Town of Saguache
Source Water Protection Plan

Saguache County, Colorado

November 2011

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Source Water Specialist
Colorado Rural Water Association

For the community water providers:
Town of Saguache: ID # CO0155800

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EXECUTIVE SUMMARY

The Town of Saguache values a clean, high quality drinking water supply and decided to work collaboratively with area stakeholders to develop a Source Water Protection Plan to protect their current water source, groundwater wells. During the months of April 2011 to November 2011, five stakeholder meetings were held at the Saguache Town Hall in Saguache, Colorado to encourage local public participation. The planning process attracted interest and participation from 22 people including local citizens, water operators, government, and agency representatives. This group comprised the Saguache Source Water Protection Planning Team (the Planning Team or Team).

The Team initially reviewed the Source Water Assessment completed by the Colorado Department of Public Health and Environment. The Assessment included the delineation of the source water protection area, potential sources of contaminants, and the potential of these contaminants to degrade the water source. Using this information as a starting point, the Team added additional areas of protection based on the recharge areas of the Town's groundwater wells. The re-delineated area defines the region where the Team has chosen to focus its source water protection measures to reduce source water susceptibility to contamination.

To develop their management approach, the Planning Team focused on the following issues of concern within the Source Water Protection Area: fuel storage tanks; impacts from transportation on roads; mining activity; wastewater - sewer and septic system; agricultural activities; flooding and stormwater runoff; town drain system; private water wells; public land management; residential and business practices; and the old town dump.

The Planning Team reviewed and discussed several possible management approaches that could be implemented within and nearby the protection area to help reduce the risks of potential contamination to the community's source water. Voluntary implementation of source water management approaches at the local level (i.e. county and municipal) applies an additional level of protection to the drinking water supply by taking preventive measures to protect the source water. The Planning Team established a "common sense" approach in identifying and selecting the most feasible source water management activities to implement locally. These management practices included in this Plan are recommended by the Team to reduce the risks of potential contaminants to the Source Water Protection Area and protect the drinking water source for the Town of Saguache.

At the completion of this plan, a Steering Committee was formed to oversee its implementation. Representatives from the Town, water providers, community, and government agencies who participated on the Planning Team volunteered to serve on the Steering Committee and meet quarterly throughout the year. The first meeting of the Steering Committee is scheduled on January 9, 2012. At this first meeting the Committee will decide which management approaches to implement during 2012.

The Colorado Rural Water Association's Source Water Protection Specialist, Colleen Williams, helped facilitate the source water protection planning process. The goal of the Association's Source Water Protection Program is to assist rural and small communities served by public water systems to reduce or eliminate the potential risks to drinking water supplies through the development of Source Water Protection Plans, and provide assistance for the implementation of prevention measures.

INTRODUCTION

The Town of Saguache operates a municipal supply water system that supplies drinking water to 485 residents of the town located in Saguache County, Colorado. They realize that in order to protect the source of their drinking water, they needed to work together to develop a protection plan to prevent possible contamination of this valuable resource. Proactive planning and implementing pollution prevention strategies are essential to protect the long-term integrity of their water supply and will limit their costs and liabilities.

Purpose of the Source Water Protection Plan

The Source Water Protection Plan (SWPP) is a tool for the Saguache community to ensure clean and high quality drinking water sources for current and future generations. This Source Water Protection Plan is designed to:

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

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

Public Participation in the Planning Process

Public participation is vitally important to the overall success of Colorado's Source Water Assessment and Protection (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. Local support and acceptance of the plan is more likely where local stakeholders have actively participated in the development of their protection plan.

During the months of April 2011 to November 2011, five stakeholders meetings were held at the Saguache Town Hall in Saguache, Colorado to encourage local public participation in the planning process. Local stakeholders were sent letters of invitation to participate and email reminders of meeting dates. The source water protection planning process attracted interest and participation from 22 people including local citizens, water operators, government, and agency representatives. Input from the following list of Planning Team participants was greatly appreciated (Table 1).

Table 1. Saguache Source Water Protection Plan Participants

Participant	Affiliation
Milton Jones	Town of Saguache Mayor
Dario Archuleta	Town of Saguache Mayor ProTem
Lyn Miles	Town of Saguache Town Trustee
Kate Vasha	Town of Saguache Town Trustee
Ruth Horn	Town of Saguache Town Trustee
Carla Quintana	Town of Saguache Town Trustee
Tina Serna	Town of Saguache Town Trustee
Dan Pacheco	Town of Saguache Public Works
Rese Garcia	Town of Saguache Town Clerk
Mike Spearman	Saguache County Board of County Commissioners
Steve Sanchez	Saguache Citizen
Della Vieira	Saguache County Public Health
Elvie Samora	Mountain Valley School District Board Member
Jim Swanson	Division of Water Resources, Water Commissioner Division 3, District 26
Edwin Neilson	Rio Grande Round Table Saguache County Member
Perry Hazard	Land Owner
Rebie Hazard	Land Owner
Tim Lovato	Land Owner N Lazy R Ranch
Lori Lovato	Land Owner N Lazy R Ranch
Violet Vigil	Resident
Matt Feier	Colorado Rural Water Association
Colleen Williams	Colorado Rural Water Association

Protection Plan Development

The source water protection planning effort consisted of public Planning Team meetings and individual meetings with water operators, government, and agency representatives. Information discussed at the meetings helped the Team develop an understanding of the issues affecting source water protection for the Town of Saguache. The Team then made recommendations for management approaches to be incorporated into a protection plan. In addition to the Planning Team meetings, data and other information pertaining to source water protection areas were gathered via public documents, internet research, phone calls, emails, and field trips to the protection area. A summary of the meetings is presented in Table 2.

PHOTO: COLLEEN WILLIAMS

Figure 1. Members of the Planning Team at the Saguache Town Hall.

Table 2. Planning Team Meetings

Date	Purpose of Meeting
4/26/11	First Planning Team meeting with presentation on the process of developing a Source Water Protection Plan for the Town of Saguache. Review of the State's Source Water Assessment and discussion of the delineation of the source water protection area.
5/23/11	Second Planning Team meeting with review of the State's re-delineation of the source water protection area for the Town's wells. Planning Team identified the potential sources of contamination around each of the Town's wells.
6/13/11	Third Planning Team meeting with discussion of issues of concern and potential source of contaminants within the springs' source water protection area. Planning Team discussed the effect of climate change and future water diversions on the Town's water sources.
8/22/11	Fourth Planning Team meeting to review and edit the Draft Plan and appoint a Steering Committee to implement the Plan.
11/15/11	Fifth Planning Team meeting to review edits to Draft Plan; set the date for the first Steering Committee meeting; and implement one of the action items on the Plan.

Steering Committee Members

At the completion of this plan, a Steering Committee was formed to implement the management approaches of this Source Water Protection Plan. Members of the Planning Team volunteered to serve on the Steering Committee and meet quarterly throughout the year. The first meeting of the Steering Committee is scheduled on January 9, 2012. At this first meeting the Committee will develop an Action Plan for management approaches to implement during 2012.

Table 3. Steering Committee Members

Name	Affiliation
Milton Jones	Town of Saguache Mayor
Dario Archuleta	Town of Saguache Mayor ProTem
Ruth Horn	Town of Saguache Town Trustee
Dan Pacheco	Town of Saguache Public Works
Jim Swanson	Division of Water Resources, Water Commissioner Division 3, District 26
To be represented	Saguache County Board of County Commissioners
Tim Lovato	Land Owner N Lazy R Ranch
Colleen Williams	Colorado Rural Water Association

WATER SUPPLY SETTING

Location

The Town of Saguache is a small rural community located in Saguache County in the northwestern part of the San Luis Valley of south-central Colorado. The town can be accessed via US Highway 285 and Colorado Highway 114 and is 170 miles southwest of Denver. The Town lies within Sections 1 and 12 of Township 44N, Range 7E and Sections 6 and 7 of Township 44N, Range 8E; and covers approximately 0.4 square miles. The Town has approximately 262 residential dwellings, a population of 485 people, and a small town atmosphere. As an incorporated statutory town, its municipal affairs are governed by the Saguache Town Council.

The county seat is also located in the town of Saguache. Saguache County covers a total area of 3,170 square miles, the seventh of the 64 counties of the State of Colorado and has a population of 6,108 people.

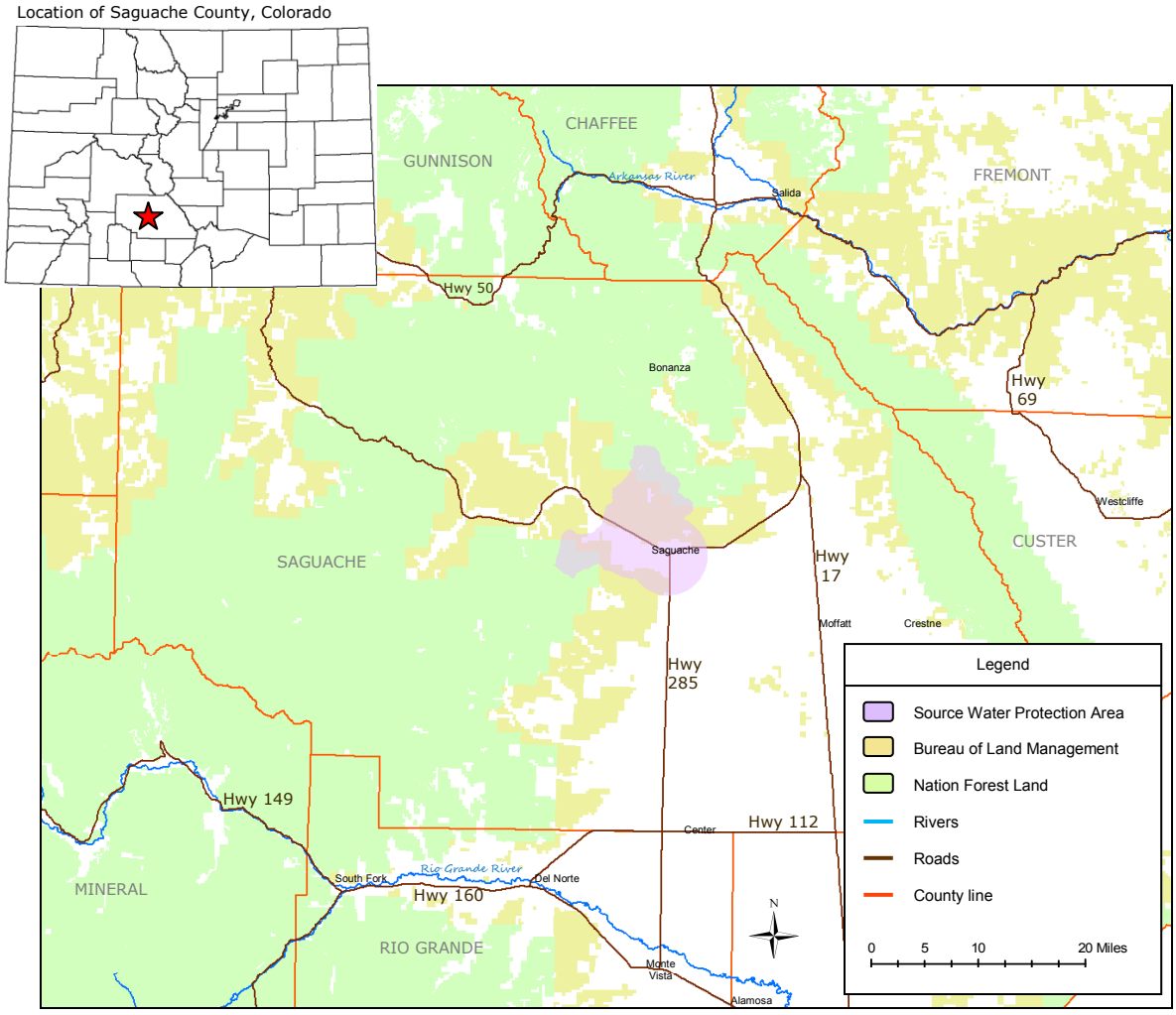


Figure 2. Regional setting map.

Physical Setting

Saguache is located at Latitude 38°05'14"N, Longitude 106°08'03"W at an elevation of 7,707 feet. It lies within the southern Rocky Mountains Physiographic Province that encompasses the center of the state and runs its entire north-south length. Saguache is located in the San Luis Valley which is the world's largest alpine desert. The San Luis Valley is approximately 122 miles long and 74 miles wide, extending from the Continental Divide on the northwest rim into the state of New Mexico on the south. In Colorado, the San Luis Valley covers approximately 3,200 square miles over five counties (Topper, et al, 2003).

Geology

The San Luis Valley is a major physiographic and structural feature formed by the north-south trending Rio Grande Rift. A rift is a thinning in the Earth's surface caused by stretching the surface through geological stress. It was initially formed between 35 and 29 million years ago when the crust began to spread apart, triggering volcanism in the region. The valley is down-faulted along the Sangre de Cristo Mountains that border the valley on the east and hinged along the San Juan Mountains on the west. The two mountain ranges on either side of the San Luis Valley are very different in origin and geology. The Sangre de Cristo Mountains consists largely of Precambrian, Paleozoic, and Mesozoic igneous and metamorphic rocks, whereas the San Juan Mountains consists of a thick sequence of volcanic rocks that underlie with sedimentary rocks within the San Luis Valley.

Over many millions of years, the valley has continued to deepen due to displacement along bounding faults, while filling with unconsolidated sediments and layers of volcanic rock shed from surrounding mountains and carried by the river systems.

Soils Types

The soil types in the vicinity of the Town of Saguache and their municipal wells are Torsido loam soil which consists of deep, poorly drained soils that formed in medium, to moderately fine textured alluvium from basalt and overlying beds of sand and gravel, also of basalt origin. Torsido soils are on fans or terraces and are poorly drained, slow to medium runoff, and have moderate permeability (NRCS, 2011)

Climate

The San Luis Valley is a high mountain desert with an arid to semiarid climate characterized by abundant sunshine and low humidity. The July high is around 80^0F, while January has an average minimum temperature of 4^0F. Most of the precipitation occurs as scattered summer afternoon rain showers or winter snow. Annual average precipitation ranges from 8 inches or less in the central part of the basin to 10 inches per year on the periphery. About 44% of the precipitation within the alluvial basin falls between July and September; while winter storms make a large contribution to annual precipitation in the surrounding mountains. The average annual evaporation rate greatly exceeds precipitation.

Most of the precipitation that falls on the land surface during snowmelt and storm events flows directly into drainages, eventually flowing into streams and rivers. Some of the water will infiltrate the soil and recharge the underlying aquifers. The average annual runoff ranges from about 0.2 inches in the center of the valley to over 5 inches at the southeastern edge, with amounts great than 20 inches per year in the higher elevations of the San Juan Mountains.

Land Ownership and Use

The Town of Saguache's Source Water Protection areas lies within both public and private lands. The public lands include land managed by the U.S. Department of Agriculture's Forest Service and U.S. Department of the Interior Bureau of Land Management. The U.S. Forest Service land within the Saguache Source Water Protection area includes land within the Rio Grand National Forest. The BLM Saguache Field Office is co-located with the U.S. Forest Service's Saguache Ranger District in Saguache, Colorado.

The private land includes land within the Town of Saguache, and land within unincorporated areas of Saguache County (Fig. 2). Land use on private land consists of agricultural, urban and rural residential development, tourism, and cottage businesses. Land use on public land consists of hiking, hunting, fishing, camping, snowshoeing, cross country skiing, wildlife habitat, and other special uses.

Land Administration: Town of Saguache

Land use decisions on private land within the Town of Saguache are made by the Town Board of Saguache. The Town's Planning Commission developed a Master Plan which was approved by the Town Board of Trustees on May 17, 2010. The Master Plan is an advisory document for the Town Board that identifies the community's core values and helps set policy and direction. It can guide the Board in managing the growth and development of the town while reminding them to protect its' unique assets and character. The Master Plan identified the following principles and actions pertaining to water:

Guiding Principles:

- Consistent delivery of quality water as mandated by State statutes and/or regulations.
- Water will be provided to all households in town and to existing out of town customers.
- The Town will promote landscaping that uses minimal amounts (i.e. xeriscaping) of water in an effort to achieve sustainable water use.

Actions:

- Annually budget sufficient resources (people and supplies) to achieve this.
- Develop a long term (5-20 year) capital improvement plan for all Town infrastructure including specific, budgeted, improvements to all systems.
- Approve new development only if water/waste infrastructure can accommodate the growth.
- Provide and upgrade, where needed, Town facilities to be able to serve existing customers.
- Create and implement a plan to inform property owners of their responsibilities regarding Town systems (e.g. use Town website, create fact sheets, etc regarding water/wastewater lines, alleys, etc.).
- Protect water quality through adherence to Town Resolution 2007-F requiring back flow prevention devices to prevent contaminating the Town's water supply.
- Identify and map service line issues and inform property owners.
- Identify needs and determine where/if more storm drainage is needed throughout Town (Saguache, 2010).

Land Administration: Saguache County

Land use decisions for Saguache County are made by the Saguache County Board of County Commissioners with recommendations from their Planning Commission. The Department of Land Use administers Saguache County's land use regulatory system. The Saguache County Master Plan, adopted in 2010, provides a framework for decision making and serves as a guide for all decisions regarding land use, the environment, the economy, transportation, housing or any other topic of potential impact to the quality of life enjoyed by the people of Saguache County. The Saguache County Master Plan guides the conservation and development of the unincorporated portions of Saguache County. Its purpose is to guide Planning Commission decisions, the adoption of land use regulations, and aid community development in ways that reflect and perpetuate its citizens' core values.

Residents in Saguache County share common values including their high quality of life and high quality of the natural resources and unpolluted environment of the region. They want to maintain their clean water sources place a priority on protecting the mountains, foothills, environmentally sensitive areas such as wetlands and riparian areas, wildlife habitats and corridors, and agricultural lands, especially those irrigated with water rights.

The Saguache County Master Plan identifies the following goals pertaining to natural resources:

> G2-3: Continue to address measures to protect the County's many unique environmental features and natural resources.
>
> G2-7: Encourage development that optimizes the use of existing infrastructure and conserves and protects natural resources (Saguache County, 2010).

Population and Growth

In 2010, Saguache County's population numbered 6,108 according to the 2010 U.S. Census Report. The county as a whole has had a population growth of 3.23% since the year 2000 when the population was 5,917. From 2010 to 2040, there is a projection population growth of 33% amounting to 9,155 people in Saguache County (DOLA, 2010). More than half of the people in Saguache County live in the unincorporated areas of the county. From 2000 to 2010 the population in the Town of Saguache decreased from 578 to 485 people, a 16.09% loss.

Economic Conditions

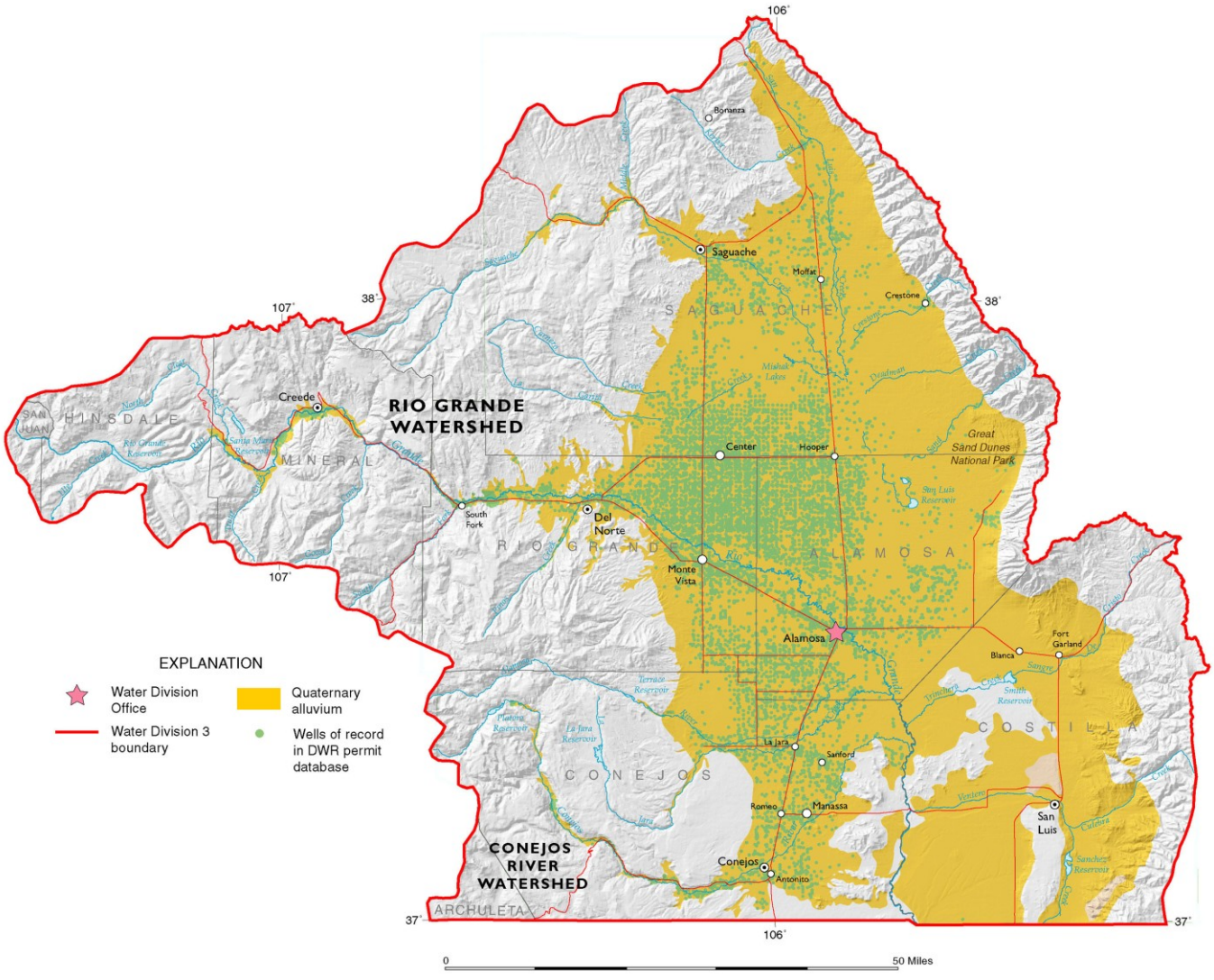
The Town of Saguache has many economic challenges for businesses to stay viable. The largest employers in town include Saguache County, Mountain Valley School, US Forest Service/Bureau of Land Management, and Mountain Valley Lumber, a sawmill just south of town.

The town is currently working on plans to reestablish Saguache as a vibrant and healthy community in which to live, visit, and work (Saguache, 2010). In July 2011, the Town of Saguache was awarded a $500,000 Community Development Block Grant from the Colorado Department of Local Affairs to begin Phase III of the Saguache Downtown Revitalization Project which includes the physical changes and improvement to 4th Street, the main downtown corridor.

WATER QUALITY – HYDROLOGIC SETTING

Hydrology

The Town of Saguache obtains its drinking water from two groundwater wells completed in the unconfined aquifer of the San Luis Valley. All of the groundwater sources are located in the subregions of the Rio Grande River basin; Hydrologic Unit Codes 130100040802, 130100040803, 130100040804, and 130100040805. The Rio Grande River basin encompasses approximately 7,500 square miles within Colorado and drains part of the Southern Rocky Mountains physiographic provinces (Fig 3). Management of waters within this basin is under the jurisdiction of the Colorado Division of Water Resources, Division 3 of the State Engineer's Office and Water Court located in Alamosa, Colorado.



SOURCE: GROUND WATER ATLAS OF COLORADO

Figure 3. Map of the Rio Grande Basin in Colorado.

San Luis Valley Aquifers

The Rio Grande River flows across the broad basin-fill deposits in the San Luis Valley in Colorado. Most basins along the Rio Grande have surface drainage to the river and are topographically open basins. The northern end of the San Luis Valley, an area of approximately 2,940 square miles, is known as the Closed Basin or Alamosa Basin. The Closed Basin has no natural outlet and does not contribute surface streamflow to the Rio Grande or its tributaries. Many smaller streams and rivers flow into the Closed Basin from the northern perimeter of the Valley. A slight divide in topography and the shallow ground-water table, formed by the alluvial fan of the Rio Grande on the west and alluvial material from the Sangre de Cristo Mountains on the east, creates an internal drainage basin for the Alamosa Basin (topper et al). Groundwater south of the divide moves toward the Rio Grande and water north of the divide flows into the Closed Basin (ScSEED, 2001).

Ground water in the San Luis Valley is obtained from unconfined and confined aquifers. These aquifers are separated by a confining "clay series" or by confining layers of volcanic rocks. These confining beds are discontinuous so it is difficult to differentiate between unconfined and confined aquifers except locally. This discontinuity in the "clay series" creates varying degrees of hydraulic connection between the aquifers. The shallow unconfined aquifer occurs almost everywhere in the valley and extends 50 to over 200 feet beneath the land surface. The depth to water in about one-half of the Valley is less than 12 feet. The unconfined aquifer consists of unconsolidated clay, silt, sand and gravel.

The deeper, confined aquifer is present in the San Luis basin except along the basin margins. The confined aquifer consists in part of unconsolidated clays, silts, sands, gravels, and interbedded volcanic rock and contains saturated permeable material that yields water under artesian pressure. The confined aquifer is a multi-layered aquifer with different formations and different hydraulic properties that affect the rate, direction of movement of water, and the artesian pressures at various depths (Simpson, 2004). The aquifer system lies at depths of about 100 to 6000 feet below ground surface.

Recharge

Recharge to the confined aquifer is primarily from precipitation in the San Juan Mountains to the west. Runoff from snowmelt or rainfall percolates downward into the bedrock aquifers formed by fractures or permeable layers in the bedrock. The bedrock aquifers then discharge this water directly into the basin-fill aquifer in the sub-surface at the mountain front and are called "mountain-front recharge". Larger quantities of recharge generally occur along the higher mountains in the northern parts of the aquifer system. About one-half of the approximately 2,000,000 acre-feet per year flow of water that enters the San Luis Valley from the San Juan Mountains is through bedrock aquifers in extensive layers of volcanic rocks that extend from the mountains into the basin fill. The much smaller drainage area of the Sangre de Cristo Mountains is underlain by relatively impermeable Paleozoic sedimentary rocks and Precambrian crystalline rocks and yields only about 250,000 acre-feet per year of water to the valley; almost all this water is streamflow (Bexfield and Anderholm, 1995).

The unconfined aquifer is recharged from precipitation, irrigation return flow, streambed infiltration, canal and ditch seepage, and upward leakage from the confined aquifer. Most of the precipitation that falls in the valley is lost to evapotranspiration. The hydraulic conductivity of the aquifers is variable, depending on the sorting of aquifer materials and the amount of silt and clay present, but generally it is high. The unconsolidated sand and gravel aquifers are susceptible to contamination because of their generally high hydraulic conductivity.

Source Waters

The Town of Saguache's ground water wells are completed at a depth of 714 feet outside of the confining clay layer of the Closed Basin. The confining clay layer generally does not exist around the valley's perimeter. It is uncertain at this point in time the actual aquifer that the wells are drawing from, but until a scientific study is completed on the well water, it is considered within the unconfined aquifer. The existing data are insufficient to describe the aquifer characteristics at this location in sufficient detail. Water testing for tritium along with carbon 14 could be use to determine the age of the water source and the aquifer that Saguache's wells draw from (Korona, 2009).

Also, the wells are located within the drainage basin of Saguache Creek which flows into the northern San Luis Valley. Saguache Creek flows across the recharge zone before reaching the edge of the blue clay of the Closed Basin. Saguache Creek is a gaining stream upstream of the confluence of the headwater streams, but changes to a losing stream downstream from this confluence (Frisbee, 2010). This loss is exacerbated by groundwater pumping in the northern San Luis Valley. To varying degrees, the surface streams, the unconfined aquifer, and the confined aquifer are hydraulically connected.

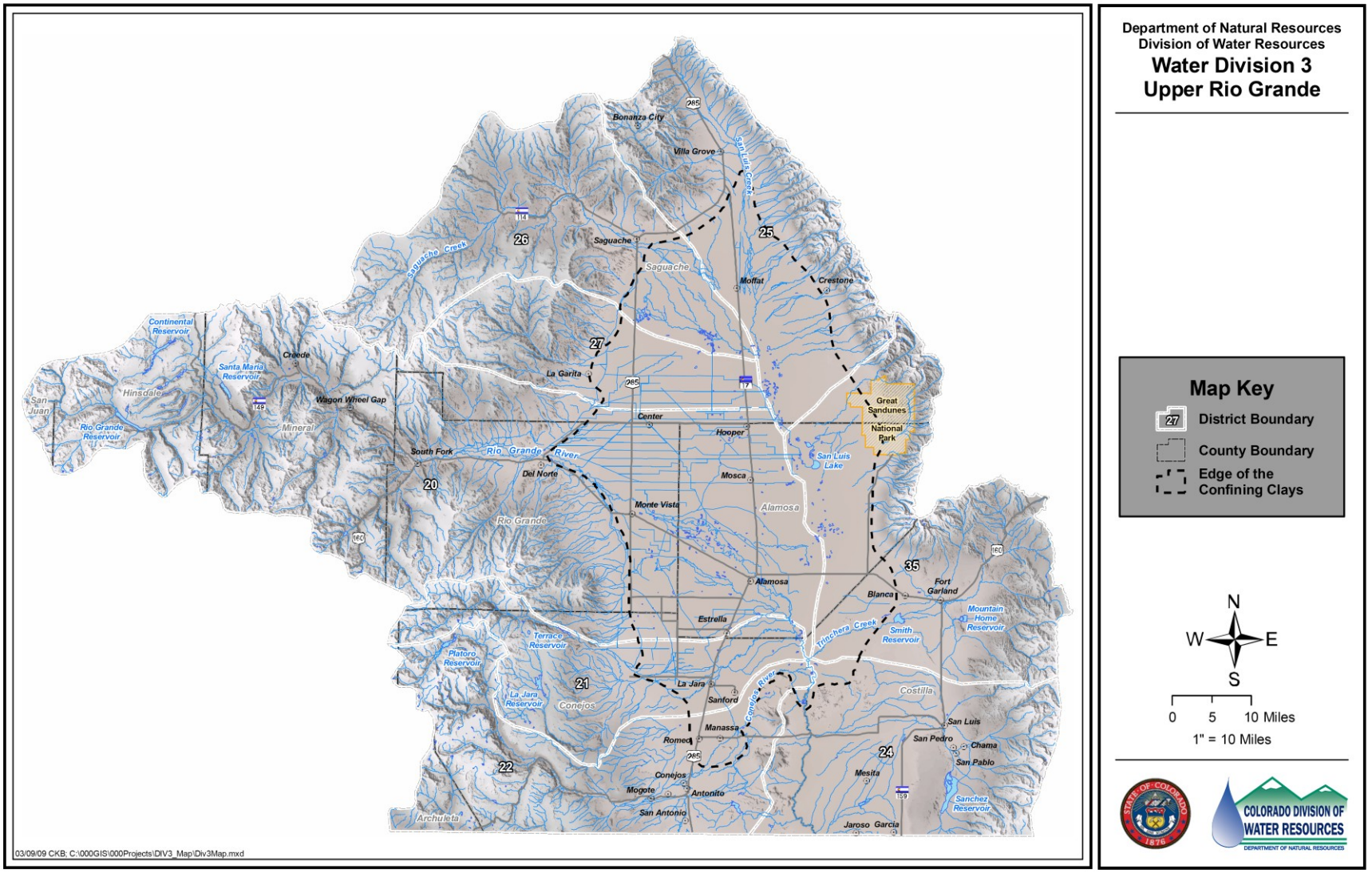
Groundwater Flow

The groundwater flow in the unconfined aquifer of the San Luis Valley is generally from the eastern, western, and northern margins of the valley toward its central axis. In the northwestern part of the Valley where the Town of Saguache's wells are located, the groundwater flow is from the north and western drainage basin. The connectivity of groundwater flowpaths between the Saguache Creek alluvium and the Town's groundwater wells can be better understood with the use of the Rio Grande Decision Support System's ground water model that is currently being developed by the State Engineers office.

Groundwater Use

Irrigated agriculture is the largest water user within the San Luis Valley, whereas water use for public supply is less than 1 percent of total use. About 54 percent of the water used for irrigated agriculture was surface water, which is diverted from the Rio Grande and smaller tributary streams. Most of the wells pumped for irrigation water are completed in the shallow unconfined aquifer (Bexfield and Anderholm, 1995).

The San Luis Valley water supplies have been overappropriated since 1900. Groundwater withdrawals from both the unconfined and confined aquifers for irrigation and public supply have resulted in declines in aquifer storage. In 2004 the State Engineer approved rules governing withdrawals from the confined aquifer. The State Engineer is currently pursuing regulation of the confined and unconfined aquifer in order to maintain a sustainable water supply. The State is creating rules to administer the use of ground water and surface water, "Colorado State Engineer's Proposed Statement of Basis and Purpose for the Proposed Rules Governing the Withdrawal of Ground Water in Water Division Number 3." Proposed Rule 6 states that there are only three ways in which water users may continue to make ground water withdrawals. Well users will be require to have an augmentation plan, a substitute water supply plan, or enroll in a subdistrict ground water management plan, in order to utilize ground water. This will ensure that the well water depletions are being replaced or "repaid" to the aquifers in the future to reach sustainable levels (Wolfe, 2011).



SOURCE: COLORADO DIVISION OF WATER RESOURCES

Figure 4. Map of the San Luis Valley and edge of the confining clays.

Groundwater Protection

Groundwater protection is managed as two separate issues of quantity and quality in Colorado. Quantity issues are managed through the Colorado Division of Water Resources/Office of the State Engineer. The Division of Water Resources administers and enforces all surface and groundwater rights throughout the State of Colorado, issues water well permits, approves construction and repair of dams, and enforces interstate compacts. The Division of Water Resources is also the agency responsible for implementing and enforcing the statutes of the Groundwater Management Act passed by the Legislature as well as implementing applicable rules and policies adopted by the Colorado Groundwater Commission and the State Board of Examiners of Water Well Construction and Pump Installation Contractors.

Under the Clean Water Act, every state must adopt water quality standards to protect, maintain and improve the quality of the nation's surface waters. Water quality is protected by the Colorado Water Quality Control Act through a number of state agencies. The Colorado Department of Public Health and Environment is the lead agency. The Colorado Water Quality Control Commission is responsible for promulgating groundwater and surface water classifications and standards. Colorado's Water Quality Control Commission has established basic standards for groundwater regulations that apply a framework for groundwater classifications and water quality standards for all waters within their jurisdictions. Standards are designed to protect the associated classified uses of water or a designated use. The groundwater classifications are applied to groundwaters within a specified area based upon use, quality and other information as indicated in Regulation No. 41, "The Basic Standards for Ground Water'"(CDPHE, 2008). Statewide standards have been adopted for organic chemicals and radionuclides. Significant areas of the state have been classified for site specific use classification and the remainder of the state's groundwater is protected by interim narrative standards.

Classifications and standards are implemented by seven separate state agencies through their rules and regulations for activities that they regulate. Regulated activities include: mining and reclamation, oil and gas production, petroleum storage tanks, agriculture, Superfund sites, hazardous waste generation and disposal, solid waste disposal, industrial and domestic wastewater discharges, well construction and pump installation, and water transfers.

Colorado has proactive groundwater protection programs that include monitoring groundwater for agricultural chemicals and pesticides, issuing groundwater discharge permits; voluntary cleanup program, permitting for large hog farm operations, and educational programs. Also, water wells must have a permit and meet minimum standards of construction and pump installation.

Drinking Water Supply Operation

Town of Saguache

The Town of Saguache operates a municipal supply water system built in 1966 to serve the residents and commercial user of Saguache. The size of the service area is approximately 8.5 square miles with a current population of 485 as per the 2010 U.S. Census. The Town has 2 groundwater wells drilled 714 feet deep within the Town's boundaries. Well #1 was drilled in September 1965 and Well #2 drilled in 1979.

Figure 5. Entering the Town of Saguache.

The distribution system consists of 6" cement asbestos underground pipelines within the Town and one above ground steel storage tank located on a hill above the Town. The storage tank has a 100,000 gallon capacity and was purchased in 1966. The tank had an estimated life of about 50-60 years, is inspected every 5 years, and is currently in good condition. Raw water from the wells is pumped up to the storage tank as well as through the delivery system to water taps.

The well water is distributed to their customers via a network of about 8.5 miles of underground mains to 325 service connections or taps, 267 of which are residential taps. The average annual demand is 72,600,000 gallons. Peak use during the summer is in June with an average of 137,300 gallons per day. The lowest usage month is February with an average of 116,290 gallons per day. The water system is nearing capacity and if a substantial increase in population occurs, then additional maintenance and increased storage capacity will be required (Saguache, 2011) (Pacheco, 2011).

The Town of Saguache provides an Annual Drinking Water Quality Report to the public which provides information on the results of their water monitoring program. The 2010 Consumer Confidence Report for calendar year 2009 is available at the Saguache Town Hall or online at www.townofsaguache.org. The Town is currently in compliance with all State water quality regulations and has had no violations in their water quality monitoring.


PHOTO: WWW.SANGRES.COM

Figure 6. The Saguache Town Hall, built in 1915, is one of the many historic buildings in town.

Water Supply Demands/Analysis: Town of Saguache

The Town of Saguache's water system currently has the capacity of meeting a peak (i.e., maximum) daily demand of 446,510 gallons per day. Current estimates by the water system indicate that the average daily demand by the water system's customers is 198,973 gallons per day, and that the average peak daily demand is approximately 446,510 gallons per day. Using these estimates, the water system has a surplus average daily demand capacity of 470,584 per day and a surplus average peak daily demand capacity of 223,047 per day (Table 4).

Using the surplus estimates above, the Town of Saguache 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 the Town of Saguache may be 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 the Town of Saguache may not be able to meet the average peak daily demand of its customers if one of the water sources became disabled for an extended period of time. The ability of the Town of Saguache 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 of Saguache 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, the Town of Saguache 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 exceed $200,000 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 concern to the Town of Saguache's Steering Committee. As a result, the Steering Committee believes the development and implementation of a source water protection plan for Town of Saguache can help to reduce the risks posed by potential contamination of its water source(s).

Table 4. Water Demand Estimator

Town of Saguache Water Source ID	Permitted Water Supply (ac-ft/yr)	Permitted Peak Daily Capacity (gals/day)	Average Daily Demand (gals/day	Average Peak Daily Demand (gals/day)
CO0155800-001 (Permit # 10227F)	375	334,778	132,338	262,257
CO0155800-002 (Permit # 48228F)	375	334,778	66,635	184,253
Total	750	669,557	198,973	446,510
Estimated Surplus (+) or Deficit (-) Capacity:			470,584	223,047

SOURCE: TOWN OF SAGUACHE

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 (CDPHE), assumed the responsibility of developing Colorado's SWAP program. The SWAP program protection plan is integrated with the Colorado Wellhead Protection Program that was established in amendments made to the federal Safe Drinking Water Act (SDWA, Section 1428) in 1986.

Colorado's SWAP program is a two-phased process designed to assist public water systems in preventing potential contamination of their untreated drinking water supplies.

Source Water Assessment Phase

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;
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 Saguache's source water comes from, what contaminant sources potentially threaten the water source(s), and how susceptible each water source is to potential contamination.

Source Water Protection Phase

The Protection Phase is a voluntary, ongoing process to employ preventive measures to protect water supplies 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. 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;
4. Monitoring the effectiveness of the protection plan and updating it accordingly as future assessment results indicate.

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. The Town of Saguache received their source water assessment report in November 2004 and has reviewed the report along with the Source Water Protection Planning Team. These assessment results were used 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 can be obtained by contacting the water system or by downloading a copy from the Colorado Department of Public Health and Environment's SWAP program web site at: www.cdphe.state.co.us/wq/sw/swaphom.html. The following sections provide a brief summary of the main findings from the three component phases of the assessment.

Source Water Assessment Area Delineation

Delineation is the process used to identify and map the drainage basin or recharge area that supplies water to a public water source. The delineated source water assessment area provides the basis for understanding where the community's source water and potential contaminant threats originate, and where the community has chosen to implement its source water protection measures in an attempt to manage the susceptibility of their source water to potential contamination.

Source Water Protection Areas

The Planning Team reviewed the State's assessment and delineations of the source water protection area for each of the well and decided to add additional protection areas to include the recharge areas for the Town's wells and areas of potential groundwater impact.

The Source Water Protection Areas for the Town of Saguache (Fig. 7) include:

1. Primary Source Water Protection Area – includes the Town of Saguache (delineation provided by Tim Lovato) and the following State's SWAP delineations (Fig. 8):
    - Zone 1 is a 500-foot radius around the water source intake.
    - Zone 2 is defined by calculating the distance from the water intake source through which a parcel of water travels over a two-year time period or 2 year time of travel (TOT).
    - Zone 3 is defined by estimating the distance from the water intake source through which a parcel of water travels over a five-year time period or 5 year time of travel (TOT).
2. Secondary Source Water Protection Area – includes a 3-mile radius around the wells.
3. Area of Interest – includes the sub-basins of the Saguache Creek Watershed as identified by the U.S. Geological Survey and the Natural Resource Conservation Service's hydrologic unit codes

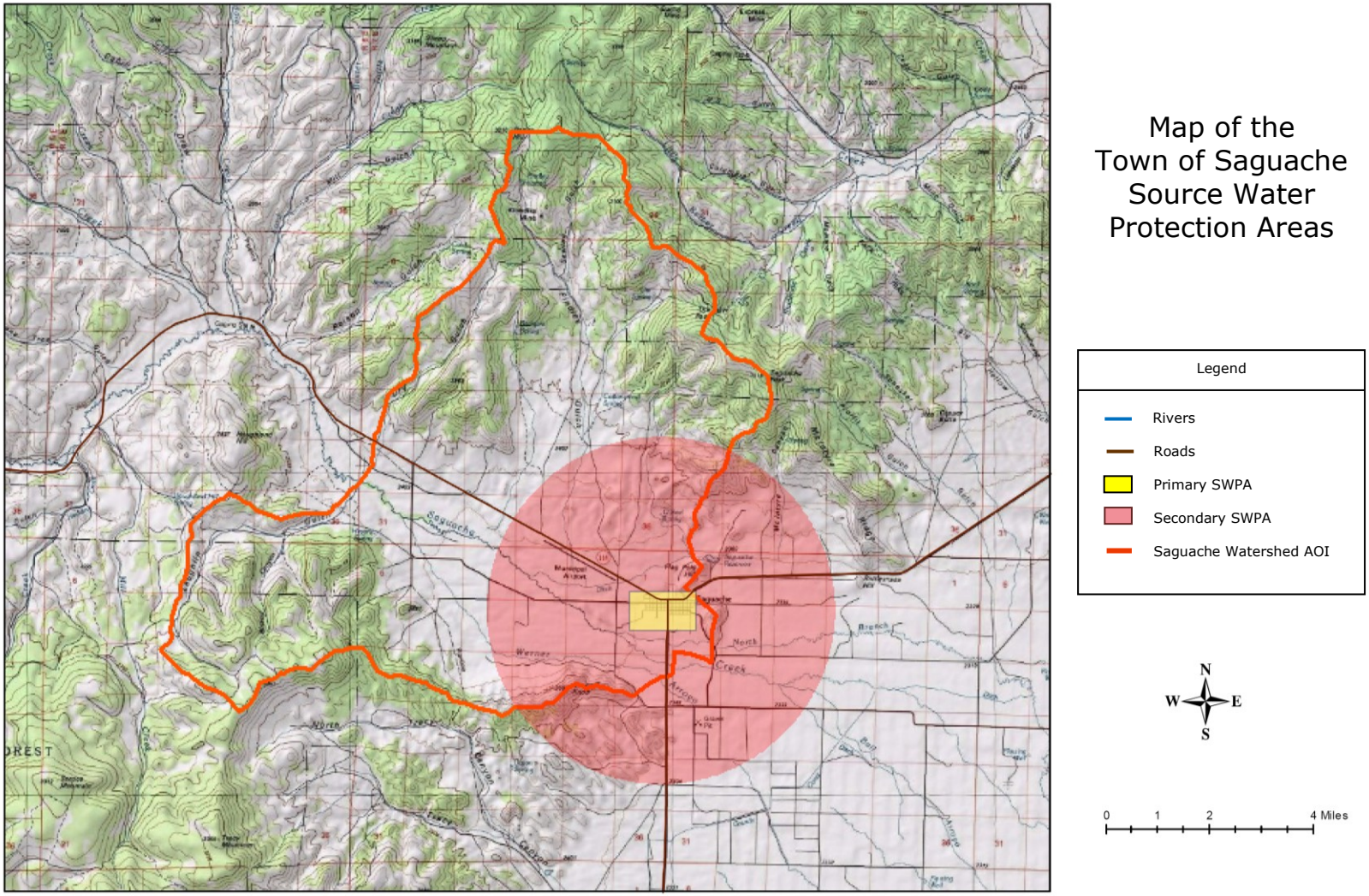


Figure 7. Map of the Town of Saguache's Source Water Protection Areas.

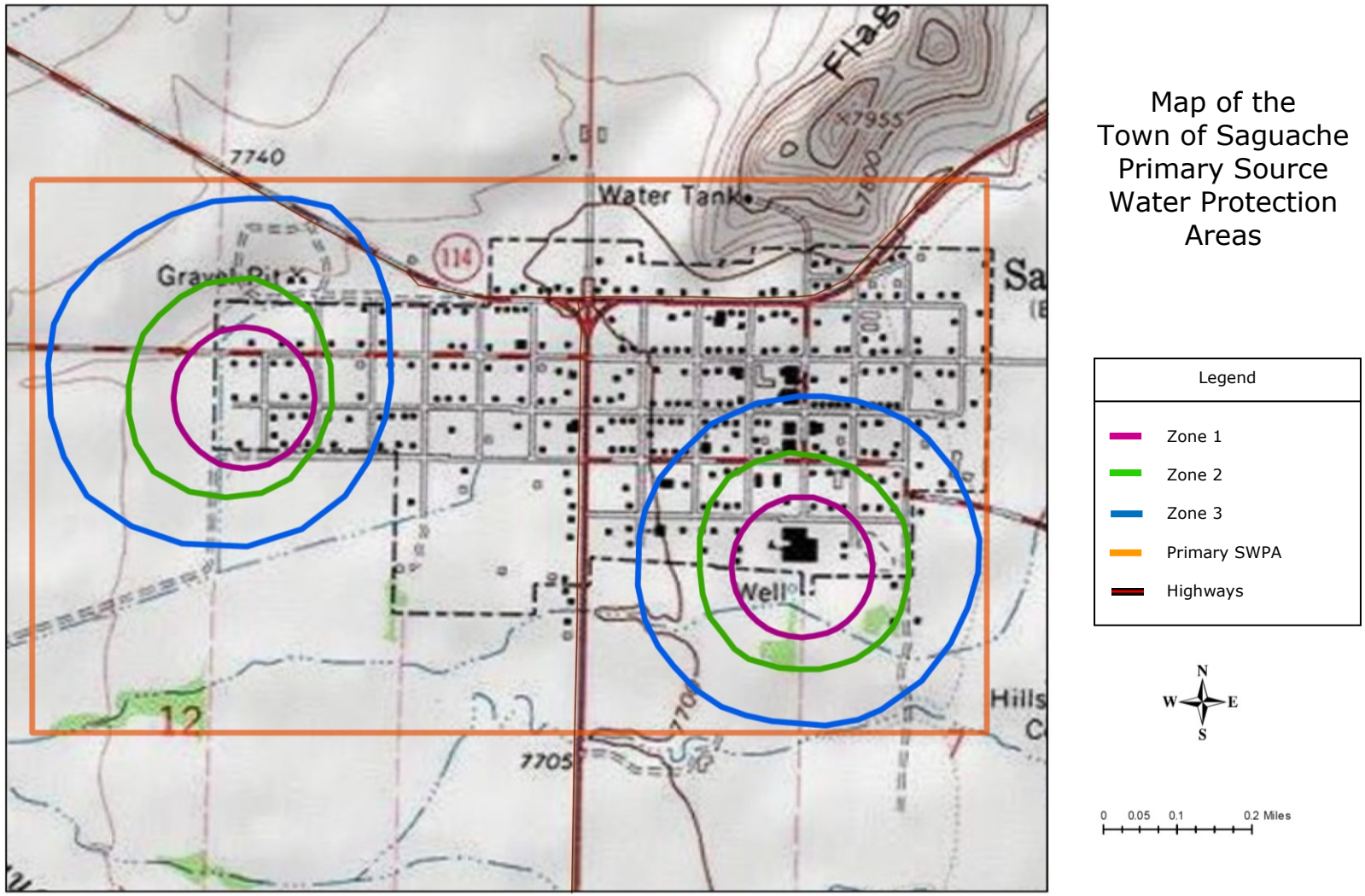


Figure 8. Map of the Town of Saguache Primary Source Water Protection Areas.

Contaminant Source Inventory

In 2001-2002 a contaminant source inventory was conducted by the Colorado Department of Public Health and Environment to identify selected potential sources of contamination that might be present within the source water assessment areas. In 2011, CDPHE provided the Town Geographic Information System (GIS) information on these potential contaminant sources located within the delineated protection areas. The Source Water Protection Planning Team field checked this existing information, added additional potential sources of contaminants based on local knowledge, and developed a current inventory.

The State's assessment for the Town used the terms "discrete" and "dispersed" potential sources of contamination. A discrete source is a facility that can be mapped as a point, while a dispersed source covers a broader area such as a type of land use (crop land, forest, residential, etc.).

Discrete Potential Sources of Contaminants

Discrete contaminant sources were inventoried using selected state and federal regulatory databases including: mining and reclamation, oil and gas production, above and underground petroleum tanks, Superfund sites, hazardous waste generators, solid waste disposal, industrial and domestic wastewater dischargers, and water well permits. The contaminant inventory was completed by mapping the potential contaminant sources with the aid of a Geographic Information System (GIS). The State's assessment of discrete contaminant source for the Town of Saguache included storage tanks, facilities, and existing/abandoned mine sites. The Planning Team added private water wells, the old town dump, and the Town's Waste Water Treatment Plant (WWTP) lagoons to the list (Fig. 9).

Dispersed Potential Sources of Contamination

Dispersed contaminant sources were inventoried using recent land use/land cover and transportation maps of Colorado, along with selected state regulatory databases. The contaminant source inventory indicates the following types of dispersed contaminant sources within the source water assessment areas analyzed:

- High and low intensity residential
- Row crops
- Pasture/hay
- Deciduous forests
- Septic systems
- Road miles

Susceptibility Analysis

The State's conducted an analysis to identify the susceptibility of a water source to contamination from potential sources inventoried within its source water assessment area. The Overall Susceptibility Rating for the Town of Saguache's well was moderate. The Physical Setting Vulnerability Rating for the Town's well was also moderate.

Contaminants Health Concerns

The discrete and dispersed sources of contaminants can cause acute and chronic health concerns as indicated below. These categories of contaminants are most likely associated with the most prevalent sources identified in Table 5 and 6.

Acute Health Concerns

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).

Table 5. Acute Health Concerns

Acute Health Concern	Discrete Contaminants	Dispersed Contaminants
Microorganisms	x	x
Nitrate/Nitrite	x	x
Pesticides	x	x
Semi-volatile organic compounds (SVOCs)	x	
Volatile organic compounds (VOCs)	x	
Lead	x	
Ammonia or nitric acid	x	x

SOURCE: COLORADO WATER QUALITY CONTROL DIVISION

Chronic Health Concerns

Chronic health concern contaminants include categories of constituents that pose potentially 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.

Table 6. Chronic Health Concerns

Chronic Health Concern	Discrete Contaminants	Dispersed Contaminants
Herbicides	x	x
Pesticides		x
Volatile organic compounds (VOCs)	x	
Non-metal inorganic compounds		
Metals – Primary Drinking Water (other than lead)	x	
Turbidity	x	x
Other inorganic compounds	x	x
Other organic compounds	x	

SOURCE: COLORADO WATER QUALITY CONTROL DIVISION

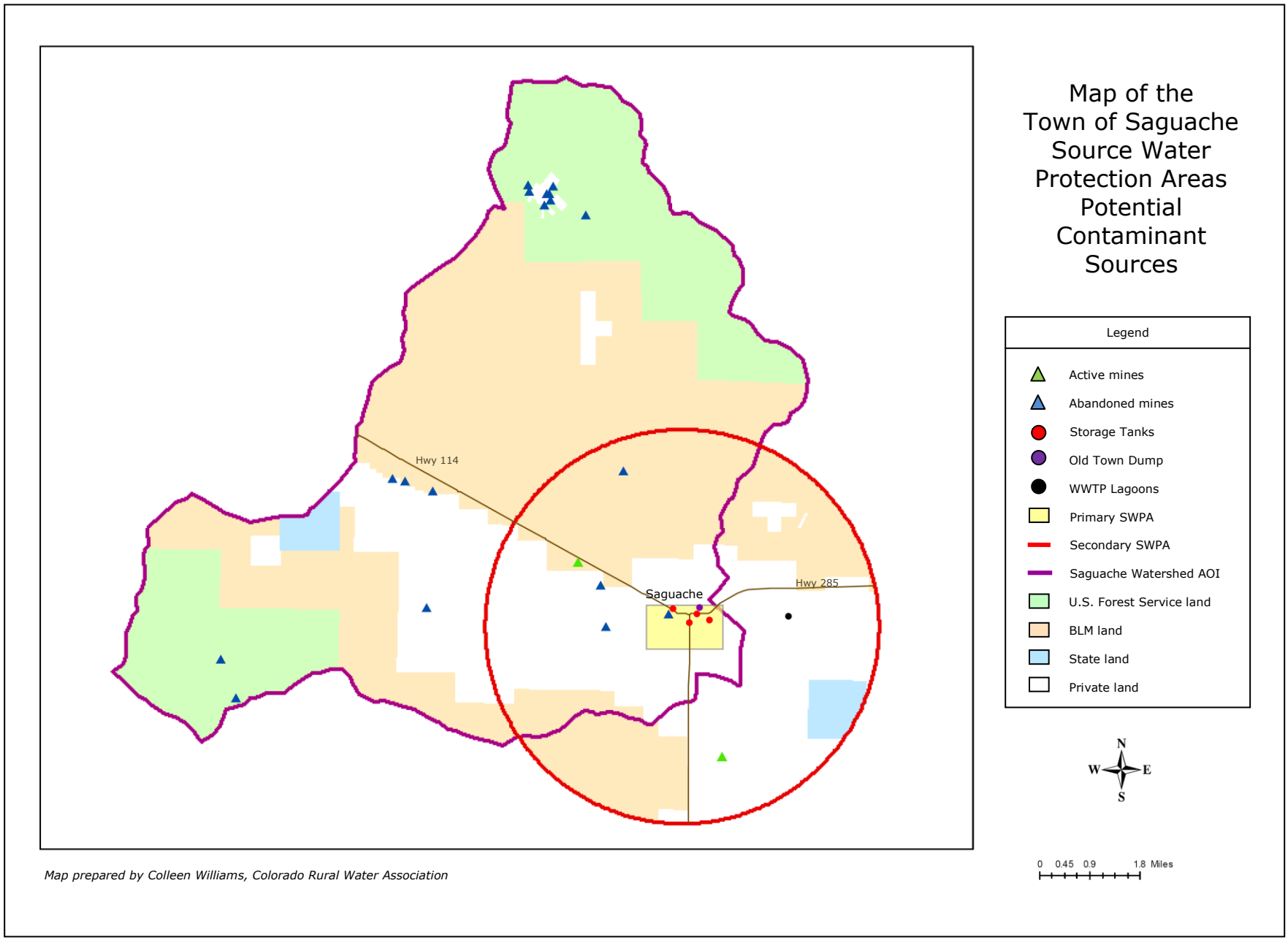


Figure 9. Map of the Town of Saguache's Source Water Protection Areas potential contaminant sources.

DISCUSSION OF ISSUES OF CONCERN

The Planning Team reviewed the information presented in the State's assessment, discussed other potential sources of contaminants not included in the assessment, and identified areas of concern within the source water protection areas in which to focus their management approaches.

Issues of concern include:

- Fuel storage tanks
- Impacts from transportation on roads
- Mining activity
- Waste water: sewer and septic system
- Flooding: stormwater runoff
- Agricultural activities
- Private water wells
- Old town dump
- Town drain system
- Public Land management
- Residential and business practices

Surface and Groundwater Contaminants

Many types of land uses have the potential to contaminate source waters: spills from tanks, trucks, and railcars; leaks from buried containers; failed septic systems, buried or injection of wastes underground, use of fertilizers, pesticides, and herbicides, road salting, as well as urban and agricultural runoff. While catastrophic contaminant spills or releases can wipe out a water resource, groundwater degradation can result from a plethora of small releases of harmful substances. According to the USEPA, nonpoint-source pollution (when water runoff moves over or into the ground picking up pollutants and carrying them into surface and groundwater) is the leading cause of water quality degradation (GWPC, 2008).

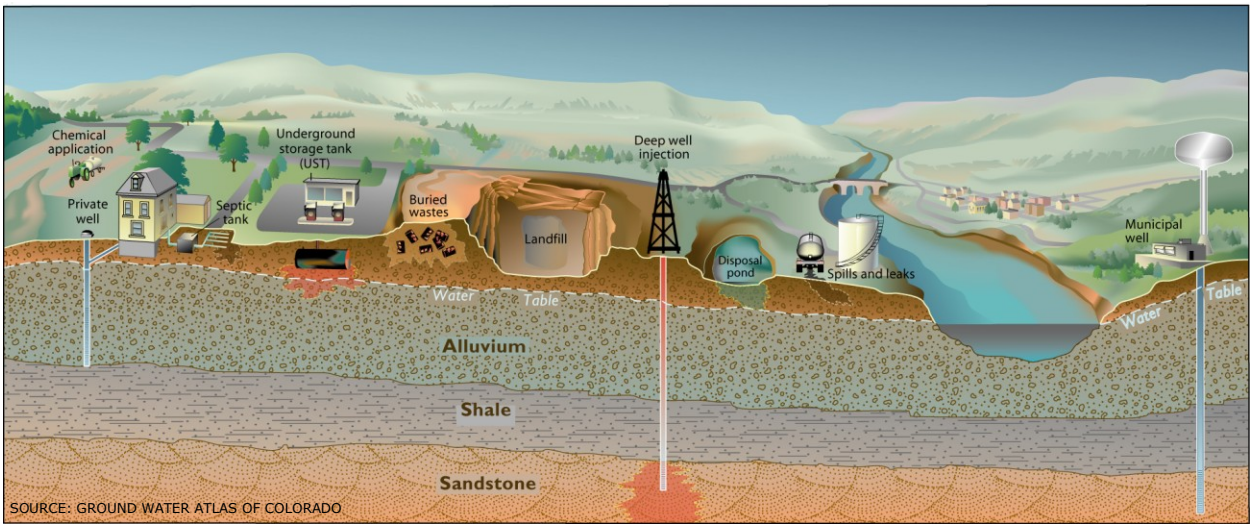


Figure 10. Schematic drawing of the potential sources of contaminants to surface and groundwater.

Fuel Storage Tanks: Above, Underground, and Leaking

There are 13 permitted fuel storage tank sites (4 active and 9 inactive) within the source water protection area (Table 7, Fig 8). Information of the current status of Aboveground Storage Tanks (AST) and Underground Storage Tanks (UST) within the source water protection area was obtained from the Colorado Department of Labor and Employment Division of Oil and Public Safety's database via their Colorado Storage Tank Information (COSTIS) website at http://costis.cdle.state.co.us

Table 7. Storage tanks with the source water protection area

Tank Site	Tank No.	Status	Event	Information
Saguache Standard Box 232	388	Inactive		5 UST closed.
Saguache Fuel Inc. 735 Gunnison	685	Inactive		2 AST closed 2002.
Saguache County Road & Bridge 202 3rd St.	2349	Active		2 AST in use .
Mountain Valley Schools 403 Pitkin Ave.	2386	Inactive*		1 AST closed; *Town confirms there are 2 active AST on site that are not regulated according to the State.
Former Hammels Superette 340 Gunnison Ave.	5676	Inactive		1 UST closed and removed; Brownfield Site.
Saguache Town Market 616 Gunnison Ave.	5878	Active	x	4 UST in use & 1 LPG tank; 1 Confirmed Release in 2002 and closed. (Old McDells Site)
1st Stop 315 8th Street	5888	Active		4 UST: 3 active & 1 closed.
CDOT Saguache 46595 W. Hwy 114	7346	Active		4 tanks: 1 active UST.
Shays Eat N Run 410 Hwy 285	7922	Inactive	x	3 UST inactive tanks; Confirmed release 1998 & LUST cleanup completed 2002 & closed.
Saguache County Road Dept. 315 Denver Ave.	8711	Inactive		2 UST closed; No records.
Saguache Ranger Site 1 mile west Hwy 114	9688	Inactive		1 UST closed; No records.
Shays Auto Service Hwy 285 & San Juan St.	10849	Inactive		3 UST closed in 1995.
McDells Supermarket Hwy 285	17371	Inactive		1 LPG tank closed.

SOURCE: COLORADO DEPARTMENT OF LABOR AND EMPLOYMENT DIVISION OF OIL AND PUBLIC SAFETY

Storage Tank Spills

Two of the underground storage tanks in the source water protection area have had leaking tanks, recorded as Confirmed Releases. Both of these tank sites have been cleaned up and closed (Table 10). A release means any spilling, leaking, emitting, discharging, escaping, leaching, or disposing of a regulated substance from a storage tank into groundwater, surface water or soils. The owner/operator must report a suspected release within 24 hours and investigate suspected releases within seven days. After confirming a release and conducting the initial response and abatement, the owner/operator must continue further source investigation, site assessment, characterization and corrective actions.

The leaky underground storage tank releases gasoline or "liquid phase hydrocarbon." The gasoline descends through the unsaturated soil zone to float on the water table (gasoline is lighter than water). The gasoline releases compounds like benzene, toluene, ethylbenzene, and xylenes (BTEX) and methyl tert-butyl ether (MTBE) to the groundwater and they are carried in the direction of groundwater flow. The extent of contamination is defined by the concentration of benzene (from 10 to 10,000 parts per billion) in the groundwater.

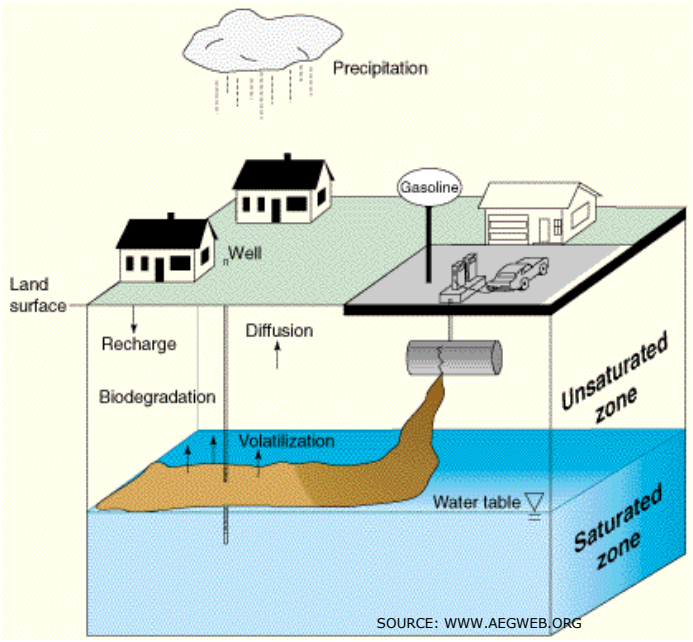


Figure 11. Schematic of a LUST spill site.

Spills from leaking underground storage tanks (LUST) sites can contaminate the groundwater and also present other hazards. Because gasoline is lighter than water, gasoline floats on the water table and remains relatively close to the land surface. The most hazardous compounds in groundwater (the BTEX compounds) are quite volatile and carcinogenic. Besides the potential for being consumed in drinking water, volatile compounds can enter nearby buildings. In poorly ventilated buildings, the compounds can accumulate and present a health risk through inhalation. In buildings, the volatile compounds can also present an explosion hazard (Ryan, 2006).

Residential Storage Tanks

Rural residents of the source water protection area may have private aboveground storage tanks containing gasoline to store vehicular fuel. The private aboveground storage tanks are a concern because they may be old and subject to leakage. It only takes a small amount of petroleum to contaminate the ground or surface water. Fuel tanks should be inspected visually on an annual basis and properly seated on a type of secondary containment structure to prevent spills from reaching the ground. The containment area should be able to hold 125% of the tank capacity.

Storage Tank Recommendations:

1. Maintain a current inventory and information on the status of regulated above and underground storage tanks in the source water protection area using the Colorado Storage Tank Information (COSTIS) website at http://costis.cdle.state.co.us. Storage tank information from this site includes: facility, tank, owner, and events.

2. Identify Leaking Underground Storage Tank (LUST) events that have occurred within the SWPA using the State's database COSTIS. Contact the Colorado Department of Labor and Employment Division of Oil and Public Safety (303-318-8000) for information regarding LUST events within the SWPA. Contact the Public Records Center for a file review at (303) 318-8521 or (303) 318-8522. Monitor progress on any remedial action conducted for the known contamination sites.

3. Develop an inventory of residential or farm unregulated storage tanks within the source water protection area.

4. Provide information to tank owners on how they can implement storage tank practices to prevent petroleum products from leaking onto the ground.

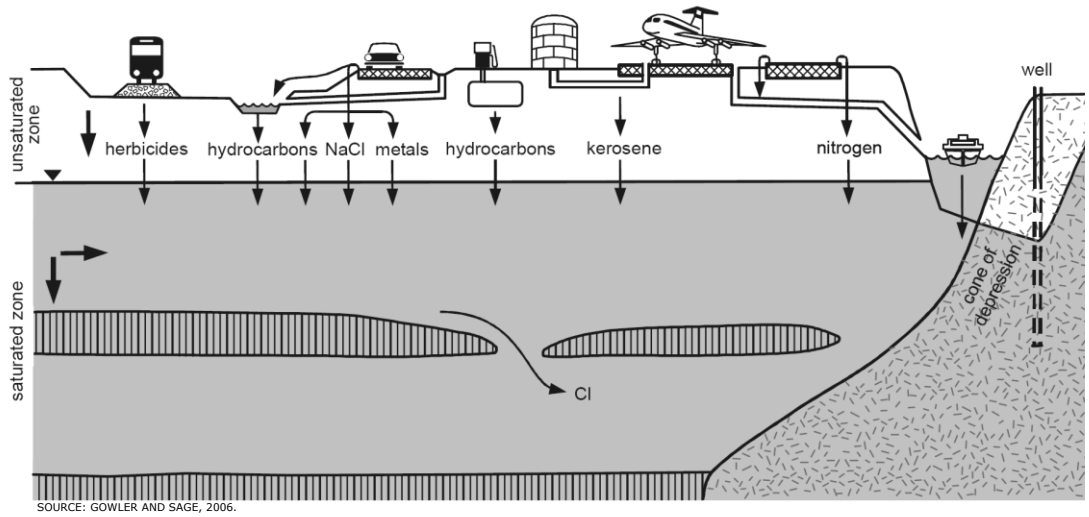
Impacts from Transportation on Roads

The source water protection area for the Town's wells is located within the boundaries of the Town and in the unincorporated areas of Saguache County. Within the town limits, there are about 8 miles of roads, most of which are paved. Highway 285 enters the Town of Saguache from the north-east then runs west and turns south heading out of town. Highway 114 enters the Town from the north-west and intersects Highway 285 within the Town. The roads within the protection area are maintained by the Colorado Department of Transportation (CDOT) and the Town of Saguache.

Groundwater Contaminant Pathways

Motor vehicles, roads and parking facilities are a major source of water pollution to both surface and groundwater. An estimated 46% of US vehicles leak hazardous fluids, including crankcase oil, transmission, hydraulic, and brake fluid, and antifreeze, as indicated by oil spots on roads and parking lots, and rainbow sheens of oil in puddles and roadside drainage ditches. An estimated 30-40% of the 1.4 billion gallons of lubricating oils used in automobiles are either burned in the engine or lost in drips and leaks, and another 180 million gallons are disposed of improperly onto the ground or into sewers. Runoff from roads and parking lots has a high concentration of toxic metals, suspended solids, and hydrocarbons, which originate largely from automobiles (Gowler and Sage, 2006). Storm water runoff over these roads can deliver contaminants from the road surface into the nearby groundwater. Figure 12 below illustrates groundwater contamination pathways from traffic and transport.

Vehicular spills may occur along the transportation route within the source water protection areas from trucks that transport fuels, waste, and other chemicals that have a potential for contaminating the groundwater. Chemicals from accidental spills are often diluted with water, potentially washing the chemicals into the soil and infiltrating into the groundwater. Roadways are also frequently used for illegal dumping of hazardous or other potentially harmful wastes.



SOURCE: GOWLER AND SAGE, 2006.

Figure 12. Most important groundwater contamination pathways from traffic and transport.

Chemical Applications

During the winter season CDOT applies a salt-sand mixture and de-icer (magnesium chloride, M1000, or Ice Slicer) to highways along routes within the source water protection areas. Surface and groundwater quality problems resulting from the use of road de-icers are causing concern among federal, state, and local governments. Salt from the highway is introduced into the groundwater through a number of ways:

1) When runoff occurs from highways, flows are sometimes carried to ditches and unlined channels through which the water infiltrates into the soil and eventually into the groundwater.

2) Also, when snow is plowed together with the salt, the pile that is accumulated on the roadside melts during warmer weathers. The water that results contains dissolved salt which can also infiltrate. Plowing and splashing of salt causes the salt to deposit along the pavement, especially near the shoulders where it melts causing runoff to enter drainage ways and then the groundwater system (Seawell, et al, 1998).

Salt contributes to increased chloride levels in groundwater through infiltration of runoff from roadways. Unlike other contaminants, such as heavy metals or hydrocarbons, chloride is not naturally removed from water as it travels through soil and sediments and moves towards the water table. Once in the groundwater, it may remain for a long time if groundwater velocity is slow and it is not flushed away. Chloride may also be discharged from groundwater into surface water and can account for elevated levels of chloride throughout the year, not just in winter. Thus, regardless of the path that the runoff takes, salt poses a water quality problem.

Transportation Corridor Recommendations:

1. Educate the public on how to respond to a hazardous spill.
2. Work with local emergency response teams to ensure that any spill within the protection areas can be effectively contained.
3. Provide the Colorado Department of Transportation, Town of Saguache Road Department, Saguache County Road and Bridge, and public land managers with a map of the protection area.
4. Encourage the use of proper road BMPs to prevent the transport of road materials into the source waters. Recommendations for application of road deicing materials include:
    - applying minimum amounts necessary;
    - apply only when removal of snow and ice cannot be accomplished by blading, plowing or sanding;
    - minimize use of chemicals in and adjacent to streams, aquifers, and flood prone areas; and
    - avoid dumping or storing chemically treated or sanded snow where it can melt and infiltrate groundwater or flow into surface waters.

PHOTO: COLLEEN WILLIAMS

Figure 13. Placing signage along the road corridor within the source water protection area is one way of educating travelers on how to notify emergency personnel if a contamination should occur.

Mining Activity

Permitted Mines

Thousands of unpatented claims and small exploratory mining operations throughout Colorado exist, most of which were never recorded in state or local government offices. It wasn't until 1973 that the State of Colorado required mines to be permitted. Current mining permit data for the source water protection areas were obtained from the Colorado Division of Mines, Reclamation, and Safety. Within the protection area there are two permitted mining operations, both of which are active sand and gravel operations (Table 8, Fig. 8).

Table 8. Permitted Mines within the Source Water Protection Area

Mines (Operator)	ID Number	Commodities Mined	Permit Status
Airport Pit (Saguache County)	M1977567	Sand and gravel	Active
Coleman Pit (Saguache County)	M1995075	Sand and gravel	Active

SOURCE: COLORADO DIVISION OF RECLAMATION, MINING, AND SAFETY

Abandoned Mine Land

Mining practices during the early days allowed the mine owners to simply abandon their mines without consideration of the impact on streams, water quality, slope stability and safety. Many old mining properties contain abandoned mine workings, mine waste and/or mill tailings. Active and inactive mining operations have a potential to contaminate drinking water supplies from either point source discharges (i.e. mine drainage tunnels or flowing adits) or nonpoint source discharges from run-off over waste rock or tailing piles. Within the source water protection areas there are a number of historic abandoned mines which provided sand and gravel, stone, pumice, lead and silver.

Sand and Gravel Mining

There are a number of active and inactive sand and gravel mining operations within the source water protection area. Sand and gravel operations have a potential to adversely impact ground water quality, both as a result of the extraction process and in site reclamation. Sand and gravel mining within an aquifer recharge area will, at a minimum, increase the vulnerability of an aquifer to be contaminated because it decrease the distance between the ground water table and land surface. In some cases, the excavation actually penetrates shallow aquifers, creating a pond or lake and a direct access to ground water.

The excavation pit and the continual collection and infiltration of wash water raise the potential for other sources of contaminant to migrate to the aquifer. Any chemical contaminants that are allowed to enter the pit via wash water or spills in the area would have quicker access to the aquifer. Once in the ground water, a chemical substance would be free to move with the water in the aquifer (Kitsap, 1997). Possible sources of releases to ground or surface water could include rainwater running off piles of waste or aggregate, leaks and spills from heavy machinery and fuel tanks, the substances used for dust control, water washing discharges at processing plants, and leachate from fill placed in the pits (Greystone, 1999).

Future Mining Activity

There is a potential for the mining of tellurium and geothermal energy in the San Luis Valley. Tellurium is a chemical element primarily used in alloys, foremost in steel and copper to improve machinability (the ease with which a metal can be machined to an acceptable surface finish). Applications in solar panels and as a semiconductor material also consume a considerable fraction of tellurium production (Wikipedia, 2011)

Geothermal Energy Development

The San Luis Valley has been identified as one of the areas in Colorado with the best potential for the development of geothermal energy. Geothermal, or heat energy extracted from the earth, can directly be used to heat buildings or indirectly to generate electricity.

The Bureau of Land Management (BLM) has identified a series of zones beneath the San Juan Mountains on the west side of the Valley as potential hot spots (Fig.14).

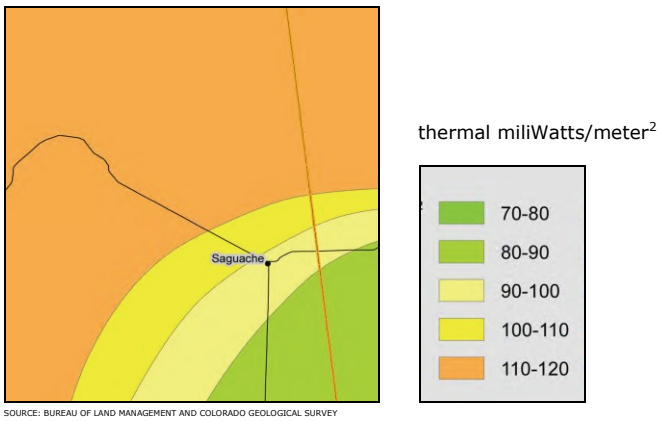


Figure 14. Map of the Geothermal Heat Flow Zones in the vicinity of the SWPA.

The BLM San Luis Valley Public Lands Center, which administers the federal mineral estate in the valley, has started a National Environmental Policy Act (NEPA) analysis of what lands should be open to geothermal leasing and what conditions should govern the development. A leasing program for geothermal would be similar to the one the agency uses for oil and natural gas. Parcels could be nominated for a lease auction, which would include competitive bidding (Richter, 2010). The agency has completed the scoping process in October 2010 in which the public submitted comments and has released the final Scoping Report for the San Luis Valley Geothermal Leasing Analysis Environmental Assessment and Resource Management Plan amendment. The final Environmental Assessment is expected to be completed in 2011. During the scoping process, the concern of impacting water resources was identified as well as the need to develop best management practices to minimize these impacts.

Geothermal resources on Federal and State land are considered a mineral resource, while on all other land in Colorado it is a water resource. However, on Federal and State Land, the medium that brings the heat to the surface is water, and regulated as a water resource. For most purposes geothermal resources are managed in the same manner as groundwater in Colorado. The rights to use this water are subject to State appropriation procedure. These rights are managed by the State Engineer and administered through the Division of Water Resources. A geothermal permit from the BLM in addition to a water use permit from the State Engineer should be obtained for use of a geothermal resource. However, the State Engineer has a mandate to ensure best use of the geothermal resources of the State and may control the quantity of geothermal fluids extracted through the establishment of a Geothermal Management District (Morgan, 2010).

Mining Activity Recommendations:

1. Gather information from the Colorado Department of Reclamation, Mining, and Safety on the status of permitted mines within the source water protection areas.

2. Maintain an inventory of permitted mines within the SWPA and get involved in the review process for mining operation's permits at the State and County level.

3. Participate in the planning and review process for resource management at the Federal and local levels.

Waste Water System

The Town operates a wastewater collection system and wastewater treatment plant (WWTP) which was constructed in 1968 and consists of un-aerated stabilization ponds. The existing collection system consists of approximately 33,000 feet of 6 to 10 inch pipe plus approximately 16,000 feet of service lines. In 2007 the Town received grant funding from the Colorado Department of Local Affairs to update the waste water system including: replacing 1,700 feet of sewer lines and manholes every 330 feet along these new lines; constructing a new building that houses a new flume, data logger and trash rack; updating the chlorination system; and installing a security fence around the WWTP. The Town is currently seeking funding to address issues related to the waste water infrastructure (Saguache, 2011).

Sanitary sewer systems are designed to collect and transport to wastewater treatment facilities the municipal and industrial wastewaters from residences and commercial buildings. Over the years, many of these systems have experience major infrastructure deterioration due to inadequate preventative maintenance and replacement programs. These conditions have resulted in deteriorated pipes, manholes, and pump stations that allow sewage to exit the systems (exfiltration) and contaminate adjacent ground and surface waters (Fig. 13). Untreated sewage often contains high levels of suspended solids, pathogenic microorganisms, toxic pollutants, nutrients, oxygen-demanding organic compounds, oil and grease, and other pollutants (Amick and Burgess, 2000).

Sewer leaks can occur from tree root invasion, soil slippage, seismic activity, loss of foundation due to washout, flooding and sewage back up, among other events. High pressure systems will push leaks to the soil surface where they can be easily detected by sight or odor. Systematic inspection of sewer lines, exclusion of hazardous waste, and adherence to modern construction and maintenance specifications are necessary preventative measures for protection of groundwater sources from sewer leaks.

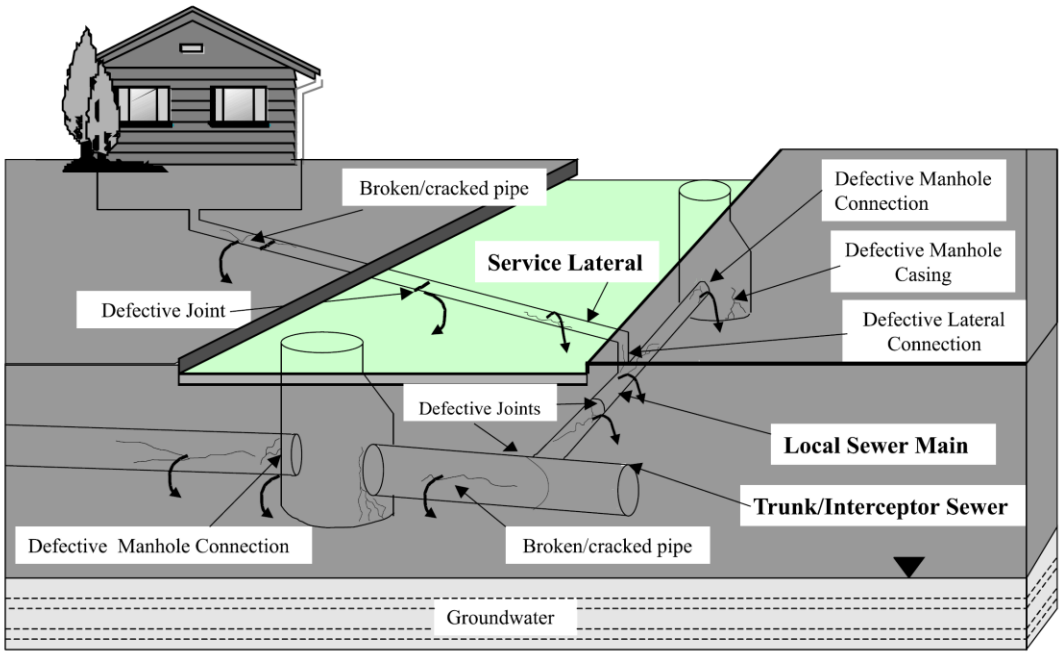


Figure 15. Sanitary sewer system components and exfiltration sources.

Septic Systems

Within the source water protection areas there are properties that rely on septic systems to dispose of their sewage. A septic system is a type of onsite wastewater system consisting of a septic tank that collects all the sewage and a leach field that disperses the liquid effluent onto a leach field for final treatment by the soil.

Septic systems are the second most frequently cited source of groundwater contamination in our country. Unapproved, aging, and failing septic systems have a large impact on the quality and safety of the water supply. The failure to pump solids that accumulate in the septic tank will also eventually clog the lines and cause untreated wastewater to back up into the home, to surface on the ground, or to seep into groundwater. If managed improperly, these residential septic systems can contribute excessive nutrients, bacteria, pathogenic organisms, and chemicals to the groundwater.

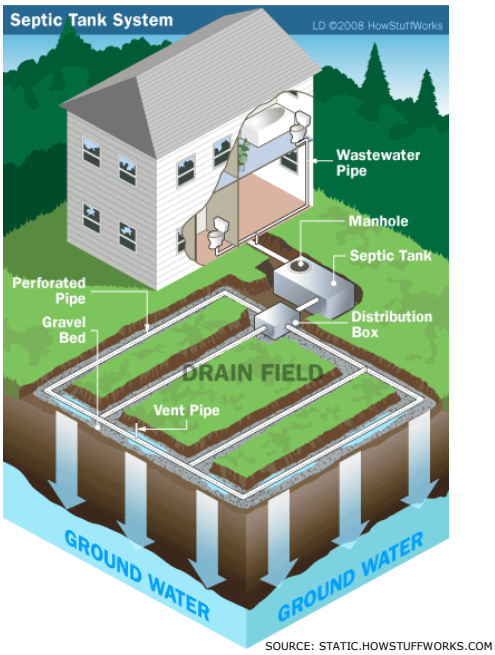


Figure 16. Septic systems are the second most frequently cited source of ground water contamination in our county.

In Saguache County individual sewage disposal systems are permitted by their Land Use Department. The County administers and enforces the minimum standards, rules, and regulations outlined in the state of Colorado's Revised Statutes (CRS 25-10-105). It is unknown at this time the number of septic systems within Saguache County, the number of unapproved systems currently in use and the age of all septic systems in the county. The absence of effective monitoring and education increases the risk of contaminants from septic systems entering the groundwater.

Waste Water and Septic System Recommendations:

1. Ensure proper maintenance of wastewater treatment plant and sewerage system to prevent contamination to groundwater from pipes leaking.

2. Develop an emergency response plan for spills and notification to the public in the event of a spill or broken pipes.

3. Educate the residents of Saguache on the prevention of pollutants entering the sewerage system, the proper use and maintenance of their septic systems, and water conservation measures.

4. Encourage the Town to develop an inventory of non–permitted septic systems in the SWPA and encourage compliance with State regulations.

5. Encourage the County Land Use Department to educate property owners when they apply for a septic permit on the link between good septic practices and protecting groundwater.

Flooding: Stormwater Runoff

Portions of the source water protection areas for Saguache's municipal wells lie within the floodplain. "Floodplain" refers to the 100-year floodplain which is a term used by the Federal Emergency Management Agency (FEMA) and refers to lands adjacent to a waterway that have at least a one percent chance of being covered by a flood in any one year. This also means that there is a 100% chance that these lands will experience flooding over a 100-year period.

Saguache County is at risk to riverine and stormwater flooding. Riverine flooding occurs when a watercourse exceeds its bankfull capacity, generally as a result of prolonged rainfall or rainfall that is combined with soils already saturated from previous rain events. Stormwater refers to water that collects on the ground surface or is carried in the stormwater system when it rains. In runoff events where the amount of stormwater is too great for the system, or if the channel system is disrupted by vegetation or other debris that blocks inlets or pipes, excess water remains on the surface. This water may pond in low-lying areas, often in street intersections. Stormwater ponding, also known as localized flooding, may result in deep water and pollution. Stormwater can pick up debris, chemicals, dirt, and other pollutants from impervious surfaces.

Saguache Creek is the greatest sources of flood hazards to the Town of Saguache. Severe weather events that happen during snowmelt runoff between May and June can cause flooding conditions within the floodplain. In 1999 there was a major flooding event northwest of Saguache. Heavy rains flooded Saguache Creek washing out roads, bridges, houses and farms (Saguache County, 2010).

The Town is currently a member of the National Flood Insurance Program. They have periodically updated their floodplain regulations to keep them current with FEMA standards. In 2007, the Town adopted Ordinance No. 23, Series of 2007 which incorporated the new flood insurance study and maps to be used for floodplain regulations as well as insurance purposes.

Floodway Practices Recommendations:

1. Develop and support regulation that limit development within the 100-year floodplain.
2. Review and update floodplain regulations.
3. Attend NFIP training programs offered by the State.
4. Include flood issues in the Emergency Management Plan.

Agricultural Activities

Nationally, states rank agriculture as the second most prevalent and threatening potential source of contamination for both ground and surface water sources of drinking water. Many studies have shown that water quality guidelines and standards have been exceeded as a result of agricultural activities. Saguache has a rich ranching history dating back nearly 150 years. Today, the town is surrounded by working ranches. These ranches have never caused contamination of the town's water supply, and the current board feels strongly that if best management practices are followed on the surrounding land, the chance of contamination from ranching is virtually nil (Vasha, 2011).

Fertilizer and Weed Abatement

The use of fertilizer and weed abatement on both the land surrounding the Town's wells has the potential to affect the source waters. The two main components of fertilizer that are of greatest concern to source water quality are nitrogen and phosphorus. Nitrogen fertilizer is biologically transformed to nitrate that is highly soluble in water and can readily be absorbed and used by plants. Soluble nitrate is highly mobile and can move with water through the soil. Excess fertilizer use and poor application methods on these fields can cause fertilizer movement into surface and groundwater.

Agricultural Practices Recommendations:

1. Public education to encourage best management practices for agricultural operations to minimize detrimental impacts on the land and water within the source water protection areas. Agricultural BMPs may include the proper application and storage of fertilizers and irrigation techniques that minimize runoff.

Private Water Wells

There are many private water wells within the source water protection areas mostly outside of the Town limits. Contaminants that infiltrate from the surface are more likely to pollute old, shallow, uncased or abandoned wells than deep wells with properly installed casings. Abandoned wells are often an easy and direct route for contaminants to enter the ground water.

Private Water Wells Recommendations:

1. Conduct an inventory of all private wells within the source water protection area and the condition of these wells. Information may be obtained from the State Department of Water Resources and local residents.

2. Provide public education to residents who have private water wells on how they can protect both private and public water supply.

3. Secure and cap wells that are temporarily not being used and permanently cap wells that are abandoned.

Town Drain System

In the spring, many millions of gallons of water stored in the surrounding mountain's snow caps start to flow to the valley bottom. This enormous volume of water raises the ground water level to within five feet of the ground surface in the same timeframe as the seasonal run-off. Area farmers are also using this water to irrigate fields which contributed to the high ground water levels in the Town of Saguache.

In 1990, the Town constructed a groundwater drain system to reduce infiltration from irrigated farmland surrounding the town entering the Town's sewer system. The town drain's perforated pipe lines run in an east to west direction parallel to and about 2 feet lower than the existing sewer mains. The drainage system is located at three different locations in Town, but does not cover the entire town. The drainage system diverts as much as 250,000 gallons of groundwater per day into the Mallone-Sullivan ditch about one half mile east of town (Saguache, 2011) (Pacheco, 2011).

The drainage system also collects the urban stormwater runoff from weather events that flow over yards, driveways, streets, construction and industrial sites within the Town. Urban runoff can pick up fertilizers, dirt, pesticides, oil and grease, and many other pollutants and flow into the Town's drain system. There are also a few businesses within the Town that have floor drains that discharge directly into the ground. It is unknown at this time the number of businesses with floor drains and whether the drainage enters the Town's drain system.

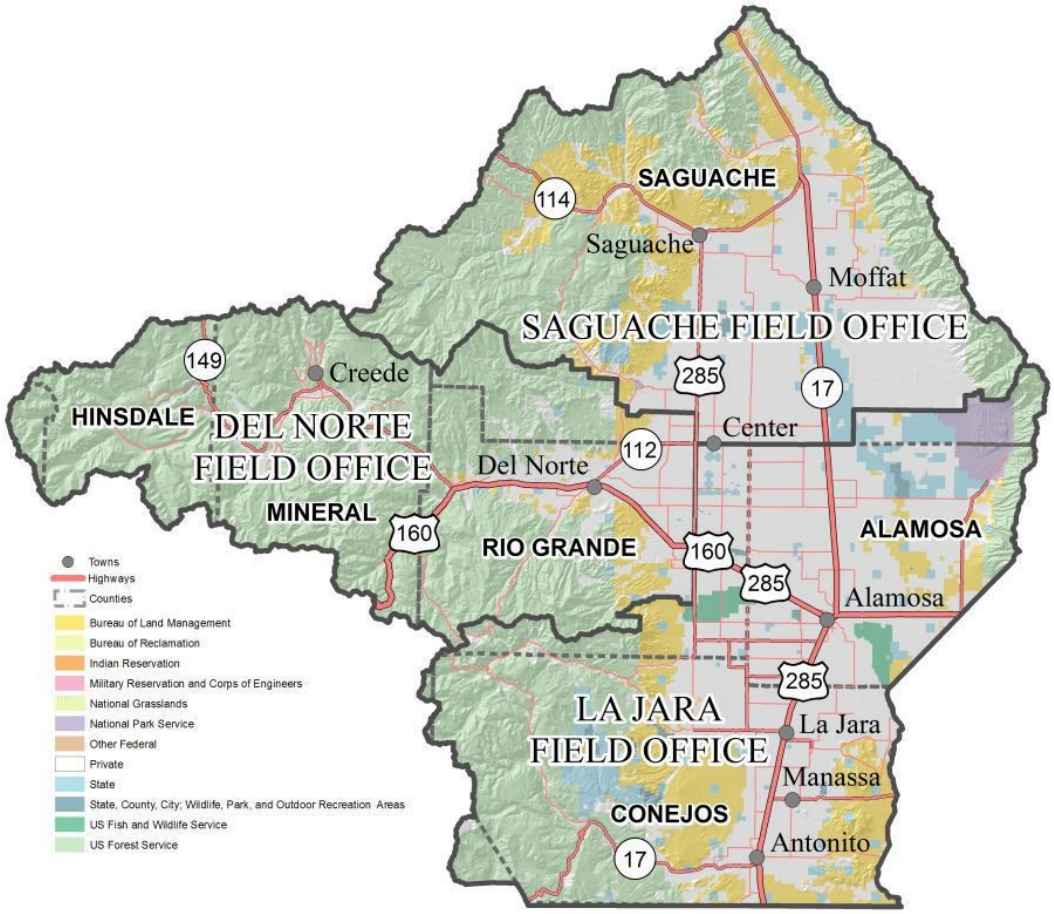
In order to improve the quality of urban stormwater discharges and control pollutants entering the Town's drain system and the groundwater aquifers the following items are recommended below.

Urban Runoff Recommendations:

1. Develop a Plan that specifically identifies deficiencies in the town drain system and prioritized infrastructure improvement projects.
2. Develop and enforce a municipal stormwater discharge ordinance.
3. Prohibit illegal connections and discharges to the town drain system (i.e. floor drains).
4. Contact gas stations within the protection area, obtain their spill prevention plan, and educate them about the importance of preventing petroleum products from washing off their property into the groundwater.
5. Promote public awareness of the hazards involved in the improper discharge of trash, yard waste, lawn chemicals, pet waste, wastewater, grease, oil, petroleum products, cleaning products, paint products, hazardous waste, sediment, and other pollutants into the storm drainage system.

Public Land Management

Public lands within the Secondary Source Water Protection Areas are owned by the federal government with lands managed by the U.S. Department of Agriculture's Forest Service and Bureau of Land Management (BLM). The Forest Service land lies within the Rio Grande National Forest with lands managed by the Saguache Ranger District. The BLM land lies within the San Luis Valley with lands managed by the Saguache Field Office. Both agencies share the Saguache Field Office and jointly manage these public lands.



SOURCE: BUREAU OF LAND MANAGEMENT

Figure 17. Map of the San Luis Valley Public Lands Center Districts.

Contact information"
Saguache Field Office BLM/USFS
46525 Highway 114
Saguache, Colorado 81149
Phone: 719-655-2547
Field Office Manager/District Ranger: Andrew Archuleta

National Forest Management

A principal purpose for which the Forest Reserves (predecessor to the National Forest System) were established was to "secure favorable conditions of water flows". Throughout its history, the Forest Service has had a very diverse and broad mission of multiple use management outlined by the Federal Land Policy and Management Act. This means that they balance outdoor recreation and preservation of wildlife habitat, air and water, and other scenic and historical values with environmentally responsible commercial development of the land and its resources.

One of the long term management goals of the Rocky Mountain Region is to manage the forest for water resources:

"Protect the resource. Maintain, and where opportunities exist, restore watershed and forest health to ensure full watershed function exhibiting high geomorphic, hydrologic, and biotic integrity. Ensure that forest management activities occur in a manner that adequately protects the integrity of watersheds (USFS, 2010)."

At the District level, the Saguache Ranger District adheres to the management directives established under the Revised Land and Resource Management Plan (Forest Plan) for the Rio Grande National Forest. The federal land managers adhere to the principal of multiple-use management outlined by the Multiple Use-Sustained Yield Act and Federal Land Policy and Management Act. This means that they balance outdoor recreation and preservation of wildlife habitat, air and water, and other scenic and historical values with environmentally responsible commercial development of the land and its resources. The Forest Plan identifies the desired condition of the National Forest System land to ensure that "water is suitable for municipal water supplies after normal treatment, including those using shallow alluvial aquifers" and that the water's "chemical, physical, and biological attributes are improved and maintained in a healthy condition, ensuring future use" (RGNF, 2010).

Water Quality Concerns

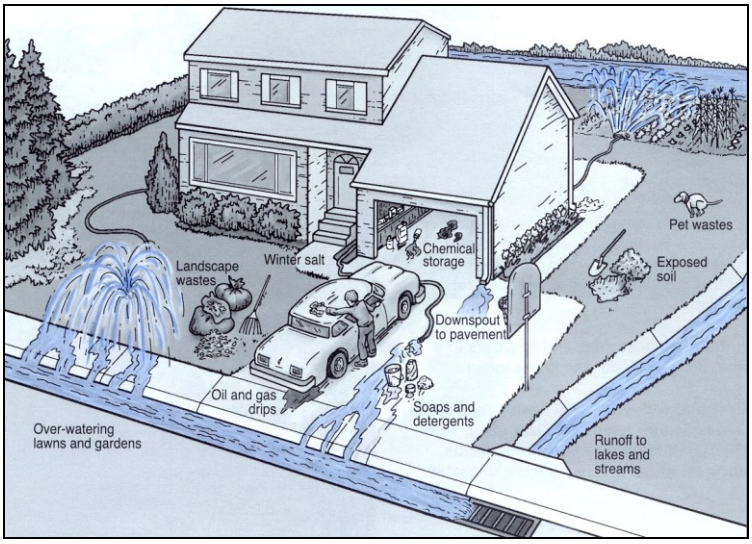
As a drinking water supplier, the Town of Saguache has the potential to be directly affected by land use or public land management activities. Water quality degradation can result from wildfires, timber harvesting, recreation, and transportation, livestock grazing, and mineral extraction. Geothermal energy development was covered in a previous section of this report.

Public Land Recommendations:

1. Keep informed on public land management issues within the source water protection area.
2. Participate in public land planning activities at the district and regional level including: Forest Plan Revisions, Fuels Reduction Plan, Timber Management Plan, and other outreach opportunity.
3. Provide written comments to public land managers on source water protection concerns.
4. Develop partnerships with public land managers.
5. Support efforts to improve watershed conditions (i.e. fuels reduction activities, wildfire assessment, and other reclamation projects).

Residential and Business Practices

The Town of Saguache's Source Water Protection Area includes rural residential dwellings and business facilities that use chemicals in their home or operations. Common household practices may cause pollutants to runoff residential property and enter the surface or groundwater as indicated in the picture below. Prevention of groundwater contamination requires education, public involvement, and people motivated to help in the effort. Public education will help people understand the potential threats to their drinking water source and motivate them to participate as responsible citizens to protect their valued resources.



SOURCE: COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Figure 18. Common household practices may cause pollutants to runoff residential property and enter the surface or groundwater.

Recommendations for Residents:

1. Properly Dispose of Chemicals and Motor Oil – Never pour on the ground, down the drain, or toilet. Participate in household hazardous waste collection events.

2. Use Fertilizers, Herbicides and Pesticides Properly - Apply chemicals according to label instructions and avoid runoff. Do not exceed recommended application rates. Use only if necessary.

3. Properly Dispose of Drugs and Personal Care Products – Pour medications into a sealable plastic bag and add kitty litter, sawdust, coffee grounds, or glue and deposit in the trash along with unused personal care products. Participate in medication drop off campaigns.

4. Dispose of Pet Waste Properly – Flush pet waste down the toilet, put into the garbage, or bury under 8 inches of soil. Pick up your pet waste when walking your dog.

5. Use Water Wisely **–** Check for plumbing leaks, use water-saving showerheads and faucets, water laws morning or evenings, avoid over watering, and direct runoff onto vegetative buffers.

6. Purchase Safer Alternative Products – Choose natural alternatives or Green Products.

SOURCE WATER PROTECTION MEASURES

Management Approaches

The Planning Team reviewed and discussed several possible management approaches that could be implemented within the Source Water Protection Area to help reduce the potential risks of contamination to the community's source water. The Planning Team established a "common sense" approach in identifying and selecting the most feasible source water management activities to implement locally. The focus was on selecting those protection measures that are most likely to work for this project. The Best Management Practices (BMPs) were obtained from multiple sources including: Environmental Protection Agency, Colorado Department of Public Health and Environment, Natural Resource Conservation Service and other source water protection plans.

The Planning Team recommends the management practices listed in Table 9, "Source Water Protection Best Management Practices" be considered for implementation by:

- Town of Saguache
- Saguache County
- Saguache Field Office
- Division of Water Resources
- Citizens of the Town of Saguache
- Rural residents of Saguache County
- Colorado Rural Water Association

Evaluating Effectiveness of Management Approaches

The Town of Saguache 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, consumers, 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. It is further recommended that this Plan be revised at a frequency of once every 3-5 years or if circumstances change resulting in new source water protection areas or new risks are identified (new water source developed or changes in land use).

The Town of Saguache is committed to applying source water assessment and protection principles to find and protect new water sources in the future. This is part of the larger ongoing commitment to providing the highest quality drinking water to their consumers.

The Town of Saguache is 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.

Table 9. Source Water Protection Best Management Practices (BMPs)

Issue	Management Approach	Implementer
Fuels Storage Tanks		
	1. Maintain a current inventory and information on the status of regulated above and underground storage tanks in the source water protection area using the Colorado Storage Tank Information (COSTIS) website at http://costis.cdle.state.co.us. Storage tank information from this site includes: facility, tank, owner, and events.	Steering Committee
	2. Identify Leaking Underground Storage Tank (LUST) events that have occurred within the SWPA using the State's database COSTIS. Contact the Colorado Department of Labor and Employment Division of Oil and Public Safety (303-318-8000) for information regarding LUST events within the SWPA. Contact the Public Records Center for a file review at (303) 318-8521 or (303) 318-8522. Monitor progress on any remedial action conducted for the known contamination sites.	Steering Committee
	3. Develop an inventory of residential or farm unregulated storage tanks within the source water protection area.	Steering Committee
	4. Educate the tank owners on the need to assess their storage system and develop a system that guards against leaks and spills that may potentially contaminate the ground water. Use the "Well-A-Syst" voluntary program from NRCS for information on petroleum storage management.	Steering Committee
Private Water Wells		
	1. Conduct an inventory of all private wells within the source water protection area and the condition of these wells. Information may be obtained from the State Department of Water Resources and local residents.	Steering Committee
	2. Provide public education to residents who have private water wells on how they can protect both private and public water supply.	Steering Committee
	3. Secure and cap wells that are temporarily not being used and permanently cap wells that are abandoned.	Steering Committee

Table 9. Source Water Protection Best Management Practices

Issue	Management Approach	Implementer
Transportation on Roads		
Road Maintenance	1. Keep informed on the road maintenance practices and schedules within the Source Water Protection Area (SWPA) including: grading, de-icing, dust abatement and Best Management Practices used. 2. Provide a copy of the Source Water Protection Plan and map of the protection area to CDOT, Town of Saguache, Saguache County Road and Bridge, and public land managers. Encourage them to use road Best Management Practices to prevent road materials from entering the source waters. Recommendations for application of road deicing materials include: • applying minimum amounts necessary; • apply only when removal of snow and ice cannot be accomplished by blading, plowing or sanding; • minimize use of chemicals in and adjacent to streams, aquifers, and flood prone areas; and • avoid dumping or storing chemically treated or sanded snow where it can melt and infiltrate groundwater or flow into surface waters.	Steering Committee Steering Committee CDOT Town of Saguache Saguache County Road and Bridge
Vehicular spills	1. Meet with Saguache Volunteer Fire Department and the Northern Saguache County Fire Protection District's Hazmat Team to discuss their emergency response plans for responding to vehicular spills within the SWPA. 2. Provide information to the local fire departments: • Importance of the Source Water Protection Plan • Location of the intakes and Source Water Protection Area • Overview of the Emergency Contingency Plan • Personnel to be notified in the event of an emergency	Steering Committee Town of Saguache Steering Committee
Public Education	1. Provide public education to residents and visitors to the SWPA including: • Call "911" to report any spills or illegal dumping within the SWPA on both public and private lands (i.e. signage or brochures) • Proper disposal of vehicular motor oil during oil changes 2. Encourage the community to participate in local hazardous waste disposal events in the county.	Steering Committee Town of Saguache Town of Saguache

Table 9. Source Water Protection Best Management Practices

Issue	Management Approach	Implementer
Land Use		
Land Use Planning and Controls	1. Provide Saguache County with a copy of the Source Water Protection Plan and GIS mapping information of the SWP area and encourage them to overlay this area on their land use maps. 2. Encourage the Town of Saguache and Saguache County Commissioners to consider source water protection when making land use decisions or zoning laws. Land use controls may include: subdivision growth controls, zoning, and land use restrictions. 3. The Town of Saguache will request to be notified by Saguache County officials of land use hearings or meetings regarding land within the Secondary SWPA and will have the opportunity to participate in the process.	Colorado Rural Water Association Town of Saguache Town of Saguache Town of Saguache
Land Transfers	1. Steering Committee will keep informed of land acquisitions within the SWPA and provide information to new residents on the source water protection area.	Steering Committee
Land Conservation	1. Work with local land trust groups in the SWPA to educate landowners about conservation easements on their land.	Steering Committee
Watershed Protection District	1. Provide information to the Saguache Town Council on the opportunity of protecting the drinking water source for the Town through the use of an ordinance that develops a watershed district.	Colorado Rural Water Association
Mining		
	1. Gather information from the Colorado Department of Reclamation, Mining, and Safety on the status of permitted mines within the source water protection areas. 2. Maintain an inventory of permitted mines within the SWPA and get involved in the review process for mining operation's permits at the State and County level. 3. Participate in the planning and review process for resource management at the Federal and local levels	Steering Committee Town of Saguache Steering Committee Town of Saguache

Table 9. Source Water Protection Best Management Practices

Issue	Management Approach	Implementer
Agricultural Activities		
Public Outreach and Communication	1. Maintain an open dialog with the agricultural users within the protection area in order to encourage stewardship of their lands to protect the quality of the groundwater. 2. Public education to encourage best management practices for agricultural operations to minimize detrimental impacts on the land and water within the Secondary Source Water Protection Area. Agricultural BMPs may include the proper application and storage of fertilizers and irrigation techniques that minimize runoff. 3. Education techniques may include: workshops, mailings and community meetings/workshops, demonstration projects, and site visits by NRCS Field Office.	Town of Saguache Steering Committee NRCS and Farm Organizations Steering Committee NRCS
Funding Opportunities	1. Explore funding opportunities and provide residents within the SWPA with information on funding opportunities for cost sharing to implement the agricultural BMPs on their land (i.e. Environmental Quality Incentive Program). 2. Provide information to agricultural users on the opportunity of conserving their lands under the Conservation Reserve Program.	Steering Committee NRCS Steering Committee Farm Service Agency
Floodway Practice		
	1. Develop and support regulation that limit development within the 100-year floodplain. 2. Review and update floodplain regulations. 3. Attend NFIP training programs offered by the State. 4. Include flood issues in the Emergency Management Plan.	Town of Saguache Town of Saguache Town of Saguache Town of Saguache

Table 9. Source Water Protection Best Management Practices

Issue	Management Approach	Implementer
Residential Practices		
Public Education and Outreach	1. Conduct public education and outreach programs for SWPA residents to encourage practices that will protect their drinking water source. Topics may include: source water protection, household hazardous waste storage and disposal, fertilizer usage, pet waste cleanup, water conservation, car washing, and secondary containment for above ground fuel storage tanks. 2. Opportunities for public education include: newspaper articles, poster displays at local utility offices and public buildings, water bill inserts, flyers, creek festivals, public forums, workshops and community events.	Steering Committee Town of Saguache
Hazardous Materials	1. Educate the community about proper disposal of any hazardous materials including: local waste oil, solvents, lubricants, and degreasers, etc., and encourage collection and recycling of used oil, batteries, tires, and agricultural chemical containers. 2. Encourage participation in local household hazardous water collection program for residents within the SWPA.	Town of Saguache Town of Saguache
Facilities Practices		
	1. Develop an inventory of facilities within the SWPA that use hazardous chemicals in their operations. 2. Provide facilities with information about the source water protection plan, the location of their facility within the protection area, and how they can use BMPs to prevent chemicals from contaminating the groundwater source.	Steering Committee Steering Committee
Old Town Dump		
	1. Keep informed on the monitoring the methane gas at the old Town Dump. 2. Develop an inventory of groundwater wells in the vicinity of the dump and their water quality data.	Steering Committee Steering Committee

Table 9. Source Water Protection Best Management Practices

Issue	Management Approach	Implementer
Municipal Utility		
Water Supply Intakes	1. Perform regular inspection of the wellheads. 2. Protect areas around intakes with fencing and signage.	System Operators System Managers
Water Operations	1. Ensure that the water treatment plant is properly managed, operated and maintained to prevent contamination of the drinking water. 2. Ensure that all employees are familiar with the Source Water Protection Plan, emergency and contingency plan, and hazardous spill response.	System Managers System Managers
Public Education	1. Provide Information concerning the SWPP in the annual Consumer Confidence Report (CCR). Insert an additional letter or paragraph in the CCR of their presence within the protection area and information on how they can help prevent pollutants from entering the source waters.	Town of Saguache
Town Drain System		
	1. Develop a Plan that specifically identifies deficiencies in the town drain system and prioritized infrastructure improvement projects. 2. Develop and enforce a municipal stormwater discharge ordinance. 3. Prohibit illegal connections and discharges to the town drain system (i.e. floor drains). 4. Contact gas stations within the protection area, obtain their spill prevention plan, and educate them about the importance of preventing petroleum products from washing off their property into the groundwater. 5. Promote public awareness of the hazards involved in the improper discharge of trash, yard waste, lawn chemicals, pet waste, wastewater, grease, oil, petroleum products, cleaning products, paint products, hazardous waste, sediment, and other pollutants into the town drain system.	Town of Saguache Town of Saguache Steering Committee Steering Committee

Table 9. Source Water Protection Best Management Practices

Issue	Management Approach	Implementer
Public Lands Management		
	1. Keep informed on public land management issues within the source water protection area.	Town of Saguache
	2. Participate in public land planning activities at the district and regional level including: Forest Plan Revisions, Fuels Reduction Plan, Timber Management Plan, and other outreach opportunity.	Steering Committee Town of Saguache
	3. Provide written comments to public land managers on source water protection concerns.	Steering Committee
	4. Develop partnerships with public land managers.	Town of Saguache
	5. Support efforts to improve watershed conditions (i.e. fuels reduction activities, wildfire assessment, and other reclamation projects).	Steering Committee
Wastewater Systems		
Sewerage system	1. Ensure proper maintenance of wastewater treatment plant and sewerage system to prevent contamination to groundwater from pipes leaking.	Town of Saguache
	2. Develop an emergency response plan for spills and notification to the public in the event of a spill or broken pipes.	Town of Saguache
	3. Educate the residents of Saguache on the prevention of pollutants entering the sewerage system.	Town of Saguache
	4. Encourage water conservation measures in the community.	Town of Saguache
Septic systems	1. Educate the public on the proper use and maintenance of their septic system to prevent groundwater contamination.	Steering Committee
	2. Encourage the Town to develop an inventory of non–permitted septic systems in the SWPA and encourage compliance with State regulations.	Steering Committee
	3. Encourage the County Land Use Department to educate property owners when they apply for a septic permit on the link between good septic practices and protecting groundwater.	Steering Committee

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APPENDICES

Emergency/Contingency Plan *

Source Water Assessment Report and Appendices

Meeting Attendance Roster

Meeting Agendas and Minutes

Contact List of Stakeholders

Presentations

Citizen Guides

Miscellaneous Maps and Reports

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Glossary

*Notice: This public document will only include information that is not deemed sensitive to the safety and operation of the individual community's water plan operation. Appendices marked with a * are only included in the Public Utility's report or kept on file at their office. All other documents are included on the CD located in the back pocket of this report. All documents can be reprinted.*