire break areas and access to critical PWS infrastructure in the event of a fire.</p> <p>Increase coordination and notification procedures with land managers (USFS, Colo. Parks Wildlife, etc.) so the PWS's are notified when land management activities in the watershed may affect water quality. Including beetle kill issues, road construction, wildlife habitat &amp; timber operations.</p> <p>Research project partners (counties, other PWS's, etc.) with mutual interest and funding opportunities to propose wildfire risk reduction projects to the appropriate land management agency.</p>	SW & GW sources	<p>Town of Buena Vista</p> <p>Town of Buena Vista</p> <p>Town of Buena Vista</p> <p>Town of Buena Vista</p> <p>Town of Buena Vista</p>	<p>Review wildfire study areas. Determine BMP</p> <p>Meet w/ USFS</p> <p>Meet w/ USFS</p> <p>Prepare letter &amp; meet w/ USFS</p> <p>Check w/wildfire plan partners, Prepare BMP project</p>	<p>BV staff time</p> <p>BV staff time</p> <p>BV staff time</p> <p>BV staff time</p> <p>BV staff time</p>	<p>BV budget</p> <p>BV budget</p> <p>BV budget</p> <p>BV budget</p> <p>BV budget</p>

Issue #	Priority Issue	Best Management Practices	Water Sources Applied	Implementation Responsibility	Implementation Schedule	Estimated Cost	Funding Sources
4	<p><b>Mining Related</b></p> <p>- Incorporate our mining expert's insight on best management practices to minimize water quality impacts to source water. Here are a few suggested BMP's to include in your source water protection plans. (For specific mining related field best management practices, please see Appendix D)</p>	<p>Abandoned Mine Issues: Research and identify mining sites that are within the near zone (5 miles upstream of intakes) and zone 1 (1,000 feet from streams) for surface water systems. Groundwater systems may want to evaluate any potential abandoned mining impacts in zones 1, 2, and 3.</p>	SW & GW sources	Town of Buena Vista	Review mine site list for impact zones. Prioritize sites.	BV staff time	BV budget
<p>Coordination on BMP's: Coordinate with the agencies who can further identify potential risks in the sensitivity zones and help determine appropriate BMP strategies (ex. CDPHE, DRMS, USFS). A list of potential BMP approaches that may be implemented once a target mine is identified on page 45 in appendix D.</p>		Town of Buena Vista		Set meeting w/ agencies once priorities are listed.	BV staff time	BV budget	
<p>Coordination with the County and Division of Mining and Reclamation and Safety: Establish contacts with the county and DRMS to get notified on any new permits/public notices related to proposed future mining areas and re-processing areas.</p>		Town of Buena Vista		Send letter for Notification of pending permits	BV Staff time	BV budget	
<p>Coordination with County, USFS, and other Land Management Agencies to further understand proposed wilderness regions and their relationship to mining and the source water areas.</p>		Town of Buena Vista		Set meeting w/ agencies after WSPP complete	BV staff time	BV budget	

<b>Issue #</b>	<b>Priority Issue</b>	<b>Best Management Practices</b>	<b>Water Sources Applied</b>	<b>Implementation Responsibility</b>	<b>Implementation Schedule</b>	<b>Estimated Cost</b>	<b>Funding Sources</b>
5	Water Quality	Establish baseline water quality data for all sources. Schedule ongoing monitoring with regular intervals. Prepare electronic format to track parameters.	SW & GW sources	Town of Buena Vista	Chart schedule for monitoring. Create spreadsheet.	PWD staff time	PWD budget
6	Road Maintenance	<p>Add Chaffee County to the distribution list for the laminate cards.</p> <p>Future coordination with Chaffee County on locations of culverts &amp; sharing of GIS data.</p> <p>Coordinate with Chaffee County &amp; get all PWS's on distribution list for remediation reports from agencies.</p> <p>Consider an "Adopt a Highway" or County Road segment from intake/well location to remove trash /debris/potential</p>	SW & GW sources	Town of Buena Vista	Town of Buena Vista	BV staff time	BV Budget
7	Storm water management	<p>Leverage education and outreach resources from Chaffee County Road &amp; Bridge Dept.</p> <p>Establish connections with ditch companies and agricultural contacts to improve storm water coordination.</p> <p>Exchange acquired GIS shape file information between storm water /culvert data from Chaffee County and with Town BV.</p> <p>Establish a SWPP brochure for kiosks and education and outreach efforts.</p> <p>Distribute a newsletter for public release of protection plans and public meeting announcements.</p> <p>Utilize Town BV web site for public announcements, and educational outreach information.</p>	SW & GW sources	Town of Buena Vista	Town of Buena Vista	Town BV in kind	BV budget

## **Additional Comments**

A Best Management Practice checklist, developed from Table 2, will be utilized to manage and coordinate work projects associated with this Water Supply Protection Plan. See attached BMP checklist.

The Town of Buena Vista is committed to developing a tracking and reporting system to gauge the effectiveness of the various source water management approaches that have been implemented. The purpose of tracking and reporting the effectiveness of the source water management approaches is to update water system managers, the Town of Buena Vista Town Council, the Buena Vista Water Department, Chaffee County Commissioners, consumers, Upper Arkansas River SWPP Steering Committee, Colorado Department of Public Health and Environment, and other interested entities on whether or not the intended outcomes of the various source water management approaches are being achieved, and if not, what adjustments to the protection plan will be taken in order to achieve the intended outcomes. The Town of Buena Vista Water Department will submit an annual report to CRWA, CDPHE, Steering Committee, Chaffee County Commissioners, etc. in order to monitor the protection plan progress.

The Town of Buena Vista and Chaffee County are voluntarily committed to applying source water assessment and protection principles to siting and protecting new water sources in the future. This is part of the larger ongoing commitment to providing the highest quality drinking water to Buena Vista's water consumers.

The Town of Buena Vista is voluntarily committed to assisting the Colorado Department of Public Health and Environment in making future refinements to their source water assessment and to revise the source water protection plan accordingly based on any major refinements. By making this commitment, the Town is assuring that future assessment results are consistent with the available data and that source water management approaches are appropriate for the susceptibility concerns.

The Town of Buena Vista established a Water Supply Protection District with Ordinance # 5 1999. Chaffee County Board of Commissioners recognized this Water Supply Protection District. The Protection District allows the Town of Buena Vista to require applications for permits of several activities listed in the Resolution within the boundaries of the District. The administration of the permitting process allows the Town of Buena Vista to recognize potential contamination or water quality degradation, require BMP's or even to deny the application.

These permits would provide valuable data for future CDPHE assessments. The Town of Buena Vista would participate in any future watershed assessments or verification of this Source Water Protection Plan data.

# Exhibits

# Exhibit A

## Watershed Protection Report RG & Associates August 2014

### **10.0 WATERSHED PROTECTION**

#### ***10.1 BACKGROUND***

The Town adopted into Code the formation of a Watershed Protection District (WSPD) in 2000. The WSPD was established to protect the primary water supply source for the Town, Cottonwood Creek. The WSPD is given the authority to permit any development or land use within the WSPD boundaries. Items and activities that are defined in the code as having potential water quality impacts that require a permit may include, but are not limited to, sewage disposal systems; drilling; timber harvest; excavating, grading, filling, and blasting; spraying fertilizers, herbicides, or pesticides; handling or storing toxic materials; using, storing, or transporting flammable or explosive materials; tampering with the Town waterworks in any way; or any activity presenting a risk to the Town's water supply.

#### ***10.2 WSPD ADMINISTRATION***

To date, the WSPD permit process has been exercised primarily with single-family development within the District boundary and the use of individual septic systems. There has been significant confusion and confrontation between permit applicants, Chaffee County, and the Town during the permit process, primarily due to the amount of subjectivity required for the Town to exercise in reviewing permits. A more standardized, risk-based approach to WSPD management and permit review is needed to reduce conflicts; however, because the infiltration gallery is such an important, and potentially sensitive, element in the Buena Vista water supply system, the authority of the District to protect the supply must be maintained. As the number and type of permit applications expands, it will be increasingly important for the Town to have an effective and efficient means to review permits and protect its resource.

This *Water Resources Master Plan* recommends that the Town pursue the following changes in the administration of the WSPD:

- Modify the WSPD boundary whenever any changes are made within a 5-mile radius of the WTP intake that warrant such a change (i.e. when supply points are



added or changed, such as with a new well, so that areas outside current boundary become eligible for inclusion).

- Increase public awareness of the WSPD. The Town should install signs along major roads at the boundaries of the WSPD with a note regarding permit requirements. The Town should run a direct-mail campaign to residents in the WSPD on an annual or semi-annual basis that reviews requirements and depicts the boundaries of the WSPD. Periodic newspaper ads should also be considered. The Town should also ensure that new property owners are aware of WSPD requirement during or immediately after property transfers.
- Require regular maintenance inspections of ISDS systems with the frequency dependent on type of system (advanced systems to be inspected more frequently). Require that maintenance reports be filed with the Town.
- Revise the WSPD code to more clearly define management zones based on proximity and/or contamination risk to the water supply; within each zone define specific sewage handling requirements (see Table 10.2.1 and Figure 10-1)
- Set clear requirements on what must be submitted to apply for a permit from the Town, depending on the specific management zone where a use is proposed.

Table 10.2.1 presents proposed WSPD management zone categories defined by relative risk of water supply contamination along with proposed requirements for wastewater handling in the zones. Proposed zone definitions were developed with consideration of the following sources, which establish guidance and requirements for setbacks of contaminant sources to water sources and water supply infrastructure:

- CDPHE *Guidelines on Individual Sewage Disposal Systems*, rev. 2000
- Colorado DWR *Rules and Regulations for Water Well Construction...*, 6/2000
- CDPHE *Design Criteria for Potable Water Systems*, rev. 3/1997

Exhibit H presents a map showing the WSPD boundary, key water system intake points, and surface water supplies within the WSPD boundary that are tributary to the Town's intake, and the proposed Zone Category I area around the Town's infiltration gallery. Management zone categories to lands within the WSPD would be assigned based on Table 10.2.1 and the surface waters identified in WSPD Boundary map (in Appendix J) along with other surface waters and/or riparian areas that the Town designates as requiring protection. The Town should refine the definition of the zone boundaries and requirements, as appropriate, as additional

watershed data become available (see Section 10.4) and an improved understanding of groundwater fate and transport, especially near the Town’s infiltration gallery, is developed.

**Table 10.2.1 - Proposed WSPD Zone Categories**

<b>WSPD Zone Category</b>	<b>Proposed Sewage Disposal Method Required</b>	<b>Zone Definition</b>
<b>I</b>	No construction, ISDSs, or sewer lines allowed	Within 25’ (horiz.) of all surface waters or riparian areas, or within 500’ upgradient or 100’ in any direction of the Town’s Gorrel Meadow infiltration gallery or within 100’ of any municipal potable production well
<b>II</b>	No ISDSs; all development must be sewerred	Between 25’ and 100’ (horiz.) of surface waters or riparian areas
<b>III</b>	Advanced ISDSs required	Between 100’ and 500’ (horiz.) of surface waters or riparian areas; or where depth to groundwater is less than 20 feet
<b>IV</b>	Engineered ISDSs required	All other areas within the WSPD

### ***10.3 WATERSHED STAKEHOLDERS GROUP***

There are activities and events in Cottonwood Creek’s watershed that could impact the Town’s source water quality and quantity, which cannot be addressed by its WSPD. Furthermore, a recent Source Water Assessment by CDPHE identified potential sources of water contamination in the Cottonwood Creek watershed. Effective watershed management hinges upon collaboration and communication between concerned water users. The Town should spearhead the development of a watershed group for the Cottonwood Creek watershed. Possible goals of the stakeholder group would be to collaborate on:

- developing consensus watershed priorities and water quality goals
- implementing a water quality/quantity monitoring program
- identifying and implementing voluntary best management practices to maintain or improve water quality
- identifying and monitoring potential threats to water quality (for example, logging, fires, septic systems, and road construction)
- educating local public and visitors about water resource importance
- being a central advocate for watershed protection as key issues arise

Potentially interested parties for the envisioned watershed group are:

- Property owners and water users in the watershed (ranches, campgrounds, others)
- Town of Buena Vista
- Chaffee County
- San Isabel National Forest
- Recreational or environmental groups (such as Trout Unlimited)
- Other groups, districts

## ***10.4 WATERSHED MONITORING***

### ***10.4.1 Water Quality Monitoring***

The Town currently performs raw water quality monitoring at its water production facilities for parameters required by CDPHE and those needed to run the production/treatment processes. However, this *Water Resources Master Plan* recommends that the Town expand its water quality monitoring in and along Cottonwood Creek in order to establish baseline stream quality/health and track long- and short-term changes in stream quality. The goal is to have an advanced warning of changes occurring within the watershed that may produce significant negative impacts on water quality at the Town's intake over time. Monitoring could also be performed in target locations along Cottonwood Creek to spatially pinpoint sources of contamination. The following types of monitoring locations should be considered:

- Near potential contamination sources (major ISDS's, etc.)
- Near major creek confluences
- Key groundwater locations
- At the Town water supply intake

Through water quality monitoring, the Town could establish baseline water quality and trigger points for the various parameters that would spur additional investigations or other activities to identify and rectify problems within the watershed. Example water quality parameters and sampling frequencies that should be considered are:

- Temperature, turbidity, conductivity, pH (weekly to monthly)
- Total dissolved solids, total suspended solids, total organic carbon, alkalinity,

- hardness (monthly to quarterly)
- total coliforms, fecal coliforms, E. Coli (monthly to quarterly)

#### **10.4.2 Water Quantity Monitoring**

Currently, the only continuous monitoring of water flows and movement in the Cottonwood Creek watershed is at the USGS gaging station just above Cottonwood Creek. In order to improve the understanding of water movement within the watershed, this *Water Resources Master Plan* recommends that the Town develop and implement a program to collect data on water quantity and movement within the watershed. These data will be useful in improving the Town's understanding of the impacts of watershed activities on water quality as well as its understanding of water supply reliability. This information would support future water supply planning efforts, watershed management decision-making processes, and regular water utility operational decisions. The following monitoring related to water quantity and movement should be considered.

1. Additional stream flow gaging - regular monitoring of flows upstream of the existing USGS gage to better track physical water supplies available to the Town and improve prediction of water shortages; one location could be the bridge just downstream of the Cottonwood Hot Springs, a historic gaging station site. Other sites would include just upstream of major creek confluences on the branch creeks.
2. Snowpack monitoring - winter/spring measurements of snowpack depths at several key locations within the watershed, combined with additional stream gaging would improve the Town's ability to forecast water availability for the peak water use periods later in the year.  
This information could be used to implement water conservation or water restriction programs, as needed.
3. Groundwater table monitoring - seasonal measurements of groundwater elevations would provide the Town a better understanding of groundwater flow directions under various conditions, and the potential impacts on the Town's water sources; this would allow optimizing watershed control programs.

## ***10.5 SECTION SUMMARY***

1. The Town should adopt defined protection zones that specify acceptable sewerage systems in effort to standardize and facilitate the permit review process. The protection zones should be based on proximity and potential affect to Town water supply sources.
2. Set clear requirements on what must be submitted to apply for a permit from the Town, depending on the specific management zones.
3. Require regular maintenance inspections of ISDS systems within critical protection zones that are filed with the Town.
4. The Town should foster the development of a Watershed Stakeholders Group.
5. The Watershed Protection Plan should be expanded to include proactive water quality and quantity monitoring.

**End of Section**

# Exhibit B

## Contaminant Types

**TABLE B-1  
CONTAMINANT TYPES ASSOCIATED WITH DISPERSED CONTAMINANT SOURCES**

Dispersed Contaminant Source Type	Acute Health Concerns							Chronic Health Concerns								Aesthetic Concerns	
	Microorganisms	Nitrate/Nitrite	Pesticides	Semi-volatile Organic Compounds (SVOCs)	Volatile Organic Compounds (VOCs)	Lead	Ammonia / Nitric Acid	Herbicides	Pesticides	Volatile Organic Compounds (VOCs)	Non-metal Inorganic Compounds	Metals - Primary Drinking Water (other than lead)	Radionuclides	Turbidity	Other Inorganic Compounds	Other Organic Compounds	Secondary Drinking Water Contaminants
<b>LAND USES:</b>																	
Commercial / Industrial / Transportation		x	x	x	x	x	x	x	x	x		x			x	x	x
High Intensity Residential	x	x	x					x	x					x	x	x	
Low Intensity Residential	x	x	x					x	x					x	x	x	
Urban Recreational Grasses		x	x					x	x					x	x	x	
Quarries / Strip Mines / Gravel Pits					x	x	x					x		x	x		x
Row Crops		x	x				x	x	x					x	x		
Fallow														x			
Small Grains		x	x				x	x	x					x	x		
Pasture / Hay	x							x	x					x			
Orchards / Vineyards / Others		x	x				x	x	x					x	x		
Deciduous Forest	x							x	x					x			
Evergreen Forest	x							x	x					x			
Mixed Forest	x							x	x					x			
<b>OTHER TYPES:</b>																	
Septic Systems	x	x	x				x	x	x						x		
Oil & Gas Wells																	x
Road Miles	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x

**TABLE A-2  
CONTAMINANT TYPES ASSOCIATED WITH SIC-RELATED DISCRETE CONTAMINANT SOURCES**

SIC Code	Discrete Contaminant Source Type	Acute Health Concerns							Chronic Health Concerns								Aesthetic Concerns
		Microorganisms	Nitrate/Nitrite	Pesticides	Semi-volatile Organic Compounds (SVOCs)	Volatile Organic Compounds (VOCs)	Lead	Ammonia / Nitric Acid	Herbicides	Pesticides	Volatile Organic Compounds (VOCs)	Non-metal Inorganic Compounds	Metals - Primary Drinking Water (other than lead)	Radionuclides	Turbidity	Other Inorganic Compounds	Other Organic Compounds
021101	LIVESTOCK FEEDING	x	x				x								x	x	x
072103	AERIAL APPLICATORS			x					x	x	x				x	x	
075205	DOG & CAT KENNELS	x	x				x								x		x
075211	PET BOARDING	x	x				x								x		x
078206	LAWN & GROUNDS MAINTENANCE		x	x					x	x					x	x	
078212	SEEDING & FERTILIZING CONTRACTORS		x	x					x	x					x	x	
138905	OIL FIELD SERVICE				x	x	x	x			x	x			x	x	x
149901	MINING COMPANIES					x	x	x			x	x		x	x		x
161106	ASPHALT & ASPHALT PRODUCTS				x	x		x			x			x	x	x	x
171107	SEPTIC TANKS/SYSTEMS-CLEANING/REPAIRING	x	x												x	x	x
208201	BREWERS					x		x			x				x	x	
208401	WINERIES					x		x			x				x	x	
239698	AUTOMOTIVE TRIMMING/APRIL FINDINGS (MFR)				x	x	x				x	x			x	x	x
243102	MILLWORK (MANUFACTURERS)				x	x					x				x	x	x
245201	LOG CABINS HOMES & BUILDINGS (MFRS)				x	x	x	x			x			x	x	x	
259901	FURNITURE-MANUFACTURERS				x	x	x	x			x				x	x	
271101	NEWSPAPERS (PUBLISHERS)				x	x	x				x	x	x				x
272102	PUBLISHERS-PERIODICAL				x	x	x				x	x	x				x
273101	PUBLISHERS-BOOK				x	x	x				x	x	x				x
274119	MULTIMEDIA (MANUFACTURERS)				x	x	x				x	x	x				x
275202	PRINTERS				x	x	x	x			x	x	x		x	x	x
275203	POSTERS (MANUFACTURERS)				x	x	x				x	x	x				x
275902	SCREEN PRINTING				x	x	x				x	x	x				x
279601	ENGRAVERS-PLASTIC WOOD & ETC				x	x	x				x		x				x
308901	MOLD MAKERS				x	x	x	x			x		x		x	x	x
308906	PLASTICS-FABRICATING/FINISH/DECOR-MFRS				x	x	x	x			x	x	x		x	x	x
311101	TANNERS (MANUFACTURERS)				x	x					x		x		x		x
327209	CONCRETE PRODS-EX BLOCK & BRICK (MFRS)					x					x		x		x	x	x
344106	STEEL-STRUCTURAL (MANUFACTURERS)				x	x	x	x			x	x	x		x	x	x
344403	SHEET METAL FABRICATORS				x	x	x	x			x	x	x		x	x	x
354405	MOLDS (MANUFACTURERS)				x	x	x	x			x		x		x	x	x
356907	AUTOMATION SYSTEMS & EQUIPMENT-MFRS				x	x	x	x			x		x		x	x	x
357908	COPYING MACHINES & SUPPLIES-MFRS				x	x	x	x			x	x	x		x	x	x
359903	MACHINE SHOPS				x	x	x	x			x	x	x		x	x	x

**TABLE A-1  
CONTAMINANT TYPES ASSOCIATED WITH REGULATED DISCRETE CONTAMINANT SOURCES**

Discrete Contaminant Source Type	Acute Health Concerns							Chronic Health Concerns									Aesthetic Concerns
	Microorganisms	Nitrate/Nitrite	Pesticides	Semi-volatile Organic Compounds (SVOCs)	Volatile Organic Compounds (VOCs)	Lead	Ammonia / Nitric Acid	Herbicides	Pesticides	Volatile Organic Compounds (VOCs)	Non-metal Inorganic Compounds	Metals - Primary Drinking Water (other than lead)	Radionuclides	Turbidity	Other Inorganic Compounds	Other Organic Compounds	Secondary Drinking Water Contaminants
EPA Superfund Sites (NPL & NPLRF)			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
EPA Abandoned Contaminated Sites (CERCLA)			x	x	x	x	x	x	x	x	x	x			x	x	x
EPA Hazardous Waste Sites (HWSQG)			x	x	x	x	x	x	x	x	x	x			x	x	x
EPA Hazardous Waste Sites (HWLQG)			x	x	x	x	x	x	x	x	x	x			x	x	x
EPA Hazardous Waste Sites (HWTSD)			x	x	x	x	x	x	x	x	x	x			x	x	x
EPA Chemical Inventory / Storage Sites (SARA)				x	x	x	x			x		x			x	x	x
EPA Toxic Release Inventory Sites (TRI)				x	x	x	x			x		x			x	x	x
Permitted Wastewater Discharge Sites (PCS)	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
Aboveground, Underground and Leaking Storage Tank Sites (TANKFAC)					x					x							
Solid Waste Sites (SWSITE)	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
Existing / Abandoned Mine Sites (MASMIL)	x				x	x	x			x		x		x	x		x
Concentrated Animal Feeding Operations (CAFO)	x	x					x								x	x	x
Other Facilities (OGFAC)				x	x					x					x	x	x
Other Facilities (WHP)				x	x					x		x			x	x	x



TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC's

Source	Contaminant*
<b>COMMERCIAL / INDUSTRIAL</b>	
Automobile, Body Shops/Repair Shops <i>CONTAM. HAZARD: B</i>	Arsenic, Ammonium Persulfate, Barium, Benzene, Cadmium, Chlorobenzene, Copper, Creosote, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, 1,4-Dichlorobenzene or P-Dichlorobenzene, Ethylene Glycol, Lead, Fluoride, 1,1,1-Trichloroethane or Methyl Chloroform, Dichloromethane or Methylene Chloride, Nickel, Nitric Acid, Phosphoric Acid (Ortho-), Sulfuric Acid, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchloroethylene (Perk), Trichloroethylene or TCE, Tin, Xylene (Mixed Isomers)
Boat Repair/Refinishing <i>CONTAM. HAZARD: A</i>	Ammoniacal Copper Arsenate, Benzene, Cadmium, Chromated Copper Arsenic, Coliform bacteria, Copper Quinolate, <i>Cryptosporidium parvum</i> , Epoxy, <i>Giardia lamblia</i> , Isopropanol, Lead, <i>Legionellae</i> sp., Mercury, Nitrate, Nitrite, Polyurethane, Vinyl Chloride, Viruses
Cement/Concrete Plants <i>CONTAM. HAZARD: B</i>	Acetone, Barium, Benzene, Dichloromethane or Methylene Chloride, Ethylbenzene, Ethylene Glycol, Lead, Methanol, Styrene, Sulfuric Acid, Tetrachloroethylene or Perchloroethylene (Perk), Toluene, Xylene (Mixed Isomers)
Chemical/Petroleum Processing <i>CONTAM. HAZARD: B</i>	Acetone, Acrylamide, Arsenic, Atrazine, Alachlor, Aluminum (Fume or Dust), Ammonia, Barium, Benzene, Cadmium, Carbofuran, Carbon Tetrachloride, Chlorine, Chlorine Dioxide, Chlorobenzene, Chloroform, Copper, Creosote, Cyanide, Captan, 2,4-D, 1,2-Dibromoethane or Ethylene Dibromide (EDB), 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,1-Dichloroethylene or Vinylidene Chloride, cis 1,2 Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) adipate, Di(2-ethylhexyl) phthalate, 1,2-Dichloroethane or Ethylene Dichloride, Dioxin, Endrin, Epichlorohydrin, Ethane, Ethylbenzene, Ethylene, Ethylene Glycol, Freon 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Formaldehyde or K157, Hexachlorobenzene, Hexachlorocyclopentadiene, Hydrochloric Acid or Muriatic Acid, Hydroquinone, Hydrogen Peroxide, Isopropyl Alcohol (Manufacturing, Strong-Acid Process), Kerosene, Lead, Mercury, Methanol, Methoxychlor, Naphthalene or K156, Nickel, Nitric Acid, Oxamyl (Vydate), Polychlorinated Biphenyls, Phosphoric Acid Ortho-, Selenium, Sodium Cyanide, Styrene, Sulfate, Sulfuric Acid, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchloroethylene (Perk), Toluene, Toluenediisocyanate (Mixed Isomers), 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene or TCE, Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)

\* Bold Denotes that contaminant is a National Primary Drinking Water Contaminant

**TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)**

Source	Contaminant*
<b>COMMERCIAL / INDUSTRIAL</b>	
Construction/Demolition <i>CONTAM. HAZARD: B</i>	Acetone, Arsenic, Asbestos, Ammonia, Ammoniacal Copper Arsenate, Benzene, Cadmium, Chloride, Chromated Copper Arsenic, Copper, Copper Quinolate, Cyanide, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Epoxy, Fluorides, Formaldehyde or K157, Lead, Lindane, Methanol, Nickel, Polyurethane, Phosphoric Acid Ortho-, Selenium, Sodium Cyanide, Sulfuric Acid, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchloroethylene (Perk), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene or TCE, Turbidity, Xylene (Mixed Isomers), Zinc (Fume or Dust)
Dry Cleaners/Dry Cleaning <i>CONTAM. HAZARD: B</i>	Amyl Acetate, Fluorocarbon 113 (Freon), Peroxide, Tetrachloroethylene or Perchloroethylene (Perk), 1,1,1-Trichloroethane or Methyl Chloroform, 1,1,2-Trichloroethane
Dry Goods Manufacturing <i>CONTAM. HAZARD: A</i>	Acetone, Ammonia, Barium, Benzene, Cadmium, Chlorine, Copper, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthalate, Formaldehyde or K157, Hydrochloric Acid or Muriatic Acid, Isopropyl Alcohol (Manufacturing Strong-Acid Process), Lead, Methanol, 1,1,1-Trichloroethane or Methyl Chloroform, Nitric Acid, Polychlorinated Biphenyls, Sulfuric Acid, Tetrachloroethylene or Perchloroethylene (Perk), Toluene, Toluene Diisocyanate (Mixed Isomers), Trichloroethylene or TCE, Xylene (Mixed Isomers)
Electrical/Electronic Manufacturing <i>CONTAM. HAZARD: B</i>	Acetone, Aluminum (Fume or Dust), Ammonia, Ammonium Persulfate, Amyl Acetate, Antimony, Arsenic, Barium, Benzene, Boric Acid, Cadmium, Chlorine, Chlorobenzene, Chloroform, Copper, Cyanide, Calcium Fluoride, Carbon Tetrachloride, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthalate, Ethylbenzene, Ethylene Glycol, Freon 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Formaldehyde or K157, Hexachlorophene, Hydrochloric Acid or Muriatic Acid, Isopropyl Alcohol (Manufacturing, Strong-Acid Process), Lead, Mercury, Methanol, Naphthalene or K156, Nickel, Nitric Acid, Polychlorinated Biphenyls, Phosphoric Acid Ortho-, Selenium, Styrene, Sulfate, Sulfuric Acid, Sodium Cyanide, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchloroethylene (Perk), 1,1,1-Trichloroethane or Methyl Chloroform, 1,1,2-Trichloroethane, Trichloroethylene or TCE, Thallium, Toluene, Toluene Diisocyanate, (Mixed Isomers), Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)

\* **Bold** Denotes that contaminant is a National Primary Drinking Water Contaminant

TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)

Source	Contaminant*
<b>COMMERCIAL / INDUSTRIAL</b>	
Fleet/Trucking/ Bus Terminals <i>CONTAM. HAZARD: A</i>	Acetone, Arsenic, Acrylamide, Barium, Benzene, Benzo(a)pyrene, Cadmium, Chlorobenzene, Chloroform, Creosote, Cyanide, Carbon Tetrachloride, 2,4-D, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, Epichlorohydrin, Formaldehyde or K157, Heptachlor (and Epoxide), Hydrochloric Acid or Muriatic Acid, Lead, Lindane, Mercury, Methanol, Methoxychlor, Naphthalene or K156, Pentachlorophenol, Phosphoric Acid Ortho-, Propylene Dichloride or 1,2-Dichloropropane, Selenium, Styrene, Sulfuric Acid, Sodium Cyanide, Toxaphene, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchlorethylene (Perk), Toluene, Toluene Diisocyanate (Mixed Isomers), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene or TCE, Vinyl Chloride, Xylene (Mixed Isomers)
Food Processing <i>CONTAM. HAZARD: B</i>	Arsenic, Ammonia, Benzene, Cadmium, Chlorine, Chloroform, Copper, Carbon Tetrachloride, Dichloromethane or Methylene Chloride, Formaldehyde or K157, Hydrochloric Acid or Muriatic Acid, Lead, Mercury, Methanol, Nitric Acid, Picloram, Phosphoric Acid Ortho-, Sulfuric Acid, Sodium Cyanide, Tetrachloroethylene or Perchlorethylene (Perk), Toluene, Toluene Diisocyanate (Mixed Isomers), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene or TCE, Xylene (Mixed Isomers)
Funeral Services/Graveyards <i>CONTAM. HAZARD: B</i>	Atrazine, Benomyl, Chlorpyrifos, Diazinon, Diquat, Glyphosate, Dichloromethane or Methylene Chloride, Nitrosamine, Phosphates
Furniture Repair/Manufacturing <i>CONTAM. HAZARD: B</i>	Ammoniacal Copper Arsenate, Barium, Chromated Copper Arsenic, Copper Quinolate, 1,2-Dichloroethane or Ethylene Dichloride, Dichloromethane or Methylene Chloride, Epoxy, Ethylbenzene, Freon 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Lead, Mercury, Nickel, Polyurethane, Phosphoric Acid Ortho-, Selenium, Sodium Cyanide, 1,1,2,2-Tetrachloroethane, Trichloroethylene or TCE, Tin
Gas Stations <i>CONTAM. HAZARD: A</i>	Benzene, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Ethylbenzene, Ethylene Glycol, Lead, 1,1,2,2-Tetrachloroethane, Methanol, Tetrachloroethylene or Perchlorethylene (Perk), Trichloroethylene or TCE, Toluene, Xylene (Mixed Isomers)
Hardware/Lumber/Parts Stores <i>CONTAM. HAZARD: B</i>	Acetone, Aluminum (Fume or Dust), Ammonia, Ammoniacal Copper Arsenate, Barium, Benzene, Cadmium, Captan, Chlorine, Chlorobenzene, Chloroform, Chromated Copper Arsenic, Copper, Copper Quinolate, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl)adipate, Di(2-ethylhexyl) phthlate, 1,4-Dichlorobenzene or P-Dichlorobenzene, Ethylbenzene, Ethylene Glycol, Freon 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Hydrochloric Acid or Muriatic Acid, Lead, Mercury, Methanol, Nickel, Nitric Acid, Polyurethane, Phosphoric Acid Ortho-, Sulfuric Acid, Tetrachloroethylene or Perchlorethylene (Perk), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene or TCE, Toluene, Xylene (Mixed Isomers)

\* Bold Denotes that contaminant is a National Primary Drinking Water Contaminant

TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)

Source	Contaminant*
<b>COMMERCIAL / INDUSTRIAL</b>	
Historic Waste Dumps/Landfills <i>CONTAM. HAZARD: B</i>	Atrazine, Alachlor, Benomyl, Chlorpyrifos, Carbofuran, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Diquat, Dalapon, Diazinon, Epoxy, Glyphosate, Dichloromethane or Methylene Chloride, Manganese, Nitrate, Nitrite, Nitrosamine, Oxamyl (Vydate), Peroxide, Phosphates, Picloram, Sulfate, Simazine, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchlorethylene (Perk), Trichloroethylene or TCE, Tin
Home Manufacturing <i>CONTAM. HAZARD: B</i>	Acetone, Arsenic, Ammonia, Ammoniacal Copper Arsenate, Barium, Benzene, Cadmium, Chlorine, Chlorobenzene, Chloroform, Chromated Copper Arsenic, Copper, Copper Quinolate, Carbon Tetrachloride, 1,2-Dichlorobenzene or O-Dichlorobenzene, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, Epoxy, Ethylbenzene, Formaldehyde or K157, Hydrochloric Acid or Muriatic Acid, Lead, Mercury, Methanol, Naphthalene or K156, Nickel, Nitric Acid, Polyurethane, Phosphoric Acid Ortho-, Selenium, Styrene, Sulfuric Acid, Tetrachloroethylene or Perchlorethylene (Perk), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene or TCE, 1,1,2,2-Tetrachloroethane, Toluene, Turbidity, Xylene (Mixed Isomers)
Injection Wells <i>CONTAM. HAZARD: B</i>	Atrazine, Alachlor, Benomyl, Bromine, Chlorpyrifos, Cyanuric Acid, Calcium Hypochlorate, Chlorine, Carbofuran, Dalapon, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Diquat, Diazinon, Endothall, Flouride, Glyphosate, Hydrochloric Acid or Muriatic Acid, Iodine, Isopropanol, Methanol, Nitrosamine, Oxamyl (Vydate), Peroxide, Phosphates, Picloram, Simazine, Sodium Carbonate, Sodium Hypochlorate, Sulfate, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchlorethylene (Perk), Trichloroethylene or TCE, Tin
Junk/Scrap/Salvage Yards <i>CONTAM. HAZARD: B</i>	Barium, Benomyl, Benzene, Boric Acid, Chlorpyrifos, Chromated Copper Arsenic, Copper, cis Dalapon, 1,2-Dichloroethylene, Diquat, Diazinon, Epoxy, Ethylene Glycol, Glyphosate, Isopropanol, Lead, N Manganese, Nickel, Nitric Acid, Nitrosamine, Polychlorinated Biphenyls, Phosphates, Sulfate, Simazine, Trichloroethylene or TCE, 1,1,2,2 - Tetrachloroethane, Tetrachloroethylene or Perchlorethylene (Perk), Tin

\* Bold Denotes that contaminant is a National Primary Drinking Water Contaminant

**TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)**

Source	Contaminant*
<b>COMMERCIAL / INDUSTRIAL</b>	
Machine Shops <i>CONTAM. HAZARD: B</i>	Acetone, Arsenic, Aluminum (Fume or Dust), Ammonia, Ammonium Persulfate, Barium, Benzene, Boric Acid, Cadmium, Chlorine, Chlorobenzene, Chloroform, Copper, Creosote, Cyanide, Carbon Tetrachloride 2,4-D, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, 1,1-Dichloroethylene or Vinylidene Chloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, Ethylbenzene, Ethylene Glycol, Flouride, Freon 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Formaldehyde or K157, Hexachlorobenzene, Hydrochloric Acid or Muriatic Acid, Hydrogen Cyanide, Isopropyl Alcohol (Manufacturing, Strong-Acid Process), Lead, Mercury, Methanol, Naphthalene or K156, Nickel, Nitric Acid, Polychlorinated Biphenyls, Pentachlorophenol, Phosphoric Acid Ortho-, Selenium, Strychnine, Styrene, Sulfuric Acid, Sodium Cyanide, Tetrachloroethylene or Perchlorethylene (Perk), TetrachloroethanB-1,1,2,2, Tin, Toluene, Toluenediisocyanate (Mixed Isomers) 1,1,1-Trichloroethane or Methyl Chloroform, 1,1,2-Trichloroethane, Trichloroethylene or TCE, Xylene (Mixed Isomers), Zinc (Fume or Dust)
Medical/Vet Offices <i>CONTAM. HAZARD: B</i>	Acetone, Arsenic, Acrylamide, Barium, Benzene, Cadmium, Chloroform, Copper, Cyanide, Carbon Tetrachloride, Dichloromethane or Methylene Chloride, 1,2-Dichloroethane or Ethylene Dichloride, Ethylene Glycol, Freon 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Formaldehyde or K157, Glutaldehyde, Hydrochloric Acid or Muriatic Acid, Lead, Mercury, Methanol, Methoxychlor, 1,1,1-Trichloroethane or Methyl Chloroform, Nickel, Potassium Alum (dodecahydrate), Potassium Bromide, Radionuclides, Selenium, Silver, Sulfuric Acid, Sodium Carbonate, Sodium Cyanide, Sodium Sulfite, Sulfuric Acid, Tetrachloroethylene or Perchlorethylene (Perk), 2,4,5-TP (Silvex), Thallium, Thiosulfates, Toluene, Xylene (Mixed Isomers)
Metal Plating/Finishing/Fabricating <i>CONTAM. HAZARD: B</i>	Acetone, Antimony, Acetylene, Aluminum (Fume or Dust), Ammonia, Ammonium Persulfate, Arsenic, Barium, Benzene, Boric Acid, Cadmium, Carbon Tetrachloride, Chlorine, Chlorobenzene, Chloroform, Chromium, Copper, Cyanide, 1,4-Dichlorobenzene or P-Dichlorobenzene, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) adipate, Ethylbenzene, Ethylene Glycol, Flouride, Freon 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Formaldehyde or K157, Hydrochloric Acid or Muriatic Acid, Hydrogen Cyanide, Isopropyl Alcohol (Manufacturing Strong-Acid Process), Lead, Mercury, Manganese, Methanol, Naphthalene or K156, Nickel, Nitric Acid, Polychlorinated Biphenyls, Pentachlorophenol, Phosphoric Acid Ortho-, Selenium, Styrene, Sulfate, Sulfuric Acid, Sodium Cyanide, Tetrachloroethylene or Perchlorethylene (Perk), 1,1,2,2 Tetrachloroethane, Thallium, Tin, Toluene, 1,1,1-Trichloroethane or Methyl Chloroform, 1,1,2-Trichloroethane, Trichloroethylene or TCE, Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)

\* Bold Denotes that contaminant is a National Primary Drinking Water Contaminant

TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)

Source	Contaminant*
<b>COMMERCIAL / INDUSTRIAL</b>	
Military Installations <i>CONTAM. HAZARD: A</i>	Arsenic, Barium, Benzene, Cadmium, Chlorobenzene, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Hexachlorobenzene, Lead, Mercury, Methanol, Methoxychlor, 1,1,1-Trichloroethane or Methyl Chloroform, Radionuclides, Selenium, Tetrachloroethylene or Perchloroethylene (Perk), 1,1,2,2 Tetrachloroethane, Toluene, Trichloroethylene or TCE
Mines/Gravel Pits <i>CONTAM. HAZARD: B</i>	Ammonia, Hydrochloric Acid or Muriatic Acid, Lead, Naphthalene or K156, Phosphoric Acid Ortho-, Selenium, Sulfate, Tetrachloroethylene or Perchloroethylene (Perk), Tin, 1,1,1-Trichloroethane or Methyl Chloroform, Turbidity
Motor Pools <i>CONTAM. HAZARD: A</i>	cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, 1,1,2,2 Tetrachloroethane, Tetrachloroethylene or Perchloroethylene (Perk), Trichloroethylene or TCE
Office Building/Complex <i>CONTAM. HAZARD: B</i>	Acetone, Atrazine, Ammonia, Barium, Benomyl, Benzene, Cadmium, Chlorine, Chlorpyrifos, Copper, 2,4-D, Diazinon, 1,2-Dichlorobenzene or O-Dichlorobenzene, Dichloromethane or Methylene Chloride, Diquat, 1,2-Dichloroethane or Ethylene Dichloride, Ethylbenzene, Ethylene Glycol, Freon 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Formaldehyde or K157, Glyphosate, Hydrochloric Acid or Muriatic Acid, Iodine, Isopropanol, Isopropyl Alcohol (Manufacturing Strong-Acid Process), Lead, Mercury, Methanol, Nitric Acid, Nitrosamine, Phosphates, Phosphoric Acid Ortho-, Selenium, Sulfuric Acid, Simazine, Tetrachloroethylene or Perchloroethylene (Perk), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene or TCE, Toluene, Vinyl Chloride, Xylene (Mixed Isomers)
Photo Processing/Printing <i>CONTAM. HAZARD: B</i>	Acetone, Acrylamide, Aluminum (Fume or Dust), Ammonia, Arsenic, Barium, Benzene, Cadmium, Carbon Tetrachloride, Chlorine, Chlorobenzene, Chloroform, Copper, Cyanide, 1,1-Dichloroethylene or Vinylidene Chloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, 1,2-Dibromoethane or Ethylene Dibromide (EDB), Ethylene Glycol, Freon 113 or CFC 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Formaldehyde or K157, Heptachlor (and Epoxide), Hexachlorobenzene, Hydrochloric Acid or Muriatic Acid, Hydroquinone, Isopropyl Alcohol (Manufacturing Strong-Acid Process), Lead, Lindane, Mercury, Methanol, Methoxychlor, Nickel, Nitric Acid, Phosphoric Acid Ortho-, Propylene Dichloride or 1,2-Dichloropropane, Selenium, Sodium Cyanide, Styrene, Sulfuric Acid, Tetrachloroethylene or Perchloroethylene (Perk), 1,1,1-Trichloroethane or Methyl Chloroform, 1,1,2,2-Tetrachloroethane, Toluene, Toluene Diisocyanate (Mixed Isomers), 1,1,2-Trichloroethane, Trichloroethylene or TCE, Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)

\* Bold Denotes that contaminant is a National Primary Drinking Water Contaminant

TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)

Source	Contaminant*
<b>COMMERCIAL / INDUSTRIAL</b>	
Synthetic / Plastics Production <i>CONTAM. HAZARD: B</i>	Acetone, Antimony, Ammonia, Arsenic, Barium, Benzene, Boric Acid, Cadmium, Captan, Carbon Tetrachloride, Chlorine, Chlorobenzene, Chloroform, Copper, Cyanide, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) adipate, Di(2-ethylhexyl) phthalate, Ethylbenzene, Ethylene Glycol, Freon 113 or CFC 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Formaldehyde or K157, Hexachlorobenzene, Hydrochloric Acid or Muriatic Acid, Hydroquinone, Isopropyl Alcohol (Manufacturing, Strong-Acid Process), Kerosene, Lead, Mercury, Methanol, Methyl Chloroform or 1,1,1-Trichloroethane, Nickel, Nitric Acid, Pentachlorophenol, Peroxide, Phosphoric Acid Ortho-, Selenium, Sodium Cyanide, Styrene, Sulfuric Acid, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchloroethylene (Perk), Toluene, Toluene Diisocyanate (Mixed Isomers), Trichloroethylene or TCE, Vinyl Chloride, Xylene (Mixed Isomers), Zinc (Fume or Dust)
RV/Mini Storage <i>CONTAM. HAZARD: B</i>	Arsenic, Barium, Chloroform, Cyanide, 2,4-D, Endrin, Formaldehyde or K157, Lead, Methoxychlor
Railroad Yards/Maintenance/Fueling Areas <i>CONTAM. HAZARD: B</i>	Atrazine, Ammoniacal Copper Arsenate, Barium, Benzene, Cadmium, Chlorine, Chromated Copper Arsenic, Copper Quinolate, Dalapon, 1,4-Dichlorobenzene or P-Dichlorobenzene, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Polyurethane, Lead, Mercury, Tetrachloroethane-1,1,2,2, Trichloroethylene or TCE, Tetrachloroethylene or Perchloroethylene (Perk)
Research Laboratories <i>CONTAM. HAZARD: B</i>	Acetone, Arsenic, Barium, Benomyl, Benzene, Beryllium Powder, Cadmium, Carbon Tetrachloride, Chlorine, Chlorobenzene, Chloroform, Cyanide, 1,2-Dichloroethane or Ethylene Dichloride, 1,1-Dichloroethylene or Vinylidene Chloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Endrin, Freon 113 or CFC 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, Formaldehyde or K157, Glutaldehyde, Hydrochloric Acid or Muriatic Acid, Isopropyl Alcohol (Manufacturing Strong-Acid Process), Lead, Mercury, Methanol, Polychlorinated Biphenyls, Potassium Alum (dodecahydrate), Potassium Bromide, Selenium, Sulfuric Acid, Sodium Carbonate, Sodium Cyanide, Sodium Sulfite, Tetrachloroethane-1,1,2,2, Tetrachloroethylene or Perchloroethylene (Perk), Thallium, Thiosulfates, Toluene, Toluene Diisocyanate (Mixed Isomers), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene or TCE, Vinyl Chloride, Xylene (Mixed Isomers)

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TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)

Source	Contaminant*
<b>COMMERCIAL / INDUSTRIAL</b>	
Retail Operations <i>CONTAM. HAZARD: B</i>	Acetone, Ammonia, Arsenic, Barium, Benzene, Cadmium, Chlorine, 2,4-D, 1,2-Dichloroethane or Ethylene Dichloride, Hydrochloric Acid or Muriatic Acid, Lead, Mercury, Methanol, Naphthalene or K156, Nitric Acid, Phosphoric Acid Ortho-, Styrene, Sulfuric Acid, Sodium Cyanide, Tetrachloroethylene or Perchloroethylene (Perk), Toluene, 1,1,1-Trichloroethane or Methyl Chloroform, Vinyl Chloride
Underground Storage Tanks <i>CONTAM. HAZARD: A</i>	Arsenic, Barium, Benzene, Cadmium, 1,4-Dichlorobenzene or P-Dichlorobenzene, Lead, Trichloroethylene or TCE
Wholesale Distribution Activities <i>CONTAM. HAZARD: A</i>	Benzene, Lead, Styrene, 1,1,1-Trichloroethane or Methyl Chloroform
Wood Preserving/Treating <i>CONTAM. HAZARD: B</i>	Ammoniacal Copper Arsenate, Chromated Copper Arsenic, Creosote, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Epoxy, Formaldehyde or K157, Lead, Naphthalene or K156, Polyurethane, Sulfate
Wood/Pulp/Paper Processing <i>CONTAM. HAZARD: A</i>	Acetone, Ammonia, Arsenic, Ammoniacal Copper Arsenate, Barium, Benzene, Cadmium, Chlorine, Chlorine Dioxide, Carbon Tetrachloride, Chloroform, Chromated Copper Arsenic, Chromic Acid, Copper, Copper Quinolate, Dichloromethane or Methylene Chloride, Dioxin, 1,2-Dichloroethane or Ethylene Dichloride, Epoxy, Ethylbenzene, Ethylene Glycol, Formaldehyde, K157, Hydrochloric Acid or Muriatic Acid, Isopropyl Alcohol (Manufacturing Strong-Acid Process), Lead, Mercury, Methanol, Nitric Acid, Polychlorinated Biphenyls, Polyurethane, Phosphoric Acid Ortho-, Selenium, Styrene, Sulfuric Acid, Gas, Tetrachloroethylene or Perchloroethylene (Perk), Trichloroethylene or TCE, Toluene, 1,1,1-Trichloroethane or Methyl Chloroform, Xylene (Mixed Isomers)

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TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)

Source	Contaminant*
<b>RESIDENTIAL / MUNICIPAL</b>	
Airports (Maintenance/Fueling Areas) <i>CONTAM. HAZARD: B</i>	Arsenic, Barium, Benzene, Cadmium, Chlorine, Carbon Tetrachloride, cis 1,2- Dichloroethylene, Dichloromethane or Methylene Chloride, Ethylbenzene, Ethylene Glycol, Freon 113 or 1,1,2-trichloro-1,2,2-trifluoroethane, Hydrochloric Acid or Muriatic Acid, Lead, Mercury, Sulfuric Acid, Selenium, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchloroethylene (Perk), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene or TCE, Urea or Carbamide, Xylene (Mixed Isomers)
Apartments and Condominiums <i>CONTAM. HAZARD: A</i>	Atrazine, Alachlor, Benomyl, Bromine, Chlorpyrifos, Coliform bacteria, <i>Cryptosporidium parvum</i> , Cyanuric Acid, Calcium Hypochlorate, Chlorine, Diquat, Dalapon, Diazinon, Epoxy, <i>Giardia lamblia</i> , Glyphosate, Hydrochloric Acid or Muriatic Acid, Iodine, Isopropanol, <i>Legionellae</i> sp., Nitrate, Nitrite, Nitrosamine, Oxamyl (Vydate), Phosphates, Picloram, Sulfate, Simazine, Sodium Carbonate, Sodium Hypochlorate, Vinyl Chloride, Viruses
Camp Grounds/RV Parks <i>CONTAM. HAZARD: A</i>	Benomyl, Chlorpyrifos, Coliform bacteria, <i>Cryptosporidium parvum</i> , Diquat, Dalapon, Diazinon, <i>Giardia lamblia</i> , Glyphosate, Isopropanol, <i>Legionellae</i> sp., Nitrate, Nitrite, Nitrosamine, Phosphates, Picloram, Sulfate, Simazine, Turbidity, Vinyl Chloride, Viruses
Drinking Water Treatment <i>CONTAM. HAZARD: B</i>	Atrazine, Benzene, Cadmium, Cyanide, Flouride, Isopropyl Alcohol (Manufacturing Strong-Acid Process), Lead, Polychlorinated Biphenyls, Phosphoric Acid Ortho-, Sulfuric Acid, Tetrachloroethylene or Perchloroethylene (Perk), Toluene, Total Trihalomethanes, 1,1,1-Trichloroethane or Methyl Chloroform
Golf Courses and Parks <i>CONTAM. HAZARD: B</i>	Arsenic, Atrazine, Benomyl, Benzene, Chlorobenzene, Chlorpyrifos, Carbofuran, 2,4-D, Diquat, Dalapon, Diazinon, Glyphosate, Lead, Methoxychlor, Nitrate, Nitrite, Nitrosamine, Phosphates, Picloram, Simazine, Turbidity
Housing <i>CONTAM. HAZARD: A</i>	Atrazine, Alachlor, Benomyl, Bromine, Chlorpyrifos, Coliform bacteria, <i>Cryptosporidium parvum</i> , Cyanuric Acid, Calcium Hypochlorate, Carbofuran, Chlorine, Diquat, Dalapon, Diazinon, Epoxy, <i>Giardia lamblia</i> , Glyphosate, Hydrochloric Acid or Muriatic Acid, Iodine, Isopropanol, <i>Legionellae</i> sp., Dichloromethane or Methylene Chloride, Nitrate, Nitrite, Nitrosamine, Oxamyl (Vydate), Phosphates, Picloram, Simazine, Sodium Carbonate, Sodium Hypochlorate, TetrachloroethanB-1,1,2,2 , Trichloroethylene or TCE, Turbidity, Vinyl Chloride, Viruses
Injection Wells <i>CONTAM. HAZARD: B</i>	Atrazine, Alachlor, Benomyl, Bromine, Chlorpyrifos, Cyanuric Acid, Calcium Hypochlorate, Chlorine, Carbofuran, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Diquat, Dalapon, Diazinon, Flouride, Glyphosate, Hydrochloric Acid or Muriatic Acid, Iodine, Isopropanol, Methanol, Nitrosamine, Oxamyl (Vydate), Peroxide, Phosphates, Picloram, Sulfate, Simazine, Sodium Carbonate, Sodium Hypochlorate, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchloroethylene (Perk), Tin, Trichloroethylene or TCE

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TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)

Source	Contaminant*
<b>RESIDENTIAL / MUNICIPAL</b>	
Landfills/Dumps <i>CONTAM. HAZARD: B</i>	Arsenic, Atrazine, Alachlor, Ammonia, Barium, Benomyl, Benzene, Cadmium, Chlorine, Chlorpyrifos, Carbofuran, cis 1,2 Dichloroethylene, Diquat, Diazinon, Epoxy, Ethylene Glycol, Glyphosate, Hydrochloric Acid or Muriatic Acid, Isopropanol, Lead, Lindane, Mercury, Methane, 1,1,1-Trichloroethane or Methyl Chloroform, Dichloromethane or Methylene Chloride, Nitrate, Nitrite, Nitrosamine, Oxamyl (Vydate), Peroxide, Phosphates, Picloram, Selenium, Sulfuric Acid, Simazine, 1,1,2,2-Tetrachloroethane, Tin, Trichloroethylene or TCE
Public Buildings and Civic Organizations <i>CONTAM. HAZARD: B</i>	Acetone, Arsenic, Acrylamide, Barium, Benzene, Beryllium Powder, Cadmium, Carbon Tetrachloride, Chlorine, Chlorobenzene, Chloroform, Cyanide, 2,4-D, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, Dichloromethane or Methylene Chloride, Di(2-ethylhexyl) phthlate, 1,2-Dichloroethane or Ethylene Dichloride, Endothall, Endrin, 1,2-Dibromoethane or Ethylene Dibromide (EDB), Formaldehyde or K157, Lead, Lindane, Mercury, Methanol, Methoxychlor, Naphthalene or K156, Selenium, Sodium Cyanide, Strychnine, Sulfuric Acid, Tetrachloroethylene or Perchlorethylene (Perk), Toluene, Toluene Diisocyanate (Mixed Isomers), 1,1,1-Trichloroethane or Methyl Chloroform, Trichloroethylene or TCE, Vinyl Chloride, Xylene (Mixed Isomers)
Schools <i>CONTAM. HAZARD: B</i>	Acetone, Arsenic, Atrazine, Acrylamide, Barium, Benomyl, Benzene, Beryllium Powder, Cadmium, Chlorine, Chlorobenzene, Chloroform, Chlorpyrifos, Creosote, Cyanide, Carbon Tetrachloride, 2,4-D, Dichloride, 1,2-Dichlorobenzene or O-Dichlorobenzene, 1,4-Dichlorobenzene or P-Dichlorobenzene, Dichloromethane or Methylene Chloride, Diquat, Diazinon, 1,2-Dichloroethane or Ethylene, Endothall, Endrin, Formaldehyde or K157, Glyphosate, Isopropanol, Lead, Mercury, Methanol, 1,1,1-Trichloroethane or Methyl Chloroform, Naphthalene or K156, Nitrosamine, Phosphates, Selenium, Strychnine, Sodium Cyanide, Tetrachloroethylene or Perchlorethylene (Perk), Toluene, Toluene Diisocyanate (Mixed Isomers), Trichloroethylene or TCE, Xylene (Mixed Isomers)
Septic Systems <i>CONTAM. HAZARD: B</i>	Atrazine, Alachlor, Benomyl, Bromine, Calcium Hypochlorate, Carbofuran, Chlorpyrifos, Coliform bacteria, <i>Cryptosporidium parvum</i> , Cyanuric Acid, Diquat, Dalapon, Diazinon, <i>Giardia lamblia</i> , Glyphosate, Hydrochloric Acid or Muriatic Acid, Iodine, Isopropanol, <i>Legionellae</i> sp., Methane, Nitrate, Nitrite, Nitrosamine, Oxamyl (Vydate), Peroxide, Phosphates, Picloram, Sulfate, Simazine, Sodium Carbonate, Sodium Hypochlorate, Vinyl Chloride, Viruses
Transportation Corridors <i>CONTAM. HAZARD: B</i>	Dalapon, Picloram, Simazine, Sodium, Sodium Chloride

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TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)

Source	Contaminant*
<b>RESIDENTIAL / MUNICIPAL</b>	
Utility Stations <i>CONTAM. HAZARD: B</i>	Acetone, Arsenic, Atrazine, Barium, Benzene, Boric Acid, Cadmium, Chlorine, Chlorobenzene, Chloroform, Creosote, Cyanide, 2,4-D, Dalapon, 1,4-Dichlorobenzene or P-Dichlorobenzene, 1,2-Dichloroethane or Ethylene Dichloride, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Formaldehyde or K157, Lead, Mercury, Methanol, Picloram, Simazine, Sodium, Sodium Chloride, Sodium Cyanide, Tin, Toluene, 1,1,2,2- Tetrachloroethane, Tetrachloroethylene or Perchlorethylene (Perk), Trichloroethylene or TCE, Xylene (Mixed Isomers)
Waste Transfer /Recycling <i>CONTAM. HAZARD: A</i>	Coliform bacteria, <i>Cryptosporidium parvum</i> , <i>Giardia lamblia</i> , <i>Legionellae</i> sp., Nitrate, Nitrite, Vinyl Chloride, Viruses
Wastewater Treatment <i>CONTAM. HAZARD: A</i>	Cadmium, Chloroform, Coliform bacteria, <i>Cryptosporidium parvum</i> , cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Flouride, <i>Giardia lamblia</i> , Isopropanol, Lead, <i>Legionellae</i> sp., Mercury, Nitrate, Nitrite, Tetrachloroethylene or Perchlorethylene (Perk) Selenium, Sulfate, Tin, 1,1,2,2-Tetrachloroethane, Trichloroethylene or TCE, Vinyl Chloride, Viruses
Wells <i>CONTAM. HAZARD: B</i>	Atrazine, Alachlor, Benomyl, Bromine, Chlorpyrifos, Cyanuric Acid, Calcium Hypochlorate, Carbofuran, Diquat, Dalapon, Diazinon, Flouride, Glyphosate, Heptachlor Epoxide, Hydrochloric Acid or Muriatic Acid, Iodine, Isopropanol, Dichloromethane or Methylene Chloride, Nitrosamine, Oxamyl (Vydate), Peroxide, Phosphates, Picloram, Simazine, Sodium Carbonate, Sodium Hypochlorate, Sulfate, TetrachloroethanB-1,1,2,2, Tetrachloroethylene or Perchlorethylene (Perk), Tin, Trichloroethylene or TCE

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TABLE C-1  
CONTAMINANTS ASSOCIATED WITH COMMON PSOC'S (cont.)

Source	Contaminant*
AGRICULTURAL / RURAL	
Auction Lots/Boarding Stables <i>CONTAM. HAZARD: A</i>	Coliform bacteria, <i>Cryptosporidium parvum</i> , <i>Giardia lamblia</i> , <i>Legionellae</i> sp., Nitrate, Nitrite, Sulfate
Confined Animal Feeding Operations <i>CONTAM. HAZARD: A</i>	Coliform bacteria, <i>Cryptosporidium parvum</i> , Freon 113 or 1,1,2-Trichloro-1,2,2-trifluoroethane, <i>Giardia lamblia</i> , <i>Legionellae</i> sp., Nitrate, Nitric Acid, Nitrite, Sulfate, Vinyl Chloride, Viruses
Crops - Irrigated + Nonirrigated <i>CONTAM. HAZARD: B</i>	Acetone, Ammonia, Benzene, 2,4-D, Dalapon, Dinoseb, Diquat, Glyphosate, Lindane, Lead, Nitrate, Nitrite, Phosphoric Acid Ortho-, Picloram, Simazine, Sulfuric Acid, Turbidity
Injection Wells <i>CONTAM. HAZARD: B</i>	Atrazine, Alachlor, Benomyl, Bromine, Calcium Hypochlorate, Carbofuran, Chlorpyrifos, Cyanuric Acid, Chlorine, Dalapon, Diazinon, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Dichloromethane or Methylene Chloride, Diquat, Glyphosate, Hydrochloric Acid or Muriatic Acid, Iodine, Isopropanol, Methanol, Nitrosamine, Oxamyl (Vydate), Peroxide, Phosphates, Picloram, Sulfate, Simazine, Sodium Carbonate, Sodium Hypochlorate, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene or Perchloroethylene (Perk), Trichloroethylene or TCE, Tin
Lagoons and Liquid Waste <i>CONTAM. HAZARD: A</i>	Atrazine, Alachlor, Coliform bacteria, <i>Cryptosporidium parvum</i> , Carbofuran, Diquat, Dalapon, <i>Giardia lamblia</i> , Glyphosate, <i>Legionellae</i> sp., Methane, Nitrate, Nitrite, Oxamyl (Vydate), Picloram, Sulfate, Simazine, Vinyl Chloride, Viruses
Managed Forests <i>CONTAM. HAZARD: B</i>	Atrazine, Diquat, Benomyl, Chlorpyrifos, Diazinon, Glyphosate, Nitrosamine, Phosphates, Picloram, Simazine, Turbidity
Pesticide/Fertilizer/Petroleum Storage <i>CONTAM. HAZARD: B</i>	Atrazine, Alachlor, Benomyl, Chlorpyrifos, Carbofuran, Chlordane, 2,4-D, Diquat, Dalapon, Diazinon, 1,2-Dibromo-3-Chloropropane or DBCP, Glyphosate, Nitrate, Nitrite, Nitrosamine, Oxamyl (Vydate), Phosphates, Phosphorus, Picloram, Strychnine, Simazine, 2,4-TP (Silvex)
Rural Homesteads <i>CONTAM. HAZARD: A</i>	Atrazine, Alachlor, Benomyl, Bromine, Calcium Hypochlorate, Carbofuran, Chlorine, Chlorpyrifos, Coliform bacteria, <i>Cryptosporidium parvum</i> , Cyanuric Acid, cis 1,2-Dichloroethylene, trans 1,2-Dichloroethylene, Diquat, Dalapon, Diazinon, <i>Giardia lamblia</i> , Glyphosate, Hydrochloric Acid or Muriatic Acid, Iodine, Isopropanol, <i>Legionellae</i> sp., Nitrate, Nitrite, Nitrosamine, Oxamyl (Vydate), Phosphates, Picloram, Sulfate, Simazine, Sodium Carbonate, Sodium Hypochlorate, Vinyl Chloride, Viruses
Naturally Occurring <i>CONTAM. HAZARD: B</i>	Antimony, Arsenic, Barium, Cadmium, Chloride, Chromium, Coliform, Copper, <i>Cryptosporidium parvum</i> , Fluoride, <i>Giardia lamblia</i> , Iron, Lead, <i>Legionellae</i> sp., Manganese, Mercury, Nickel, Radionuclides, Selenium, Silver, Sodium, Sulfate, Zinc

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## Exhibit D

### Best Management Practices

**Purpose:** Incorporate a wildfire risk expert's insight on best management practices to minimize water quality impacts to source water. The following is a list of suggested BMP's:

- Water providers should evaluate the priority zones of concern in the Arkansas wildfire risk assessment (<http://www.jw-associates.org/arkansasheadwate.html>) and further identify areas with overlapping public water system concerns (areas to reduce fire intensity near PWS infrastructure/close to streams, intake locations, high potential sediment yield areas, places to implement sediment retention structures, etc.)
- Improve coordination with USFS by establishing direct contacts and incorporate any potential restoration concerns with the BAER (Burn Area Emergency Rehabilitation) team prior to a fire occurring.
- Provide the USFS with all relevant information (plans/shapefiles) regarding the source water protection area, areas of concern, potential thinning/fire break areas and access to critical PWS infrastructure in the event of a fire.
- Increase coordination and notification procedures with land managers (USFS, Chaffee County, etc.) so the PWSs are notified when land management activities in the watershed may affect water quality.
- Research project partners (counties, other PWS's, etc.) with mutual interest and funding opportunities to propose wildfire risk reduction projects to the appropriate land management agency.

**Purpose:** Incorporate a mining expert's insight on best management practices to minimize water quality impacts to source water. The following is a list of suggested BMP's:

- Abandoned Mine Issues: Research and identify mining sites that are within the near zone (5 miles upstream of intakes) and zone 1 (1,000 feet from streams) for surface water systems. Groundwater systems may want to evaluate any potential abandoned mining impacts in zones 1, 2, and 3.
- Coordination on BMP's: Coordinate with the agencies who can further identify potential risks in the sensitivity zones and help determine appropriate BMP strategies (ex. CDPHE, DMRS, USFS, etc.). A list of potential BMP approaches that may be implemented once a target mine is identified.
- Coordination with the County and Division of Mining and Reclamation and Safety: Establish contacts with the county and DMRS to get notified on any new permits/public notices related to proposed future mining areas and re-processing areas.

- Coordination with County, USFS, and other Land Management Agencies to further understand proposed wilderness regions and their relationship to mining and the source water areas.

The list below includes all BMP's discussed during the public meetings. Public Water Systems are not expected to carry out these all of these BMP's, but they are provided for informational purposes. Each site is unique and generally requires a combination of BMP's to see an improvement.

- Waste Pile/Tailings Removal & Consolidation (Repositories)
  - High & Dry
  - Cap in Place
  - Wrap Waste in Geo-membrane
  - Haul Waste Material Offsite
- Hydrologic Controls (keep clean water from getting dirty)
  - Rerouting of Contaminated Water
  - Stream Channel Diversions and Diversion Ditches
  - Retention/Settling Ponds, and Treatment Ponds
  - Armoring (waste piles or stream banks)
  - Storm Water Management Planning
- Underground Source Controls
  - Bulkheads
  - Hydrologic Controls (Closing off stopes, diverting water around, anything to keep water from entering the mine workings)
- Sulfate Reducing Bioreactors (SRB)/Wetlands
  - Low pH, High metal effluent using sulfate-reducing bacteria to reduce sulfate to sulfide in an anaerobic system.
- Erosion Controls (Reduce Sediment Transport)
  - Regrade to reduce slope angle, and surface roughening
  - Revegetation/Hydro-seeding
  - Jute Netting, Wattles, Blankets, and all of those other fun controls
- Waste Management Minimization and Recycling
- Membranes "Burritos"
- Native Fill, Vegetation and Seeding
- Manure Suppository

**Purpose:** Incorporate onsite wastewater treatment system (OWTS) expert's insight on best management practices (BMPs) to minimize potential threats and impacts to source water and the overall watershed. The following is a list of suggested BMP's:

- Develop a GIS layer with septic systems identified along with prioritizing which OWTS are the most immediate threat (Zone 1 or 1,000 ft. for 5 miles upstream may be considered).
- Share GIS layer with the county to identify sensitivity areas, buffer zones, and protection areas related to OWTS's.
- Use public outreach to educate specific OWTS owners about how to maintain and check their systems. Consider sending this information out in the water utility billing (ex: Are you aware that not operating your septic system properly could affect your drinking water quality?)

- Coordination on adoption of new state OWTS regulations and add language to county plans to address threats to drinking water from OWTS.
- Consider septic pumping rebates or “sludge judge” monitoring in sensitivity zones.

**Purpose:** Incorporate a transportation and spills risk expert’s insight on best management practices (BMPs) to minimize potential threats and impacts to source water and the overall watershed. The following is a list of suggested BMP’s:

- Develop and distribute laminate handout with identified areas for Public Water Systems (PWSs) concerns, source water intakes, key storm-water outfalls, as well as a priority emergency contact list including Public Water Systems, Colorado State Parks, and Colorado Department of Public Health and Environment information for response and follow up to a spill event and remediation.
- Establish community procedures for acceptable follow up that identify the entity responsible for cleanup and the remediation of a site.
- Establish a clear and effective chain of communication so that information can be relayed quickly and concisely between first responders, dispatch officials, and public water providers. Use the reverse 911 system to alert private water user when a spill has occurred.

### **Agricultural Practices**

Recommended Best Management Practices (BMPs) for Agricultural Practices.

- Utilize education and outreach efforts from ranching associations to educate new land owners during property transfers about suitable land practices. Prioritize areas of concern.
- Share GIS shape files on source water protection areas with ranching community and organizations.
- Consider an “Adopt a Lateral/Ditch” cleanup approach in specific areas and partner with CSU Extension.
- Illustrate the connection between overall water quality and drinking water quality.
- Emphasize voluntary efforts to achieve goals of protecting water quality

### **Road Maintenance and Storm-Water Management**

Recommended BMPs for Road Maintenance and Storm-Water Management:

- Add CDOT to the distribution list for the laminate cards.
- Future coordination with CDOT on locations of culverts and sharing of GIS data.

- Coordination with Andy Flurkey (CDOT) to ensure PWSs are on distribution list of remediation reports from CDOT.
- Consider an “Adopt a Highway” segment upstream from intake/well location to remove trash/debris/potential contaminants. Make a public connection to this area or region.

### **Storm-Water Management**

- Leverage education and outreach resources from Chaffee County storm-water department.
- Establish connections with ditch companies, irrigators, and agricultural contacts to improve storm-water coordination.
- Exchange acquired GIS shape file information between storm-water, culvert, city, and county departments along with PWSs.
- Establish a SWPP brochure for kiosks and education and outreach efforts.
- Distribute a newsletter release for protection plans and public meeting announcements.

### **UAACOG SWAP and NPS Integrated Action Plan**

#### **Preferred BMP’s**

Both meetings discussed which BMP’s the PWS’s would like to see enacted. The following is a list of preferred BMP’s:

- Populate and distribute the laminate cards to emergency responders and dispatch personnel.
- Leverage resources and funds to help present the message of water quality protection to grade school children, possibly partnering with Melanie Scavarda of the Natural Resource Conservation Service (NRCS) or hiring an outreach staff member.
- Dedicate an area of the customer’s water bill to discuss Source Water Protection Activities.
- Position and install CDOT approved road signs from CDPHE to help mark the sensitive water areas.



## **Education and Outreach**

Recommended Best Management Practices (BMPs) for Education and Outreach.

- Coordinate and work with local advocacy organizations, like GARNA and Friends of the Arkansas, to share Source Water Protection Planning (SWPP) materials.
- Draft an article to highlight and distribute SWPP efforts in upcoming newsletters (Friends of the Arkansas, GARNA, etc....)
- Get on GARNA's annual meeting agenda in February and work with UAACOG and GARNA to inform county commissioners about potential MOU.
- Utilized various platforms to share SWPP information such as county newsletters, local radio segments, and social media platforms like Facebook.
- Partner with other support agencies, like Natural Resources Conservation Service (NRCS), to have targeted SWPP presentation for youth audiences and possible community "adopt a drainage way" segment.
- Host public meetings and open houses to share with the specific Public Water Systems (PWS) SWPP.
- Partner with the County, Colorado Parks and Wildlife, Colorado River Outfitters Association (CROA) and raft guides to provide specific literature regarding water quality.
- Coordinate with Water Commissioners and Ditch Commissioners to alert PWSs if there is a threat to water quality.

## Appendix E

# Source Water Protection Checklist

## Best Management Practices Guide for Protecting Source Water Quality

While we all can help protect drinking water, certain individuals in positions of authority have added responsibility. County and town planners, staff members, county commissioners, town council members, and private sector project designers may not think of themselves as protectors of a region's drinking water quality. But in fact the decisions these people make or don't make, can have a large impact on source water quality.

Decision makers, public water providers, and emergency response personnel play key roles in protecting water quality, both in the short and long terms. They are the community's front line to protect against spills and emergencies, deal with everyday contaminants of concern, mitigate negative impacts of development, and protect against long term watershed degradation.

New projects are typically reviewed by planners, water providers, town governments, and other decision makers as part of the project review and approval process. It is critical that new development does not degrade surface and groundwater resources.

Effective emergency spill responses depend on good communications and quick actions by a relatively few individuals, which include emergency responders and water supply managers. Maintaining adequate water supply during floods, forest fires, windstorms, or manmade disasters is a matter of good planning to protect water supplies and power to operate treatment and supply facilities.

Protecting against everyday contamination sources such as leaking fuel tanks, inadequate septic systems, nitrates and nitrites from agriculture, tree spraying, and common lawn chemicals is a matter of understanding common contaminants of concern within specific watersheds, educating and regulating, appropriate testing and compliance enforcement.

Protecting against long-term watershed degradation through forest fire, loss of vegetation and other factors, requires good coordination between land managers and public water providers. It is critical that decision makers, public water providers, and emergency planning personnel have a full understanding of potential impacts on source water.

The following checklist is designed to assist these front line personnel in performing their water quality protection duties.

### **Characterize the Source Water Protection Area (know your watersheds)**

The size and configuration of the source water protection area (SWPA) is dependent on natural topography, direction of surface water flow, direction of groundwater flow, soil types, velocity and quantity of flow, and other factors. Each SWPA includes a set of unique features such as roads or developments that may impact water quality in wells and surface water intakes. Many times a SWPA can be characterized as a watershed. For planning and evaluation purposes it is not necessary to be

perfect when drawing the boundaries of the SWPA. It is more important to understand how facilities and events within the SWPA can affect water quality at the well or surface water intake.

- On an existing topographic map draw the SWPA
- Know locations of surface water intakes and wells
- Show major roads and water features
- Show locations of development
- Know locations of water treatment and supply facilities
- Know locations of power supply lines (electric and natural gas)
- Ask water district managers, engineers, and other experts for assistance

### **Identify Contaminants of Concern**

Contaminants of concern include those chemicals, wastes, and other products which are likely to contaminate source water based on local conditions.

- Are there large scale agricultural operations which could raise nitrate/nitrite levels?
- Is there extensive fertilization, (for agricultural or residential applications)?
- Are there past or present mining activities that can degrade water quality?
- What are the contaminants of concern associated with these mining activities?
- Consider the use of lawn chemicals and in relationship to water quality impacts.
- Establish relationships with homeowners associations, property management companies
- Is there widespread use of pesticides, herbicides, tree spraying and fertilizers?
- Who may be applying these compounds?
- Are there above ground or underground gasoline storage tanks?
- Are there other chemical storage, treatment, or manufacturing facilities?
- Are there landfills?
- Is there significant commercial, residential, or recreational development?
- What chemicals could potentially impact your source water protection area and untreated drinking water quality.
- Obtain Material Safety Data Sheets (MSDS) for chemical regularly used or that might be used in your SWPA.
- Evaluate any source water tests/analysis for variations/links to chemical in SWPA areas.
- Develop tests for important chemicals and contaminants used in the source water

### **Existing Buildings, Parking Lots and Other Facilities**

Identify existing businesses, structures, and other facilities that degrade or can significantly degrade water quality. Focus on types that are known to degrade water quality.

- Map gasoline stations and fuel facilities, characterize as to storage capacity, and volume
- Map and characterize dry cleaners
- Map and characterize industrial facilities

- Map and characterize other larger scale facilities such as shopping centers and resorts
- Identify locations of parking lots and large soil disturbances
- Identify other facilities

### **Notification and Spill Response / Roads and Highways**

Roads and highways can contaminate water sources through spills, creation of airborne contaminants which eventually distill into the watershed, through road treatments including salts, sands, and other chemicals for snow and ice, siltation, and fuels, oils, and other contaminants carried by vehicles and released slowly onto roads and highways.

- Map significant roads and highways within the watershed and develop laminate card.
- Review existing notification procedures
- Develop Communication Protocol for notification procedures.
- Consider transit time and volume and duration of release in relationship to intakes and critical water system infrastructure.
- Coordination with notification on clean up/remediation activities with responsible parties.
- Develop Standard Operating Procedures for acceptable follow-up on remediation/cleanup issues.
- Understand likelihood of contamination from spills, right of way maintenance, stormwater and agricultural conveyances.
- Identify, and establish relationships with key emergency response personnel to include railroad and highway officials and personnel.
- Establish a strong working relationship with these people
- Maintain up-to-date contact lists
- Identify key public water supply personnel internally and surrounding public water systems.
- Coordination with road and bridge maintenance crews toward decreased use of salts and other chemicals which impact water quality in critical areas.
- Take other proactive measures

### **Onsite Wastewater Treatment Systems (OWTS)**

Address contaminants of concern including discharges, failing septic systems, and residual contaminants from OWTS which potentially may impact local water quality.

- Conduct a general GIS intersection and compile inventory of SWAP Zone 1 (1,000 feet stream buffer for 5 miles upstream) and septic systems layer.
- Coordinate with internal and Chaffee County GIS personnel to share general GIS intersection data and refine the approach with county personnel.
- Develop and consider sending outreach and education material on OWTS operation, maintenance and drinking water protection (ex: flyer in bills or direct mailings?).
- Identify the County representative that will be coordinating on new WQCD OWTS regulations.

- Collaborate with County personnel to address concerns regarding sensitive source water protection areas and potential septic impacts and incorporate concerns into the regulatory language if practical.
- Identify highest risk priority septic systems from inventory and consider septic maintenance incentives (ex: pumping rebates, sludge judge, etc.)
- Identify potential funding sources to implement septic maintenance incentives (ex: SWAP grant program, fees?)

### ***Coordinated Resource Management Models***

A Coordinated Resource Management Model (CRMM) is a tool that benefits both water providers and forest resource managers, providing a structure to coordinate efforts to optimize results within source water protection areas. A Coordinated Resource Management Model defines watershed protection, fire mitigation, and forest restoration as common goals shared by local water providers, government agencies, and interested stakeholders. The plan establishes mechanisms to share information and design actions and outcomes that meet the needs of local water providers, stakeholders and communities.

Recently a Memorandum of Understanding (MOU) was signed between the U.S. Forest Service (USFS) and the Colorado Department of Public Health and Environment (CDPHE) committing both agencies to work together to protect watersheds. This document should be viewed as a basis for subsequent agreements between the USFS and local communities and water providers to protect public watershed resources on National Forest System lands. The MOU designates CDPHE-delineated Source Water Areas as “Municipal Supply Watersheds”.

The purpose of a CRMM is to build on work that has already been done in large-scale efforts, by providing a structure for coordinated resource management of small-scale watersheds. The intent is to better coordinate stakeholder actions in a watershed to achieve the goals of the SWPP, the Arkansas River Watershed Assessment, and the MOU, while protecting specific source water areas.

Time, money and effort are optimized once all stakeholders know what others are doing to remove trees, create sediment basins, monitor stream quality and conduct other efforts to promote forest health, prevent catastrophic wildfire and improve water quality.

Water providers will likely find that use of this tool can improve their source water protection efforts.

### **Wildfire Risk Assessment and Mitigation**

Incorporate wildfire risk expert’s insight on best management practices to minimize water quality impacts to source water. Here are a few suggested BMP’s to include in your source water protection plans.

- Revisit the Arkansas Wildfire Risk Assessment Data ([jw-associates.org/Projects/UpperArk](http://jw-associates.org/Projects/UpperArk)) and/or identify zones of concern that overlap the source water protection area.
- Identify Land Management Agency personnel to establish communication protocol and discuss potential prevention and restoration concerns (ex: BAER Team response, etc.)
- Collaborate with BLM, USFS, and other Land Managers and Public Water Systems to share and exchange GIS data regarding source water protection area, general areas of concern, PWS infrastructure located in high risk areas, along with information on planned area for potential thinning and fire break construction.

- Evaluate the implementation potential of interagency/county agreements and wildfire risk reduction strategies (ex: USFS/CDPHE and/or PWS/County Memorandums of Understanding).
- Improve communication protocol and contact information between BLM, USFS, Private Land Owners, and PWSs by identifying key personnel.
- Research future projects and project-partners to identify methods and funding for wild fire risk reduction projects.
- Propose public water system areas of wildfire risk concerns in an attempt to prioritize water supply focused risk reduction projects. Look for opportunities to supply public water system specific project information to local fire districts, community wildfire protection plans (CWPP), USFS, BLM, Colorado State Forest Service, and Colorado Parks and Wildlife.
- Identify and coordinate on any local Community Wildfire Protection Plans (CWPP's) and research inclusion of sensitive source water protection areas/zones of concern.
- Understand and communicate on forest health impacts (ex: pest infestation, plant disease, etc.) and coordinate with Land Management entities on restoration/remediation efforts in relationship to drinking water sources.
- Research and implement outreach and education programs (ex: Forest Wise Program) to address wildfire mitigation for rural property owners.

### **Historic and Abandoned Mines**

Incorporate our mining expert's insight on best management practices to minimize water quality impacts to source water. Here are a few suggested BMP's to include in our source water protection plans.

- Identify mining sites that are within the near-zone (5-miles upstream of intake) and zone 1 (within 1,000 feet of streams) to prioritize risk based on Appendix C (MASMIL) in the SWAP report for surface water systems.
- Coordinate with identified agencies to further identify potential risks within sensitivity zones.
- Work with the Chaffee County and Division of Mining and Reclamation and Safety to establish contacts with the county and DMRS to get notified on any new permits/public notices related to proposed future mining areas and re-processing areas.
- Collaborate with Chaffee County, USFS, BLM and other Land Management Agencies to further understand proposed wilderness regions and their relationship to mining and the source water protection areas.
- Evaluate potential integration with Non-Point Source Watershed planning and share SWAP mining assessment information and priorities. Leverage potential funding opportunities as appropriate.

### **Reviewing Applications for New Projects**

By its very nature new construction adds contamination potential to the watershed. This may be because of the introduction of petroleum hydrocarbons or hazardous chemicals, construction of large parking lots with runoff of typical vehicle contaminants, increased surface water runoff from parking lots, or other factors. Good planning is critical to mitigating these adverse impacts while allowing future development. It is essential that those charged with approving any new development understand what contaminants a new facility may introduce, the volume of potential contamination, and the location of

the new facility relative to source water supplies, intakes, and wells. Referral agencies and decision makers can take a proactive role as part of the project review process to help prevent contamination before it occurs.

- Identify the location of the proposed project relative to wells, intakes, and the watershed.
- Is the new project up gradient or upstream of wells and intakes?
- How far?
- What is the likelihood of impact based on contaminate types and volumes?
- What is the likelihood of impact based on soil permeability and groundwater flow?
- Are adequate mitigation and monitoring systems incorporated into the project design?
- Do project designers working for developers know locations of critical source water features?
- Are planning departments fully informed?
- Are there adequate regulations prohibiting septic systems which may degrade water supplies?

### **Emergency preparedness**

Loss of power during emergencies can quickly impact the water provider's capacity to provide clean water in ample quantity during and after emergency events. Having backup capacity is thus critical to public health and safety. Being prepared may include having a backup power supply such as diesel generators with fuel storage tanks, immediate access to other power supply sources, greater water storage capacity, and easy access to water supplies from other providers within the SWPA. It is also appropriate to examine the issue from the standpoint of cooperating with adjacent water providers and emergency power management protocols. The checklist below includes key steps to prepare for large-scale longer-term power outages.

- Establish a working relationship with official energy company contact personnel
- Join coordinated emergency planning groups
- Establish water sharing capacity with other water providers
- Analyze storage capacity in context of water needs during a major emergency
- Research potential options and plan for backup power supply systems.
- Construct and maintain backup power supply systems
- Establish protocol to notify water users during emergency events
- Write a notification plan with identified spokespersons and appropriate messaging
- Have a plan to coordinate with local emergency and governmental agencies
- Develop an emergency checklist of responsibilities
- Have a plan to protect surface intakes, well fields, treatment plants, and critical infrastructure

### **Education**

Education is the cornerstone of successfully protecting our water supplies. Planners, staff, elected officials, project designers, water providers, emergency personnel, and other decision makers need to

educate themselves about potential threats, and how to protect against them. All parties need to educate water users and the public at large about potential dangers to public water. For this to happen there should be good lines of communication between all parties, along with active participation.

The best way to protect the source water is to be involved with activities in the area of the source water to assure that others do not take actions that jeopardizes the source water inadvertently. If a party does not know the source water protection area, they are not likely to consider their actions on a water supply source. Best Management Practices dictate active participation.

- Expand new development review procedures to include more stakeholders
- Identify primary contaminants of concern
- Educate water users and the general public about the threats
- Work closely with federal, state, and local government land management agencies
- Establish a list of key public agency contacts
- Coordinate with other water providers and water protection groups
- Develop and distribute educational materials and brochures
- Keep water users informed through periodic updates
- Keep developers informed so they can design new projects to have the least impact on water quality
- Be proactive

Protecting our public water supplies against risks of contamination, natural disaster, and disrupted flow is the shared responsibility of government, the private sector, and individual citizens.

On the front line are town and county planners, staff, elected officials, project designers, public water providers, and emergency response personnel, whose duty it is to protect our water.

- Are there large scale agricultural operations which could raise nitrate/nitrite levels?
- Is there extensive fertilization, (for agricultural or residential applications)?
- Are there past or present mining activities that can degrade water quality?
- What are the contaminants of concern associated with these mining activities?
- Develop a list of commonly used lawn chemicals and understand their cumulative impact
- Establish relationships with homeowners associations, property management companies
- Is there widespread use of pesticides or herbicides?
- Is there tree spraying?
- Are there underground gasoline storage tanks?
- Are there above ground gasoline storage tanks?
- Are there other chemical storage, treatment, or manufacturing facilities?
- Are there landfills?
- Is there significant commercial, residential, or recreational development?
- What chemicals are regularly used in your source water protection area?
- Obtain MSDS for chemical regularly used or that might be used in your SWPA
- Generate a list of contamination sources
- Generate a list of chemical applicators
- Develop tests for important chemicals and contaminants used in the source water



- Develop list of tree sprayers that regularly work in the SWPA
- Develop tests for important chemicals in use in SWPA
- Identify other contaminants of concern
- Coordination with Federal Land Managers (USFS)
- USFS Checklist
- Provide the USFS with all relevant information in the source water protection plan, reference guide, and map and GIS coverage of zones of concern (per Protecting Critical Watersheds in Colorado from Wildfire: methodology).
- Work on coordinating with the USFS to set up a notification procedure to contact the DVD when land use decisions/activities may affect water quality.
- Coordination with Local Government/Planning Agencies
- All too often a local or county planning agency will take an action without knowing or understanding the impact of that action on a water supply. An important element of source water protection is being proactive with planning agencies to make sure the agencies know and understand the water supply protection area.
- Local Government/Planning Agencies Checklist
- Provide Chaffee County Planning Department, with relevant information in the source water protection plan, the reference guide and map and GIS coverage of zones of concern (per Protecting Critical Watersheds in Colorado from Wildfire: methodology).
- Work on coordinating with Chaffee County Planning Department to set up a notification procedure to contact the Town of Buena Vista when land use decisions/activities may affect water quality.
- Chaffee County’s Community Wildfire Protection Plan (CCCWPP) prioritizes areas throughout the county for cutting trees to protect based on potential damage to life and property from wildfire. CCCWPP is one of many throughout the state. Check these websites for details: <http://csfs.colostate.edu/wildfire-mitigation/colorado-community-wildfire-protection-plans/>, <http://csfs.colostate.edu/districts/salida-district/salida-wildfire-mitigation-education/>.
- The Buena Vista Watershed Assessment evaluated hazards to water supplies due to wildfires and then prioritized watersheds that should be treated first to address those natural hazards.
- Within the last year there has been a Memorandum of Understanding (MOU) signed between the U.S. Forest Service and the Colorado Department of Public Health and Environment (CDPHE) committing both agencies to work together to protect watersheds. This document should be viewed as a basis for subsequent agreements between the U.S. Forest Service and local communities and water providers to protect public watershed resources on National Forest System lands. The MOU designates CDPHE-delineated Source Water Areas as “Municipal Supply Watersheds”. The Town of Buena Vista WSPP is a CDPHE-delineated Source Water Area and is therefore recognized by the U.S. Forest Service as a Municipal Supply Watershed.

***For more information, contact the Town of Buena Vista Public Works Department at 719-395-6898, or call the Colorado Department of Public Health & Environment at (303) 692-3534.***

## **Appendix F**

### **Cottonwood Creek Basins Wildfire Assessment and maps**

## Zones of Concern

The Work Group identified an important hazard for water supply related to transport of debris and sediment from upstream source water areas. The source water areas (i.e. watershed areas) above important surface water intakes, upstream diversion points and drinking water supply reservoirs have a higher potential for contributing significant sediment or debris. These areas, called Zones of Concern (ZoC), can be used by stakeholders to further define project areas for protection actions.

There were several methods suggested by the Colorado Watershed Protection Data Refinement Work Group (2009) to define ZoC. The Upper Arkansas Watershed Stakeholders initially agreed to use the five-mile upstream distance. This approach is based on Colorado State Statute 31-15-707 which allows municipal water providers to enact an ordinance to protect their water intakes within five miles upstream of their intakes. This municipal statute has been in place since the late 1800's and has been tested in court several times and upheld.

Many of the ZoC stopped at a watershed divide before they reached the five mile upstream distance. There were several important diversions and reservoirs that are positioned lower in the watershed. During the third stakeholder meeting, the group suggested that the ZoC be extended to 11 miles upstream for Arkansas River, Cottonwood Creek, DeWeese Reservoir and Harrington Ditch. These ZoC were added as separate areas covering from five to 11 miles upstream.

Fourteen ZoC within five miles upstream of diversions and reservoirs were delineated in the Upper Arkansas Watershed (Figure 13 and Table 3) totaling more than 120,000 acres. Four of the ZoC were extended to 11 miles upstream increasing the total ZoC area to more than 284,000 acres. The ZoC were overlaid on the Final Priority map (Figure 12). More detailed maps of the ZoC are presented in the *Opportunities & Constraints* section below. The water supply agencies for each ZoC have also been identified in Table 3. Some of the ZoC overlap with others, or in other areas, the ZoC are close to overlapping other ZoC. In those situations, ZoC can be combined or viewed as one, combining several stakeholders into a larger ZoC.

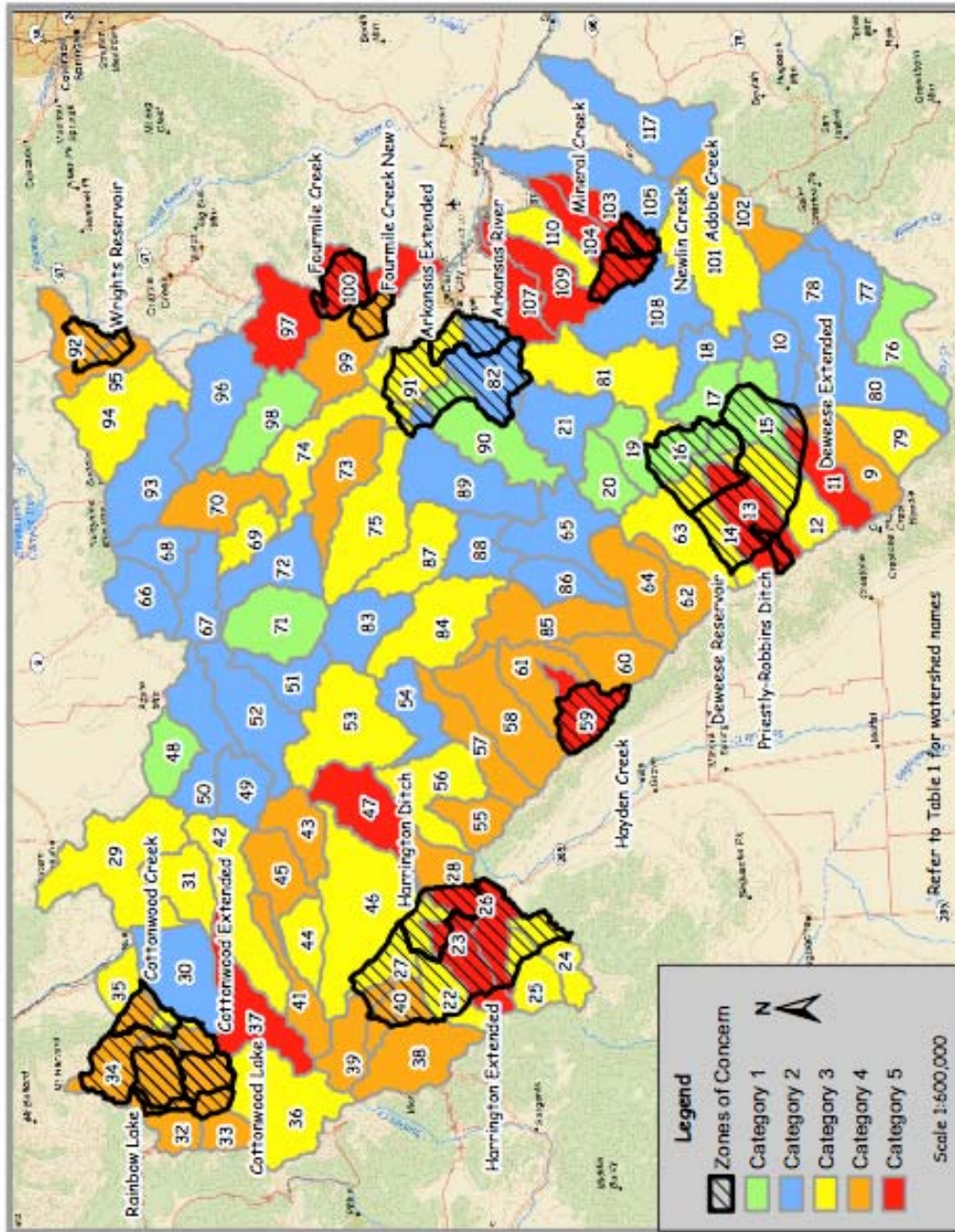


Figure 13. Upper Arkansas Watershed ZoC<sup>4</sup>

<sup>4</sup> The *Opportunities & Constraints* section below displays and identifies each ZoC at a better scale than Figure 13.

**Table 3. Upper Arkansas Watershed Zones of Concern<sup>5</sup>**

Water Supply Name	0-5 Mile ZoC	5-11 Mile ZoC	Total ZoC Area	Owner/Operator
Adobe Creek	3,067	0	3,067	City of Florence
Arkansas River	8,532	32,862	41,394	City of Canon City
Cottonwood Creek	7,074	33,783	40,857	Town of Buena Vista
Cottonwood Lake	10,377	0	10,377	Town of Buena Vista
DeWeese Reservoir	22,825	43,784	66,609	NA
Fourmile Creek	9,267	0	9,267	Park Center WD
Fourmile Creek New	4,689	0	4,689	Park Center WD
Harrington Ditch	12,959	53,701	66,660	City of Salida & Town of Poncha Springs
Hayden Creek	11,592	0	11,592	Cutty's Hayden Creek Resort
Mineral Creek	2,055	0	2,055	City of Florence
Newlin Creek	6,680	0	6,680	City of Florence
Priestly-Robbins Ditch	2,355	0	2,355	Mountain Cliff Ski Area
Rainbow Lake	11,019	0	11,019	Town of Buena Vista
Wrights Reservoir	7,919	0	7,919	NA
<b>Totals</b>	<b>120,410</b>	<b>164,130</b>	<b>284,540</b>	

<sup>5</sup> The areas of the ZoC are in acres. Some of the ZoCs in the Cottonwood Creek Watershed overlap, therefore some acres are double counted in that area.

## RECOMMENDATIONS

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This watershed assessment is a process that sets priorities, identifies stakeholders and ZoC. The next steps that are taken by stakeholders using the information presented in this report are essential to address the hazards identified through this process. Some potential opportunities are presented in the next section of this report. These recommendations are presented first to guide the reader through the *Opportunities & Constraints* section.

### **Hazard Reduction Strategies**

Although there are other strategies that can be pursued, the reduction of wildfire severity is the main goal for minimizing adverse hydrologic responses following intense wildfires. Wildfire severity is the effect that the fire has on the ground. Vegetative forest treatments can be effective in reducing the threat of crown fire (Graham et al. 1999). Treatments that reduce density and change the composition of stands would reduce the probability of crown fire, decrease severity, and enhance fire-suppression effectiveness and safety (Oucalt and Wade 1999, and Pollet and Omi 2002). In forested stands that have developed without regular disturbance, combinations of mechanical harvest/thinning and prescribed fire are the most effective technique for altering the fuels matrix (Graham et al. 2004).

There are portions of watersheds that may not be available for vegetation treatments because they are economically or administratively inaccessible. Examples of economic inaccessibility include areas that are far from existing roads where it would be very costly to build new roads to provide access, or areas that are so steep that removal of logs by helicopter may be the only option. During follow-up planning efforts the costs of specific project alternatives should be carefully evaluated in light of fire probabilities and the potential costs of no action. An example of administrative inaccessibility would be areas designated by the US Forest Service as wilderness.

There are some prudent measures that can be taken in situations where critical watersheds are economically or administratively inaccessible including:

1. Managing wildland fires in certain places as a management tool that would allow wildfire to reduce wildland fuels under defined circumstances. The conditions would be monitored frequently to ensure that the fire stays within that management prescription or suppression efforts would be required.
2. Reduction of wildfire severity in surrounding areas within those watersheds to reduce the potential extent of high severity burn.
3. Pre-permitting sediment control structures downstream from high hazard watersheds. Following the Hayman Fire in 2002, Denver Water installed a sediment control structure in Turkey Creek above Cheesman Reservoir. It took more than one year to get all approvals and permits in place to construct that structure. The highest sediment yield from wildfires is usually in the first 2-3 years. Stakeholders can do much of the permitting work ahead of time, including planning with the appropriate government agencies and conceptual design.
4. Communicating with state and local leaders and other interested groups about the hazards that these watersheds pose. There may be other resources at risk below these watersheds that can be protected, such

as; houses in floodplains, important fisheries or riparian areas, and areas of mining tailings that could be a water quality risk if they are transported downstream.

## **Stakeholder Group Organization**

The ZoC are natural project areas for stakeholders to start the next planning steps. In some cases several ZoC may be lumped together to form larger project areas. Stakeholder groups will, by definition, include the water providers and/or municipalities that own water rights and operate in those watersheds, but should also include the following:

1. U.S. Forest Service - Salida and San Carlos Ranger Districts of the Pike and San Isabel National Forest.
2. Colorado State Forest Service - Canon City and Salida Districts
3. Chaffee and Fremont Counties
4. Home owner associations
5. Other interested groups such as power companies

Stakeholders should review the *Opportunities & Constraints* section below to determine what watersheds/ ZoC should be their priority. Some additional planning will be required to initiate watershed protection/ hazard reduction projects within those ZoC. The discussion below presents some of the options.

There is a new planning process that is focused on watershed issues called Critical Community Watershed Wildfire Protection Plans (CWPP). The CWPP process (see [http://www.jw-associates.org/Projects/Front\\_Range/Front\\_Range.html](http://www.jw-associates.org/Projects/Front_Range/Front_Range.html)) is similar to the Community Wildfire Protection Plan (CWPP) process but expands to include watershed issues. Some existing CWPPs may cover portions of the watersheds/ZoC of interest. It may be more efficient to revise an existing CWPP by incorporating the watershed components from this assessment than to complete the CWPP process. Specific treatment areas and priorities identified in existing plans also should be reviewed for their contribution to the watershed protection efforts and incorporated into the expanded plan. Other efforts, such as source water protection plans, may also gain some efficiency and consistency by incorporating the results of this assessment.

National Environmental Policy Act (NEPA) planning efforts on federal lands may be able to be modified to incorporate watershed priorities. The NEPA analysis and decision-making process may also benefit from the technical support provided by this watershed assessment. Other existing land and vegetation management plans, fuels treatment plans, source water protection plans, watershed restoration plans or prescribed fire or fire-use plans may exist that cover portions of the critical watersheds.

## OPPORTUNITIES & CONSTRAINTS

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This section of the assessment presents the first step in identifying opportunities and constraints within the ZoC. This analysis is intended to identify potential opportunities that will aid the stakeholders in deciding whether to pursue watershed protection/hazard reduction efforts, the overall scope that those efforts might involve, and identification of the key partners for those projects. This section is organized by general descriptions of the opportunities and constraints first and then presentation of potential opportunities for each ZoC that are shown on Figure 14.

### General Opportunities & Constraints

The opportunities and constraints described below were applied to the ZoC as a series of filters and identifiers of potential opportunities.

#### Ownership

Major ownership classifications are Federal, State, Local Government and Private. Federal Lands include the NFS Lands, Bureau of Land Management (BLM), National Park Service, Department of Defense, and potentially other agencies and departments. State lands are typically those owned or managed by the State Land Board, the Colorado Division of Wildlife, or State Parks. However, there are other agencies or institutions, such as state universities, that also may own significant acreage.

Local Government lands typically include county, city or town-owned properties. County-owned lands are often managed as open space or park lands. City-owned lands are also often owned and managed for open space or parks, but also for watershed protection or other purposes.

Private land is basically a category that can include a myriad of other types of ownerships including special district lands, company or corporate-owned lands, privately owned properties and more. Privately owned parcels can be present in extremely complex patterns, particularly where they are composed of old mining claims.

#### Access

Access to and within a watershed or ZoC is a key factor in determining opportunities for mitigating wildfire hazards or the ability to install, operate and maintain erosion and sediment control structures following wildfires. The analysis often is limited by the data available in determining what roads exist within any given area. Normally, data layers available for the analysis usually show major roads and access routes, but often fail to include small, local roads and trails, particularly on non-federal lands. Such roads are very important for accessing backcountry areas for conducting mitigation activities. Experience has shown that old roads used for mining or logging that can be temporarily re-opened to conduct project work may not be shown on any maps. Another option is temporary roads that can be constructed and closed following treatment, but they add costs to projects and current policies on many federal lands make even use of temporary roads difficult.



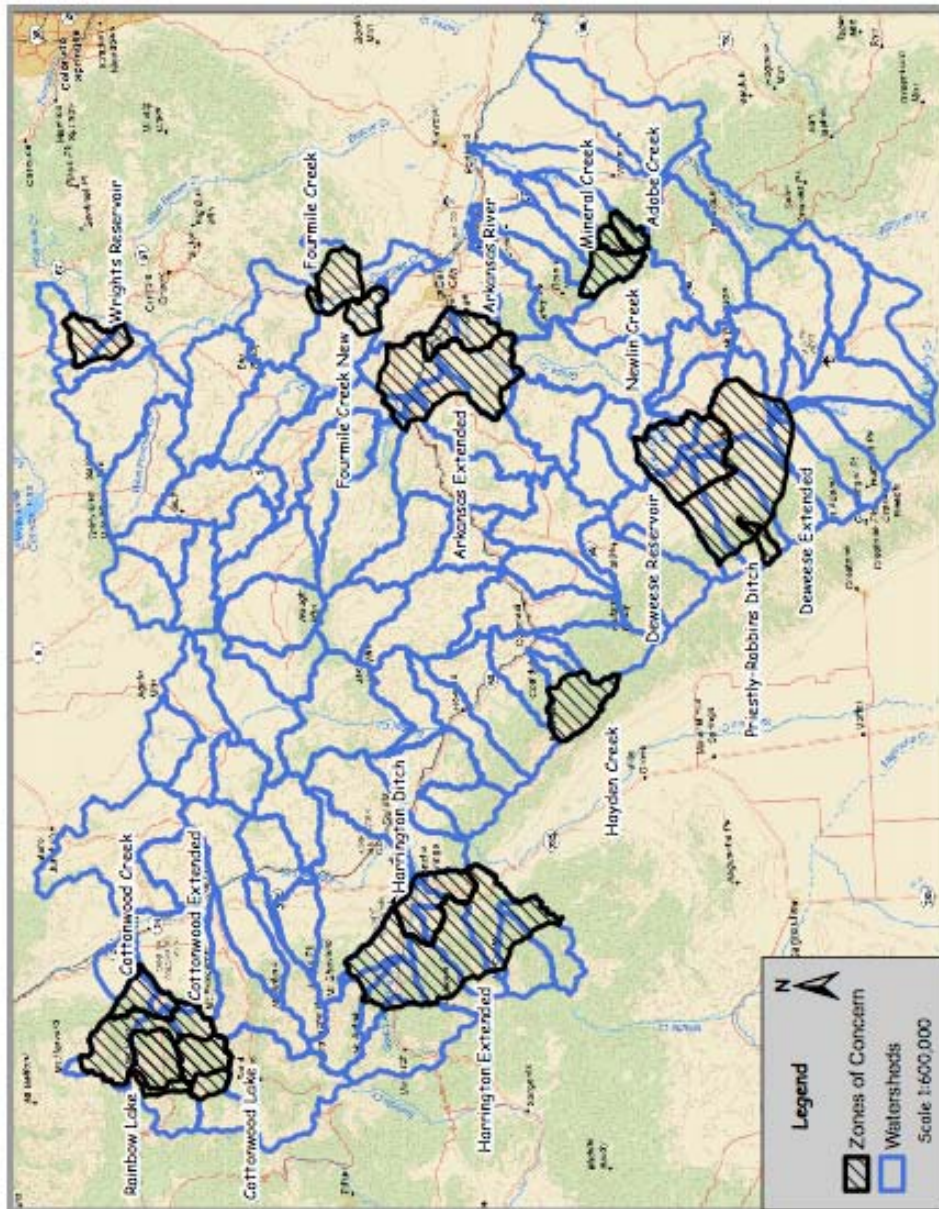


Figure 14. Upper Arkansas ZoC Base Map

When conducting traditional logging and thinning operations where products are removed from the forest, areas within ¼-mile of roads can be accessed. If products do not have to be removed to meet fuel loading requirements and alternate treatment methods such as “mastication” or mulching can be used, areas within ½-mile of roads can typically be considered.

### **Slopes**

Land slope can be a major constraint when considering where and what treatments may be conducted to reduce wildfire hazards. Slope constraints are related directly to the typical harvesting or treatment systems and equipment employed and available within Colorado. Land management agency policies may also constrain the slopes upon which treatments may be conducted.

Slopes of 30 percent or less are the easiest to treat and the most traditional threshold for treatment given typical harvesting systems and equipment availability. Technological, power and other improvements now allow equipment to operate on slopes of 40 percent or perhaps even steeper ground. Experimental work conducted by the Colorado State Forest Service on Denver Water’s lands in the Upper South Platte showed that tracked mastication equipment could work on slopes of up to 55 percent without causing erosion.

Quite recently in Colorado there have been several cable logging and even a few helicopter logging operations conducted. Slope is typically not an absolute constraint with these types of operations, but other factors such as the shape of the hillside (convex vs. concave), whether the project can be treated from above or below and others determine actual project feasibility.

The stakeholders decided to use a 40 percent slope as the upper limit of mechanical treatments. Potential opportunities were identified as greater on shallower slopes (less than 40 percent slope).

### **Wilderness Areas**

Operations in designated wilderness areas are highly restricted by law and agency policies. Often the only treatments possible would be to plan for use of natural fire to reduce wildfire hazards.

### **Roadless Areas**

Operations in designated roadless areas are restricted primarily by agency policies. Regulations allow construction of temporary roads, and their closure upon project completion, for the purpose of conducting harvests and wildfire hazard reduction treatments. Agency policy has caused treatments to focus on areas other than roadless whenever possible.

Colorado is one of two states that are attempting to develop rules for treatments within roadless areas. The Colorado Roadless Areas are currently under review by the US Secretary of Agriculture, but are operating under their proposed rules. This situation has resulted in roadless areas being divided into 2001 Roadless Rule (Federal) and Colorado Roadless Areas. Due to current legal actions, 2001 Roadless Rule areas are basically off limits to forest management. However, they should not be viewed as off limits to long-term watershed protection efforts.

The Colorado Roadless Areas have been reviewed and adjusted for actual conditions and therefore are likely more precise than the 2001 Roadless Rule areas. As currently proposed, treatments within Colorado Roadless Areas may be possible adjacent to at risk communities and for reducing wildfire hazards within

watersheds. Areas within ½-mile of communities, and in some circumstances up to 1.5-miles from communities, may be treated to reduce wildfire hazards. Areas within watersheds may be treated if the USFS Regional Forester determines a significant risk of wildfire exists. All decisions about specific projects within roadless areas will be made by the USFS Regional Forester.

## **Vegetation**

Vegetation is what fuels a wildfire. The vegetation type and its arrangement, size, density, and moisture content; the slope of ground and the aspect it is found on; whether it is dead or alive; the weather and season of the year, and more all dictate if and how intensely fuels will burn.

The Colorado State Forest Service is developing a series of documents related to watersheds and their protection. The first document, tentatively titled, "*A Comprehensive Strategy for the Management and Protection of Colorado's Watersheds*," will have a series of companion documents entitled, "*Management and Protection Techniques for Colorado's Watersheds*." The first companion document discusses management of ponderosa and lodgepole pines and uses numerous photographs to illustrate what these treatments might look like.

In general, ponderosa pine should most often be managed using forest restoration management techniques. Dense, homogenous stands of ponderosa pine can be thinned to a much more open state, and openings created and maintained across the landscape. This type of management makes a much more resilient ecosystem, one that reduces wildfire intensities is better able to absorb and recover from the impacts of wildfire (Colorado State Forest Service 2007).

In Colorado, lodgepole pine is also found in dense, continuous stands. Because lodgepole grows differently than ponderosa pine and has a different ecology, it is difficult, within a short time period, to thin it sufficiently to develop diversity significant enough to reduce wildfire hazards. This much needed diversity must be developed by creating diversity at the stand and landscape levels by clearcutting, patch cutting, creating permanent openings, converting areas to aspen. Once management has begun for watershed protection, in some situations it may be advisable to utilize less traditional management techniques, such as thinning in young lodgepole pine stands, for long-term management (Colorado State Forest Service 2009).

Spruce/fir is a major component of the forest vegetation in the Upper Arkansas Watershed. This forest type is comprised of mixtures of Engelmann and Colorado blue spruce, subalpine fir and other minor species. It too, like lodgepole pine, is difficult, within a short time period, to thin it sufficiently to develop diversity significant enough to reduce wildfire hazards. This much needed diversity must be developed by creating varied conditions at the stand and landscape levels by group selection, small patch cutting, creating permanent openings, converting areas to aspen, and by other techniques. Once management has begun for watershed protection, in some situations it, too, may be advisable to utilize less traditional management techniques for long-term management.

The pinyon-juniper vegetation type is common in the Upper Arkansas Watershed. This vegetation type seldom burns intensively in the absence of strong winds. But when driven by high winds fires can burn intensely, spot long distances and be difficult to suppress. Diversity may be developed by creating varied conditions at the stand and landscape levels by thinning, group selection, small patch cutting, creating permanent openings, converting areas to grasslands, and by other techniques. In general, it is suggested that

when retaining trees on a site that pinyon be favored over juniper. Pinyon tends to re-invade treated areas more slowly, and as it grows pinyon can be pruned to reduce the chance of surface fires moving into the tree crowns.

The stakeholders decided to use aspen, pinyon-juniper, mixed conifer and ponderosa pine for vegetation targets at lower elevations, and included lodgepole pine at higher elevations as targets for vegetation treatments to reduce wildfire severity.

## Cottonwood Creek, Cottonwood Lake, & Rainbow Lake ZoC

The Cottonwood Creek extended ZoC, the Cottonwood Lake ZoC and the Rainbow Lake ZoC substantially overlap. They are also part of Buena Vista's water supply system. Therefore, they are grouped together in this analysis (Figure 15). Three main streams define the Cottonwood ZoC, North, Middle and South Cottonwood Creeks. Note that the ZoC are shown here in pink with crosshatching, but in the remaining figures the outlines appear as bold black lines with no crosshatching.

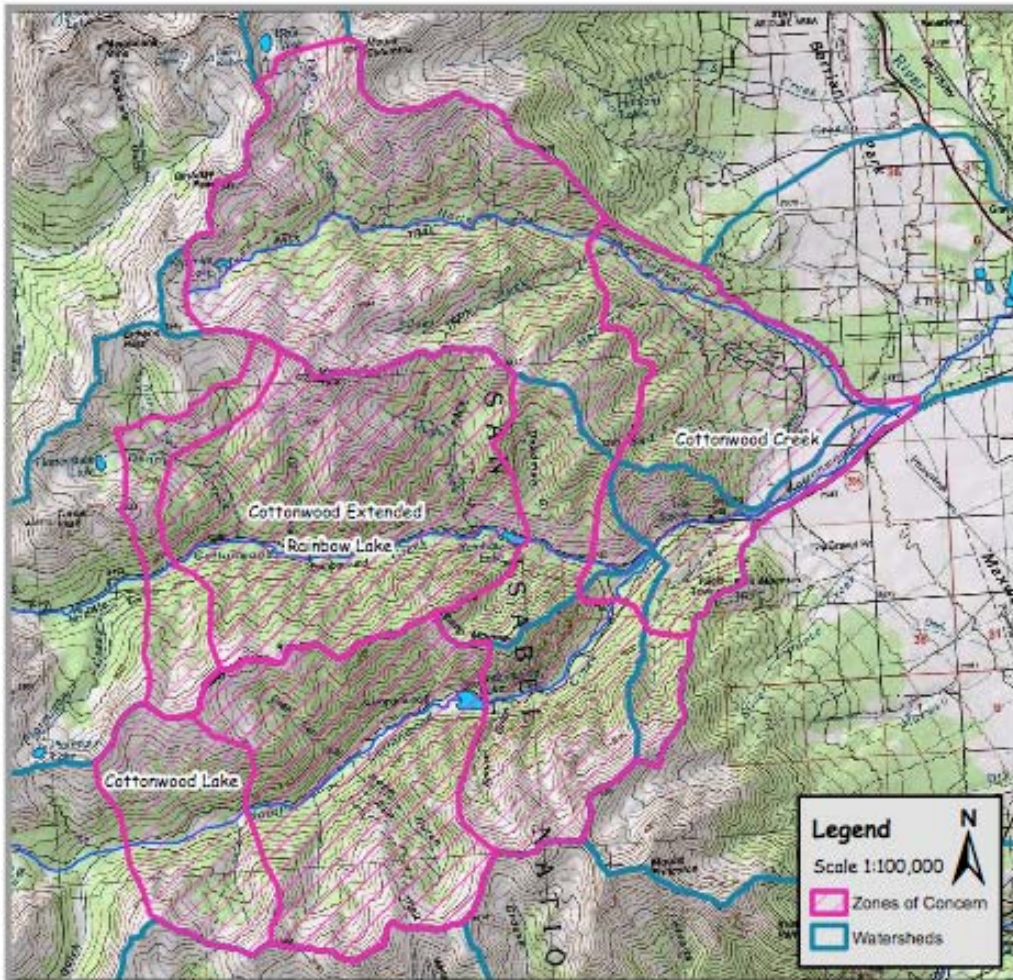


Figure 15. Cottonwood Creek, Cottonwood Lake, and Rainbow Lake ZoC Location

## Appendix G

### Water Protection District Ordinance # 5 Series 1999

#### **ARTICLE II Water Supply Protection District**

Sec. 13-21. Water Supply Protection District established.

Sec. 13-22. Jurisdiction and intent of district regulations.

Sec. 13-23. Adoption of protection district boundaries and map.

Sec. 13-24. Definitions.

Sec. 13-25. Prohibited activity.

Sec. 13-26. Permit required.

Sec. 13-27. Permit application and review procedures; fee.

Sec. 13-28. Permit issuance standards.

Sec. 13-29. Certificate of compliance.

Sec. 13-30. Wastewater and sewage disposal facilities.

Sec. 13-31. Water quality monitoring plans.

Sec. 13-32. Delegation of authority.

Sec. 13-33. Enforcement.

Sec. 13-34. Violations and penalties.

Sec. 13-35. Certain de minimis activities exempted.

Sec. 13-36. Variances.

Secs. 13-37 \_13-40. Reserved.

#### **Sec. 13-21. Water Supply Protection District established.**

There is hereby established the Town of Buena Vista Water Supply Protection District for the purpose of protecting the sources, supply, quantity, quality, delivery, storage, treatment and distribution of water serving the Town, its citizens and water-using customers.

(Ord. 5-1999 §1)

#### **Sec. 13-22. Jurisdiction and intent of district regulations.**

This Article has been adopted in accordance with Section 31-15-707, C.R.S., and is designed and intended to extend and enforce the Town's legal jurisdiction and authority to the maximum extent allowed by law for the purpose of protecting the Town's drinking water resources and delivery system from interference, pollution and other degradation over an area comprised of all territory within five (5) miles above or around any point or points from which the Town diverts or otherwise draws water for domestic use. The Town's authority and jurisdiction shall extend, by way of example and not limitation, to all reservoirs, streams, trenches, ditches, pipes, drains and other waterworks. All ordinances and regulations adopted under the authority of this Article shall be liberally construed and enforced in order to satisfy and further the purposes and intent as set forth above.

(Ord. 5-1999 §1)

#### **Sec. 13-23. Adoption of protection district boundaries and map.**

The Town does hereby approve and adopt the official Town of Buena Vista Water Supply Protection District Map dated January, 2000, defining and illustrating the geographical boundaries of the protection district. At least one (1) copy of the map shall at all times be maintained in the office of the Town Clerk for public inspection during regular business hours. Copies of the map may be ordered for purchase at such cost as deemed necessary and reasonable by the Town Clerk.

(Ord. 5-1999 §1; Ord. 1-2000 §1)

#### **Sec. 13-24. Definitions.**

As used in this Article, the following words and phrases shall mean as follows unless the context plainly requires otherwise:

Absorption system means a wastewater disposal system or leaching field utilizing and/or inclusive of adjacent soils for the treatment of sewage by means of absorption into the ground.

Absorption trench means a trench in which sewage effluent is transported or directed for percolation into the soil.

Aquifer means a water-bearing formation that contains sufficient ground water to be important as a source of supply.

Best management practice means the most effective means of preventing, reducing or mitigating the harmful impacts of development activities consistent with the standards set forth in this Article.

Development or development activity means any construction or activity which alters or changes the natural or preexisting character and/or use(s) of the land on which the construction or activity occurs, excepting residential gardening or landscaping.

Dispersal system means a system for the disposal of effluent after final treatment in an ISDS by a method which does not depend upon or utilize the treatment capability of the soil.

Effluent means the liquid waste discharge from a sewage disposal system.

Excavating means any act by which ten (10) cubic yards or more of soil or rock is cut into, quarried, uncovered, removed, displaced or relocated, and includes the conditions resulting therefrom.

Filling means the deposition of ten (10) cubic yards or more of material brought from another location by other than natural means.

Foreseeable risk means the reasonable anticipation that harm or injury may result from an act or omission.

Grading means the alteration of the natural surface of any land by leveling, stripping, filling or excavating and involving ten (10) or more cubic yards of soil or other surface material; or the alteration of any natural or preexisting drainage pattern or channel through the alteration, movement or addition of surface materials; or the installation of any road or other surface utilized for the movement of vehicles.

Hydric soil means soil that, in its undrained condition, is saturated, flooded or ponded long enough during a growing season to develop an anaerobic condition that supports the growth or regeneration of hydroponic vegetation.

Individual sewer disposal system (ISDS) means an on-site sewage system of any size or flow designed to collect and treat, neutralize, stabilize and dispose of sewage that is not part of or connected to a permitted municipal sewage treatment works. Examples include, without limitation, conventional septic tanks and leach fields, absorption trenches and pits, constructed wetland treatment systems, evapotranspiration systems and mound systems.

Maximum extent feasible means that no feasible and prudent alternative exists and all possible efforts to comply with a regulation, or minimize potential harm or adverse impacts, have been undertaken.

Person means any individual, partnership, corporation, trust, association, company or other public, governmental or corporate entity, or instrumentality thereof.

Pollute or pollution means the contamination or befouling of the natural biological, chemical, physical or radiological composition or integrity of water or soil through human or human-induced conduct or activities.

Sewage means a combination of liquid wastes that may include chemicals, house wastes, human or animal excreta, or animal or vegetable matter in suspension or solution, and/or other solids in suspension or solution, and that is discharged from, without limitation, a building, vehicle, tank or other structure or facility.

Sewage disposal system or facility means a septic tank, leach field or other facility regardless of size or flow designed and constructed for the purpose of receiving, treating or disposing of sewage.

Sewage treatment works means any system or facility for treating, neutralizing, stabilizing or disposing of sewage and which has a designed or operational capacity to receive more than two thousand (2,000) gallons of sewage per day.

Significant degradation means to lessen in grade, quality or desirability so as to create or cause unsafe or harmful impacts.

Stream (primary) means a visible waterway expected to run flowing water for more than one (1) month per year.

Stream (secondary intermittent) means a visible waterway, normally dry and not expected to run flowing water for more than one (1) month per year.

Substantial means material and/or considerable in importance, value, degree, amount or extent.

Surfacing means the compaction, hardening or covering of the natural land surface with asphalt, concrete, gravel or similar materials in an area greater than two hundred (200) square feet.

Wastewater means the same as sewage.

Water Supply Protection District permit (WSPD permit) or permit means the written approval issued by the Town under this Article for a land use activity or development within the Buena Vista Water Supply Protection District.

Watershed means the area encompassed by the Buena Vista Water Supply Protection District.

Waterworks means any and all man-made or designed components of the Town's drinking water collection and treatment system, including but not limited to transmission, storage and filtration facilities and all wells, springs, aquifers, reservoirs, streams, trenches, pipes and drains used in and necessary for the operation and maintenance of the Town's water supply system.

Wetland means land that has a predominance of hydric soils and that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal conditions does support, a prevalence of hydroponic vegetation typically adapted for life in saturated soil conditions.

(Ord. 5-1999 §1; Ord. 16-2003 §1; Ord. 21 §3, 2012)

**Sec. 13-25. Prohibited activity.**

Unless exempted as provided for in this Article, it shall be prohibited and unlawful for any person to engage in or cause any of the following activities or conduct within the Buena Vista Water Supply Protection District unless such person has first obtained a permit:

- (1) The construction, installation, expansion or removal of any ISDS or sewage disposal system, excepting a system connected to a municipal sewage treatment works.
- (2) Excavating, grading, filling, blasting or surfacing, including road building.
- (3) Timber harvesting, excluding the removal of dead or diseased trees for firewood or for noncommercial domestic purposes.
- (4) Drilling operations of any kind.
- (5) Altering or obstructing natural or historic water drainage courses.
- (6) Surface and subsurface mining operations.
- (7) The out-of-doors spraying or using of fertilizers, herbicides or pesticides, excepting noncommercial applications for domestic household or gardening purposes.
- (8) Using, handling, storing or transporting toxic or hazardous substances, including, but not limited to, radioactive materials, except for noncommercial domestic household purposes as permitted by law.
- (9) Using, handling, storing or transporting flammable or explosive materials, except for noncommercial domestic household purposes as permitted by law, or within vehicular fuel storage tanks.
- (10) Moving, tampering, adjusting, impairing, obstructing or trespassing upon any Town waterwork.
- (11) Increasing or decreasing any rate of stream flow or natural or existing drainage pattern or course, except as permitted pursuant to an adjudicated water right; increasing sediment deposition in any stream; causing or increasing erosion on any slope or stream bank; or disturbing any wetland within the watershed.
- (12) Any activity reasonably giving rise to a foreseeable risk of injury or pollution to the Town's sources of water supply or water supply system or waterworks.

(Ord. 5-1999 §1; Ord. 16-2003 §1)

**Sec. 13-26. Permit required.**

No person shall engage in or cause any development, development activity or prohibited activity or conduct identified in this Article without first applying for and obtaining a duly authorized WSPD permit from the Town. Permits may be limited and/or subjected to expiration and renewal requirements.

(Ord. 5-1999 §1)

**Sec. 13-27. Permit application and review procedures; fee.**

(a) All applications for a permit shall be initiated in writing and shall include, at a minimum, the information set forth in this Section. No application shall be accepted, processed or approved unless and until it is complete and all fees associated therewith have been paid. The application shall be accompanied by not less than three (3) copies. The Public Works Director may waive certain application information requirements if he or she deems the same to be unnecessary or overly burdensome with respect to a specific proposed activity. All costs incurred by the Town in processing an application, inclusive of the costs for outside professional services or consultants necessary to evaluate an application, shall be paid by the applicant, inclusive of testing, engineering, inspection and legal fees.

The name, mailing address and telephone number of the applicant.

The name, mailing address and telephone number of the owner(s) of the land upon which the development or activity subject to the permit is to occur if different from the applicant, and written authorization from the landowner(s) for the submission of the application.

A legal description of the lot, tract, parcel or other land upon which the development is to occur.

A written narrative describing the development activity for which the permit is being sought, including a general identification of the environmental characteristics of the subject land and surrounding area.

A vicinity map showing the land on which the proposed development is to occur and all lots, tracts, parcels or other lands adjacent thereto, and illustrating any wetlands, lakes, ponds, springs, watercourses or other bodies of water and water wells.

A boundary and improvements map or sketch of the land subject to the application containing sufficient detail and drawn at a scale to accurately illustrate, review and assess the location of all proposed development activity and existing structures, and illustrating the existing direction of slope (contours) and direction of surface runoff. A professionally prepared boundary and improvements survey may be required if the Public Works Director deems the same necessary in order to adequately assess an application.

A listing and copy of all federal, state or local permits or approvals required or obtained for implementation of the development activity.



A detailed description of the impacts or potential impacts the development activity may have on any surface or subsurface water sources or courses, inclusive of wetlands.

A detailed description of the impacts or potential impacts the development activity may have on existing vegetation, trees and groundcover.

A detailed description of the impacts or potential impacts the development activity may have on soils, inclusive of a description of the nature and condition of existing soils and any planned grading, excavation, filling or surfacing.

A detailed description of the impacts or potential impacts the development activity may have on existing drainage patterns and land contours, inclusive of comparative run-off and absorption calculations for the subject land and any impacted adjacent land, both pre- and post- development.

A detailed description of any proposed wastewater or sewage disposal system to be installed and a copy of the design/engineered plans, including soils and percolation test results for same.

A detailed description of any proposed water supply/delivery system to be installed, inclusive of water source and/or aquifer and anticipated consumptive use, and a copy of the design/engineered plans for the same.

A detailed description and copy of any and all mitigation plans or measures addressing impacts resulting from the development activity to surface and subsurface water sources, wetlands, vegetation and trees, soils, drainage and slopes.

The identification of any activity to be undertaken by the applicant as part of the development that presents, or may present, a foreseeable risk of pollution or injury to the Town's water sources, supply or waterworks, along with a specific description of the best management practices designed to eliminate or minimize such risk(s) to the maximum extent feasible.

(16) Such additional information as the applicant or Town may deem necessary to fully evaluate the proposed development and/or demonstrate or explain why a watershed permit should be issued.

(b) All applications for a permit shall be filed with the Public Works Director. The application and all supporting material shall be reviewed and evaluated by the Public Works Director to determine whether the application is complete and satisfies the requirements of this Article. Where appropriate and weather permitting, the Public Works Director may schedule a site visit to inspect the land on which the proposed development activity is to occur. Advance notice of the time and date of such site visit shall be provided to the applicant.

(c) Within ninety (90) days following receipt of a complete application, and weather permitting for any necessary site visits or inspections, the Public Works Director shall determine whether the permit application should be granted or denied. The issuance of a permit may be conditioned upon the applicant's compliance with such mitigation measures, financial security, performance standards or time deadlines, or such other terms and conditions as the Public Works Director may deem necessary to ensure protection of the Town's water supply sources, watershed and/or waterworks from pollution, disruption or damage. A failure by an applicant to accept or timely adhere to such terms and conditions shall constitute cause to deny or revoke a permit.

(d) Any applicant dissatisfied with a decision or order made by the Public Works Director under this Article may pursue an appeal of the same to the Board of Trustees by filing a written notice of appeal and appropriate fee with the Town Administrator within ten (10) days from the date of the decision or order appealed from. Upon receipt of a timely notice, the Town Administrator shall agendize the appeal for a hearing before the Board of Trustees to be conducted within forty-five (45) days from the date the notice of appeal was received. The hearing shall be conducted de novo, and written notice of the date, time and place for the hearing shall be sent by regular mail or personally delivered to the applicant not less than ten (10) days in advance thereof. A failure by the applicant to appear at the hearing without good cause shall constitute a waiver of the applicant's appeal rights, and the decision or order subject to the appeal may be automatically affirmed. The applicant shall carry the burden of persuasion with regard to all issues on appeal. Decisions of the Board of Trustees on appeal shall be entered within thirty (30) days from the conclusion of the hearing thereon and shall be reduced to writing, a copy of which shall be mailed to the applicant. The Board of Trustees may on appeal prescribe such conditions on the issuance of a permit as it may deem necessary to protect or implement the intent and purposes of this Article.

(Ord. 5-1999 §1; Ord. 16-2003 §1; Ord. 21 §4, 2012)

### **Sec. 13-28. Permit issuance standards.**

The following standards shall be applied in determining whether a WSPD permit should be issued under this Article:

(1) (2)

The compliance of the application with all application requirements set forth in this Article.

The proximity of the proposed development activity to the Town's water supply sources and/or waterworks. No ISDS component shall be located within a 100-year floodplain. Additionally, no ISDS treatment or disposal component shall be located, at a minimum, within one hundred (100) feet from any water supply source or primary stream, and no ISDS absorption component shall be located, at a minimum, within two hundred (200) feet of any water supply source or primary stream, or fifty (50) feet from a secondary intermittent stream. Minimum

setbacks may be increased if deemed necessary to protect a water supply source, primary stream or waterwork from pollution, disruption or contamination.

(3) The environmental suitability of the proposed development activity and proposed site therefor taking into consideration surface and subsurface water courses, soils, slopes, drainage patterns, geologic formations, existing vegetation and tree stands, wetlands, erosion and the intensity and impact of the proposed development activity.

(4) The likelihood or threat of pollution or injury to the Town's water supply sources, watershed or waterworks presented by the proposed development activity.

(5) The effectiveness of all protective or mitigation measures proposed by the applicant to eliminate or minimize pollution or injury to the Town's water supply sources, watershed and waterworks, and the availability of alternative protective and/or mitigation measures.

(6) The overall anticipated impact of the proposed development activity on the Town's water supply sources, watershed and waterworks.

(Ord. 5-1999 §1; Ord. 16-2003 §1)

**Sec. 13-29. Certificate of compliance.**

(a) At or immediately prior to the completion of any development or activity performed under a permit, and in all events prior to the burying or covering up of any work or facility authorized under a permit, the permittee shall notify the Public Works Director and request inspection and the issuance of a certificate of compliance in order to establish and confirm the permittee's adherence with the provisions of this Article and with all terms and conditions as may have been imposed as part of the permit. As soon as reasonably practicable, and not more than fifteen (15) working days after receipt of the request, weather permitting, the Public Works Director, or his or her designee, shall inspect the subject development or activity to ascertain if there is conformance with the permit application and the plan and specifications submitted to the Town, and any conditions imposed as part of the permit. Alternatively, the Public Works Director may elect to allow a qualified permittee or third-party professional to submit a written inspection report certifying that the permittee has fully complied with all permit requirements, inclusive of all plans, specifications and conditions.

(b) All costs incurred by the Town in conducting inspections shall be paid by the permittee, inclusive of any costs for outside consultants. If the inspection determines that the development conforms to the provisions of this Article and to all applications, plans, specifications and conditions of the permit, a certificate of compliance shall be issued. However, if the inspection determines that the development or activity fails in any manner to comply as set forth above, a certificate of compliance shall not be issued. In such case, the permittee shall be informed in writing of the reason(s) why the certificate of compliance cannot be issued and the requirements to be met before issuance of the certificate may be obtained. All follow-up inspections shall be conducted in accordance with this Section.

(c) It shall be a violation of this Section for any person who is required to obtain a permit to use any land within the Buena Vista Water Supply Protection District without first having obtained a certificate of compliance.

(Ord. 5-1999 §1; Ord. 16-2003 §1)

**Sec. 13-30. Wastewater and sewage disposal facilities.**

(a) Notwithstanding any other provision or requirement contained within this Article, all wastewater and/or sewage disposal facilities or systems within the Water Supply Protection District shall be designed by a licensed engineer and constructed, operated and maintained so as to eliminate and/or minimize to the maximum extent feasible any pollution or injury, or threat of pollution or injury, to the Town's water supply sources, watershed and waterworks. A WSPD permit shall be required for the installation of any new wastewater or sewage disposal facility. Additionally, no existing wastewater or sewage disposal facility shall be expanded, repaired, replaced or abandoned without a permit having first been obtained.

(b) The Public Works Director, or his or her designated agent, may investigate and inspect any wastewater and sewage disposal facility located within the Water Supply Protection District to determine whether such facility is being properly constructed, operated or maintained. All owners and/or operators of a wastewater or sewage disposal facility shall maintain written service records on the site of said facility illustrating the age of the facility and the date(s) and service provider for all inspections, installations, repairs, cleanings or other maintenance performed on the facility. In order to ensure that a sewage disposal facility is constructed, performing or being maintained properly, the Public Works Director may order the owner or operator of such facility to install a monitoring well(s) or other monitoring device(s) as a condition for issuance of a WSPD permit, or as deemed reasonably necessary to determine the operational integrity of an existing facility. In the event any owner or operator refuses access to the Public Works Director to any wastewater or sewage disposal facility, or refuses to make available service records as required under this Section, the Town shall take such steps as necessary to

secure the appropriate warrants or court orders to undertake such inspections or obtain the records and seek to recover the costs therefor, including attorney fees, against the nonconsenting owner and/or operator.

(c) Without limiting the circumstances under which a failure of an ISDS shall be found to have occurred, the occurrence or presence of the following factors shall be deemed sufficient to establish a failure in an ISDS:

(1) (2) (3)

Ponding in a leach field or dispersal trench. Obstructed leaching pipes. The presence of unacceptable levels of nutrients or fecal coliform in soil or groundwater.

(d) All wastewater and sewage disposal systems shall, at a minimum, be designed, constructed and maintained in conformity with all applicable federal, state and local laws, standards and permits in addition to complying with the terms and conditions of this Article. In the event of a conflict between competing laws, standards or regulations, the most restrictive and/or protective of the Town's water supply and waterworks shall prevail.

(e) Minimum separation distances between ISDS components and protected structures or physical features as required by this Article shall be maintained at all times unless soil, geological or other conditions warrant greater distance separation. ISDS components that are not water tight should not extend into areas occupied by the root systems of nearby trees. Where repair or upgrading of an existing ISDS is involved, and the size of the lot or parcel precludes adherence to the distance separation standards prescribed in this Article, the repairs or repaired system components shall not be closer to protected structures or features than first existing.

(f) All owners or operators of substandard wastewater and sewage disposal systems existing within the watershed protection district on or before the effective date of this Article shall be provided notice and a reasonable period of time in which to correct any deficiency or noncompliance with respect to their system(s) and the requirements of this Article.

(Ord. 5-1999 §1; Ord. 16-2003 §1)

### **Sec. 13-31. Water quality monitoring plans.**

Notwithstanding any other provision or requirement contained within this Article, the Public Works Director may require the preparation and implementation by an applicant of a water quality monitoring plan and program as a condition for the issuance of a WSPD permit. Such plan may include the installation of monitoring devices, the regular collection of soil and water samples and the establishment of reporting requirements. The costs for the design, implementation and inspection of any water quality monitoring plan shall be borne by the applicant.

(Ord. 5-1999 §1)

### **Sec. 13-32. Delegation of authority.**

The Public Works Director may from time to time devise, adopt and enforce supplemental administrative, procedural or technical/engineering rules and regulations as he or she may deem necessary and advantageous to the successful implementation and enforcement of the provisions of this Article, inclusive of the preparation of standardized forms and fees associated with the evaluation and issuance of permits. All rules and regulations must be consistent with the terms of this Article and be approved by the Town Administrator. The Board of Trustees may review, amend or vacate such rules and regulations upon written complaint or appeal.

(Ord. 5-1999 §1)

### **Sec. 13-33. Enforcement.**

(a) Right of entry. When it is necessary to make an inspection to enforce the provisions of this Article or the terms and conditions of any permit, or where reasonable grounds exist to believe that a condition, activity or facility on any premises presents a threat of pollution or injury to any of the Town's water sources, supplies or waterworks, the Public Works Director, or his or her designee, may enter onto such premises at reasonable times to inspect and/or perform such investigation and duties as called for under this Article; provided that if the premises be occupied, proper identification be shown to the person(s) on the premises and a request for access be made. If the premises are unoccupied, reasonable efforts shall be made to locate and/or provide notice to the owner or operator of the land or facility in question of the desired access. If access is refused, a warrant to enter onto the premises shall be obtained ex parte from the Municipal Court.

(b) Stop work and cease and desist orders. Whenever any development or activity is being performed or continued in violation of the provisions of this Article or the terms and conditions of a permit, or where it is determined that a permit was issued in error or as the result of incorrect, inaccurate or misleading information, the Public Works Director may execute and issue a written stop work and/or cease and desist order commanding that the subject development or activity immediately cease and/or be corrected. A stop work and/or cease and desist order shall set forth in plain language the nature of any violation and shall be served on the permittee or person(s) engaged in the prohibited development or activity by personal service or by regular mail. A copy of the order shall also be posted at some conspicuous place on the subject premises. Appeals or challenges to a stop work or cease and desist order shall be heard by the Board of Trustees upon written request filed with the Town Clerk not less than five (5) working days after service of the order on the permittee or person contesting the same. The

failure of a person to timely file an appeal or challenge, or to appear at the hearing thereon, shall constitute a waiver of their right to contest the order. Hearings shall be conducted by the Board of Trustees within thirty (30) days from the date on which the written notice of appeal or challenge was filed with the Town Clerk. Written notice of the hearing shall be sent by regular mail or personally served on the appellant not less than ten (10) days in advance thereof. The continuation of any development or activity subject to a stop work or cease and desist order shall constitute a violation of this Article.

(c) Permit revocation.

(1) All WSPD permits shall be subject to revocation by the Public Works Director for violations of this Article or the rules and regulations adopted pursuant thereto, inclusive of stop work and cease and desist orders. Written notice of a proposed revocation shall be mailed to the permittee not less than fifteen (15) days prior to the effective date of the revocation and shall set forth in plain language the grounds justifying the revocation. A hearing on the revocation shall be conducted by the Board of Trustees upon the written request of the permittee filed with the Town Clerk prior to the effective date of the revocation. All hearings shall be promptly scheduled before the Board of Trustees by the Town Clerk and written notice thereof mailed to the permittee at least five (5) business days in advance thereof. The effectiveness of any order of revocation shall be stayed pending the decision of the Board of Trustees on appeal, except where the Public Works Director certifies in writing that a delay in revoking the permit will present a clear and immediate danger to public health, safety, welfare or property. All decisions on appeal shall be reduced to writing and a copy thereof provided to the permittee.

(2) Upon the revocation of a permit the Town may require the permittee to restore any land, facility or site to such condition as deemed necessary to prevent pollution or injury to the watershed or any water source, supply or waterwork. Upon the failure of the permittee to timely perform such restoration, the Town may, at its option, perform or have performed the restoration and assess the costs thereof against the permittee, inclusive of the imposition of a lien against the permittee's property on which such restoration work took place.

(Ord. 5-1999 §1)

### **Sec. 13-34. Violations and penalties.**

(a) It shall be unlawful for any person to engage in or cause a violation of any provision of this Article or of any term or condition of any WSPD permit, and such person or persons shall be fined upon conviction thereof in an amount up to one thousand dollars (\$1,000.00), and/or imprisoned up to one (1) year in jail.

(b) Any development, activity, facility or structure which is continued, operated or maintained in violation of this Article or the terms and conditions of any permit shall be subject to injunction, abatement and/or other appropriate legal remedy as may be sought and obtained by the Town, in which event the Town shall be entitled to recover its reasonable costs and attorney fees from the offending party or parties.

(c) All penalties and remedies for violations of this Article shall be nonexclusive and cumulative, and the Town's pursuit and/or exercise of one (1) remedy or penalty shall not foreclose or prohibit the pursuit and exercise of alternative or other remedies.

(Ord. 5-1999 §1)

### **Sec. 13-35. Certain de minimis activities exempted.**

(a)

The Public Works Director may determine upon written request that an activity or proposed schedule of activities to be undertaken within the Water Supply Protection District presents a de minimis risk of pollution to or disruption of the Town's water supply, watershed and/or waterworks and may, thus, exempt or except such activity or activities from some or all of the application and/or permit requirements as contained in this Article. The burden will be upon the applicant seeking an exemption to supply sufficient information to demonstrate that the activity or activities in question will present no more than a de minimis threat or risk to the Town's water supply and/or water supply system. In no event shall the installation or repair of an ISDS be deemed an exempt activity, and in all events an applicant must provide the Public Works Director written notice of when and where any exempted activity is to occur.

Site-specific request information which identifies the specific criteria from which a variance is being requested. Technical justification by a Colorado registered professional engineer or Colorado registered professional geologist experienced in ISDS or other experience acceptable to the Town which indicates the specific conditions which exist and/or the measures which will be taken to result in no greater risk than that associated with compliance with the requirements of the regulation. Examples of conditions which exist or measures which might be taken include, but are not limited to, the following:

a. Evidence of a natural or physical barrier to the movement of effluent to or toward the feature from which the variance is requested.

b. Placement of a man-made physical barrier to the movement of effluent to or toward the feature from which the variance is requested.

c. Soil amendment or replacement to reduce the infiltration rate of the effluent, such that the travel time of the effluent from the absorption field to the physical feature is no less than the travel time through the native soils at the prescribed setback.

d. Treatment to be provided equivalent to that required to meet National Sanitation Foundation (NSF) Standard 40.

A discussion of alternatives considered in lieu of the requested variance.

Technical support for the selected alternative, which may include a testing program which confirms that the variance does not increase the risk to public health and to the environment.

A statement of the hardship which creates the necessity for the variance. No variance will be allowed solely for purposes of economic gain.

All applications for variance shall be accompanied by a list of adjoining property owners with current mailing addresses.

(b) All exceptions or exemptions must be reduced to writing, specifically identify the activity or activities excepted hereunder and any conditions with regard thereto, and specify in detail the basis for such exception or exemption. In the event an excepted or exempted activity is not fully implemented or concluded in the manner as represented and authorized under this Section, then the Public Works Director shall order the cessation or correction of such activity in accordance with the enforcement procedures contained in this Chapter.

(Ord. 16-2003 §1)

### **Sec. 13-36. Variances.**

(a) In the event that any applicant under this Article is advised by any official for the Town that the application and/or the site that is the subject of the application fails to comply with one (1) or more of the requirements of this Chapter, the applicant may apply for a variance from one (1) or more of such requirements to the Board of Trustees. Approval of a variance under this Section will require a majority vote of the Board of Trustees.

(b) Prior to the rendering of a decision on any such variance request, the Board of Trustees must conduct a public hearing. The hearing shall be the subject of a public notice, or notice shall be sent by certified mail, with a minimum of a twenty-day reply time from the date of mailing to all adjacent property owners. The cost of mailing shall be paid by the applicant at the time of application.

(c) All applications for variances must be accompanied by:

(d) The applicant has the burden of proof that the variance is justified and that the variance will pose no greater risk to public health and the environment than would a system meeting the standard from which the applicant is seeking to obtain a variance.

(e) The Board of Trustees has the ability to impose any requirements and/or conditions on any variance granted pursuant to this Section which the Board of Trustees, in its sole and absolute discretion, deems necessary to achieve the objectives of this Chapter.

(f) The applicant shall be notified in writing of the decision regarding the application for a variance. The notice of denial of a variance shall include the reasons which form the basis for the denial. The notice of an approval for a variance application shall include any conditions or restrictions imposed on the approval. The variance, and any conditions thereof, shall be recorded on the deed to the real property in question, and any expenses associated with that recording shall be the responsibility of the applicant. The Board of Trustees shall either approve or deny an application for a variance, pursuant to this Section, through resolution.

(g) The following shall serve as prohibitions of the approval of any variance requests:

(1) No variance shall be issued to mitigate any error in construction involving any element of property improvements.

(2) No variance shall be issued where the property that is the subject of the application can accommodate a conforming ISDS.

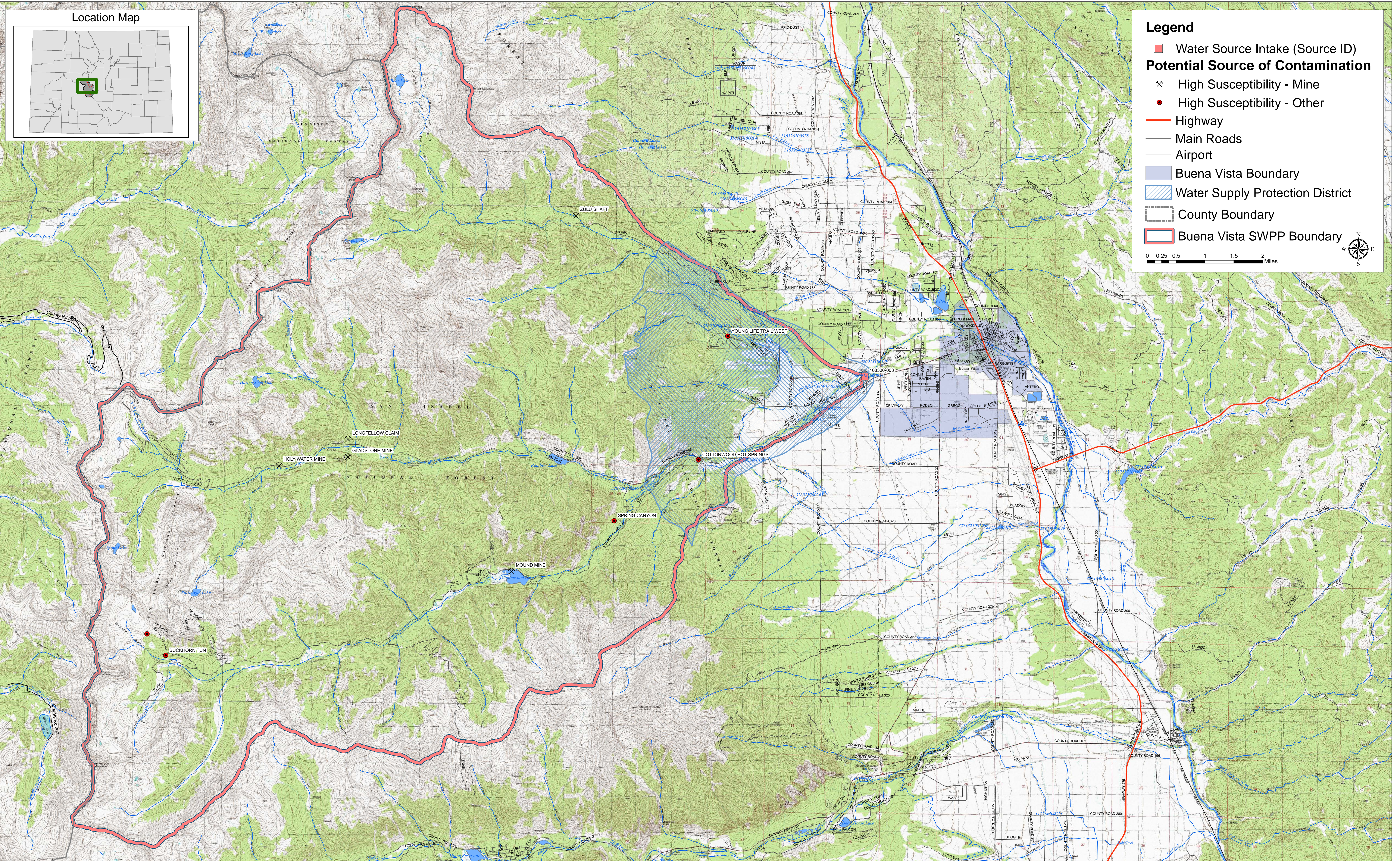
(3) No variance shall be issued which will result in setbacks to an off-site physical feature which do not conform to the minimum setbacks set forth elsewhere in this Code.

(4) No variance shall be issued which reduces the four-foot separation to groundwater or bedrock.

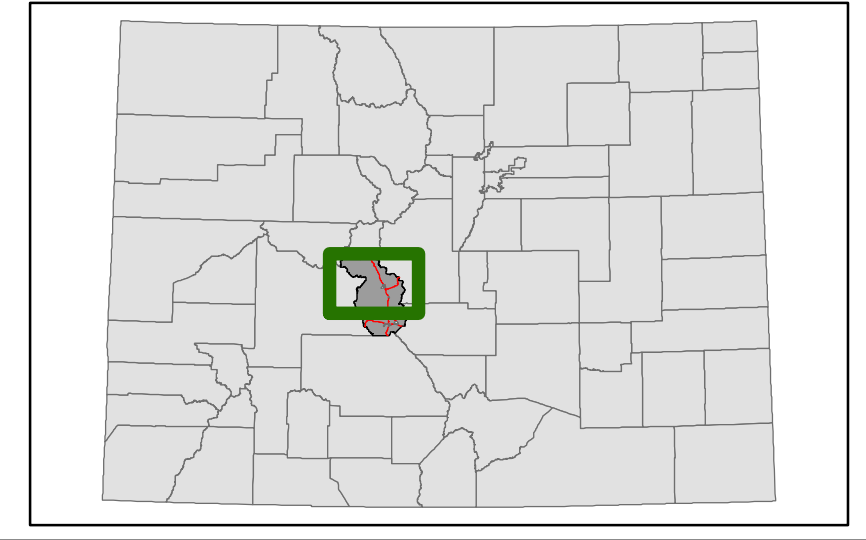
(Ord. 4-2007 §1)

### **Secs. 13-37 \_13-40. Reserved.**

# Buena Vista SWPP Map 1



Location Map

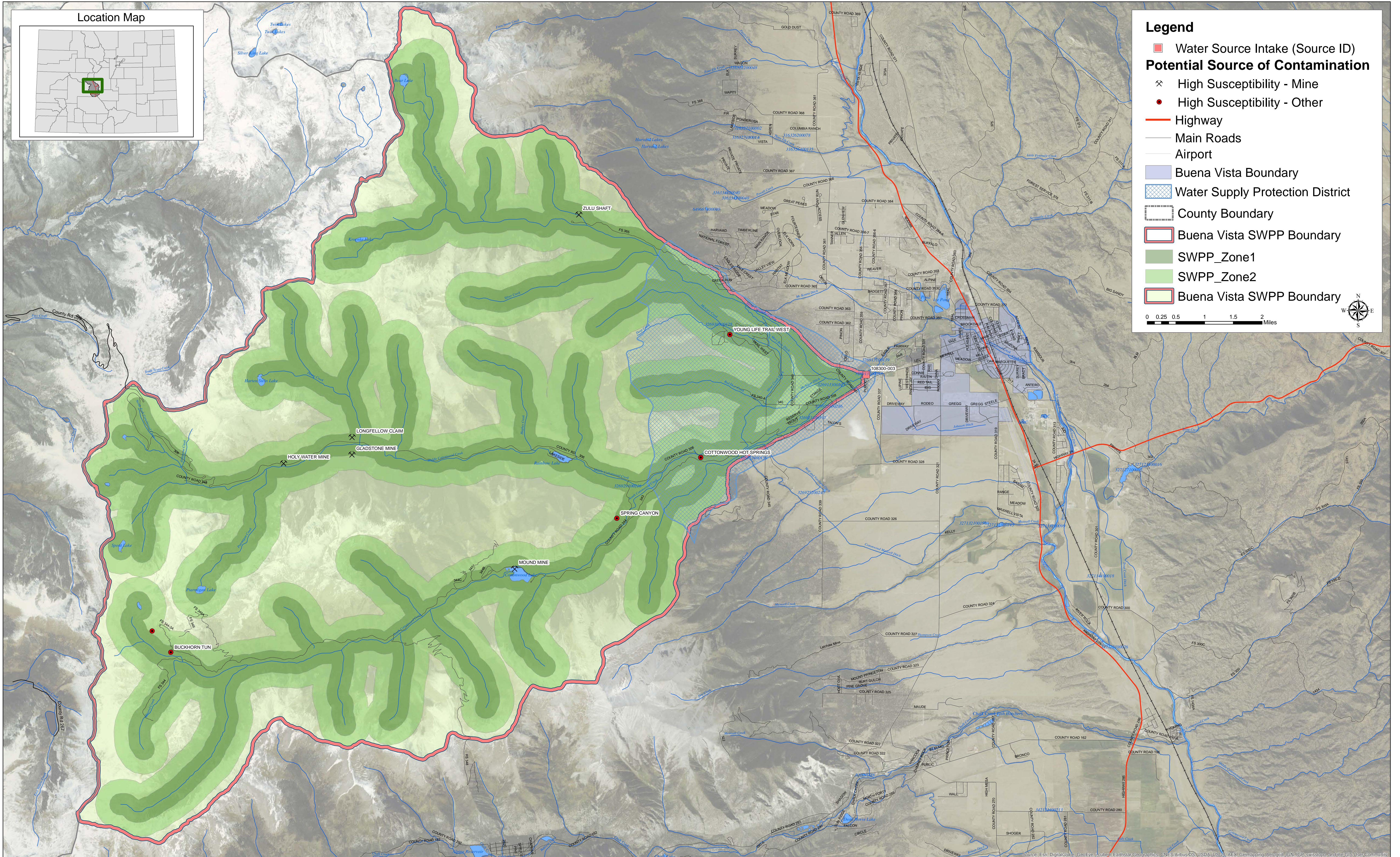
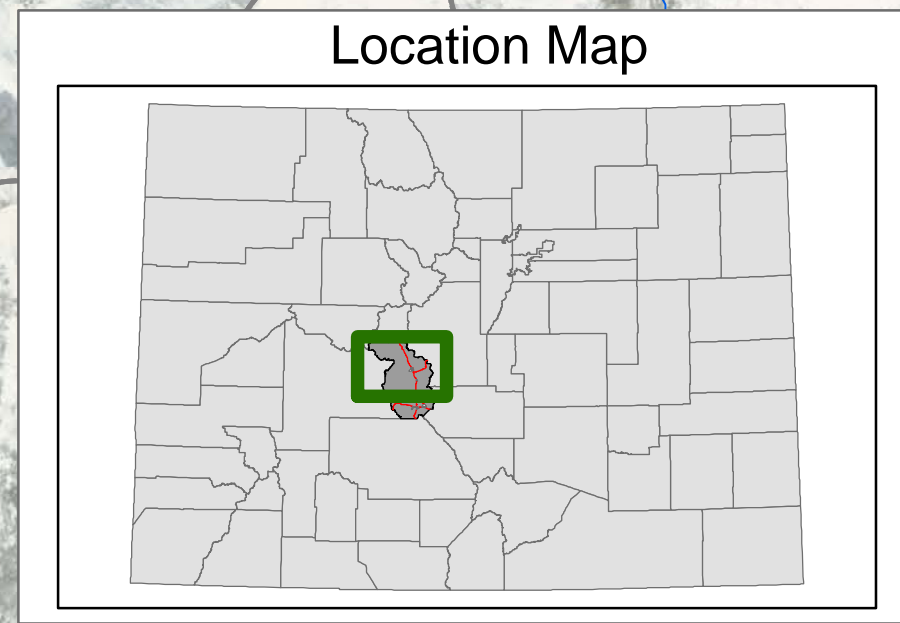


**Legend**

- Water Source Intake (Source ID)
- Potential Source of Contamination**
  - High Susceptibility - Mine
  - High Susceptibility - Other
- Highway
- Main Roads
- Airport
- Buena Vista Boundary
- Water Supply Protection District
- County Boundary
- Buena Vista SWPP Boundary

0 0.25 0.5 1 1.5 2 Miles

# Buena Vista SWPP Map 2



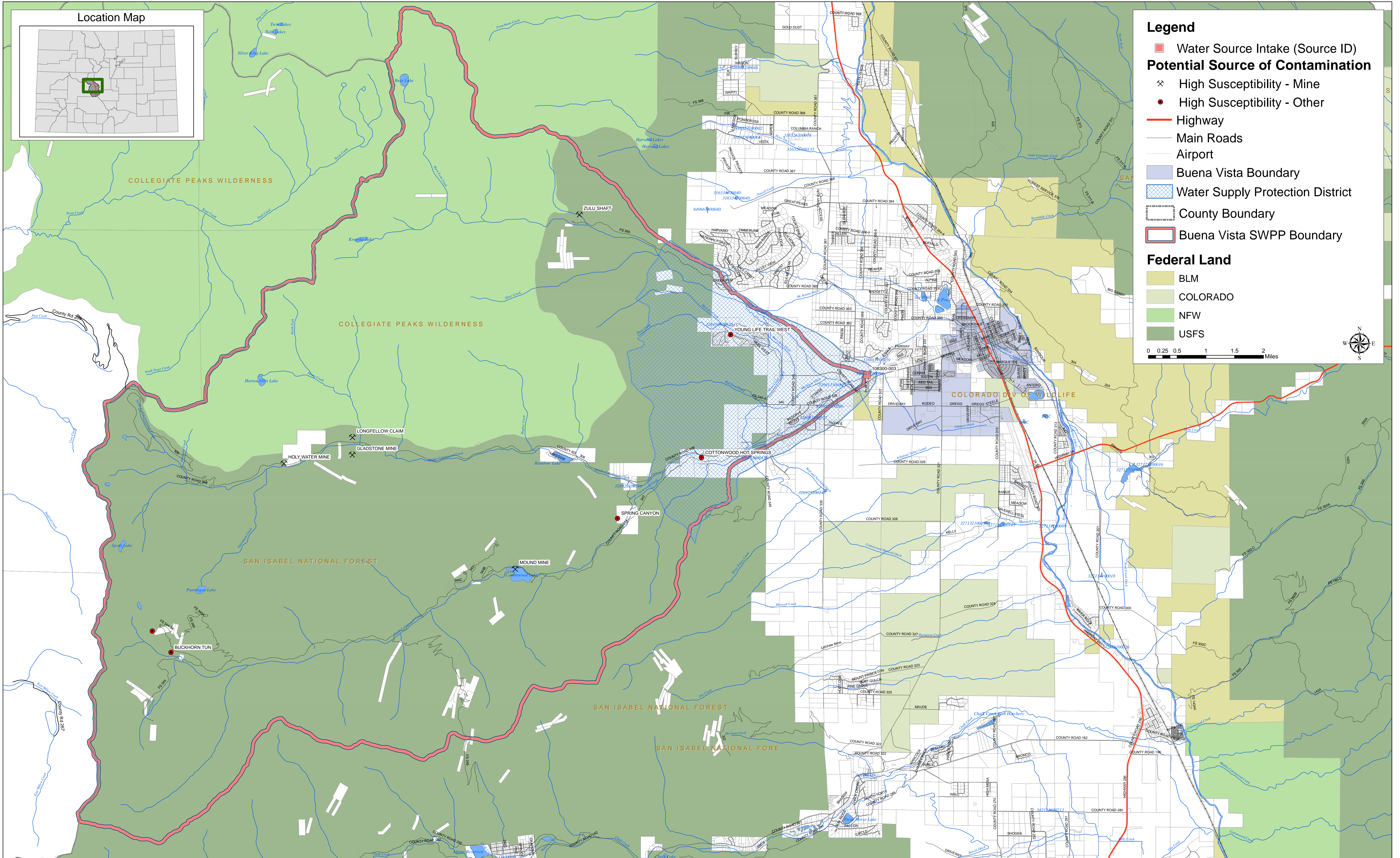
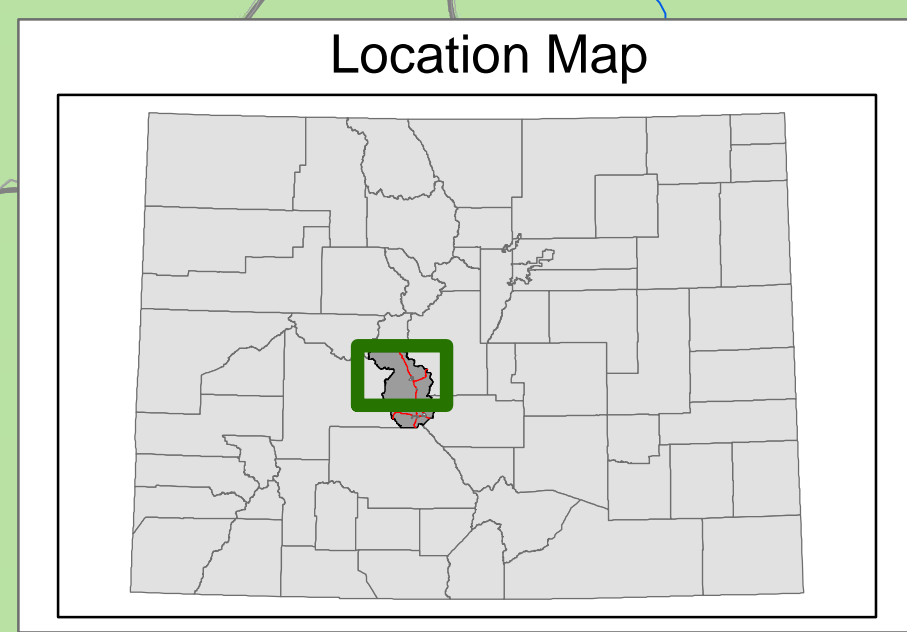
**Legend**

- Water Source Intake (Source ID)
- Potential Source of Contamination**
- High Susceptibility - Mine
- High Susceptibility - Other
- Highway
- Main Roads
- Airport
- Buena Vista Boundary
- Water Supply Protection District
- County Boundary
- Buena Vista SWPP Boundary
- SWPP\_Zone1
- SWPP\_Zone2
- Buena Vista SWPP Boundary

0 0.25 0.5 1 1.5 2 Miles

Source: Esri, DigitalGlobe, GeoEye, IGN, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, SNT, GEBCO, Swire, and the GIS User Community

# Buena Vista SWPP Map 3



### Legend

- Water Source Intake (Source ID)
- Potential Source of Contamination**
  - High Susceptibility - Mine
  - High Susceptibility - Other
- Highway
- Main Roads
- Airport
- Buena Vista Boundary
- Water Supply Protection District
- County Boundary
- Buena Vista SWPP Boundary
- Federal Land**
  - BLM
  - COLORADO
  - NFW
  - USFS

0 0.25 0.5 1 1.5 2 Miles