

# DENVER WATER SOURCE WATER PROTECTION PLAN FOR THE UPPER SOUTH PLATTE RIVER

November 2015



**COLORADO**  
Department of Public  
Health & Environment

 **DENVER WATER**

**Source Water Protection Plan  
for the  
Upper South Platte River  
CO0116001  
Surface Water Sources**

**Park, Douglas, Jefferson, and  
Teller Counties, Colorado**

**Denver Water  
1600 W. 12<sup>th</sup> Ave.  
Denver, CO 80204**

**Prepared in Collaboration with the  
Coalition for the Upper South Platte**

**November 2015**

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

*– Margaret Mead*

*When the well is dry, we know the worth of water*

*– Benjamin Franklin*

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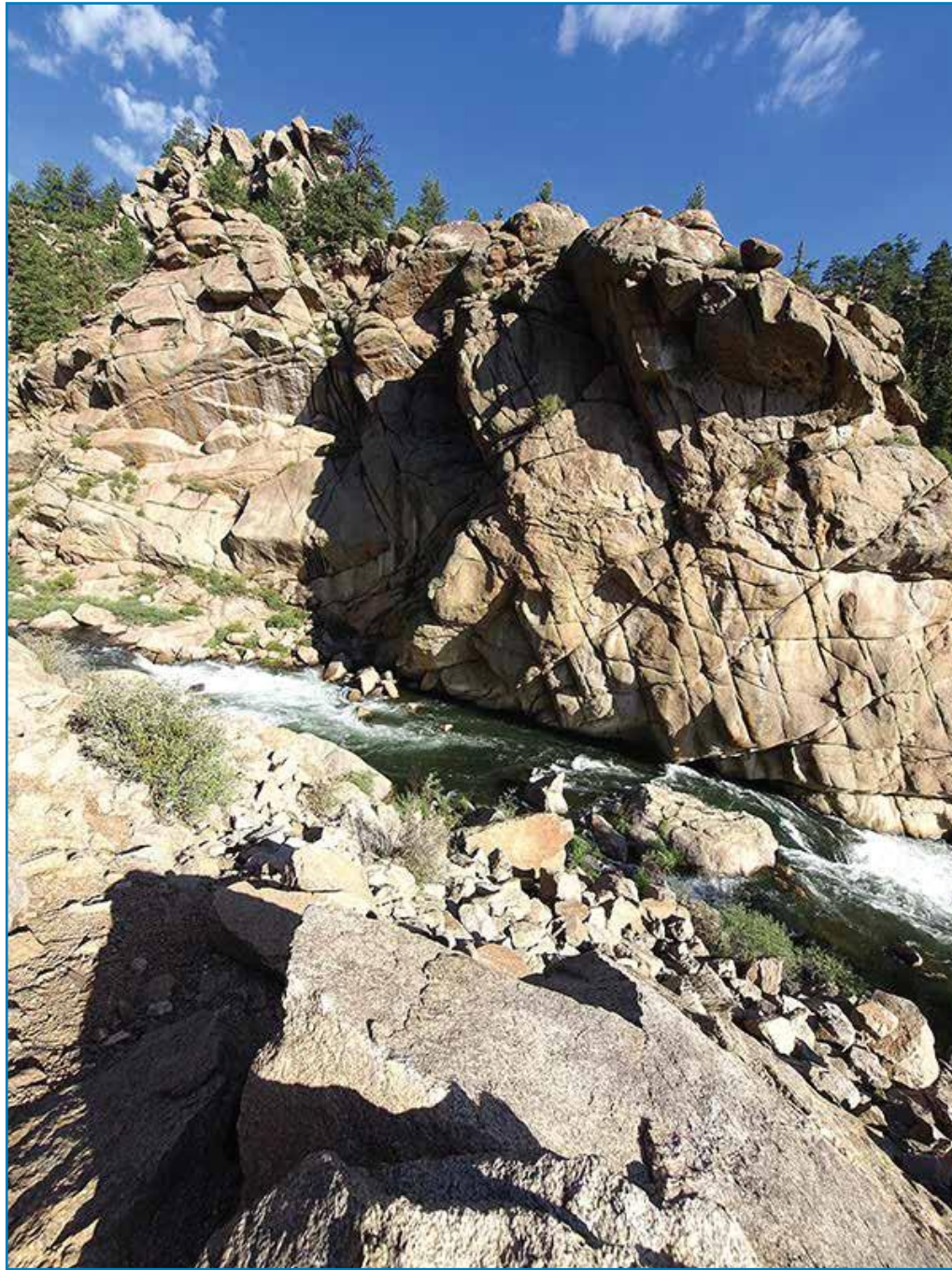
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# 1.0 EXECUTIVE SUMMARY

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## 1.0 EXECUTIVE SUMMARY

Denver Water recognizes the importance of watershed health and source water protection and has been actively working in the Upper South Platte River watershed for more than a century. Denver Water chose to prepare its first formal Source Water Protection Plan (SWPP) for the Upper South Platte River (USPR) watershed. Denver Water chose the USPR watershed as a trial for future SWPPs on other watersheds in Denver Water's supply system because it provides water to many residents of Colorado's Front Range, including Denver Water's 1.3 million customers. It is also the largest of Denver Water's source water watersheds (2,600 square miles). Denver Water intends to use experience gained in the preparation of this plan to inform other source water protection planning efforts.

The potential financial and water supply risks of possible contamination of Denver Water's water sources are a concern to water suppliers in the Upper South Platte River watershed and downstream cities reliant upon water from the Upper South Platte River. While the water quality analyses conducted by both the Colorado Department of Public Health and Environment (CDPHE) and Denver Water show the Upper South Platte River watershed has high quality water, there is a need to continually work to protect water quality. This SWPP was developed utilizing a Steering Committee and stakeholders from the watershed to prioritize source water protection concerns and to identify local source water management approaches that can be implemented to protect source water. The source water assessment results supplied by the CDPHE were used as a starting point in developing the SWPP.

The Steering Committee for this planning effort was created to reach a broad base of stakeholders in the watershed and consists of staff members from water suppliers including Denver Water and Aurora Water; CDPHE coordinators; staff from Park, Teller, Jefferson and Douglas counties; staff from federal agencies including the USFS, BLM and EPA; staff from the nonprofit Colorado Trout Unlimited; members of the Center of Colorado Water Conservancy District; a well-informed citizen of the Upper South Platte Watershed; and Coalition for the Upper South Platte staff. The Denver Water Upper South Platte River Source Water Protection Steering Committee (Steering Committee) recommended adopting a Source Water Protection Area (SWPA) that is similar to the source water assessment area defined by the CDPHE, only including the Upper South Platte River watershed. The source water protection area defines the region where the Steering Committee has chosen to implement its source water protection measures. The chosen source water protection measures attempt to reduce the susceptibility of their source water to potential contamination.

The Steering Committee adopted a two-step strategy recommended by the CDPHE for prioritizing the water sources and potential contaminant sources of focus for the protection measures. The first step of the strategy prioritized the water sources based on their total contaminant susceptibility and physical setting vulnerability scores. The second step prioritized the potential contaminant sources based on (1) their prevalence, (2) the potential threat they pose, or (3) a combination of prevalence and potential threat. Using this strategy, the Steering Committee recommended focusing source water protection measures on both the most prevalent and threatening discrete contaminant sources and the most prevalent dispersed contaminant sources in the source water protection area.

Voluntarily implementing source water management approaches provides an additional level of protection to the drinking water supply by taking preventive measures at the local level (i.e., county and municipal level) to protect the source water. The Steering Committee reviewed and discussed a number of source water management approaches that could be implemented within the source water protection area to help reduce the potential risks of contamination from the prioritized potential contaminant sources. The Steering Committee established acceptance criteria as part of identifying and selecting the most feasible source water management approaches to implement locally.

The Steering Committee recommended specific source water best management practices to be implemented by Denver Water, watershed partners, state and federal regulatory agencies, and local governments including the Park, Teller, Jefferson and Douglas county planning commissions. The topic areas the Steering Committee focused on are listed below:

- Onsite Wastewater Treatment Systems (OWTS)
- Agriculture Practices
- Oil & Gas Exploration
- Transportation: Roads and Maintenance
- Transportation: Emergency Response and Hazardous Waste
- Forest Health
- Mine Drainage and Uranium Development
- Hydro-Geomorphic Issues
- Monitoring
- GIS/Mapping
- Outreach & Education

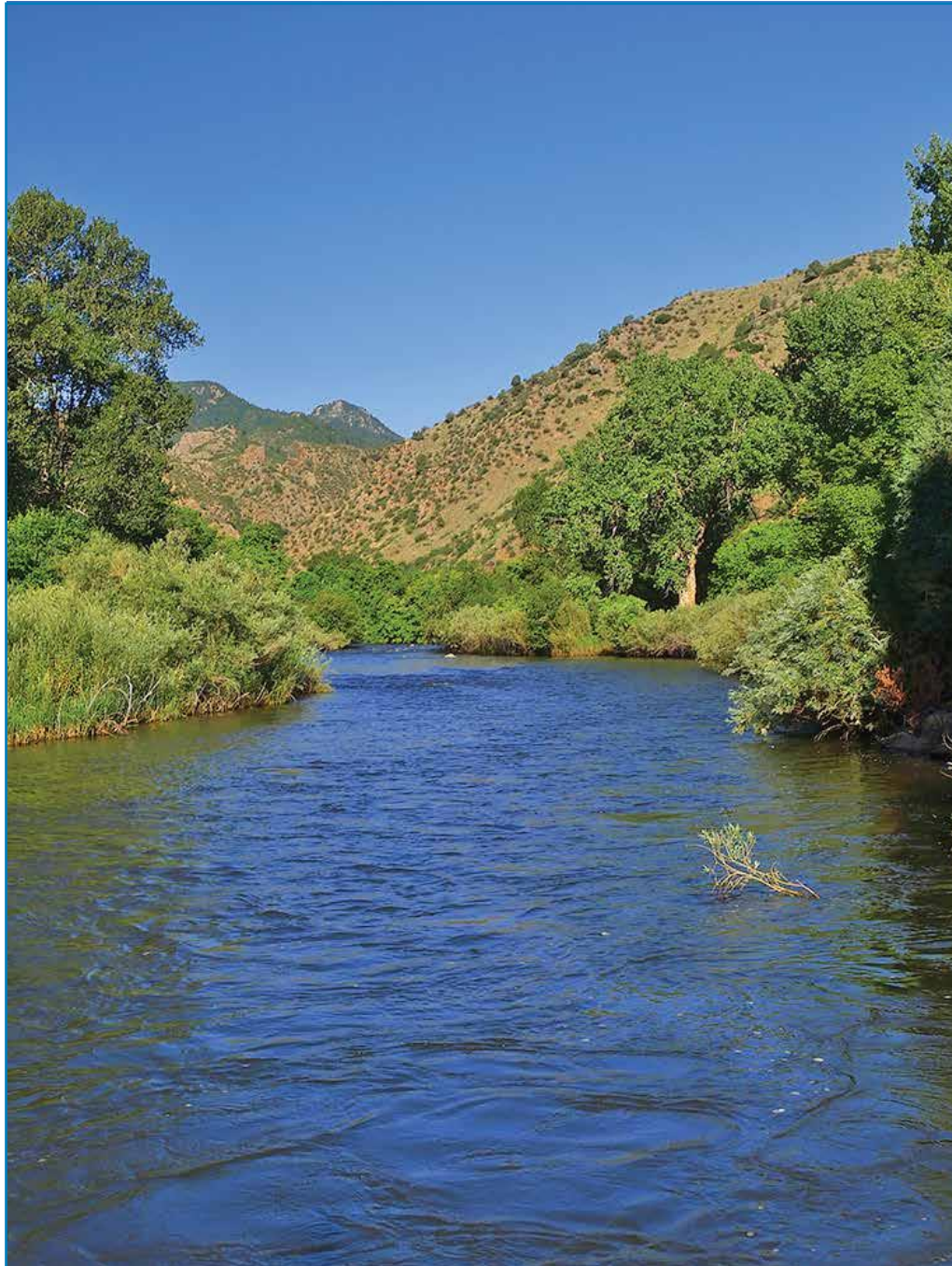
Denver Water, the Coalition for the Upper South Platte (CUSP) and the Steering Committee will work to implement this plan in order to maintain high quality water and reduce the need for additional water treatment costs in the future. The Steering Committee estimates it will cost approximately \$495,500 in time and materials to implement these management approaches. Funding to cover these costs will come from a broad base of funding sources and will consist primarily of in-kind donations of time and materials. Implementation of these management approaches began on June 30, 2015 and is ongoing.

Denver Water voluntarily commits to work with the counties within the Upper South Platte Watershed through a Memorandum of Understanding (MOU). Within this MOU (attached in Exhibit A), Denver Water commits to share resources including GIS spatial data on the delineated SWPA, share information on SWPP implementation and update the counties annually on progress. Additionally, Denver Water commits to develop SWPPs for other watersheds within their collection system. Specifically, Denver Water will create a SWPP for the Fraser River Watershed. Lastly, Denver Water commits to assist the CDPHE in refining their plans and mentoring other utilities creating SWPPs.



# 2.0 OVERVIEW OF COLORADO'S SWAP PROGRAM

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## 2.0 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 (WQCD), an agency of the CDPHE, assumed the responsibility of developing Colorado's SWAP program. The SWAP program protection plan is integrated with the existing Colorado Wellhead Protection Program that was established in amendments made to the federal Safe Drinking Water Act (SDWA, Section 1428) in 1986. Wellhead protection is a preventative concept that aims to protect public groundwater wells from contamination. The Wellhead Protection Program and the SWAP program have similar goals and combine protection efforts into one merged program plan.

Colorado's SWAP program is an iterative, two-phased process (Figure 1) designed to assist public water systems in preventing potential contamination of their untreated drinking water supplies. The two phases include the Assessment Phase and the Protection Phase as depicted in the upper and lower portions of Figure 1, respectively.

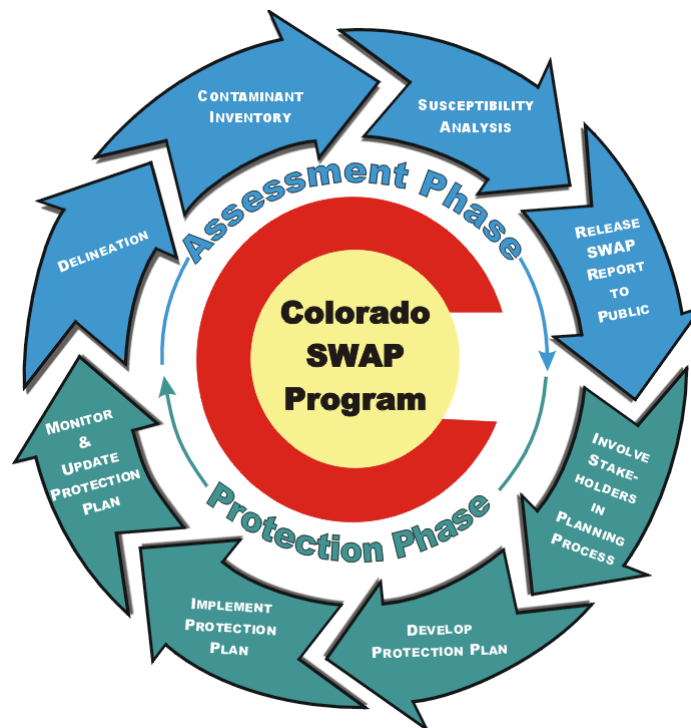


Figure 1. Source Water Assessment and Protection Process

## **2.1 Source Water Assessment Phase**

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

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

The Assessment Phase involves understanding which potential contaminant sources threaten the Upper South Platte River Watershed and how close the water source is to specific potential contamination sources. The susceptibility of an individual water source is analyzed by examining the properties of its physical setting (e.g. proximity of potential contaminant sources to the water source) and potential contaminant source threats. The resulting analyses report an estimate of how susceptible each water source is to potential contamination.

## **2.2 Source Water Protection Phase**

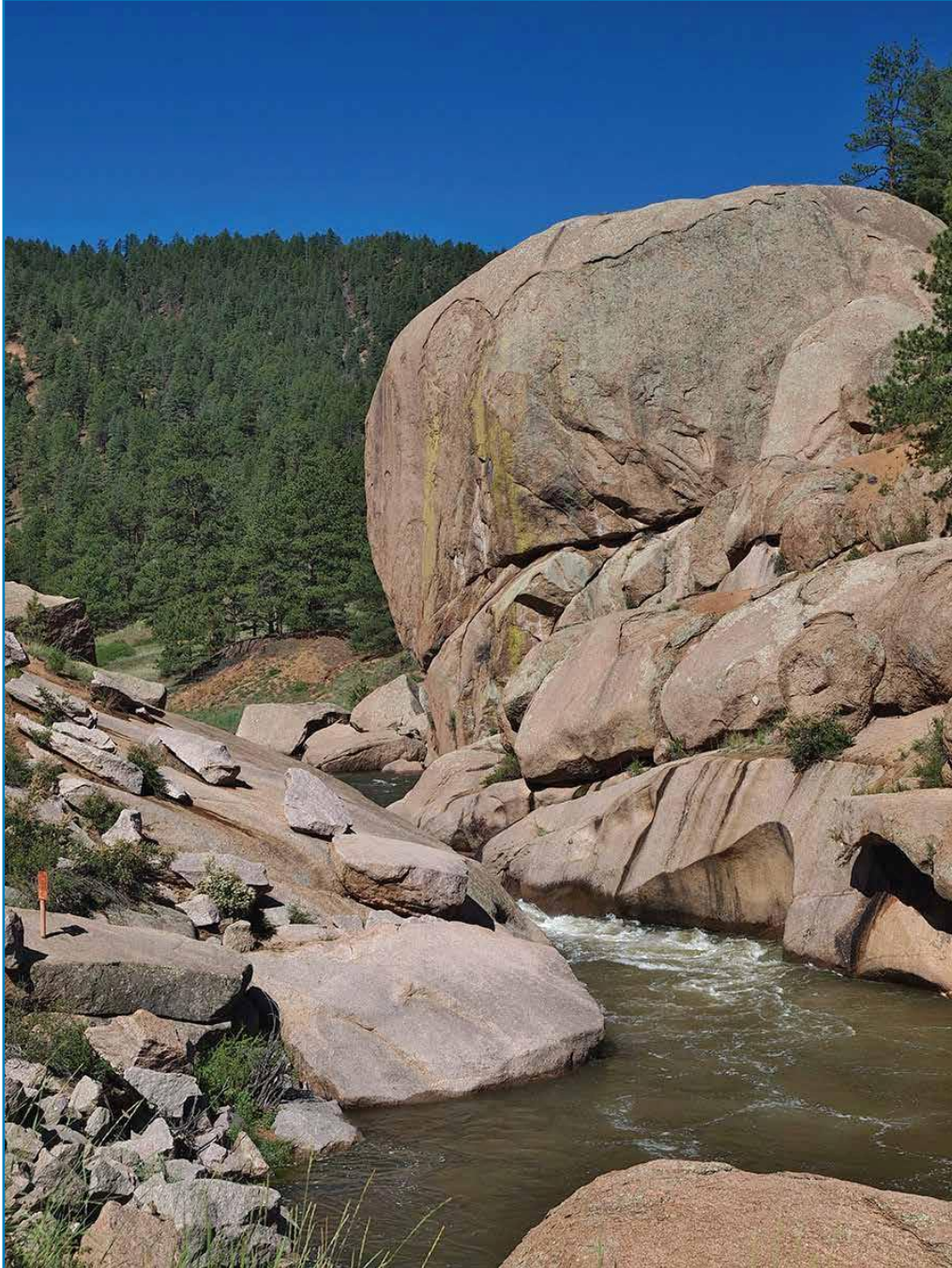
The Protection Phase is an ongoing process in which the Steering Committee has encouraged voluntary implementation of preventive measures to protect the water supply from the potential sources of contamination to which it is most susceptible. The Protection Phase aids in avoiding unnecessary treatment 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, in addition to other pertinent information, as a starting point to develop a protection plan. As depicted in the lower portion of Figure 1, the source water protection phase for all public water systems consists of four primary elements.

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

The water system and the community recognize that the Safe Drinking Water Act grants no statutory authority to the Colorado Department of Public Health and Environment or to any other state or federal agency to force the adoption or implementation of source water protection measures. This authority rests solely with local communities and governments. The source water protection phase is an iterative process as indicated in Figure 1. The evolution of the SWAP program is to incorporate any new assessment information provided by the public water supply systems and update the protection plan

# 3.0 OVERVIEW OF PLANNING PROCESS

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## 3.0 OVERVIEW OF PLANNING PROCESS

### 3.1 Purpose of Source Water Protection

Denver Water's existing water treatment plants are fed by watersheds with relatively high quality water; consequently, the probability of needing to add advanced treatment technologies to these plants in the 20-year budgeting period is considered to be low. However, should advanced treatment be needed, it will be expensive. Cost estimates range from \$1 to \$1.8 billion depending on the technology. Avoiding technology upgrades through Source Water Protection Planning is anticipated to cost much less. Source Water Protection Planning can also protect water supply health by proactive management of lands damaged by fire, acid mine drainage, energy extraction practices and land development regulations that ensure storm water quality and proper sanitation. For all of Denver Water's watersheds, Denver Water has been working to improve water quality monitoring and evaluation, participate in watershed groups and lobby for increased protection of drinking water sources.

In 2012, Denver Water selected the Upper South Platte River Watershed for its first preliminary water quality assessment and used it to develop a standard watershed evaluation approach that can be applied to the remaining watersheds. The watershed is more than 2,600 square miles and reaches from the Continental Divide to Strontia Springs Reservoir, southwest of Denver. It varies in elevation from about 6,000 feet to more than 14,000 feet above sea level and contains five major municipal and several smaller reservoirs. The watershed is geographically the largest of Denver Water's source water watersheds and provides municipal water for approximately three quarters of Colorado's residents. Additionally, it is a recreational mecca with more than 1.6 million acres of public lands, renowned for its "gold-medal" fishing streams and is home to numerous threatened and endangered species.

Denver Water hired ARCADIS in December 2012 to evaluate the water quality data for the Upper South Platte River in close collaboration with Denver Water staff and Jim C. Loftis, Ph.D. Professor in the Civil and Environmental Engineering Department at Colorado State University. The results from the water quality assessment demonstrated that the Upper South Platte Watershed is generally in good health and that water quality has been stable or improving over the last 10 years.

Denver Water's formal Upper South Platte Watershed Source Water Protection Planning process was initiated in 2013. The plan was developed as part of a collaborative process convened by Denver Water, facilitated by the Coalition for the Upper South Platte (CUSP), and funded by the CDPHE through the Colorado Source Water Assessment and Protection program. The planning process and final plan are designed to provide municipal water providers and public consumers with information about drinking water, as well as provide a way for water providers and community members to get involved in protecting the quality of their drinking water. The program encourages community-based protection and preventive management strategies to ensure public drinking water resources are kept safe from future contamination.

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

Denver Water recognizes the financial and water supply risks for water suppliers dependent upon the Upper South Platte River Watershed for safe, reliable drinking water. In an effort to address the potential problems that could affect this source water, Denver Water, WQCD and CUSP appointed a Steering Committee. The Denver Water Upper South Platte River Source Water Protection Steering Committee (Steering Committee) identified local source water management approaches to be voluntarily implemented in an effort to reduce the risks of potential contamination of the untreated source water.

The primary reason for developing and implementing source water management approaches is to apply an additional level of protection to the drinking water supply. Preventive measures at the local level (i.e., county and municipal) may aid in the protection of the source water. These preventive measures will complement existing regulatory protection measures implemented at the state and federal levels by filling protection gaps that can only be addressed at the local level.

The source water protection plan identifies the source water protection area where the community has chosen to implement its source water protection measures. In addition, the protection plan establishes a strategy for prioritizing the water sources and potential contaminant sources to which the source water management approaches will be applied. The strategy is based on the source water assessment results for the Upper South Platte River as a starting point from which these priorities were identified. The protection plan also identifies the source water management approaches and associated tasks that will be implemented within the source water protection area. In addition, the expected outcome of the tasks, how achievements are measured and the proposed schedule and costs for implementation are included in this report. The funding sources to sustain these approaches and tasks are also identified.

In addition to the source water protection plan, an emergency response plan or contingency plan was independently developed by Denver Water as part of the overall source water management effort. The emergency response plan lays out a coordinated plan for responding rapidly, effectively and efficiently to any emergency incident that threatens or disrupts the community water supply. A summary of the emergency plan is attached in Exhibit B.

### ***3.3 Protection Plan Process Guidance***

The following table is a reference document Denver Water (which in this case acts as the Public Water System (PWS)), CHPHE and CUSP used to effectively plan and develop a source water protection planning process for the Upper South Platte River watershed. More detailed instructions are provided in each section throughout the document.

**Table 1. Process Steps for Developing a Source Water Protection Plan**

<b>Task</b>	<b>Output</b>	<b>Responsible Party</b>
Review SWAP assessment results	Report of findings & recommendations	PWS, CDPHE, CUSP
Report findings to decision makers	Formal presentation to decision makers	PWS, CDPHE, CUSP
Advocate for developing protection plan	Formal endorsement of decision makers	PWS, CDPHE, CUSP
Explore feasibility of partnering with other PWSs in watershed (if applicable)	Determination of partnering with other PWSs	PWS, CDPHE, CUSP
Appoint Steering Committee to advise	Steering Committee	PWS, CDPHE, CUSP
Outline planning process to follow	Planning Process	Steering Committee, PWS, CUSP
Develop schedule for planning process	Planning Schedule	Steering Committee, PWS, CUSP
Decide on public involvement process	Public Involvement Process	Steering Committee, PWS, CUSP
Produce and distribute plan	Protection Plan	Steering Committee, PWS, CUSP

### **3.4 Public Participation and Steering Committee Establishment**

Public participation has been important to the overall success of Colorado’s SWAP program. Source water protection was founded on the concept that informed citizens, equipped with fundamental knowledge about their drinking water source and the threats to it, will be the most effective advocates for protecting this valuable resource. The state successfully used voluntary citizen advisory groups in the development of both the wellhead protection and source water assessment and protection program plans.

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

### **3.5 Steering Committee and Participants**

Denver Water, the Colorado Department of Public Health and Environment and the Coalition for the Upper South Platte appointed a Steering Committee for the design and development of the source water protection plan for the Upper South Platte River watershed. Table 2 below



lists the members of the Steering Committee that was established for the Upper South Platte River.

**Table 2. Upper South Platte River Source Water Protection Steering Committee Members**

<b>Name</b>	<b>Role/Responsibility</b>	<b>Title</b>	<b>Affiliation</b>
Sarah Dominick	Water Supplier	Water Resource Engineer	Denver Water
John Duggan	Coordination	SWAP Coordinator	CDPHE
Kristen Hughes	Coordination	Source Water Protection Specialist	CDPHE
Mike McHugh	Water Supplier	Environmental Permitting Coordinator	Aurora Water
Tom Eisenman	County Government	County Administrator	Park County
Sheila Cross	County Government	County Planner	Park County
Aaron Doussett	County Government	Environmental Health Officer	Teller County
Patrick O'Connell	County Government	County Geologist	Jefferson County
Garth Englund	County Government	Special Projects Engineer	Douglas County
Randy Hickenbottom	Federal Government	District Ranger, South Platte Ranger District	USFS
David Gilbert	Federal Government	Fishery Biologist	BLM
Peter Ismert	Federal Government	Healthy Watersheds Program	EPA
David Nickum	Nonprofit	Executive Director	CO Trout Unlimited
Dan Drucker	Water Conservation District	Operations Manager	CCWCD
Chris Fuller	Water Conservation District	Board Director	CCWCD
Darcy Campbell	Informed Participant	Retired EPA	Citizen
Carol Ekarius	Coordination	Executive Director	CUSP
Amy Jacobi	Coordination	Communications & Education Coordinator	CUSP
Helen Dyer	Coordination	Development & Outreach Director	CUSP

CCWCD – Center of Colorado Water Conservancy District

BLM – Bureau of Land Management

EPA – Environmental Protection Agency

USFS – U.S. Forest Service

The source water protection planning process attracted interest and participation from many other key entities. Input by these entities was greatly appreciated and was instrumental in developing the source water protection plan.

## OTHER PARTICIPANTS

Brian Banks – USFS  
Ramon Castro – ABE  
Nancy Herzog – Interested Individual  
Eric Howell – Colorado Springs Utilities  
Marcella Huchinson – EPA  
Edward Kochman – ABE  
Beth Nielson – CUSP  
Mark Platten – Colorado State University  
Dylan Eiler – Colorado Rural Water  
Association  
Suzanne O’Neill – ABE & CWF  
Kim Gortz – Colorado Springs Utilities  
Peter Milonas – CO State Land Board  
Stephanie Thomas – Palmer Land Trust  
Joel Jones – URS Corp  
Paula Daukas – Denver Water  
Christine Schuyler-Rossie – Denver Water  
Keith Berger – BLM  
Gregory Oberley – EPA  
Judy Bloom – EPA  
Jay Raiford – BLM  
Erik Anderson – CO State Land Board  
Aaron Richter – BLM  
Nathan Elder – Denver Water  
Holly Huyak – CDOT  
Josh Voorhis – USFS  
Jeff Underhill – USFS  
Jeremy Allen – Denver Water

Don Moore – Jefferson Conservation District  
Bob O’Connor – Park County Environmental  
Health  
Kate Carney – COWC  
Tricia Pfeiffer – EPA  
David Kurz – CDPHE  
John Smeins – BLM  
Afshan Andesha – Denver Water  
Ben Berlinger – NRCS  
John Woodward – CCA  
Steve Ryder – CO Department of Agriculture  
Jerry Strahan – BLM  
Oscar Martinez – USFS  
John Dow – USFS  
Andrew Casper – COGA  
Jara Johnson – CUSP  
Kyle Hamilton – CH2M Hill  
Gary Vanderslice – Lytle Water Solutions  
Carrie Adair – CUSP  
Diego Portillo – Denver Water  
Linda Rosales – Denver Water  
Bob Baltz – Denver Water  
Ian Babson – Denver Water  
Katie Knoll – Denver Water  
Peter Gallagher – Fin-Up Inc.  
Tim Galvin – Owner, Underground Solutions  
Terrance O’Neill – ABE/CWF

ABE – Advisory Board on the Environment (Park County)  
CWF – Colorado Wildlife Federation  
COGA – Colorado Oil & Gas Association  
CCA – Colorado Cattlemen’s Association

### 3.6 Protection Plan Development Process

The source water protection planning effort consisted of a structured process of work group meetings followed by public meetings. The Steering Committee’s recommendations were developed from these work group meetings that were convened to establish the goals and objectives of the protection plan, evaluate the source water assessment results, establish protection priorities, and evaluate source water management approaches. Ultimately, the Steering Committee’s recommendations were incorporated into a draft source water protection plan and presented at 10 public meetings for comment and discussion. A summary of the public meetings that were held is presented below in Table 3, and detailed meeting information can be found in Exhibit C.

**Table 3. Description of Public Meetings**

Date	Location	Purpose / Description
12/14/13	Deckers Community Center, Deckers, CO	Onsite Wastewater Treatment Systems (OWTS)
02/14/14	Deckers Community Center, Deckers, CO	Agricultural Practices and Issues
03/14/14	Fairplay Community Center, Fairplay, CO	Oil and Gas Exploration and Extraction Issues (Part 1)
04/11/14	Fairplay Community Center, Fairplay, CO	Oil and Gas Exploration and Extraction Issues (Part 2)
05/09/14	Fairplay Community Center, Fairplay, CO	Transportation (Part 1)
06/13/14	Deckers Community Center, Deckers, CO	Transportation (Part 2)
08/08/14	Denver Water, Three Stone Buildings, Denver, CO	Forest Health
11/14/14	Deckers Community Center, Deckers, CO	Uranium and Mine Drainages
12/12/14	Denver Water, Three Stone Buildings, Denver, CO	Hydro-Geomorphic Issues
04/10/15	Denver Water, Board Room, Denver, CO	GIS and Mapping

The general public was notified of the public meeting schedule prior to each meeting — location, dates and times via targeted outreach to key stakeholders, posting on the CUSP webpage and calls for participation through contact networks. An invitation to attend and participate in these public meetings was extended to the entire community and to residents of unincorporated Park, Teller, Jefferson and Douglas counties who are served by the Upper South Platte River or potentially affected by the source water protection plan as well as residents within the watershed area of Denver Water.



# 4.0 WATER SUPPLY SETTING

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## 4.0 WATER SUPPLY SETTING

### 4.1 Hydrogeographic and Water Quality Setting – Surface Water Systems

The Upper South Platte River is one of the sources that supplies drinking water to the residents within the service area of Denver Water as well as other public utilities and private users both in the watershed and on the Front Range of Colorado. Denver Water serves approximately 1.3 million people and is predominantly a metropolitan community.

The Upper South Platte River watershed conveys water native to both the South Platte River and Blue River watersheds. Water is diverted from the Blue River watershed via the Roberts Tunnel to the North Fork of the South Platte River. It should be noted however that for the purpose of this source water protection plan, only the South Platte River watershed is assessed. The Blue River watershed has already developed and implemented a source water protection plan. The Upper South Platte River is primarily fed directly from snowmelt and diversions through the Roberts Tunnel. Elevations within the source water area range from 5,512 feet near Kassler, Colorado to 14,271 feet at Mt. Evans. The climate within the source water area includes alpine forests, high elevation grasslands and lower elevation forests with annual average precipitation ranging from less than 12 inches to greater than 30 inches.

The water quality of the untreated source water is measured against various use classifications and water quality standards that are established and periodically reassessed by the Colorado Department of Public Health and Environment and the Water Quality Control Commission for Colorado's rivers and streams. Currently, most of the stream segments located above Denver Water's intakes are classified to protect drinking water use. For the stream segments with a drinking water use classification, drinking water standards have been established for the constituents in Table 4.

**Table 4. Constituents with Established Drinking Water Standards**

Physical & Biological	Inorganic	Metals
Dissolved Oxygen, pH and E. Coli	Residual Chlorine, Free Cyanide, Boron, Nitrite, Nitrate, Chloride, Total Phosphorous and Sulfate	Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Uranium and Zinc

These stream standards are a reflection of known water quality conditions, as well as historic land uses within the Upper South Platte River watershed. Drinking water classifications and associated water quality standards provide public water systems and communities with a mechanism for monitoring and protecting the quality of their source water.

## ***4.2 Drinking Water Supply Operation***

Denver Water maintains and operates a water system that serves the residents of Denver, Colorado and the surrounding communities and businesses within the Denver Water service area. The water system is operated by employees of Denver Water.

Denver Water utilizes an intake at Strontia Springs Reservoir and one just downstream in Waterton Canyon located southwest of Denver to get water from the Upper South Platte River watershed into its system. The raw water diverted from the surface water intakes is sent to two surface water treatment plants (Foothills and Marston) to be treated prior to distributing the drinking water to the water system's customers. The treatment systems have a maximum capacity to treat a total of 500 million gallons of drinking water per day (MGD) (280 MGD at Foothills Water Treatment Plant and 220 MGD at the Marston Water Treatment Plant). Once the water is treated at any of Denver Water's three water treatment plants (Foothills, Marston and Moffat), it becomes part of an integrated water system and is treated as one. Its storage and distribution is not separated by the source from where the water supply originated. The water system stores untreated source water in multiple storage reservoirs prior to treatment and stores its treated water in 24 storage tanks within the drinking water distribution system. Denver Water has the maximum capacity to store 374.7 million gallons of treated drinking water in reservoirs alone and 671.4 million gallons in the distribution system as a whole.

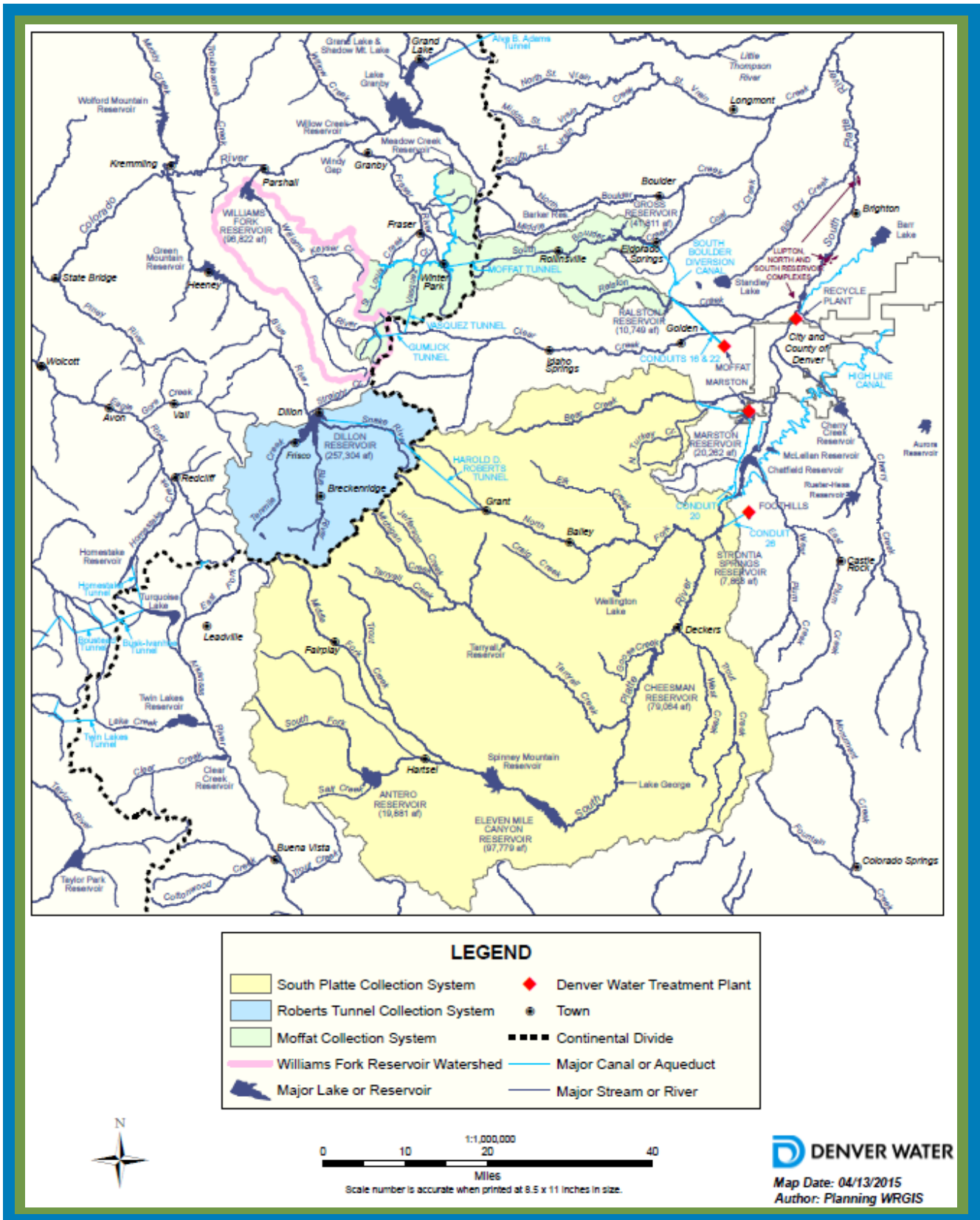


Figure 2. Denver Water Collection System.





### ***4.3 Water Supply Demands and Analysis***

The water system serves an estimated 313,035 potable connections, approximately 100 recycled water connections and approximately 1.3 million residents and other users in the service area annually. The water system currently has the capacity of meeting a peak (i.e., maximum) daily demand of 685 MGD. Current estimates by the water system indicate that the average daily demand by the water system's customers is approximately 185 MGD (averaged over 2008-2013), and that the average peak daily demand is approximately 374 MGD (averaged over 2008-2013). Using these estimates, the water system has a surplus average daily demand capacity of 500 MGD and a surplus average peak daily demand capacity of 311 MGD (calculations shown in Exhibit D). Using the surplus estimates above, Denver Water 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 Denver Water may not be able to meet the average daily or the average peak daily demand of its customers if the Upper South Platte River watershed became disabled for an extended period of time. This is especially important to plan for since three quarters of Denver Water's water supply flows through the Upper South Platte River watershed. The ability of Denver Water 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 becomes disabled.

The potential financial and water supply risks related to the long-term disablement of one or more of its water sources are a concern to Denver Water. While it is hard to quantify, it is estimated to cost \$1.7 billion to replace the water lost if Denver Water could no longer rely on the USPR as a water supply source. As a result, the Steering Committee and Denver Water believe the development and implementation of a source water protection plan for the Upper South Platte River watershed can help to reduce the financial risks posed by potential contamination of its water source.

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

The latest census information indicated a population of 1.3 million for the Denver Water service area. Based on the latest and previous census information, Denver Water has been experiencing an increase in population growth within the community and future projections estimate that the population will continue to grow. However, increased population does not directly correlate to increased water usage, as shown in the figures below. Figure 4 shows that until the mid-1960s, water use and population grew at approximately the same rate. Just after that, the population continued to grow at the same rate, but water use spiked dramatically. Water use remained fairly steady for the following 30 years and then dropped in 2000 and has remained consistently lower, despite continued population increase. Figure 5 shows that maximum day water use has decreased since 1985. The inability to accurately predict water use based on population growth underscores the challenges associated with predicting future water use. As a result of this uncertainty, it is vital to protect the water sources that Denver Water has in order to prepare for multiple water use scenarios and provide the ability to quickly adapt to changes if water use suddenly diverges from its prediction.

Currently, the majority of the land area within the proposed source water protection area for its water source is currently undeveloped. However, some of this undeveloped land is currently zoned for development in the future. Denver Water estimates the breakdown of land ownership within the proposed source water protection area as follows: private ownership (37 percent), state or federal ownership (59 percent), local city or county ownership (2 percent) and water system ownership (2 percent).

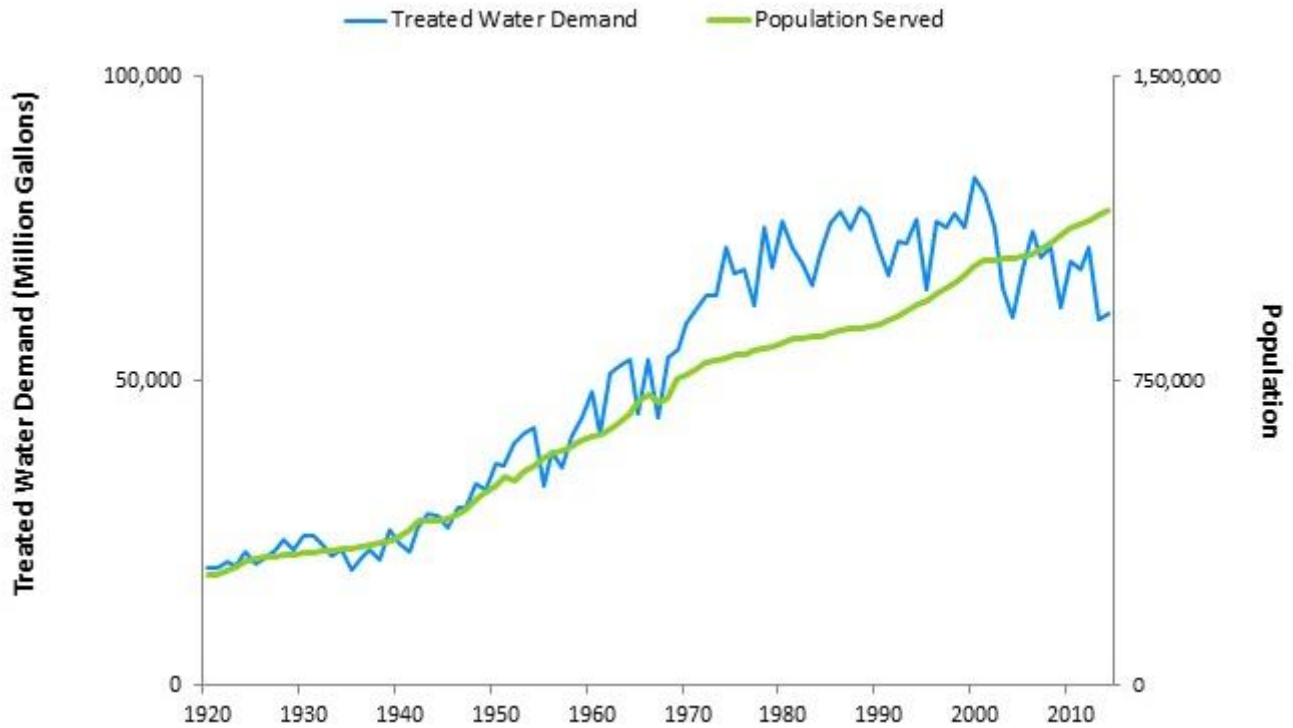
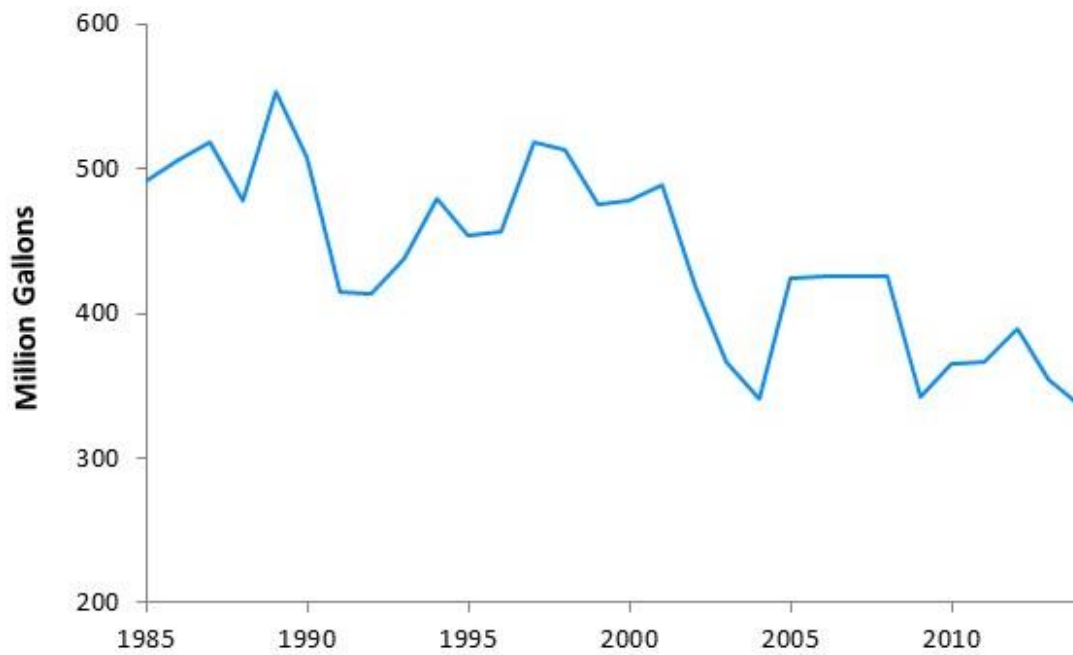


Figure 4. Denver Water treated water demand and population curves for 1920-2014.

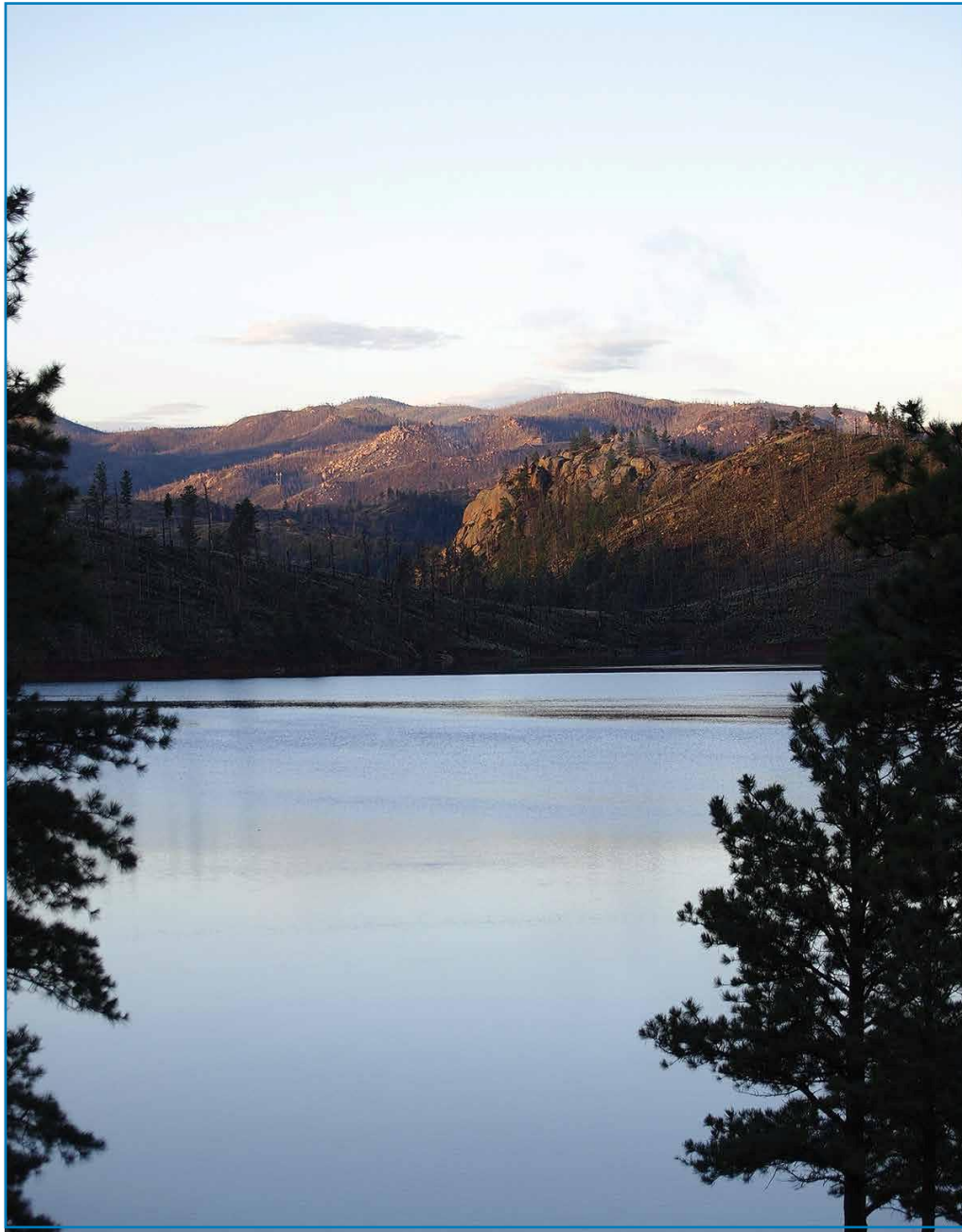


**Figure 5. Denver Water yearly maximum day water use.**



# 5.0 SOURCE WATER ASSESSMENT RESULT

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## 5.0 SOURCE WATER ASSESSMENT RESULTS

The Colorado Department of Public Health and Environment assumed the lead role in conducting the initial source water assessments for public water systems in Colorado. Denver Water received their source water assessment report in November 2004 and has reviewed the report along with the Steering Committee. Denver Water and the Steering Committee are committed to using these results as a starting point to guide the development of appropriate management approaches to protect their source water from potential contamination. A copy of the source water assessment summary report for the Upper South Platte River watershed can be obtained by contacting Denver Water or by downloading a copy from the Colorado Department of Public Health and Environment's SWAP program website at: [www.cdphe.state.co.us/wq/sw/swaphom.html](http://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.

### 5.1 Source Water Assessment Area Delineation – Surface Water Systems

The source water assessment area provided to Denver Water from the Colorado Department of Public Health and Environment includes portions of the following watersheds: Upper South Platte, Blue, Frying Pan, Eagle, Arkansas, Fraser, Williams Fork, South Boulder and Ralston. For the purpose of this plan for the Upper South Platte, the area consists of approximately a 2,600-square-mile area draining the Upper South Platte River watershed. The Colorado Department of Public Health and Environment provided Denver Water with a draft map of their source water assessment area (Figure 6) and asked them to voluntarily review and comment on its accuracy.

The delineated source water assessment area not only provides the basis for understanding where the community's source water and potential contaminant threats originate, but also provides the basis for establishing the source water protection area under this source water protection plan. Further discussion is provided in a later section on the source water protection area that was established under this plan.

### 5.2 Contaminant Source Inventory

*Notice to readers:*

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

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

completed by mapping the potential contaminant sources with the aid of a Geographic Information System (GIS).

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

#### Discrete Potential Sources of Contamination

The contaminant source inventory results for the Upper South Platte River watershed indicate the following types of discrete contaminant sources were identified within the source water assessment area for all of the surface water sources analyzed:

- EPA Abandoned Contaminated Sites (CERCLA)
- EPA Hazardous Waste Generators (HWLQG, HWSQG, HWTSD)
- EPA Chemical Inventory/Storage Sites (SARA)
- EPA Toxic Release Inventory Sites (TRI)
- Permitted Wastewater Discharge Sites (PCS)
- Aboveground, Underground and Leaking Storage Tank Sites (TANKFAC)
- Solid Waste Sites (SWSITE)
- Existing/Abandoned Mine Sites (MASMIL)
- Other Facilities (OGFAC, PSWFB, SIC, WHP)

#### Dispersed Potential Sources of Contamination

The contaminant source inventory results for the Upper South Platte River watershed indicate the following types of dispersed contaminant sources were identified within the source water assessment area for all of the surface water sources analyzed:

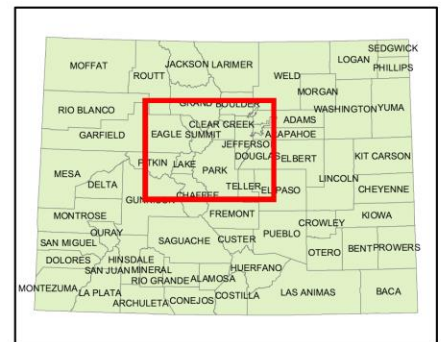
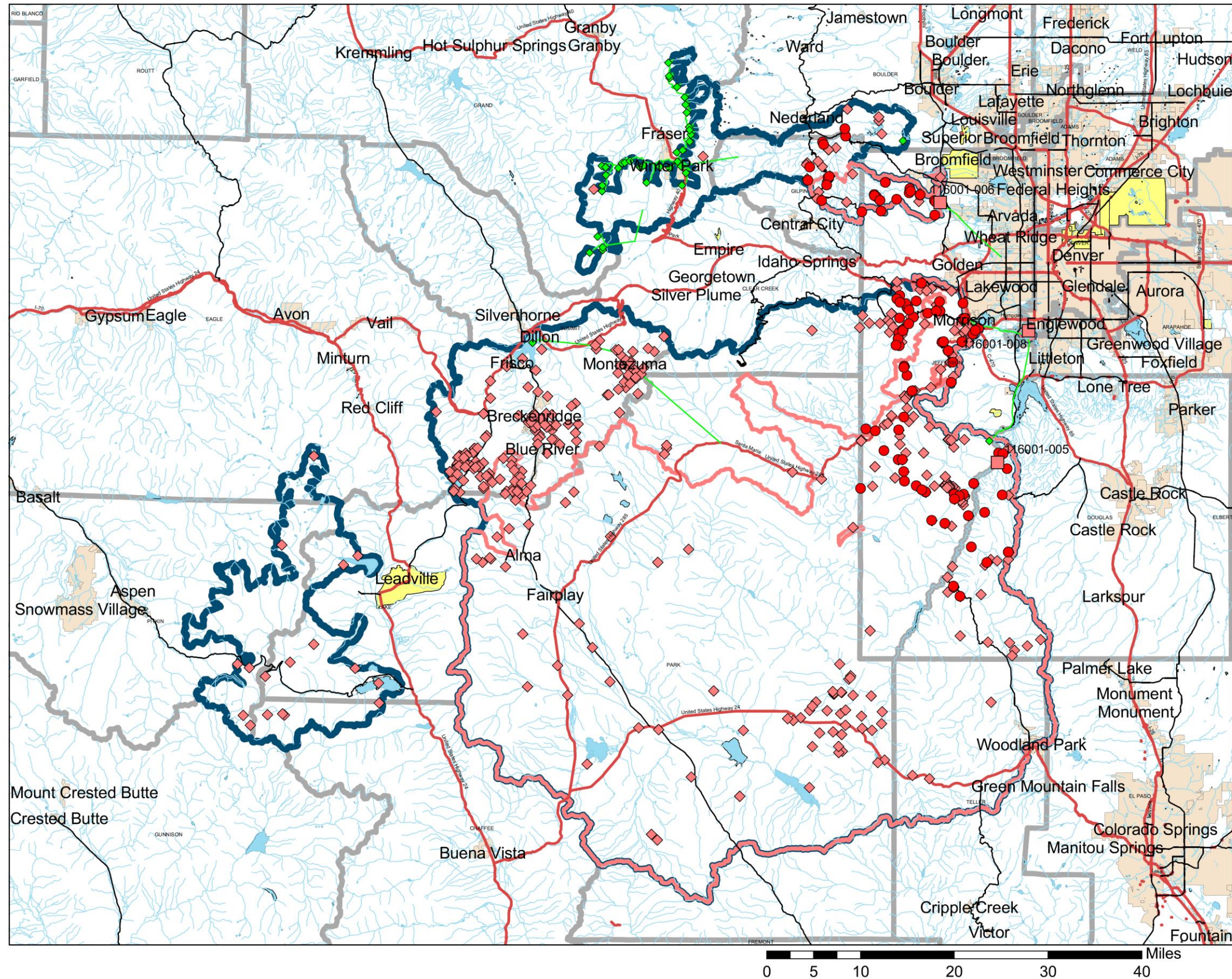
##### *Land Uses:*

- Commercial/Industrial/Transportation
- Low Intensity Residential
- Urban Recreational Grasses
- Quarries/Strip Mines/Gravel Pits
- Row Crops
- Fallow
- Pasture/Hay
- Deciduous Forest
- Evergreen Forest
- Mixed Forest

##### *Other Types:*

- Septic Systems
- Oil & Gas Wells
- Road Miles





**COLORADO SWAP**  
 Susceptibility Analysis Results  
 for Discrete Contaminant Sources

Public Water System Name:  
 DENVER WATER BOARD

Public Water System ID:  
 CO0116001

November 2004

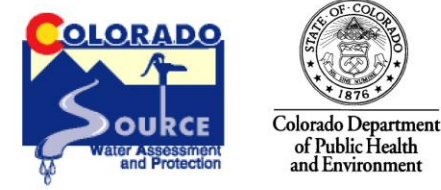
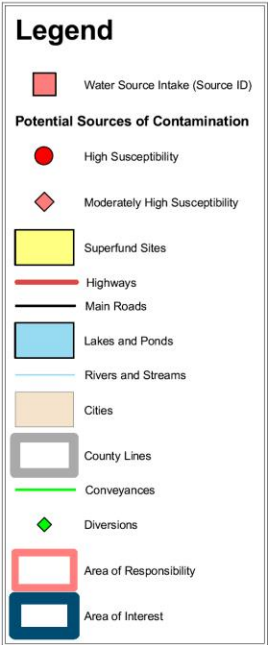


Figure 6. SWAP for Denver Water.



### **5.3 Source Water Protection Priority Strategy and Susceptibility Analysis**

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

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

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

Most prevalent contaminant sources: Under this option, protection measures would be focused on the discrete and dispersed contaminant sources that occur most frequently in the water system's source water protection area, regardless of the individual susceptibility ratings they may have received.

Most threatening contaminant sources: Under this option, protection measures would be focused on the individual discrete and dispersed contaminant sources in the water system's source water protection area to which the water source is most susceptible. The most threatening contaminant sources are defined as any potential contaminant source receiving a Moderately High or High individual susceptibility rating.

Most prevalent and threatening contaminant sources: Under this option, protection measures would be focused on the most frequently occurring discrete and dispersed contaminant sources in the water system's source water protection area that received a Moderately High or High individual susceptibility rating.

In applying this strategy, the Steering Committee recommends focusing source water protection measures on the Upper South Platte River watershed, and the most prevalent and threatening discrete contaminant sources and the most prevalent dispersed contaminant sources contained in the source water protection area for this water source. The Steering

Committee chose to solely look at the most prevalent dispersed contaminant sources because there were no threatening sources in the Upper South Platte River watershed.

Table 5 outlines the water sources that the community and the Steering Committee feel should be prioritized based on the assessment susceptibility results. The potential contaminant sources for the Upper South Platte River watershed is listed in Table 5 according to the adopted priority strategy (i.e., most prevalent, most threatening, most prevalent and threatening).

**Table 5. Source Water Protection Priority Strategy and Susceptibility Results**

SOURCE ID	CO0116001-005
Source Name	Strontia Springs Res Intake
Source Type	SW
Total Susceptibility Rating	Moderately High
Physical Setting Vulnerability Rating	Moderately Low

MOST PREVALENT AND THREATENING DISCRETE CONTAMINANT SOURCES (cumulative count for all		MOST PREVALENT DISPERSED CONTAMINANT SOURCES	
EPA Superfund Sites	0	Commercial/Industrial/Transportation	X
EPA Abandoned Contaminated Sites	3	High Intensity Residential	
EPA Hazardous Waste Sites	2	Low Intensity Residential	X
EPA Chemical Inventory/Storage Sites	6	Urban Recreational Grasses	X
EPA Toxic Release Inventory Sites	0	Quarries/Strip Mines/Gravel Pits	X
Permitted Wastewater Discharge Sites	0	Row Crops	X
Aboveground, Underground and Leaking Storage Tanks	20	Fallow	X
Solid Waste Sites	2	Small Grains	
Existing/Abandoned Mine Sites	336	Pasture/Hay	X
Confined Animal Feeding Operations	0	Orchards/Vineyards/Other	
Other Facilities of Concern	19	Deciduous Forest	X
<b>TOTAL</b>	<b>388</b>	Evergreen Forest	X
		Mixed Forest	X
		Septic Systems	X
		Oil/Gas Wells	X
		Road Miles	X
		<b>TOTAL</b>	<b>13</b>

## 5.4 Susceptibility Analysis

Notice to readers:

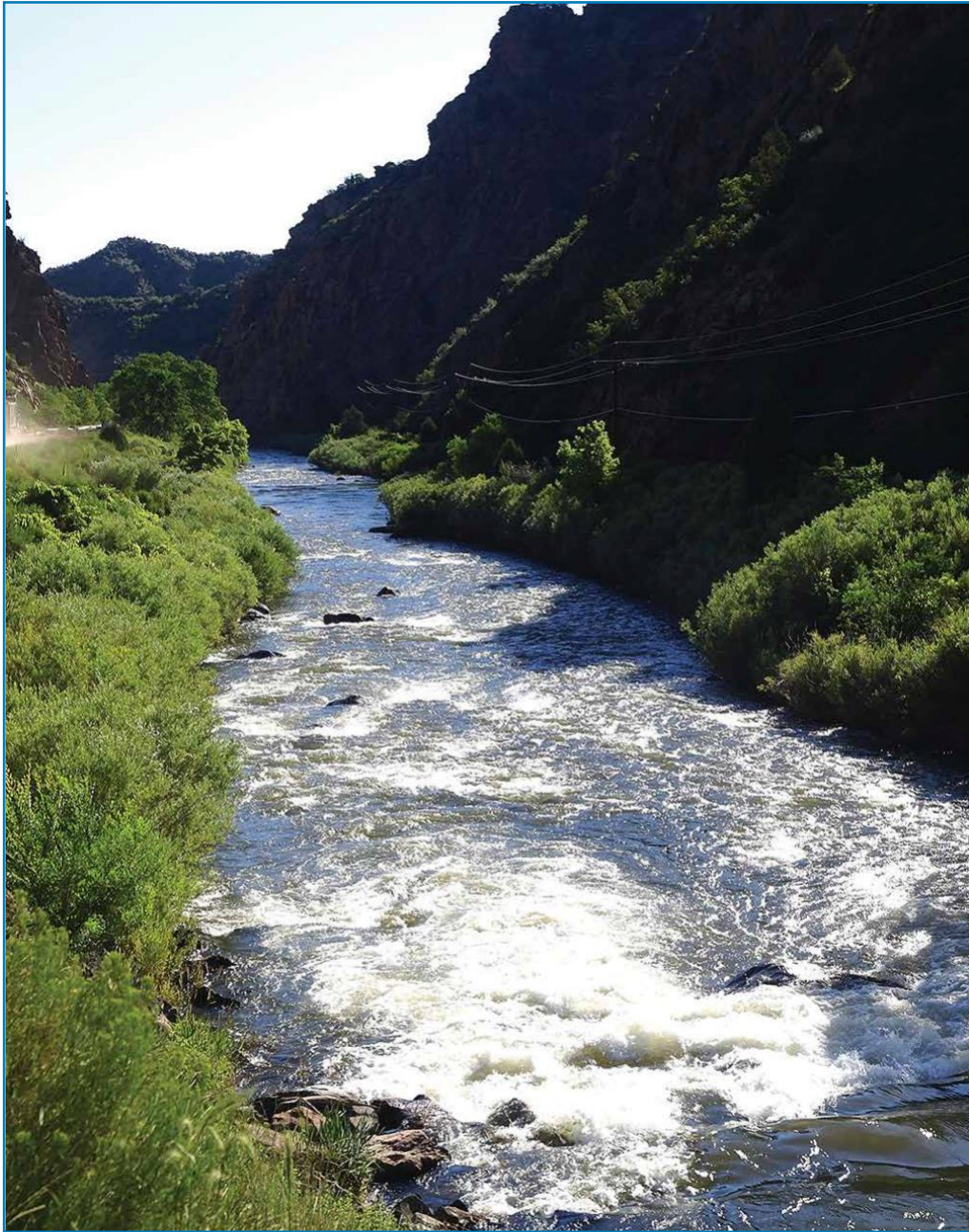
*The susceptibility analysis provides a screening-level evaluation of the likelihood that a potential contamination problem could occur rather than an indication that a potential contamination problem has occurred or will occur. The analysis is NOT a reflection of the current quality of the untreated source water, nor is it a reflection of the quality of the treated drinking water that is supplied to the public.*

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

Table 5 on the previous page presents the priority strategy and the susceptibility analysis results for selected water sources for Denver Water. The table summarizes the total susceptibility and physical setting vulnerability results, as well as the individual susceptibility results for the discrete and dispersed contaminant sources associated with each of the water sources that have been prioritized for source water protection measures under this plan. As a starting point, these water sources have been prioritized based on the source water protection priority strategy recommended by the Steering Committee. The priority strategy was discussed previously, in section 5.3 (Source Water Protection Priority Strategy and Susceptibility Analysis).

# 6.0 SOURCE WATER PROTECTION MEASURES

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## 6.0 SOURCE WATER PROTECTION MEASURES

### 6.1 Defining the Source Water Protection Area

The source water protection area defines either the watershed region or the surficial region overlying the local aquifer where the community has chosen to implement its source water protection measures in an attempt to manage the susceptibility of their source water to potential contamination. The Steering Committee chose the Upper South Platte River Watershed Protection Area (Figure 7) as the source water protection area. They did not, however, choose the other watersheds discussed in Section 5.1.

The Steering Committee considered several factors in defining the source water protection area in this manner. The Upper South Platte watershed was chosen because it is the largest of Denver Water's source water watersheds (2,600 square miles) and provides approximately 75 percent of the source water to Denver Water's 1.3 million customers. After the Upper South Platte River Watershed Source Water Protection Plan has been implemented (and necessary changes have been addressed) the planning process will be implemented into the remaining watersheds.



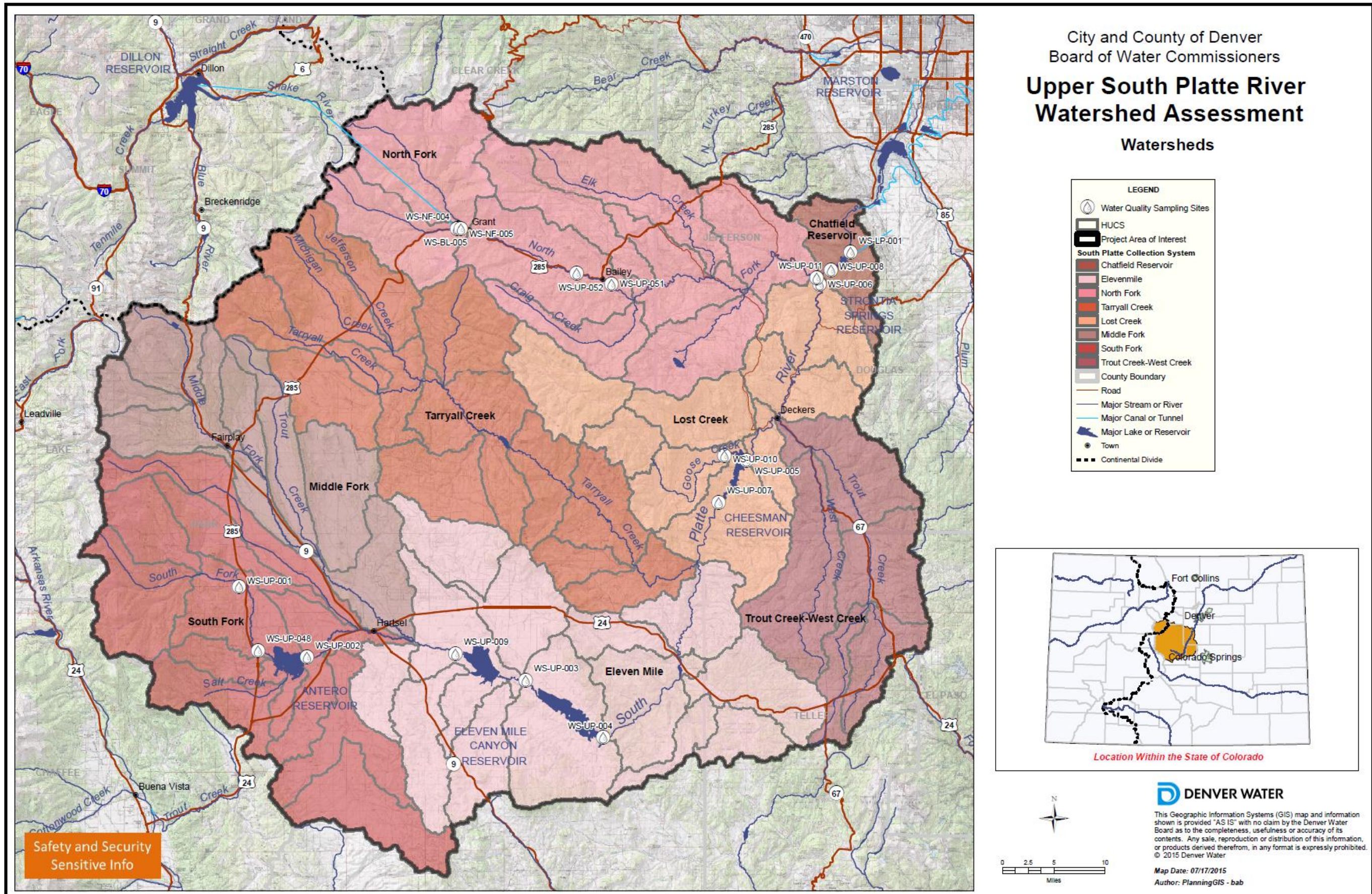


Figure 7: Upper South Platte River watershed source water protection area.



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

The most common categories of contaminants that are most likely associated with the most prevalent and threatening discrete contaminant sources identified in Table 5 include:

### *Acute Health Concern Contaminants:*

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

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

### *Chronic Health Concern Contaminants:*

- Herbicides
- Pesticides
- Volatile organic compounds (VOCs)
- Non-metal inorganic compounds
- Metals – primary drinking water (other than lead)
- Turbidity
- Other inorganic compounds
- Other organic compounds

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

### *Aesthetic Concern Contaminants: Secondary drinking water contaminants*

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

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

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

The most common categories of contaminants that are most likely associated with the most prevalent and threatening dispersed contaminant sources identified in Table 5 include the following:



*Acute Health Concern Contaminants:*

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

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

*Chronic Health Concern Contaminants:*

- Herbicides
- Pesticides
- Volatile organic compounds (VOCs)
- Non-metal inorganic compounds
- Metals – primary drinking water (other than lead)
- Radionuclides
- Turbidity
- Other inorganic compounds
- Other organic compounds

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

*Aesthetic Concern Contaminants: Secondary drinking water contaminants*

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

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

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

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

The Steering Committee established certain acceptance criteria as part of identifying and selecting the most feasible source water management approaches to implement locally. The Steering Committee developed a list of topic areas which address the potential sources of contamination and arranged for experts to present information on those identified topic areas. Experts presented a range of information including background, current state of source water protection with regards to their topic and what could be improved. Following the expert presentations, the Steering Committee identified the relevant best management practices (BMPs) to be implemented in the Upper South Platte River SWPP.

The Steering Committee recommends the following table of source water management tools to be implemented by Denver Water in collaboration with the Park, Teller, Jefferson and Douglas county planning commissions. Please note in the following table that when TCH is listed in parentheses following "County Planning Departments," that the Tri-County Health (TCH) department will be implementing the BMP instead of Douglas County. Due to the size of this watershed, it was not possible to create a number-ordered list. Instead, the list is prioritized on a high, medium-high, and medium priority basis, which is identified in Table 6. Exhibit H, the BMP Checklist, provides detailed information about the tools laid out in Table 6.

**Table 6. Source Water Protection Priorities and Best Management Practices (Applied to CO0116001-005)**

Issue #	Initial Steering Committee Priority Ranking	Priority Issue	Best Management Practices	Implementation Responsibility	Proposed Implementation Schedule	Estimated Cost	Proposed Funding Sources
1	High/Medium	On-site Wastewater Treatment Systems (OWTS)	Coordinate GIS overlays and mapping to identify sensitive areas	Denver Water, County Planning Departments (TCH), CUSP	Year 1	\$10,000 [In-Kind Time & Materials]	Denver Water, County Planning Departments, CUSP
			In sensitive areas, perform surface water monitoring for nutrients and other potential contaminants	Denver Water, CUSP	Year 2	\$20,000 [In-Kind Time & Materials]	Denver Water, CUSP
			Using targeted public outreach, develop effective OWTS awareness to inform landowners and realtors of BMPs	Denver Water, County Planning Departments (TCH), CUSP	Year 3	\$10,000 [In-Kind Time & Materials]	Denver Water, County Planning Departments, CUSP
			Review OWTS regulations and standards	NAWT, County Enviro Health & Building Depts, TCH	July 2014 & ongoing	\$20,000 [In-Kind Time & Materials]	County Enviro Health & Building Depts
			Encourage OWTS inspections and record submittals on property transfers	Denver Water, County Planning & Health Depts, TCH	Year 2	\$15,000 [In-Kind Time & Materials]	Denver Water, County Planning & Health Depts
2	High	Agriculture Practices	Identify sensitive drinking water areas adjacent to and downstream of agricultural operations	Denver Water, Counties, BLM, CUSP	Year 1	\$10,000 [In-Kind Time & Materials]	Denver Water, Counties, BLM, CUSP
			Draft standardized language and policies for grazing contracts between large landowners, land use managers and ranchers	USFS, BLM, CO Cattlemen's Assoc., Denver	Year 1	\$10,000 [In-Kind Time & Materials]	Denver Water, CUSP, with review time from others



				Water, CO State Forest Service, CPW, SLB		\$2,000 Intern	
			Using targeted education tools, develop effective agricultural practices materials to inform landowners and real estate industry of BMPs	USFS, BLM, CO Cattlemen's Assoc., Denver Water, CO State Forest Service, CPW, SLB	Year 3	\$20,000 [In-Kind Time & Materials]	Denver Water, CUSP, with review time from others
			Identify and promote funding opportunities for landowners to improve agricultural practices	NRCS, CSU Extension, USDA, Counties (TCH), 4H	Year 2	\$15,000 [In-Kind Time & Materials]	Denver Water, Counties [funding opportunities from NRCS, non-profits, others]
			Research the availability of augmentation water or regulatory alternatives for off channel livestock watering	Denver Water, Counties (TCH), BLM, CUSP	Year 3	\$15,000 [In-Kind Time & Materials]	Denver Water
<b>3</b>	<b>High/ Medium</b>	<b>Oil &amp; Gas Exploration</b>	Participate in the BLM Master Leasing Plan process and the Pike and Saint Isabel National Forests Oil and Gas Leasing process	USFS, BLM, Denver Water, CSFS, CPW, COGCC, COGA, State Land Board	Year 1	\$10,000 [In-Kind Time & Materials]	USFS, BLM, Denver Water, CSFS, CPW, COGCC, COGA, State Land Board
			Work with other counties to raise awareness of BMPs for oil and gas development	Counties (TCH), Landowners, COGCC, COGA, EPA, State Land Board, BLM	Ongoing	\$20,000 [In-Kind Time & Materials]	Counties, Landowners, COGCC, COGA, EPA, State Land Board, BLM
			Monitor oil and gas leasing on Denver Water properties	Denver Water	Ongoing	\$10,000 [In-Kind Time &	Denver Water

						Materials]	
<b>4</b>	<b>High</b>	<b>Transportation Roads &amp; Maintenance</b>	Identify sensitive areas and sediment potential occurring in proximity of these areas	Denver Water, Counties (TCH), CDOT	Year 2	\$10,000 [In-Kind Time & Materials]	Denver Water, Counties, CDOT
			Identify maintenance entities that work in sensitive areas and provide maps of sensitive areas to maintenance crews	CUSP, Counties (TCH), Denver Water, CDOT	Year 2	\$20,000 [In-Kind Time & Materials]	CUSP, Counties, Denver Water, CDOT
			Coordinate with road owners and trade organizations that deal with grading roads to do coordinated outreach and training of operators	CUSP, Counties (TCH), Denver Water, CDOT	Year 3	\$25,000 [In-Kind Time & Materials]	CUSP, Counties, Denver Water, CDOT
			Review USFS Road Construction Best Management Practices and integrate where appropriate	CUSP, Counties (TCH), Denver Water, CDOT	Year 2	\$10,000 [In-Kind Time & Materials]	CUSP, Counties, Denver Water, CDOT
<b>5</b>	<b>High</b>	<b>Transportation Emergency Response and Hazardous Waste</b>	Identify and raise awareness to sensitive areas and the potentially hazardous activities occurring in proximity	CDPHE, Denver Water	Year 1	\$10,000 [In-Kind Time & Materials]	Denver Water
			Outreach to emergency responders and dispatchers to help them understand the potential impacts of spills and hazardous waste to source water quality	Denver Water, CUSP	Year 1	\$2,500 Intern	Denver Water
			Conduct spill kit inventory and provide spill kits to emergency responders in sensitive areas	CUSP (possible intern) Teamed with card?	Year 1	\$2,500 Intern, \$3,500 kits	Denver Water
			Encourage development of hazardous waste disposal and recycling programs in watershed	Denver Water, Park and Teller Counties	Year 2	\$20,000 [In-Kind Time & Materials]	Denver Water, Counties

<b>6</b>	<b>High</b>	<b>Forest Health</b>	Define setbacks and firebreaks for critical infrastructure and resources to coordinate emergency response	Denver Water, Counties (TCH), CUSP, USFS	Year 1	\$10,000 [In-Kind Time & Materials]	Denver Water, Counties, CUSP
			Identify funding resources for forest health projects	Denver Water, CUSP, Front Range Round Table	Year 2	\$10,000 [In-Kind Time & Materials]	Denver Water, CUSP, Front Range Round Table
			Participate in research and outreach related to forest health topics	Denver Water, CUSP, USFS, BLM, CSF	Ongoing	\$20,000 [In-Kind Time & Materials]	Denver Water, CUSP, USFS, BLM, CSF
<b>7</b>	<b>High/Medium</b>	<b>Mine Drainage and Uranium Development</b>	Research and partner with groups and agencies already working on abandoned mine issues	Denver Water, CUSP, USFS, BLM, local interests, USGS, MSHA	Year 1	\$10,000 [In-Kind Time & Materials]	Denver Water, CUSP, USFS, BLM, local counties, USGS, MSHA
			Develop a method to monitor and track mine permit applications	Denver Water, CUSP, USFS, BLM, Counties (TCH), USGS, MSHA	Year 2	\$10,000 [In-Kind Time & Materials]	Denver Water, CUSP, USFS, BLM, Counties, USGS, MSHA
			Define setbacks from water sources and critical infrastructure	Denver Water	Year 2	\$10,000 [In-Kind Time & Materials]	Denver Water
<b>8</b>	<b>High</b>	<b>Hydro-geomorphic Issues</b>	Identify and map existing Watershed Assessment of River Stability and Sediment Supply (WARSSS) and similar type studies and reports within the watershed	Denver Water, CUSP	Year 2	\$50,000 [Consultant costs]	Grants, Denver Water, CUSP
<b>9</b>	<b>Medium</b>	<b>Monitoring</b>	Increase monitoring of source water priority constituents with special monitoring projects	Denver Water	Year 1	Costs above	Denver Water
<b>10</b>	<b>High</b>	<b>GIS/Mapping</b>	Create an online GIS tool to share information related to source water protection with stakeholders	Denver Water	Year 1	\$15,000 [In-Kind Time & Materials]	Denver Water
<b>11</b>	<b>High</b>	<b>Outreach &amp; Education</b>	Create an outreach and education campaign to inform stakeholders about source water protection priority issues	Denver Water	Year 2	Costs above	Denver Water

			Enter into a Memorandum of Understanding regarding source water protection	Denver Water, Counties (TCH)	Year 1	\$20,000 [In-Kind Time & Materials]	Denver Water, Counties
<b>12</b>	<b>High</b>	<b>Intern</b>	Hire a Source Water Intern to assist with the implementation of BMPs	CUSP	Year 1	Costs above	Denver Water



### ***6.5 Additional Commitments from Denver Water***

Denver Water 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.

Denver Water will provide annual updates to the local counties, CDPHE and the Steering Committee on the protection plan progress. This will in part be achieved through a Memorandum of Understanding (MOU) between Denver Water and the counties within the Upper South Platte River Watershed. Within this MOU (Exhibit A), Denver Water commits to share resources including GIS spatial data on the delineated SWPA, share information on SWPP implementation and update the counties annually on progress. In addition, Denver Water will report the protection plan progress to its users in the consumer confidence report, which is included in Denver Water bills once a year.

Furthermore, Denver Water commits to incorporate SWPPs into other watersheds within their collection system. Specifically, Denver Water will create a SWPP for the Fraser River watershed. This is part of the larger ongoing commitment to providing the highest quality drinking water to Denver Water consumers.

Denver Water is voluntarily committed to assisting the Colorado Department of Public Health and Environment in making future refinements to their source water assessment and to revise the source water protection plan accordingly based on any major refinements. Lastly, Denver Water commits to mentor other utilities creating SWPPs. By making this commitment, Denver Water is assuring that future assessment results are consistent with the available data and that source water management approaches are appropriate for the susceptibility concerns.

# EXHIBITS

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## EXHIBIT A: Memorandum of Understanding

### SOURCE WATER PROTECTION AREA MEMORANDUM OF UNDERSTANDING (May 2015 DRAFT)

Between: County of \_\_\_\_\_ and \_\_\_\_\_ Public Water System

This Memorandum of Understanding (MOU) is made and entered into by and between the County of \_\_\_\_\_ (hereafter referred to as the [County]) and \_\_\_\_\_ a public water system (hereafter referred to as [PWS]) located in the County of \_\_\_\_\_.

#### A. PURPOSE:

To establish a framework for the County and PWS to work together in a cooperative manner on issues regarding the management and protection of water quality in the PWS Source Water Protection Areas (SWPA's) within the County. Working together includes awareness of, communication and coordination of management and protection activities between each party.

#### B. STATEMENT OF MUTUAL BENEFIT AND INTERESTS:

The County and the public water systems, municipal/town governments, and community stakeholders have responsibilities for ensuring the protection of public water systems' source water protection areas, water treatment and distribution network. These County PWS's directly implement the 1996 Amendments to the Federal Safe Drinking Water Act in concert with the Colorado Department of Public Health and Environment (CDPH&E) Source Water Assessment and Protection (SWAP) Program. The SWAP Program encourages community-based protection and preventative management strategies to ensure that all public drinking water sources minimize potential risks and are kept safe from future contamination.

The PWS's Source Water Protection Plan (SWPP) has delineated Source Water Protection Areas for their water supplies that are located in the County. Sources of both surface water and groundwater need to be protected from point and non-point sources of potential degradation for the benefit of the County and PWS consumer residents.

Protecting public water system's Source Water Protection Areas in the County requires awareness of these areas, communication and coordination protocol between the County and PWS's. The PWSs through the SWPP process have identified and understand that the County is the implementing agency of land use planning and zoning. The PWS would like to request that the SWPA's are considered for future planning efforts. Collaborative efforts between the County and PWS, consistent with its planning and regulations, will promote the most effective management of water quality for the public water system uses and will enhance benefits to public health and the water resource. It is in the overall public interest and mutual interest of the County and PWS to research opportunities to collaborate. This may involve identifying solutions to challenging water quality issues through future cooperative agreements. The County Comprehensive Land Use Plan and Zoning Code Statement of Purpose and Goals Statements cite overall and specific intentions to promote and protect health, safety, water resources and water quality throughout the County and the specific citations follow:

(County specific) County Comprehensive Plan of \_\_date\_\_ Section, Page: text

(County specific) County Zoning Code of \_\_date\_\_ Section, Page: text

#### C. THE COUNTY AND THE PUBLIC WATER SYSTEM:

### Awareness

1. Public Water System (PWS) and County Government agree to increase awareness by:
  - a. The PWS recognizes they are the responsible entity for implementation of the Source Water Protection Plan (SWPP). The County recognizes that a SWPP has been completed with a public process by the PWS.
  - b. The County and PWS agree to distribute Source Water Protection Planning information to the appropriate County staff, departments, and general public. In collaboration, each party is aware that all MOU activities must be consistent with both County and PWS's codes and regulations.
  - c. The responsibility of protecting the drinking water sources relies not only on the County and the PWS, but also the general public and entities that have a potential impact to the drinking water supply.

### Information Sharing

2. Public Water System (PWS) and County Government agree to share information by:
  - a. The PWS will provide the County with updated Geographic Information System (GIS) spatial data and information on delineated Source Water Protection Planning Areas in the County.
  - b. The County will refer all requests for the Source Water Protection Area database to the PWS.
  - c. The County is given the opportunity to enter into a data sharing agreement with the Colorado Department of Public Health and Environment (CDPH&E) to identify all remaining PWS's in the County.
  - d. The PWS will share information and encourage input from County departments, personnel, and advisory groups on Source Water Protection Planning implementation.
  - e. The PWS will provide annual updates to the County on implementation of the Source Water Protection Plan.

### Management

3. Public Water System (PWS) and County Government agree to coordinate on management strategies to protect drinking water:
  - a. The parties acknowledge that the County and municipalities share jurisdiction on implementing management approaches to maintain and improve existing water quality.
  - b. The parties will work in collaboration to identify potential mutual concerns that may impact water quality in the Source Water Protection Areas.
  - c. The County will provide the PWS opportunity to review and comment on land use activities that occur within the Source Water Protection Areas.
  - d. Responsibilities of parties: the County, Municipalities, and PWS's will handle their own activities and utilize their own resources including expenditures of their own funds in pursuing the objectives of the MOU. Each party will carry out its separate activities in a coordinated and beneficial manner.



- e. The parties acknowledge that local municipalities or PWS have the ability to adopt and collaborate with the County on independent watershed protection strategies. (OPTIONAL).
- f. The County and PWS will coordinate review of CDPH&E WQCD site applications for new or expanded wastewater treatment facilities located in the delineated Source Water Protection Area.

D. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

- 1. Participation in similar activities: This MOU in no way restricts the County or PWS from participating in similar activities with other public or private agencies, organizations and individuals.
- 2. Commencement and termination: This MOU takes effect upon the authorizing signatures of the County, Municipality, and the PWS and shall continue indefinitely. Termination may be initiated by either party with written notice ninety (90) days prior to the effective date of termination. Each party will provide opportunity for reconciliation of the reason(s) for termination during the notice period.
- 3. Non-fund Obligating MOU: Nothing in this MOU shall obligate either party to obligate funds. Mutually agreed to specific work projects or activities involving funding or resources will involve a separate agreement between the parties.
- 4. Establishment of responsibility: This MOU is not intended to, and does not create any right, benefit, or trust responsibility, substantive or procedural, enforceable by law by a party against the County, Municipality, or PWS.
- 5. Principal contacts: The County, Municipality, and PWS will designate principal contacts and these contacts may change with regard to specific projects, activities and staffing.

THE PARTIES HERETO HAVE EXECUTED THIS MEMORANDUM OF UNDERSTANDING:

County of _____	Title of PWS
Board of _____ County Commissioners	Governing Board

\_\_\_\_\_  
Name – Title – Date

\_\_\_\_\_  
Name - Title – Date

ATTACHMENT: Exhibit 1: \_\_\_\_\_ PWS’s Source Water Protection Plan

PRINCIPAL CONTACTS:

## EXHIBIT B: Denver Water's Comprehensive Emergency Management Program

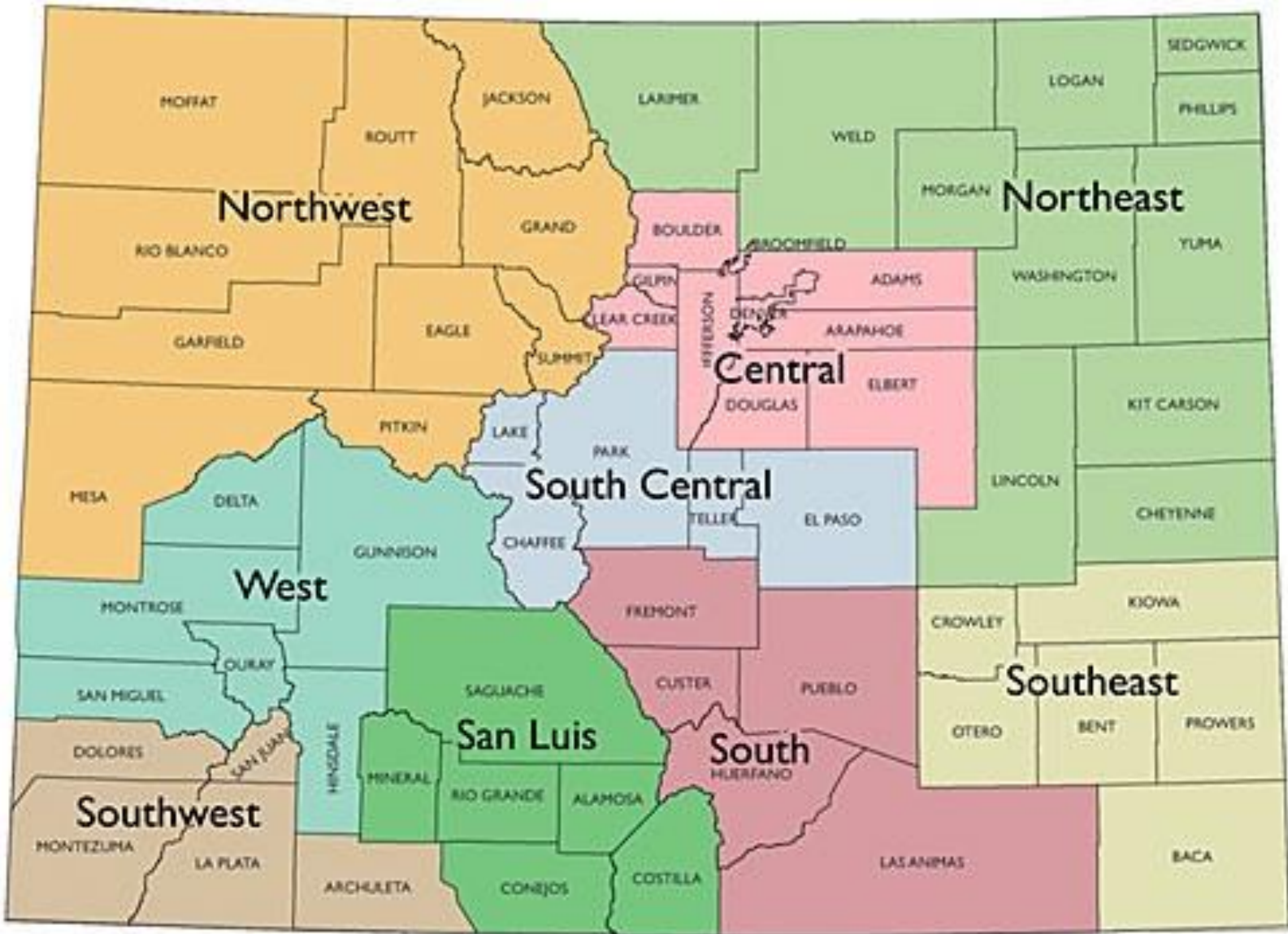
**Emergency Management** was brought on board in August 2012 to develop, implement and maintain a comprehensive emergency management program for the utility and to network with local emergency management programs to ensure an efficient and effective response during system interruptions. Below is a summary of plan development, training and exercise functions that are coordinated by emergency management and supported by the designated operational section. Information represents current state of program.

Plan Development			
Emergency Management	Source of Supply	Treatment & Water Quality	Distribution
Guidelines: <ul style="list-style-type: none"> <li>- FEMA CPG 101</li> <li>- AWWA G440</li> </ul>	Guidelines: <ul style="list-style-type: none"> <li>- FERC Guidelines</li> <li>- State Dam Engineering Guidelines</li> </ul>	Guidelines: <ul style="list-style-type: none"> <li>- EPA's large water system guidelines</li> <li>- EPA's Clean Safe Water</li> <li>- State CDPHE</li> </ul>	Guidelines: <ul style="list-style-type: none"> <li>- EPA's large water system guidelines</li> <li>- EPA's Clean Safe Water</li> <li>- State CDPHE</li> </ul>
<ul style="list-style-type: none"> <li>• Emergency Operations Plan (EOP)                             <ul style="list-style-type: none"> <li>○ Emergency Support Functions</li> <li>○ Incident Annexes</li> <li>○ Support Annexes</li> </ul> </li> <li>• Emergency Operations Center Operational Guideline</li> <li>• Continuity of Operations/Government</li> </ul> Other plans managed in other areas: <ul style="list-style-type: none"> <li>• Crisis Communications Plan</li> <li>• Security Plans</li> <li>• Safety Plans</li> </ul>	FERC Regulated Dams: <ul style="list-style-type: none"> <li>• DW owns 4 FERC regulated dams</li> <li>• Emergency Actions Plans exist for all 4 dams</li> </ul> State Regulated Dams: <ul style="list-style-type: none"> <li>• DW owns 14 state regulated dams.</li> <li>• Emergency Action Plans exist for all 14 dams</li> <li>• DW own other dams and/or gravel pits and does have call sheets and response plans for these sites.</li> </ul>	EPA Guidelines: <ul style="list-style-type: none"> <li>• DW owns 3 treatment plant facilities and 1 recycling plant.</li> <li>• Emergency Response Plans exist for all 4 plants</li> </ul> Other plans managed in other areas associated with treatment: <ul style="list-style-type: none"> <li>• Spill Response Plan</li> <li>• Risk Management Plans</li> </ul>	EPA Guidelines: <ul style="list-style-type: none"> <li>• DW owns over 3,000 miles of distribution pipes, 18 pump stations/vaults, etc.</li> <li>• Emergency Response Plans exists for the distribution system.</li> </ul>
Training For all Plans/SOPs developed			
<ul style="list-style-type: none"> <li>• NIMS/ICS</li> <li>• EOP/ESF/Incident/Support Annexes</li> <li>• EOC</li> <li>• COOP</li> <li>• WebEOC</li> </ul>	<ul style="list-style-type: none"> <li>• Dam Safety Training</li> <li>• EAP training</li> <li>• SOP training</li> </ul>	<ul style="list-style-type: none"> <li>• Treatment Plant &amp; Water Quality Training</li> <li>• ERP Training for Plants</li> <li>• SOP Training for Plants and WQ</li> <li>• Hazwopper Training</li> </ul>	<ul style="list-style-type: none"> <li>• Distribution Training</li> <li>• ERP Training</li> <li>• SOP Training</li> </ul>
Exercises FEMA/HSEEP Standards/AARs/IP developed and managed			
<ul style="list-style-type: none"> <li>• NIMS/ICS</li> <li>• EOC/WebEOC</li> <li>• COOP</li> <li>• Crisis Communications Exercises</li> </ul>	<ul style="list-style-type: none"> <li>• EAP Orientations for all dams</li> <li>• EAP Tabletops for all FERC dams</li> <li>• EAP Functional for all FERC dams</li> </ul> <p style="color: red;">Future State will include tabletop and functional exercise on all dams/facilities.</p>	<ul style="list-style-type: none"> <li>• Water Quality Discussions</li> <li>• Water Quality Tabletops</li> </ul> <p style="color: red;">Future State will include tabletop and functional exercise for all treatment plants.</p>	<ul style="list-style-type: none"> <li>• To date, no exercises have been conducted under the distribution system.</li> <li>• The distribution has had to deal with real incidents over the last 3 years and AARs/IP have been developed and tracked.</li> </ul>

## Coordination/Information Sharing

<ul style="list-style-type: none"> <li>• 4 Homeland Security Regions (North Central Region, Northeast Region, South Central Region and Northwest Region)</li> <li>• 12 County Emergency Management Offices (WebEOC and the NCR ESF #5 committee)</li> <li>• 6 LEPC Entities</li> <li>• Denver Urban Area Security Region</li> <li>• State Emergency Management Office</li> </ul> <p><i>Other Information:</i></p> <ul style="list-style-type: none"> <li>• Mutual Aid agreement with State Emergency Management</li> <li>• Have seats in 5 local emergency management offices (ESF #12 Utilities)</li> <li>• Have access to State WebEOC and City &amp; County of Denver's WebEOC systems.</li> <li>• COWARN agreement/steering committee</li> <li>• Denver Water Amateur Radio Club</li> <li>• Denver Water Storm Spotter Club</li> <li>• Mobile Incident Command Trailer</li> <li>• Mobile Satellite/Communications Trailer</li> </ul> <p style="color: red;">Future State to include the Denver Water Incident Management Team that will be comprised of various strike team groups throughout the organization that can be utilize as deployment teams to support system interruptions and/or external deployments.</p> <p style="color: red;">Plan development/information sharing/training and exercises with our distributors.</p>	<p>Training coordination occurs with State Dam Engineers and internal DW personnel from SOS, Dam Safety, Planning, and Emergency Management.</p> <p>Exercises include local/county/state/federal response partners.</p> <p>SOS has a 6 member strike team that is red carded and wildland fire qualified.</p>	<p>Training coordination occurs with internal DW personnel from treatment plants, water quality section, environmental compliance and emergency management sections.</p> <p>Exercises for WQ include DW WQ/Emergency Management/Public Affairs and our distributors.</p> <p>Exercises for Spills included DW Environmental Compliance Section, Fleet, and Emergency Management.</p> <p style="color: red;">Future State to include exercises at treatment plants to include local hazmat teams.</p> <p style="color: red;">Water Quality will be developing a strike team.</p>	<ul style="list-style-type: none"> <li>• To date, no exercises have been conducted under the distribution system.</li> <li>• The distribution has had to deal with real incidents over the last 3 years and AARs/IP have been developed and tracked.</li> </ul> <p style="color: red;">Future State to include exercises throughout the distribution system and with our distributors.</p>
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## EXHIBIT C: Detailed Description of Public Meetings

### Onsite Wastewater Treatment Systems (OWTS)

**Date:** Friday, December 14, 2013

**Location:** Deckers Community Center, Deckers, CO

**Presenters:** David Kurz, CDPHE; Kate Carney, Church OWTS Consultants; Tim Galvin, Underground Solutions.

**Related links to presentations:** <http://cusp.ws/wp-content/uploads/2014/10/OWTS-Source-Water-Protection-12-13-13.pdf>

Vast areas of the Upper South Platte River service area are rural or remote and with residential septic systems rather than community/city sewer. The regions with community sewer are mainly located in the more densely populated northeastern region of the watershed. It is important to address contaminants of concern including discharges, failing septic systems, and residual contaminants from OWTS that potentially may impact local water quality.

**Using targeted online/survey education tools, develop effective septic system awareness to inform landowners and realtors of BMPs and potential opportunities**

- Develop a website to educate DW customers on a range of source water issues including OWTS
  - Online Public Meeting to get information out to consumers and direct them to:
    - Survey links
    - Rebates and incentives
  - Quick kits for testing
  - Provide information to the real estate industry regarding regulations related to
    - Transfer of Title requirements
    - Inspections
    - Pumping
    - Repairs at time of sale
- Door knocking
- Flyers (send information with water and/or tax bills)

#### **Review Practitioner Certification Standards:**

- Research, review, and store the OWTS regulation that each county adopted.
- Identify the county representative(s) that handle septic system issues and establish a line of communication for future developments that may impact water quality.

#### **Coordinate GIS overlays and mapping and identify sensitive areas:**

- Research best layer for approximating septic system density (currently using well information)
  - Septic system density

- Soil treatment areas (leach fields)
- Contact Park County Administrator (Tom Eisenman) for USGS septic system study
- Define and map sensitive drinking water areas
  - Proximity to stream(s) (1000 foot buffer)
  - Soil type(s)
  - Density of systems
  - Age of development(s)

**In sensitive areas, perform surface water monitoring for nutrients and other potential hazards**

- Pick sample points
- Monitor for nutrients and emerging contaminants (*and tracers such as caffeine and endocrine disrupters – re Sarah: Water Research Foundation study*)
- Collect and analyze data
- Determine if data shows degradation due to septic systems
- Dye testing
- Agricultural impacts
- Uranium
- Abandoned mine drainage/effluent

**Research potential for septic inspections/record submittals on property transfers (sensitive areas only)**

Examine new County regulations for all four counties, adopted June 30, 2014, regarding inspections at transfer of title, whether old systems get grandfathered in, whether installers are certified, if effluent filters are required, setbacks from water bodies and drinking water wells, whether land disposal of pumped waste is allowed, etc.

- Check with counties for current practices (Boulder County is a good example) Check with Tri-Lakes
- If not in effect, recommend that counties incorporate inspections at time of transfer (*only for sensitive areas?*)
- Work with Counties to provide safe pumped sludge storage/disposal

**Agricultural Practices and Issues**

**Date: Friday, February 14, 2014**

**Location: Deckers Community Center, Deckers, CO**

**Presenters: Ben Berlinger, NRCS; John Woodward, CCA; Steve Ryder, CO Dept. of Ag**

**Related links to presentations: [http://cusp.ws/wp-content/uploads/2014/10/Small-Acreage-Management-for-Horse-Owners\\_Boulder-Valley-Conservation-District.pdf](http://cusp.ws/wp-content/uploads/2014/10/Small-Acreage-Management-for-Horse-Owners_Boulder-Valley-Conservation-District.pdf); <http://www.cusp.ws/wp-content/uploads/2014/10/Water Quality J Woodward.pdf>; <http://www.cusp.ws/wp->**

[content/uploads/2014/10/CUSP\\_Feb2014.pdf](#); [http://cusp.ws/wp-content/uploads/2014/10/Principles-of-Controlled-Grazing\\_University-of-CA-at-Davis.pdf](http://cusp.ws/wp-content/uploads/2014/10/Principles-of-Controlled-Grazing_University-of-CA-at-Davis.pdf);  
[http://cusp.ws/wp-content/uploads/2014/10/CUSP\\_Grazing-Principles\\_2-14-2014.pdf](http://cusp.ws/wp-content/uploads/2014/10/CUSP_Grazing-Principles_2-14-2014.pdf)

Ranching is a rich part of the history of the Upper South Platte Watershed as well as a vibrant industry in the region today. From large-scale ranching operations to small hobby farms, ranching thrives in the western portions of the watershed. Strong and active associations and organizations help ranchers understand state-of-the-art ranching techniques and best management practices.

Programs offered through the USDA NRCS also provide outstanding resources and funding opportunities for the ranching communities. There is still much to be done to ensure consistent BMPs that preserve and protect the resources impacted by agricultural activities.

- **Draft standardized language and policies for *grazing* contracts/MOUs between large landowners, land use managers and ranchers**
- Research USDA, Department of Ag, Cattlemen’s Association, Colorado State Extension, etc., to assist in language development
- Draft a proposed example contract containing sample language
- Distribute document to partners and refine it as needed
- Develop a stakeholder based approach to engage the entities in using the new template (*please explain*)
- Outreach, education, and marketing of new template – implementation
- Check with CALF – Colorado Agricultural Leadership Foundation

**Spatial identification and analysis of sensitive drinking water areas adjacent to, and downstream of, agricultural operations**

- Gather GIS data indicating land use for agricultural purposes
- Define sensitive drinking water areas
  - Proximity to stream (1000 foot buffer)
  - Soil type
  - Density of operations
- Encourage use of
  - Riparian buffers
  - Hardened Water sites
  - Fenced buffers
  - Potential augmentation water for off channel livestock watering

**Using targeted education tools and working with an intern, develop effective agricultural practices *materials*/awareness to inform/educate landowners and real estate industry**

- Identify/generate “Rural Realities/Lifestyle” resources e.g.  
[http://www.extension.colostate.edu/gilpin/natu/natu\\_docs/Mountain\\_Livestock](http://www.extension.colostate.edu/gilpin/natu/natu_docs/Mountain_Livestock)



[Brochure-GilpinNew reviewed.pdf](#) ;  
<http://www.co.teller.co.us/communications/rural.htm>

- Identify grazing related county regulations
- Subdivision grazing fence-out
- Hobby Ranching
- Coordinate with Colorado State University (CSU) Extension Services and inform them of sensitive areas
- Coordinate with NRCS (*and Conservation Districts*)
- Through partners
  - Develop a website to educate
  - Door knocking
  - Flyers
  - Rebates

**Identify and promote funding opportunities for landowners to improve agricultural practices (*such as fencing to keep cattle out of riparian areas, hardened water crossings, rotational grazing, etc.*)**

- Create a list of funding sources for agricultural practices and BMP's
- Research ways to implement off-channel livestock watering practices (augmentation?)
- Determine best outreach organization and coordinate with them (probably not Denver Water)  
(NRCS, Colorado Cattleman's association, USDA, USFS, BLM)  
Research Conservation easements (tax implications)  
Cattleman's Land Trust easement  
Palmer Land Trust  
Mountain Area Trust  
Colorado Open Lands  
CALF (Colorado Agricultural Leadership Foundation)

## Oil and Gas Exploration and Extraction Issues (Two Part)

### Part One

Date: Friday, March 14, 2014

Location: Fairplay Community Center, Fairplay CO

Presenters: Peter Milonas, State Land Board; John Dow, USFS; Keith Berger, BLM; Jerry Strahan, BLM

Related links to presentations: <http://cusp.ws/wp-content/uploads/2014/10/South-Park-BMP-Presentation.pdf>; <http://www.cusp.ws/wp-content/uploads/2014/10/CUSP 2011 Groundwater and Surface Water Baseline Monitoring Project.pdf>

### Part Two

Date: Friday, April 11, 2014

Location: Fairplay Community Center, Fairplay CO

Presenters: Andrew Casper, COGA; Tom Eisenman, Park County

Related links to presentations: <http://cusp.ws/wp-content/uploads/2014/10/OG-Meeting-COGA-presentation.pdf>; [http://cusp.ws/wp-content/uploads/2014/10/South-Park-Groundwater-Quality-Scoping-Study\\_Final.pdf](http://cusp.ws/wp-content/uploads/2014/10/South-Park-Groundwater-Quality-Scoping-Study_Final.pdf)

Oil and gas resource exploration and extraction in Colorado has been taking place since the mid-twentieth century. The majority of active extraction currently occurs in the northern part of the state, but areas within the Upper South Platte watershed have been identified as viable sources for exploration. This is a complex and potentially controversial issue. It can be complicated further by matters of surface land ownership vs. mineral rights and the vast areas of land involved in horizontal and vertical drilling. It is also important to understand the many ways in which water can be impacted ranging from the intensive use of water for resource extraction as well as the impacts to the quality of the water once it is recycled.

The Colorado Oil and Gas Conservation Commission, a division of the Colorado Department of Natural Resources is the agency that interfaces with the Colorado Oil and Gas Association and the industry in regulatory and compliance issues.

**Participate in, and help define setbacks, drilling stipulations, BMP approaches, etc. to be included in the BLM Master Leasing Plan process and *the PSICC Forest Service Oil and Gas Leasing process***

- Provide GIS layers
- Attend planning meetings
- Work with key agencies in BLM Master Leasing Plan process (Royal Gorge BLM, RMP, Pike Isabel Oil and Gas Leasing Plan)
  - BLM (Statewide draft water stipulations for surface protection, NSO Municipal wells, etc. – get copies)
  - Park County (has regulations related to oil and gas development)
  - Colorado Department of Public Health and Environment (CDPHE)
  - COGA
  - COGCC
  - USFS
- Determine and define setbacks/perimeters/buffers around reservoirs, perennial rivers, wells, diversion points, and other sensitive areas (GIS component) for well drilling
- Apply lessons learned to other Denver Water watersheds

**Work with other counties to raise awareness of BMPs for oil and gas drilling**

- Identify environmentally sensitive areas for all of Upper South Platte watershed
- Contact local designee for each county, establish a relationship with them and inform them of recommendation of BLM master leasing program

### **Monitor oil and gas leasing on Denver Water properties**

- Check COGCC permit application information
- Connect with COGCC
- Form working relationships with State Land Bard personnel
- Provide guidance on suggested BMPs to local designee
- Research what counties have 1031 jurisdiction being implemented.

## **Transportation (Two Part)**

### **Part One: Roads**

**Date: Friday, May 9, 2014**

**Location: Fairplay Community Center, Fairplay, CO**

**Presenters, Kyle Hamilton, CH2M Hill; Holly Huyuk, CDOT**

**Related links to presentations: <http://cusp.ws/wp-content/uploads/2014/10/CUSPDenverWaterWaPlan-RdsandTrls.pdf>; <http://cusp.ws/wp-content/uploads/2014/10/CDOT-SedandSpillCtrl4CUSP.pdf>**

### **Part Two: Emergency Response**

**Date: Friday, June 13, 2014**

**Location: Deckers Community Center, Deckers, CO**

**Presenters: Andy Flukey, CDOT; Sheila Cross, Park County; Garth Englund, Douglas County**

**ROADS:** Multi-modal transportation corridors in the Upper South Platte Watershed range from social trails established over decades of recreational use to well-traveled State highways. The four State highways (285, 24, 67 and 9) that crisscross the watershed carry residents, commuters, tourists and commercial users throughout the watershed, also connecting them to major metropolitan and recreational destinations.

### **Identify sensitive areas and potentially hazardous activities occurring in proximity to these areas**

- Review previous WARSSS and/or similar assessments for priorities and focus areas
- Combine and assess existing info
  - Erodability
  - Slope
  - Wildfire risk assessment has some information
- GIS/mapping of roads etc., in relation to drinking water infrastructure
- Form a committee of experts to discuss this issue and assess priority areas
- Ground truth where roads are contributing to sediment in surface water
- Additional monitoring
- Identify who owns roads, who maintains (USFS, BLM, County, private)
- Establish connections for weed spraying activities, share the sensitive areas near streams with them.

### **Identify maintenance entities that work in sensitive areas**

- Counties

- Review county(s) BMPs – consolidate for road maintenance education at all levels (including targeted subdivisions/private ownership)
  - Integrate BMP training into existing annual organizational internal training events
  - Attend appropriate staff meetings for educational purposes

**Coordinate with CH2M Hill and organizations that deal with grading roads to do coordinated outreach (and training of operators)**

- Identify current/existing projects that employ BMPs to use as project example/review sites for county maintenance crews – possibly develop a video tour or workshops
- Create “cheat sheet”/card for road maintenance operators
- Signage for blade operators: e.g., tilt left here
- Speakers’ Circuit – (APWA local annual conference presentation)
- Provide road training for Denver Water operators

**Review USFS Road Construction Best Management Practices and integrate where appropriate (See appendix).**

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

Roads and highways can contaminate water sources through spills, creation of airborne contaminants which eventually distill into the watershed, through road treatments including salts, sands, and other chemicals for snow and ice, siltation, and fuels, oils, and other contaminants carried by vehicles and released slowly onto roads and highways. Rapid and coordinated response and communication during all phases of Emergency Response is critical for the health and safety of area residents and their water supply.

**Education/Outreach to ALL emergency responders/dispatchers to help them understand the potential impacts to all of their constituents/communities/drinking water**

- Create/Provide laminated info card with
  - Hotline Info-**1-877-518-5608** – is manned 24/7 –
  - Sensitive areas/Map
  - Provide Hot Line number to ALL emergency responders, public water system staff/managers, and dispatchers (Sheriffs’ Offices, Police Departments, Colorado State Police, etc.)
- Dashboard stickers with Hotline info

**Encourage development of hazard waste dumping/recycling program in counties.**

- Reach out to counties to see if they have an existing program
- Research ways and funding opportunities to develop programs
- Identify locations in watershed for recycling centers
- Awareness and outreach
- Potential focus areas
  - Prescription take back
  - Electronic recycle
  - Habitat for Humanity paint recycling
  - Pesticides/Herbicides

**Spill kits**

- Do an inventory/analysis of who has what (oil/hazmat) and who is trained to use



- Consider adding additional spill kits in emergency response vehicles – oil spill kits, hazmat kits (car accidents etc.)

#### **Raising awareness of sensitive areas**

- Identify sensitive areas
- Determine audience
  - County workers
  - General public
- Work with CDOT
- Signage on side of road (entering USPW signage)

### **FOREST HEALTH**

**Date: Friday, August 8, 2014**

**Location: Denver Water Three Stones Building, Denver, CO**

**Presenters: Jonathan Bruno, CUSP; Jeff Underhill, USFS; Joseph Hanson, Jeffco CD**

**Related links to presentations: <http://cusp.ws/wp-content/uploads/2014/05/SWAP2014.pdf>; [http://cusp.ws/wp-content/uploads/2014/10/Silviculture\\_2014.pdf](http://cusp.ws/wp-content/uploads/2014/10/Silviculture_2014.pdf)**

The Upper South Platte Watershed has seen some of Colorado's most devastating wildfires. The 2002 Hayman Fire burned over 136,000 acres and is still ranks as the largest wildfire in Colorado history. In response to wildfires, many regional agencies and organizations have become expert at not only dealing with post-fire recovery, but in learning the importance of prevention through mitigation. Bringing a heavily forested watershed into a state of balanced vigor demands an ongoing and proactive approach to forestland management.

From research to implementation, it is important to recognize and understand, emerging, state-of-the-art and innovative mitigation and treatment technologies. It is essential that Denver Water continue its vital leadership role in collaborative and cooperative planning and implementation processes such as the Front Range Roundtable that address these issues.

#### **Define/map setbacks and firebreaks for critical infrastructure and resources including**

- Up-to-date risk assessments for critical areas
  - Review existing assessments for gaps
- Drinking water reservoirs
- Water treatment facilities
- Key diversions
- Make sure these areas are accessible to emergency responders
- Work with USFS to define the actual setbacks and what is the best indication – what are the patterns - coordinate on the USFS – FS needs to know where actual infrastructure is located
- Preventative strategies - layers to share
- Make the layers to the cooperating agencies
- How do we best share this info – pre fire meetings
- **Emergency response**
- Identify key responders
- Develop protocols for rapid response
- Provide maps of critical infrastructure
- Coordinate with Denver Water Emergency Response team - Sarah
- **Funding Resources – Run By Don Kennedy – coordinate with internal resources**

- Identify potential project areas/timeline (long-range to “low hanging fruit”)
  - Identify appropriate project/program partners
  - Identify/list project needs
  - Develop per project budgets
- Identify potential funding sources
  - Governmental/Foundations
  - Calendar of availability/deadlines
  - Table of requirements/eligibility
    - Match
    - In-kind
- **Public Education**
- Identify programs for public/property owner programs
- Educate re:
  - Prescribed burns
  - Combo treatments
  - Related legislation/mandates
- **Continue to Participate in research related to**
- Fire impacts -
- Mitigation
  - Identify who is doing research and where it is being done
  - Identify and map areas with CWPPs

## URANIUM AND MINE DRAINAGES

**Date: Friday, November 14, 2014**

**Location: Deckers Community Center, Deckers, CO**

**Presenters: Jara Johnson, CUSP**

**Related links to presentation:** [http://cusp.ws/wp-content/uploads/2014/05/CO\\_DMGM\\_BMPs\\_AML\\_Reclamation.pdf](http://cusp.ws/wp-content/uploads/2014/05/CO_DMGM_BMPs_AML_Reclamation.pdf); <http://cusp.ws/wp-content/uploads/2014/05/UraniumFactSheetCGS1.pdf>; <http://cusp.ws/wp-content/uploads/2014/05/Mining-in-USPW.pdf>

Colorado’s history is, in large part, built on mining. The promise of wealth from mining brought many people to the area in the mid- 1800’s and for decades was a major economic driver within the state. Mineral mining still thrives in the state and impacts related to past and abandoned mining activities still pose issues throughout the watershed.

Uranium was first discovered in the U.S. in Colorado. While the highest concentration of active uranium projects are in the southwest region of the state, there is a long history of uranium mining in Park County. Since this is a heavily regulated and monitored industry, it is important to be aware of updates to related regulations, stipulations and laws.

### **Research and partner with groups and agencies already working on abandoned mine issues – coordinate efforts**

- Abandoned mine team
  - USFS, USFWS, DRMS, CDPHE, EPA, CUSP, Local counties
- Work with BLM
  - Establish and draft a cooperative agency agreement
  - Update Resource Management Plan as applicable
    - Master Leasing Plan
- **Permitting, monitoring and tracking**

- Develop a process for monitoring and tracking
  - Internal Denver Water tracking process
    - Who gets notified for which permitting and or monitoring processes
    - Counties are notified, therefore they may be the best contact DRMS needs to notify before rather than after
    - County agencies - DW, Counties and DRMS to set up a better chain of communication – set-up flow chart of information. Get DW on communication list
- Identify existing monitoring programs
- Review permits being requested for deep drilling re impacts to uranium beds

**Consistently define setbacks from water sources and critical infrastructure for all related industries (oil & gas, uranium).**

- Require coordination with DW re operations and response
- Final draft from O&G leasing meetings and the county has 500 ft from all streams in Park co – agreed to have set backs – what should they be?
- Review Master Leasing Plan recommendations and formulate a strategy
- Mapping exercise via MLP– keep document for potential issues – look at 2 prop – take piece from MLP to use a place to start – keep the language and coordinate with Park County (T. Eisenman)
- Local designee – coordinate on 2A process with COGCC –
- Jefferson & Douglas county – local designee
- Table of local designee – contact list for the COGCC process – counties, CDPHE – Intern

**HYDRO-GEOMORPHIC ISSUES**

**Date: Friday, December 12, 2014**

**Location: Denver Water Three Stones Building, Denver, CO**

**Presenter: Peter Gallagher, Fin-Up**

Because water is one of the most important agents in forming and shaping of landforms, Hydrogeomorphology can be defined as an interdisciplinary science that focuses on the interaction and linkage of hydrologic processes with landforms or earth materials and the interaction of geomorphic processes with surface and subsurface water in temporal and spatial dimensions. With this understanding, Hydrogeomorphology is not a singular issue, but rather an inclusive one that impacts most areas of plan development when considering BMPs.

- Identify and map existing WARSSS and/or similar type studies/plans/reports/analysis within the watershed
  - Implement rapid assessment in areas with no data
- Get involved and participate in Basin Implementation Plans –
  - How do they tie to WARSSS and other assessments –
  - Look at quantity/quality relationship
  - Is funding is going the engaged roundtables?
- Identify high priority projects
  - Identify partners
  - Identify funding sources as needed

## GIS/MAPPING

**Date: Friday, April 10, 2015**

**Location: Denver Water, Board Room, Denver, CO**

**Presenters: Diego Portillo, Denver Water; Carrie Adair, CUSP**

GIS and mapping are the tools that tie the plan together. They provide the picture of where source water points exist in the watershed as well as the proximity of activity to those points. Effectively using GIS, layering, overlays and mapping can be a complex process and requires cooperation from many stakeholders. Hosting the dense amounts of information needed to create functional products is a challenge that requires identifying both needs and products as well as existing information and gaps in needed information.

- Identify each plan area that requires GIS, layers and mapping components
- Identify audience(s). This will inform what layers are needed
  - Internal use
    - Potentially more complex product
  - Potentially small fire districts, water providers
  - Public use
    - Potentially a story map
  - Create a simple map and track usage and patterns
    - Use this info to improve/modify/expand
- Identify the type(s) of functionality required
  - ArcGIS
- Identify applications/data/systems hosting options
  - Secured/unsecured (data security criteria)
  - Develop a list of what data is shared with stakeholders vs. public
    - Secured for identified stakeholders
    - Unsecured for public access
  - ESRI
- Data gaps analysis for required layers for the plan
  - Identify what entities will have the information, e.g.,
    - Counties
    - USFS
    - DW
    - BLM, etc.
- Analyze value/benefits of more resource-intensive GIS tool



**EXHIBIT D: Water Demand Estimator**

<b>Water Source ID</b>	<b>Permitted Water Supply (ac-ft/yr)</b>	<b>Permitted Peak Daily Capacity (million gals/day)</b>	<b>Average Daily Demand (million gals/day)</b>	<b>Average Peak Daily Demand (million gals/day)</b>
CO0116001-005	≈ 345,000	685	185	374
<b>Estimated Surplus (+) Capacity:</b>			<b>500</b>	<b>311</b>

**EXHIBIT E: Contaminant Types Associated with Discrete Contaminant Sources**

**Table E-1: Contaminant Types Associated with Regulated Discrete Contaminant Sources**

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

**Table E-2: Contaminant Types Associated with Contaminant Types Associated With SIC-Related Discrete Contaminant Sources**

SIC Code	Discrete Contaminant Source Type	Acute Health Concerns							Chronic Health Concerns								Aesthetic Concerns	
		Miroorganisms	Nitrate/Nitrite	Pesticides	Semi-volatile Organic Compounds (SVOCs)	Volatile Organic Compounds (VOCs)	Lead	Ammonia / Nitric Acid	Herbicides	Pesticides	Volatile Organic Compounds (VOCs)	Non-metal Inorganic Compounds	Metals - Primary Drinking Water (other than lead)	Radionuclides	Turbidity	Other Inorganic Compounds	Other Organic Compounds	Secondary Drinking Water Contaminants
02110 1	LIVESTOCK FEEDING	X	X					X								X	X	X
07210 3	AERIAL APPLICATORS			X					X	X	X					X	X	
07520 5	DOG & CAT KENNELS	X	X					X								X		X
07521 1	PET BOARDING	X	X					X								X		X
07820 6	LAWN & GROUNDS MAINTENANCE		X	X					X	X						X	X	
07821 2	SEEDING & FERTILIZING CONTRACTORS		X	X					X	X						X	X	
13890 5	OIL FIELD SERVICE				X	X	X	X			X		X			X	X	X
14990 1	MINING COMPANIES					X	X	X				X	X		X	X		X
16110 6	ASPHALT & ASPHALT PRODUCTS				X	X		X			X				X	X	X	X

17110 7	SEPTIC TANKS/SYSTEMS- CLEANING/REPAIRING	x	x														x	x		x
20820 1	BREWERS					x		x			x						x	x		
20840 1	WINERIES					x		x			x						x	x		
23969 8	AUTOMOTIVE TRIMMING/APPRL FINDINGS (MFR)					x	x	x			x		x				x	x		x
24310 2	MILLWORK (MANUFACTURERS)					x	x				x		x				x	x		x
24520 1	LOG CABINS HOMES & BUILDINGS (MFRS)					x	x	x	x		x		x		x		x	x		
25990 1	FURNITURE-MANUFACTURERS					x	x	x	x		x		x				x	x		
27110 1	NEWSPAPERS (PUBLISHERS)					x	x	x			x	x	x							x
27210 2	PUBLISHERS-PERIODICAL					x	x	x			x	x	x							x
27310 1	PUBLISHERS-BOOK					x	x	x			x	x	x							x
27411 9	MULTIMEDIA (MANUFACTURERS)					x	x	x			x	x	x							x
27520 2	PRINTERS					x	x	x	x		x	x	x				x	x		x
27520 3	POSTERS (MANUFACTURERS)					x	x	x			x	x	x							x
27590 2	SCREEN PRINTING					x	x	x			x	x	x							x
27960 1	ENGRAVERS-PLASTIC WOOD & ETC					x	x	x			x		x							x
30890 1	MOLD MAKERS					x	x	x	x		x		x				x	x		x
30890 6	PLASTICS- FABRICATING/FINISH/DECOR- MFRS					x	x	x	x		x	x	x				x	x		x





45810 4	AIRCRAFT SERVICING & MAINTENANCE					x	x	x	x				x	x	x			x	x		x
45810 6	AIRPORTS					x	x			x			x	x	x			x	x		x
46120 1	PIPE LINE COMPANIES						x		x	x			x	x	x			x	x		x
49110 1	ELECTRIC COMPANIES					x	x	x	x	x			x	x	x			x	x		x
49250 1	GAS COMPANIES						x		x	x			x	x	x			x	x		x
49410 2	WATER & SEWAGE COMPANIES- UTILITY	x	x			x	x	x	x	x			x	x	x			x	x		x
49530 2	GARBAGE COLLECTION	x	x	x		x	x	x		x	x	x	x	x	x			x	x	x	x
50320 8	CONCRETE PRODUCTS (WHOLESALE)												x		x			x	x	x	x
50321 1	SAND & GRAVEL (WHOLESALE)						x		x					x	x			x			x
50852 0	HYDRAULIC EQUIPMENT & SUPPLIES (WHOL)												x		x						x
50852 2	INDUSTRIAL EQUIPMENT & SUPPLIES (WHOL)						x						x	x	x						x
50931 2	RECYCLING CENTERS (WHOLESALE)	x	x					x		x			x		x						x
51720 3	DIESEL FUEL (WHOLESALE)					x							x								x
51720 8	GAS-LIQUEFIED PETRO- BTTLD/BULK (WHOL)																				x
51721 0	GASOLINE & OIL-WHOLESALE						x						x								x
51911 4	FERTILIZERS (WHOLESALE)		x	x								x							x	x	
51980 3	PAINT-WHOLESALE						x						x						x	x	
52112	CONCRETE-READY MIXED						x						x		x				x	x	x

8																			
52113 8	HOME CENTERS		x	x	x	x	x	x	x	x	x						x	x	x
52610 1	LAWN & GARDEN EQUIP & SUPPLIES-RETAIL		x	x		x				x	x	x							
52610 4	GARDEN CENTERS		x	x	x	x				x	x	x				x			
52613 7	ENGINES-GASOLINE					x						x							
54110 3	CONVENIENCE STORES				x	x						x							
55110 2	AUTOMOBILE DEALERS-NEW CARS					x	x					x	x				x	x	
55110 3	AUTOMOBILE DEALERS-USED CARS					x	x					x	x				x	x	
55410 1	SERVICE STATIONS-GASOLINE & OIL					x						x							
65530 2	CEMETERIES		x			x				x	x						x	x	
70320 3	CAMPS	x	x							x						x	x	x	x
70330 1	CAMPGROUNDS	x	x							x						x	x	x	x
72120 1	CLEANERS					x						x					x	x	
75140 1	AUTOMOBILE RENTING & LEASING					x						x							
75320 1	AUTOMOBILE BODY-REPAIRING & PAINTING					x	x	x				x	x	x			x	x	x
75320 4	AUTOMOBILE RESTORATION-ANTIQUE & CLASSIC					x	x	x				x	x	x			x	x	x
75370 1	TRANSMISSIONS-AUTOMOBILE					x	x					x	x	x			x	x	x
75380 1	AUTOMOBILE REPAIRING & SERVICE					x	x	x	x			x	x	x			x	x	x

753810	ENGINES-REBUILDING & EXCHANGING					x	x	x	x				x	x	x			x	x		x
753811	RECREATIONAL VEHICLES-REPAIRING & SVC	x	x			x	x	x	x				x	x	x			x	x		x
753812	TRUCK-REPAIRING & SERVICE					x	x	x	x				x	x	x			x	x		x
753903	WHEEL ALIGNMENT-FRAME & AXLE SVC-AUTO						x						x		x			x	x		x
753914	BRAKE SERVICE												x	x	x			x	x		x
754201	CAR WASHING & POLISHING														x			x			
754203	AUTOMOBILE DETAIL & CLEAN-UP SERVICE														x			x			
754205	CAR WASHING & POLISHING-COIN OPERATED														x			x			
754903	AUTOMOBILE LUBRICATION SERVICE					x	x						x								x
769957	LAWN MOWERS-SHARPENING & REPAIRING					x	x						x	x	x			x	x		x
769967	MOTORCYCLES & MOTOR SCOOTERS-RPR & SVC					x	x	x	x				x	x	x			x	x		x
769985	BATHTUBS & SINKS-REPAIRING & REFINISHING					x	x		x				x		x			x	x		x
799201	GOLF COURSES-PUBLIC		x				x			x	x	x						x	x	x	
799706	GOLF COURSES-PRIVATE		x				x			x	x	x						x	x	x	
799968	STABLES	x	x						x									x			x
806202	HOSPITALS						x	x					x	x	x	x		x	x		x
807101	LABORATORIES-MEDICAL						x	x					x	x	x	x		x	x		x
80990	HEALTH SERVICES						x	x					x	x	x	x		x	x		x



7																			
87340 2	LABORATORIES-TESTING				x	x	x					x	x	x	x		x	x	x
87341 9	RADON TESTING & CORRECTION											x		x					x
96210 2	STATE GOVERNMENT- TRANSPORTATION PROGRAMS				x	x	x					x	x			x	x	x	x
97110 1	FEDERAL GOVERNMENT- NATIONAL SECURITY				x	x	x					x	x		x				x
ALL OTHE R SIC CODE S	GENERIC SIC DEFAULT				x	x	x	x				x	x	x			x	x	x

**EXHIBIT F: Potential Sources of Contamination**

**COMMERCIAL / INDUSTRIAL**

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

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

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

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

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



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

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

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

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

**RESIDENTIAL / MUNICIPAL**

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



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

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

**AGRICULTURAL / RURAL**

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

**EXHIBIT G: Contaminant Types Associated with Dispersed Contaminant Sources**

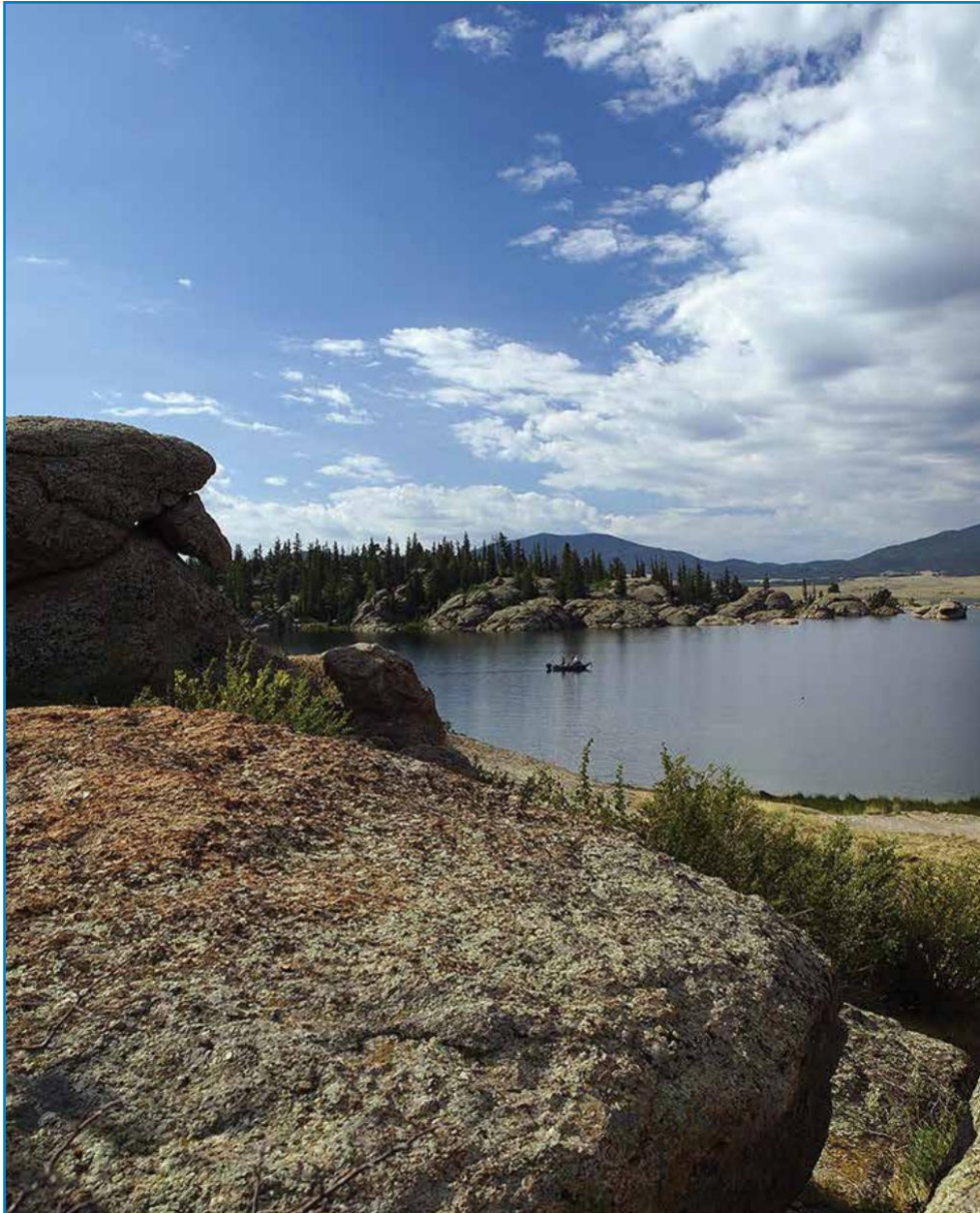
Dispersed Contaminant Source Type	Acute Health Concerns							Chronic Health Concerns								Aesthetic Concerns	
	Miroorganisms	Nitrate/Nitrite	Pesticides	Semi-volatile Organic Compounds (SVOCs)	Volatile Organic Compounds (VOCs)	Lead	Ammonia / Nitric Acid	Herbicides	Pesticides	Volatile Organic Compounds (VOCs)	Non-metal Inorganic Compounds	Metals - Primary Drinking Water (other than lead)	Radionuclides	Turbidity	Other Inorganic Compounds	Other Organic Compounds	Secondary Drinking Water Contaminants
LAND USES:																	
Commercial / Industrial / Transportation		X	X	X	X	X	X	X	X	X		X			X	X	X
High Intensity Residential	X	X	X					X	X				X	X	X		
Low Intensity Residential	X	X	X					X	X				X	X	X		
Urban Recreational Grasses		X	X					X	X				X	X	X		
Quarries / Strip Mines / Gravel Pits					X	X	X					X	X	X		X	
Row Crops		X	X				X	X	X				X	X			
Fallow													X				
Small Grains		X	X				X	X	X				X	X			
Pasture / Hay	X							X	X				X				
Orchards / Vineyards / Others		X	X				X	X	X				X	X			
Deciduous Forest	X							X	X				X				

Evergreen Forest	x							x	x					x				
Mixed Forest	x							x	x					x				
OTHER TYPES:																		
Septic Systems	x	x	x					x	x	x						x		
Oil & Gas Wells																	x	
Road Miles	x	x	x	x	x			x	x	x	x	x		x	x	x	x	x



# UPPER SOUTH PLATTE BEST MANAGEMENT PRACTICES FOR PROTECTING SOURCE WATER QUALITY

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## SUMMARY

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Protecting water quality throughout a watershed is a constant and challenging responsibility requiring persistent oversight and planning. The responsibility for protecting and preserving this most precious and invaluable resource falls to a broad range of stakeholders, beneficiaries, and end users. Individuals from county and local governments, federal agencies, land owners, local residents, and private sector project designers may not think of themselves as protectors and stewards of a region's drinking water quality but, in fact, their decisions can have significant impacts on source water quality and supply. Water providers and utilities have added responsibility to ensure that the water they serve is safe for their customers.

Denver Water understands the importance of maintaining high quality source water, as shown through Denver Water's mission "to be a responsible steward of the resources, assets and natural environments entrusted to us in order to provide a high-quality water supply, a resilient and reliable system, and excellent customer service". Denver Water has been collecting water quality and flow data in its watersheds since the 1970's. After many revisions of the focus and design of the watershed monitoring efforts, the most recent Watershed Monitoring Project was launched in 2002.

As part of an Integrated Resource Planning process in 2011, Denver Water concluded that its water treatment plants are fed by watersheds with relatively high quality water; consequently, the probability of needing to add advanced treatment technologies to these plants in the 20-year budgeting period is considered to be low. However, should advanced treatment be needed, it will be expensive. Cost estimates range from \$1.0 to \$1.8 billion depending on the technology implemented. Avoiding technology upgrades through watershed protection is anticipated to cost much less.

In 2012, Denver Water selected the Upper South Platte River Watershed for its first preliminary water quality assessment and to develop a standard watershed evaluation approach that can be applied to the remaining watersheds. The watershed covers over 2,600-square-miles and reaches from the Continental Divide to the Strontia Springs Reservoir, southwest of Denver. It varies in elevation from about 6,000 feet to over 14,000 feet above sea level and contains five major municipal and several smaller reservoirs. The watershed is geographically the largest of Denver Water's source water watersheds and provides municipal water for about three quarters of Colorado's residents. It is a recreational mecca with over 1.6 million acres of public lands, renowned for its "gold-medal" fishing streams and is home to numerous threatened and endangered species.

Denver Water hired ARCADIS in December 2012 to evaluate the water quality data for the Upper South Platte River in close collaboration with Denver Water staff and Jim C. Loftis, Ph.D. Professor in the Civil and Environmental Engineering Department at Colorado State University. The results from the water quality assessment demonstrated that the Upper South Platte Watershed is generally in good health and that water quality has been stable or improving over the last 10 years.

Denver Water's formal Upper South Platte Watershed Source Water Protection Planning process was initiated in 2013. The plan was developed as part of a collaborative stakeholder process convened by Denver Water, facilitated by the Coalition for the Upper South Platte, and

funded by the Colorado Department of Public Health and Environment through the Colorado Source Water Assessment and Protection program. The planning process and final plan are designed to provide municipal water providers, local governments and the public with information about drinking water, as well as provide a way for water providers and community members to get involved in protecting the quality of their drinking water. The program encourages community-based protection and preventive management strategies to ensure public drinking water resources are kept safe from future contamination.

The planning process recognizes that decision makers, public water providers, and emergency response personnel all play key roles in protecting water quality, both in the short and long terms. They are the community's front line to protect against spills and emergencies, deal with everyday contaminants of concern, mitigate negative impacts of development, and protect against long-term watershed degradation. For this reason, a Steering Committee comprised of broad stakeholders was convened to help direct the project.

The Steering Committee worked with subject matter experts to develop Best Management Practices (BMPs) for contaminants of concern within the watershed. These BMPs will be implemented to protect against contamination from chemical spills, leaking fuel tanks, inadequate septic systems, nutrients from agriculture, mine contamination, oil and gas development, and forest fires. In addition, protecting against long-term watershed degradation requires coordination between land managers and public water providers. It is critical that decision makers, public water providers, and emergency planning personnel have an understanding of potential impacts on source water.

Denver Water has been working with others in Colorado to improve water quality monitoring and evaluation, to increase participation in watershed groups, and to lobby for increased protection of drinking water sources. This plan for the Upper South Platte Watershed will serve as a guide and template for the development of plans in other watersheds upon which Denver Water's customers depend.

The following checklists are designed to assist these front line personnel in performing their water quality protection duties. The checklist is broken out into two sections; the first section details how to set up a plan and the second section provides specific checklist for topic areas that were developed during the plan setup. Section One of the checklist has been completed and can be used as a model for other Source Water Protection planning efforts.

# SECTION ONE – HOW TO SET UP A SOURCE WATER PROTECTION PLANNING PROCESS

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## Task I - Characterize the Source Water Protection Area

The size and configuration of the source water protection area is dependent on natural topography, direction of surface water flow, direction of groundwater flow, soil types, velocity and quantity of flow, and other factors. Each source water protection area includes a set of unique features, such as roads or developments that may impact water quality in wells and surface water intakes. The following steps outline how to set up a source water protection area.

- Work with CDPHE to obtain a copy of the Source Water Assessment for the water source watershed
  
- Characterize the water supply setting
  - Identify locations of water treatment and supply facilities
  - Identify watershed boundaries
  - Identify and obtain past watershed plans in proximity to watershed
  - Gather and analyze existing water quality data
  - Gather data related to watershed health, including locations of potential contaminate sources
  - Compile information and create maps of potential contaminate sources
  
- Based on the Source Water Assessment and the water supply setting, determine boundaries for the source water protection area

## Task II – Identify Steering Committee and Key Stakeholders

Water quality protection and proper land use planning are integral components of an effective source water protection plan. Understanding who all of the relevant, well-informed players are becomes vitally important in ensuring a balanced, inclusive and representative steering committee and plan. To formulate an effective strategy and plan, engage stakeholders whose interests are well represented throughout the watershed including, but not limited to, federal, state and county landowners and agencies; as well as local governmental authorities, established and respected nongovernmental organizations whose missions embrace watershed concerns and proactive citizens willing to aid and assist the planning process to the benefit of their communities.

- Identify key land use decision makers, landowners and planners and establish relationships. These may include representatives from:
  - Counties (including appropriate advisory boards)
  - Local governments (including municipalities, town, etc.)
  - Governmental Agencies (Federal, State and Local)
    - United States Forest Service (USFS)
    - Bureau of Land Management (BLM)
    - Environmental Protection Agency (EPA)
    - Colorado Parks and Wildlife (CPW)
    - Colorado Department of Public Health and Environment (CDPHE)
    - Water Conservancy Districts
  - Non-governmental Organizations
    - Existing watershed groups
    - Environmental groups (e.g. Trout Unlimited)
  
- Invite select stakeholders and decision makers to join the Steering Committee
  
- Invite other key stakeholders to participate in the Source Water Protection Planning process



### Task III - Identify and Prioritize Source Water Priority Issues

One of the first activities for the Steering Committee should be to identify the potential threats and risks for the watershed. Contaminants of concern in the source water protection area may range from man-made pollution to naturally occurring hydro-geomorphic issues. Knowing and understanding the range of land use activities and natural processes within the watershed helps drive the identification of potential pollutants and contaminants. The identification of these areas of concern will help to drive the selection process for determining which areas should be addressed in the plan.

- Convene meetings with Steering Committee to identify source water priority issues
- Provide background to Steering Committee, including information compiled in Task I (Characterize the Source Water Protection Area)
- The Steering Committee should ask the following questions to help identify source water priority issues
  - Is there significant industrial, commercial, residential or recreational development or activity, current or planned?
  - Are there landfills, above or underground gasoline storage tanks or chemical storage, treatment or manufacturing facilities?
  - Are there large scale agricultural operations or small hobby farms which could raise nitrate/nitrite levels?
  - Is there extensive fertilization application used for agricultural and/or residential properties?
  - Are there past or present mining or other resource extraction operations or activities that can impact or degrade water quality? If so, map these operations and identify the associated potential contaminants.
  - How are roads, both hard and soft surface, treated for maintenance, ice removal, dust suppression, and/or weed eradication?
  - Is there widespread use of pesticides, herbicides and/or tree spraying for mountain pine beetles and if so, who typically is responsible for using and applying these compounds?
  - Are there naturally occurring contaminants in the SWPA (e.g., uranium or soils naturally high in phosphorus)? Highly erodible soils? Etc.
  - What are the wildfire impacts; past fires and future high risk areas?
  - Does water quality data indicate a degradation of watershed health?
- Based on answers to questions above, identify topics and areas of interest relevant to source water protection

Prioritize contaminants of concern and topic areas

Rankings of High, Medium and/or Low priority are objective and take into account a range of conditions and circumstances. For instance, an important concern or issue might be ranked as “Low” priority because there are other plans, procedures and/or regulations in place that effectively address the issue. This plan should refer to these issues rather than needing to address them directly. Also a topic might be ranked as “High” priority because its implementation and rewards and benefits are easier to achieve and access. The table below is an example of the priorities given to the source water priority issues in the Upper South Platte.

Topic	High	Medium	Low
Wildfire and Forest Health	X		
Onsite Wastewater Treatment Systems	X	X	
Oil & Gas Development	X	X	
Uranium Development	X	X	
Natural Sources of Pollution			
Hydro-geomorphic Issues	X		
Mineral			X
Transportation			
Roads/Trails/Routes/Sediment	X		
Emergency Response/Spills/Impacts	X		
Agriculture	X		
Land Use/Development (Integrates into each topic area)	X		
Recreation	X		

## Task IV – Conduct Stakeholder Meetings and Identify Best Management Practices for Source Water Priority Issues

Based on the ranking of source water priority issues from Task III, stakeholder meetings on the source water priority issues should be held. The stakeholder meetings bring in experts to present their view of the priority issues and to propose best management practices (BMPs). The following format worked well for the meetings in the Upper South Platte: have the Steering Committee meeting for an hour prior to the meeting to review BMPs from the previous topic. The experts were given two hours for their presentations and then BMPs for the watershed were developed in the final hour of the meeting. The following steps are guidelines for holding stakeholder meetings and developing BMPs.

- Identify experts who can present on the source water priority issues and recommend BMPs
- Schedule one or two meetings per priority issue for discussion with the Steering Committee, stakeholders, and experts
- Work with stakeholders, experts, and Steering Committee to develop BMPs for each priority issue
- Develop reasonable time-line for implementation of each BMP
- Identify entities responsible for implementation
- Determine costs for implementation and maintenance and identify potential funding sources

## Task V – Prepare Source Water Protection Plan and Implement Best Management Practices

Once the stakeholder meetings on each of the source water priority issues are complete, it is important to document the source water protection planning process and the BMPs. The following steps outline how to document the protection phase of the planning process.

- Obtain the Source Water Protection Plan template from the CDPHE
- Complete Source Water Protection Plan and distribute to Steering Committee for review
- Revise Source Water Protection Plan and distribute to stakeholders

The following items relate to the implementation of the BMPs and are good guidelines for the implementation and protection phase of source water protection.

- Establish procedural processes to monitor local, state and federal development activities
- Develop effective communication strategies and collaborate with land use planners and engineers to provide comments, feedback and guidance to protect water quality on land use issues
- Establish an effective way to monitor updates to land use policies, land use agency plans and present source water protection planning concerns and planning BMPs
- Develop consistent language recognizing source water protection planning as an important community consideration and incorporate the language in Master Planning documents

## SECTION TWO – BEST MANAGEMENT PRACTICES CHECKLISTS

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The Steering Committee and other stakeholders developed the following Best Management Practices (BMPs) during the source water protection planning process. The intent of the BMPs is to improve source water quality in the watershed. The Steering Committee recognizes that not all of the BMPs can be immediately implemented and that some of the BMPs will take a number of years. The following checklist should be used to assist Denver Water staff and others invested in source water protection in performing their water quality protection duties.



## **ONSITE WASTEWATER TREATMENT SYSTEMS (OWTS)**

Vast areas of the Upper South Platte River watershed are rural and remote. Many homes and communities in the watershed rely on residential septic systems rather than community sewers. The regions with community sewer are mainly located in the more densely populated northeastern region of the watershed. The Steering Committee understands that it is important to address contaminants of concern (including nutrients and trace organic pollutants) that come from OWTS discharges, failing septic systems, and residual contaminants from OWTS that could potentially impact local water quality. The Steering Committee recommends the following BMPs.

### **Coordinate GIS overlays and mapping to identify sensitive areas**

- Research best data source for approximating septic system density (currently using well information)
  
- Define criteria for and identify sensitive drinking water areas
  - Proximity to stream(s) (1000 foot buffer)
  - Soil type(s)
  - Density of systems
  - Age of development(s)

### **In sensitive areas, perform surface water monitoring for nutrients and other potential contaminants**

- Develop a sampling plan that will provide data to increase understanding how OWTS effect water quality
  
- Collect and analyze data to determine if OWTS contribute to water quality issues

### **Using targeted public outreach, develop effective OWTS awareness to inform landowners and realtors of BMPs**

- Educate property owners and residents in the USP watershed on issues related to OWTS. Outreach may include:
  - Online public meeting to provide information
  - Door knocking in sensitive areas
  - Direct mail flyers
  
- Rebates and incentives to residents may be used to encourage proper OWTS maintenance
  
- Provide information to the real estate industry regarding regulations related to:

- Transfer of Title requirements
- Inspections
- Pumping
- Repairs at time of sale

### **Review OWTS regulations and standards**

- Review the OWTS regulations for each county
- Identify the county representative(s) that handle OWTS issues and establish a line of communication for reviewing future developments that may impact water quality
- Participate in next review of Regulation to ensure source water issues are addressed

### **Encourage OWTS inspections and record submittals on property transfers**

- Examine new County regulations for all four counties (adopted June 30, 2014) regarding inspections at transfer of title
- If not in effect, recommend that counties incorporate OWTS inspections at time of transfer

## **AGRICULTURE PRACTICES**

Ranching is a vital part of the rich history of the Upper South Platte Watershed as well as a vibrant industry in the region today. From large-scale ranching operations to small hobby farms, ranching thrives in the western portions of the watershed. Strong and active associations and organizations help ranchers understand state-of-the-art ranching techniques and best management practices.

Programs offered through the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) also provide outstanding resources and funding opportunities for the ranching communities. There is still much to be done to ensure consistent BMPs that preserve and protect the resources impacted by agricultural activities.

### **Identify sensitive drinking water areas adjacent to and downstream of agricultural operations**

- Gather GIS data indicating land use for agricultural purposes
  
- Define sensitive drinking water areas
  - Proximity to stream (1000 foot buffer)
  - Soil type
  - Density of operations
  
- Coordinate with Colorado State University (CSU) Extension Services, NRCS, and Conservation Districts to identify and protect priority areas

### **Draft standardized language and policies for grazing contracts between large landowners, land use managers and ranchers**

- Research example lease language (USDA, NRCS, Cattlemen's Association, Colorado State Extension)
  
- Draft example contract containing sample language. Encourage use of
  - Riparian buffers
  - Hardened water crossings for livestock
  - Off channel livestock watering
  
- Distribute document to stakeholders and refine it as needed
  
- Develop a stakeholder based approach to engage the entities in using the new template

### **Using targeted education tools, develop effective agricultural practices materials to inform landowners and real estate industry of BMPs**

- Identify/generate “Rural Realities/Lifestyle” resources e.g.  
[http://www.extension.colostate.edu/gilpin/natu/natu\\_docs/Mountain Livestock Brochure-GilpinNew reviewed.pdf](http://www.extension.colostate.edu/gilpin/natu/natu_docs/Mountain_Livestock_Brochure-GilpinNew_reviewed.pdf) ; <http://www.co.teller.co.us/communications/rural.htm>
- With input from partners, develop and distribute outreach materials

**Identify and promote funding opportunities for landowners to improve agricultural practices**

- Create a list of funding sources for agricultural practices and BMP’s
- Research ways to implement off-channel livestock watering practices
- Determine best outreach organization and coordinate with them. Potential partners include: NRCS, Colorado Cattleman’s association, USDA, USFS, BLM
- Research the potential of funding for BMPs through conservation easements. Potential partners include: Cattleman’s Land Trust, Palmer Land Trust, Mountain Area Trust, Colorado Open Lands and Colorado Agricultural Leadership Foundation (CALF).

**Research the availability of augmentation water or regulatory alternatives for off channel livestock watering**

## OIL & GAS EXPLORATION

Oil and gas resource exploration and extraction in Colorado have been taking place since the mid-twentieth century. The majority of active extraction currently occurs in the northern part of the state, but areas within the Upper South Platte watershed have been identified as viable sources for exploration. This is a complex and potentially controversial issue. Matters of surface land ownership versus mineral rights and the vast areas of land involved in drilling can further complicate the issue. It is important to understand the many ways in which water can be impacted ranging from the intensive use of water for resource extraction to the impacts on water quality caused by drilling and extraction operations, as well as reinjection or water disposal.

The Colorado Oil and Gas Conservation Commission (COGCC), a division of the Colorado Department of Natural Resources is the agency that interfaces with the Colorado Oil and Gas Association (COGA) and the industry in regulatory and compliance issues. After presentations from COGCC and COGA, the Steering Committee recommended the following BMPs.

### **Participate in the BLM Master Leasing Plan process and the Pike and San Isabel National Forests Oil and Gas Leasing process**

- Work with key agencies in BLM Master Leasing Plan process (Royal Gorge BLM, RMP, Pike San Isabel Oil and Gas Leasing Plan)
  - BLM (Statewide draft water stipulations for surface protection, NSO Municipal wells, etc. – get copies)
  - Park County (has regulations related to oil and gas development)
  - Colorado Department of Public Health and Environment (CDPHE)
  - COGA
  - COGCC
  - USFS
  
- Provide GIS layers as requested
  
- Attend planning meetings and provide comments relevant to source water protection
  
- Determine and define setbacks around reservoirs, perennial streams, wells, diversion points, and other sensitive areas

### **Work with other counties to raise awareness of BMPs for oil and gas development**

- Identify environmentally sensitive areas for all of Upper South Platte watershed
  
- Contact local designee for each county, establish a relationship with them and inform them of recommendation of BLM Master Leasing Program

- Develop consistent language recognizing source water protection planning as an important community consideration and include language in Memorandum of Understanding with counties

**Monitor oil and gas leasing on Denver Water properties**

- Check COGCC permit application information on a regular basis
- Form working relationships with State Land Board personnel
- Provide guidance on suggested BMPs to local designee for each county



## **TRANSPORTATION: Roads and Maintenance**

Multi-modal transportation corridors in the Upper South Platte Watershed range from social trails established over decades of recreational use to well-traveled State highways. The four State highways (285, 24, 67 and 9) that crisscross the watershed carry residents, commuters, tourists and commercial users throughout the watershed, and also connect them to major metropolitan and recreational destinations. The Steering Committee recommends the following BMPs related to roads and trails.

### **Identify sensitive areas and sediment transport/deposition potential occurring in proximity to these areas**

- Review previous sediment impact assessments for sensitive area analysis
- Form a committee of experts to discuss this issue and assess priority areas
- Define criteria for sensitive areas (e.g., roads in close proximity to drinking water infrastructure, hazardous material trucking routes, etc.)

### **Identify maintenance entities that work in sensitive areas and provide maps of sensitive areas**

- Identify who owns roads and maintains roads in the watershed. Likely parties include:
  - USFS
  - BLM
  - Counties
  - Private land owner and home owners associations
  - USFS
  - Colorado Department of Transportation (CDOT)
  - Denver Water
- Review county(s) BMPs – consolidate for road maintenance education at all levels (including targeted subdivisions/private ownership)
  - Integrate BMP training into existing annual organizational internal training events
  - Attend appropriate staff meetings for educational purposes
- Establish connections for weed spraying activities, share the sensitive areas near streams with them

### **Coordinate with road owners and trade organizations that deal with grading roads to do coordinated outreach and training of operators**

- Identify existing projects that employ BMPs to use as project review sites for county maintenance crews – possibly develop a video tour or workshops

- Create “cheat sheet” with BMPs for road maintenance operators
- In sensitive areas, consider signage for blade operators (e.g., tilt left here)
- Consider presenting BMPs at APWA local annual conference
- Provide road maintenance training for Denver Water operators

**Review USFS Road Construction Best Management Practices and integrate where appropriate**

## **TRANSPORTATION: Emergency Response and Hazardous Waste**

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

Roads and highways can contaminate water sources through spills, dust, and road treatments including salts, sands, and other chemicals for snow and ice. Additionally, fuels, oils, and other contaminants carried by vehicles can be released slowly onto roads and highways. Rapid and coordinated response and communication during all phases of Emergency Response is critical for the health and safety of area residents and their water supply.

### **Identify and raise awareness to sensitive areas and the potentially hazardous activities occurring in proximity**

- Form a committee of experts to discuss this issue and assess priority areas
- Define criteria for sensitive areas (e.g., roads in close proximity to drinking water infrastructure, hazardous material trucking routes, etc.)
- Consider signage on the side of the road indicating that motorists are entering a sensitive source water protection area

### **Outreach to emergency responders and dispatchers to help them understand the potential impacts of spills and hazardous waste to source water quality**

- Create and provide a laminated info card and dashboard stickers to emergency responders with
  - Colorado Spill Hotline Info: **1-877-518-5608**
  - Sensitive areas map
  - Denver Water and other agency contact information
- Distribute laminated card and dashboard stickers with hotline info to emergency responders

### **Conduct a spill kit inventory and provide spill kits to emergency responders in sensitive areas**

- Do an inventory analysis of which emergency responders have spill kits and who is trained to use them

Consider adding additional spill kits in emergency response vehicles – oil spill kits, hazmat kits (for car accidents, etc.)

Provide kits to emergency responders who operate in sensitive areas and do not have kits

**Encourage development of hazardous waste disposal and recycling programs in watershed**

Reach out to counties to see if they have existing programs

Research ways and funding opportunities to develop programs. Potential focus areas should include:

- Prescription take back programs
- Electronics recycling
- Habitat for Humanity paint recycling
- Pesticide and herbicide disposal

Coordinate with counties and other stakeholders to develop and promote hazardous waste disposal and recycling programs

## FOREST HEALTH

The Upper South Platte Watershed has seen some of Colorado's most devastating wildfires. The 2002 Hayman Fire burned over 136,000 acres and is still ranked as the largest wildfire in Colorado history. In response to wildfires, many regional agencies and organizations have become experts at not only dealing with post-fire recovery, but have learned the importance of prevention through mitigation. Bringing a heavily forested watershed into a state of balanced vigor demands an ongoing and proactive approach to forestland management.

It is important to understand emerging, state-of-the-art, and innovative mitigation and treatment technologies. It is essential that Denver Water continue its vital leadership role in collaborative and cooperative planning and implementation processes such as the Front Range Roundtable that address these issues. The Steering Committee recommends the following BMPs.

### **Define setbacks and firebreaks for critical infrastructure and resources to coordinate emergency response**

- Review existing reports for risk assessments for critical areas
- Make sure assessments include up-to-date information about drinking water infrastructure including reservoirs, water treatment facilities, and key water diversions
- Work with USFS and other stakeholders to define the setbacks required to protect infrastructure
- Share setbacks and critical areas with cooperating agencies through sharing of GIS data and pre-fire meetings
- Develop strategies for emergency response including, identification of key responders, development of protocols for rapid response, and coordination with Denver Waters Emergency Response Team.

### **Identify funding resources for forest health projects**

- Identify potential funding agencies including governmental and non-governmental programs
- Create a funding resource guide including a calendar of funding deadlines, eligibility requirements, and other relevant information
- Prepare for funding cycles by identifying and prioritizing potential projects. This may include:
  - Identifying appropriate project partners
  - Identifying project needs
  - Developing project budgets

### **Participate in research and outreach related to forest health topics**

- Foster relationships with researchers including those at Colorado State University, the Water Research Foundation, and other groups funding forest health research
- Participate in local watershed activities related to forest health
- Promote forest health education related to prescribed burns, forest treatments, and potential legislation related to forest health



## **MINE DRAINAGE AND URANIUM DEVELOPMENT**

Colorado's history is, in large part, built on mining. The promise of wealth from mining brought many people to the area in the mid-1800's and for decades was a major economic driver within the state. Mineral mining still thrives in the state and impacts related to past and abandoned mining activities still pose issues throughout the watershed.

Uranium was first discovered in the United States in Colorado. While the highest concentration of active uranium projects are in the southwest region of the state, there is a long history of uranium mining in Park County. Since this is a heavily regulated and monitored industry, it is important to be aware of updates to related regulations, stipulations and laws.

### **Research and partner with groups and agencies already working on abandoned mine issues**

- Check in with the Colorado Abandoned Mine Team whose members include participants from USFS, USFWS, DRMS, CDPHE, EPA, CUSP, and local counties
- Work with the BLM to establish and draft a cooperative agency agreement and to update their Resource Management Plan

### **Develop a method to monitor and track mine permit applications**

- Develop an internal Denver Water tracking process for mine permit applications that defines:
  - Who at Denver Water gets notified during the permitting processes
  - How Denver Water staff coordinates and communicates with counties and DRMS
- Review permits for potential impacts to source water quality and provide input to the counties and DRMS as needed

## **Define setbacks from water sources and critical infrastructure**

- Work with partners and stakeholders to provide input on creating setbacks that are protective of source water quality
  
- Participate in BLM's Master Leasing Plan and provide recommendations on setback distances
  
- Consider requiring setbacks under Colorado's Rule 317(b) which provides a setback distance and additional BMPs and containments up to a ½ mile upstream of water intakes

## **HYDRO-GEOMORPHIC ISSUES**

The hydro-geomorphology of the region is critical to understanding impacts on source water. Knowing the material makeup of the river bank, as well as its stability is important in preparing for and preventing river bank erosion. In addition, understanding the top- and sub-soil makeup aids in preparing for additional sediment transport to the river through both the saturated and unsaturated zones.

### **Identify and map existing Watershed Assessment of River Stability and Sediment Supply (WARSSS) and similar type studies and reports within the watershed**

- Implement WARSS Rapid Assessments in areas with no data
  
- Get involved and participate in Basin Implementation Plans and river basin roundtables
  - How do they tie to WARSSS and other assessments
  - What is the relationship between the water quantity and water quality
  - Is funding available for assessments from the roundtables
  
- Identify high priority projects
  - Identify partners
  - Identify funding sources as needed

## **MONITORING**

Monitoring the progress of the SWPP is vital to its overall success. Monitoring helps identify areas in which the plan has not been followed or is behind schedule and can bring the project back on task. In addition, it allows for critique of the plan and implementation of changes as issues inevitably arise.

### **Increase monitoring of source water priority constituents with special monitoring projects**

- Identify areas in plan that would benefit from specific monitoring
  - Existing/ongoing
  - New monitoring projects
  
- Attend DW fall monitoring meeting to discuss needs for the source water plan
  - First go over the existing monitoring program/strategy to understand what DW is currently doing
  - Outline needs for out-of-house monitoring
  - Get broader group together to define monitoring projects
  
- Prioritize contaminants
  
- Develop monitoring plan for source water; identify specific needs that would become special projects with DW and/or outside partners
  
- Cohesive monitoring plan – assess existing data and process; reevaluate the monitoring strategy and modify to meet the needs of the source water plan

## GIS/MAPPING

GIS and mapping are the tools that tie the plan together. They provide the picture of where source water points exist in the watershed as well as the proximity of activity to those points. Effectively using GIS can be a complex process and requires cooperation from many stakeholders. Hosting the large amounts of information needed to create functional products is a challenge that requires identifying both needs and products as well as existing information and gaps in needed information.

### **Create an online GIS tool to share information related to source water protection with stakeholders**

- Identify each plan area that requires GIS, layers and mapping components
  
- Identify audience(s). This will inform what layers are needed
  - Internal Denver Water use
  - Small fire districts, water providers
  - Public use
  
- Based on the targeted audience, identify the type of functionality required
  - ArcGIS
  - Online tools
  
- Identify applications/data/systems hosting options
  - Secured/unsecured (data security criteria)
  - Develop a list of what data is shared with stakeholders vs. public
    - Secured for identified stakeholders
    - Unsecured for public access
  - ESRI
  
- Data gaps analysis for required layers for the plan
  - Identify what entities will have the information,
    - Counties
    - USFS
    - DW
    - BLM, etc.
  
- Analyze value/benefits of more resource-intensive GIS tools

## **OUTREACH & EDUCATION**

Effective outreach and education is critical to the planning process and ensuring that clear information and tools get to the entities and people who need them. Developing a structure and platform for information dissemination is vital to the plan implementation. Messaging must be cohesive, consistent and targeted.

### **Create an outreach and education campaign to inform stakeholders about source water protection priority issues**

- Identify each plan area that requires outreach and education
  - Determine the strategies that best fit each area
  - Identify existing educational materials
    - Reach out to entities that have good educational resources and inform them of the SWPP and ask for their help in getting info regarding source water out to their constituents
    - Use and link these materials before developing new material
  - Determine new materials that need to be developed
  
- Work with Denver Water's Public Affairs department to integrate messaging related to source water protection into Denver Water's existing messaging program
  
- Develop additional outreach and educational materials as needed. Be sure to consider the following:
  - Who is the audience?
  - What do they need?
  - How can the information be share effectively?

### **Enter into a Memorandum of Understanding regarding source water protection**

- Draft Memorandum of Understanding (MOU) with input from Steering Committee
  
- Reach out to staff from the counties who have participated in the source water protection planning effort to determine how to introduce the MOU to County Commissioners
  
- Present MOU to County Commissioners and sign MOU



## INTERN

As part of the grant from CDPHE, a portion of the funds must be used for implementation of the BMPs. The Steering Committee decided that a good use of those funds would be to hire an intern to get started on some of the high priority BMPs. The Upper South Platte Watershed Source Water Intern will work on projects to protect the water quality of the Upper South Platte Watershed. The following steps outline the process for hiring the intern and the tasks the intern should work on.

### **Hire a Source Water Intern to assist with the implementation of BMPs**

- Write job description for the internship
- Submit a letter indicating intent to spend implementation funds to CDPHE on Source Water Intern
- Work with CUSP to hire intern
  - Post job announcement
  - Screen candidates
  - Interview candidates
  - Select intern
- Work with interns to implement BMPs. Projects may include:
  - Developing educational and reference materials for professionals and the public on topics such as septic system best practices, agricultural management, road maintenance, hazardous spills response, forest health, mining, and erosion mitigation as they relate to protecting water quality
  - Creating inventories of existing resources, such as spill kit availability for hazardous spill response and funding sources for landowners to make water quality improvements on their property
  - Connecting residents in the Upper South Platte Watershed with existing resources for protecting water quality in their area
  - Coordinating with other organizations to develop or disseminate resources and plan projects
  - Attending conference call meetings with the larger source water protection team

## EXHIBIT I: Acronym List

Acronym	Name
1041 Regs	Colorado House Bill 74-1041 powers allow local governments to identify, designate, and regulate areas and activities of state interest through a local permitting process.
ABE	Advisory Board on the Environment
APWA	American Public Works Association
BLM	Bureau of Land Management
BMP	Best Management Practice
CALF	Colorado Agricultural Leadership Foundation
CCA	Colorado Cattlemen's Association
CCWCD	Center of Colorado Water Conservancy District
CDPHE	Colorado Department of Health and Environment
CDOT	Colorado Department of Transportation
CFLR Act	Collaborative Forest Landscape Restoration Act
CGS	Colorado Geological Survey
CO DNR	Colorado Department of Natural Resources
COGA	Colorado Oil & Gas Association
COGCC	Colorado Oil & Gas Conservation Commission
CO SLB	Colorado State Land Board
CPW	Colorado Parks & Wildlife
CRWA	Colorado Rural Water Association
CSFS	Colorado State Forest Service
CSP	Colorado State Patrol
CSU	Colorado State University
CUSP	Coalition for the Upper South Platte
CWPP	Community Wildfire Protection Plan
CWF	Colorado Wildlife Federation
DRMS	Division of Reclamation Mining & Safety
DW	Denver Water
EPA	Environmental Protection Agency
FD	Fire Department
FRRT	Front Range Round Table
GIS	Geographic Information Systems
HOA	Home Owners Association
MLRB	Mined Land Reclamation Board
MOU	Memorandum of Understanding
MSHA	Mine Safety and Health Administration
NRCS	Natural Resources Conservation Service
NSO	Neighborhood Stabilization Overlay
OSWS	On-site Wastewater System
PD	Police Department
PSICC	Pike & San Isabel National Forests & Cimarron & Comanche National Grasslands
RMP	Rocky Mountain Power
SDWA	Safe Drinking Water Act
SO	Sheriff's Office
SPEB	South Platte Enhancement Board
SWAA	Source Water Assessment Area
SWAP	Source Water Assessment and Protection
SWPA	Source Water Protection Area

SWPP	Source Water Protection Plan
TU	Trout Unlimited
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish & Wildlife Service
USGS	United States Geological Survey
USP	Upper South Platte
USPR	Upper South Platte River
USPW	Upper South Platte Watershed
WARSSS	Watershed Assessment of River Stability and Sediment Supply
WQCD	Water Quality Control Division