

CHAPTER 4: CONTAMINANT SOURCE INVENTORY

4.1 INTRODUCTION

The contaminant source inventory is one of the most important elements in the source water assessment. It identifies potential sources of contamination (PSOCs) associated with specific activities, industries, and land uses located within the source water assessment area (SWAA). The inventory process is normally undertaken after delineation, and to some degree in conjunction with the susceptibility analysis. The contaminant source inventory serves three important functions:

1. Assesses past and present activities that may pose a threat to the water supply based on their contamination potential. Activities covered include transporting, storing, manufacturing, producing, using, or disposing of potential contaminants;
2. Identifies the locations of activities and operations that pose the greatest risks to the water supply; and
3. Educates the public about the potential threats to the water supply posed by various activities.

Colorado's approach to the contaminant inventory will be iterative, starting simple and moving to the more complex as experience and resources grow. The first step will be to identify the most significant or serious sources of contamination, those that are unarguably a concern for a PWS were they to enter the source water. The basis for identifying these substances will be those contaminants regulated under Colorado's Primary Drinking Water Regulations. Activities and land uses that manufacture, produce, store, use, dispose or transport these regulated contaminants within the SWAA will be identified. **Table 4.1** provides a list of activities of greatest concern to the State in the first iteration of the process. **Appendix E** contains a list of contaminants usually associated with each of these activities. At a minimum within the current timeframe established for the SWAP program, a SWAA must be evaluated for the presence of these significant PSOCs.

The Water Quality Control Division (Division) will assemble and integrate data on activities regulated by various state and federal agencies. During the initial contaminant inventory effort, the Division and its contractor(s) will pull this information together for all PWSs to identify and locate the most significant or serious sources of contamination to the PWSs. Once this information has been given to and reviewed by the PWS, the PWS and/or interested stakeholders will be encouraged to review this information and gather additional data on activities regulated by local and county governments. This local information will be added to the database if it is collected. Additionally, information collected by and from local citizens will be added to the database to complete the inventory of PSOCs within the SWAA. If permitted in the timeframe of the SWAP program, the Division and its contractor(s) will expand the list to include sources and contaminants of lesser concern once the database integration is more complete.

Table 4.1. Significant Potential Sources of Contamination in Colorado

SIGNIFICANT SOURCES	POTENTIAL CONTAMINANTS PRESENT
<p><i>COMMERCIAL / INDUSTRIAL:</i> Chemical / Petroleum Processing (incl. oil/gas wells, pipelines, refineries, tank farms) Dry Cleaning Fleet / Trucking / Bus Terminals Food Processing Gas Stations & Fueling Areas Injection Wells Machine / Maintenance / Repair Shops Manufacturing Facilities (incl. dry goods, electrical/electronics & synthetics/plastics) Metal Plating / Finishing / Fabricating Military / Government Installations (e.g., bases, depots, nuclear facilities, etc.) Mining (active & inactive) / Milling / Gravel Mining Railroad Yards (incl. fueling & maintenance areas) Storage Tanks (above-ground & underground)</p>	<p>Organics, inorganics Organics Organics, inorganics Organics, inorganics Organics, inorganics Organics, inorganics Organics, inorganics, microbial Organics, inorganics Organics, inorganics, radionuclides Organics, inorganics, radionuclides Organics, inorganics Organics, inorganics</p>
<p><i>RESIDENTIAL / MUNICIPAL:</i> Airports (commercial & municipal) Golf Courses, Parks (chemical/fertilizer application) Landfills/Dumps - active & historic, Incinerators, Waste Transfer Stations & Recycling Facilities (incl. municipal / commercial / hazardous waste) Septic Systems Transportation Corridors (transport of hazardous materials) Utility Stations (e.g., substations, powerplants, etc.) Wastewater Treatment Plants</p>	<p>Organics, inorganics Organics, inorganics Organics, inorganics, microbial Microbial, inorganics Organics, inorganics, radionuclides Organics, inorganics, radionuclides Microbial, inorganics, organics</p>
<p><i>AGRICULTURAL / RURAL:</i> Campgrounds & Rest Areas (septic systems) Confined Animal Feeding Operations (CAFOs), Animal Feeding Operations (AFOs), Auction/Feed Lots & Stockyards Irrigated Crop Areas (chemical/fertilizer application) Pesticide / Fertilizer Storage & Distribution Facilities</p>	<p>Microbial, inorganics Microbial, inorganics Organics, inorganics Organics, inorganics</p>

A second, but equally important reason for using an iterative approach is to build public involvement in the process. Experience with seeking public involvement in SWAP in small communities has reinforced the need to move from the simple to the more complex. In working with citizen groups on pilot and demonstration projects, the State learned that building confidence was very important to sustaining public participation in the assessments. Honoring this fact is critical for public participation while transitioning into the protection phase of SWAP.

Although citizens are encouraged to participate in all stages of SWAP; their involvement is particularly welcome and effective in the contaminant inventory phase. Interested citizens, equipped with clipboards and lists of activities to look for, can comb the SWAA area in teams. The results are usually very complete lists of PSOCs. The opportunity to compare and discuss the results with other citizen volunteers and local officials can have beneficial community development outcomes as well.

4.2 SIGNIFICANT SOURCES OF CONTAMINATION

Significant PSOCs are those activities or facilities that the State has determined to have the potential to release contaminants regulated under Colorado's Primary Drinking Water Regulations within a SWAA in amounts that could seriously contaminate the PWS. A listing of the PSOCs of most concern to the State is contained in Table 4.1. Significant PSOCs will be those which are known, or are likely, to manufacture, produce, use, store, dispose or transport regulated contaminants for which maximum contaminant levels (MCLs) or maximum contaminant level goals (MCLGs) have been established. Maximum contaminant levels refer to maximum permissible levels of a contaminant in drinking water, and maximum contaminant level goals are the levels of a contaminant which treatment facilities endeavor to attain. With a few minor exceptions, these would include all Class A and some Class B contaminant hazards (see Chapter 5.0 - Susceptibility Analysis). Other sources are also likely to manufacture, produce, use, store, dispose or transport regulated contaminants which do not have established MCLs or MCLGs and are of lesser concern. These sources would include some Class B and all Class C contaminant hazards.

Typically, significant PSOCs will include, but not be limited to, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or Superfund sites, Toxic Release Inventory sites, National Pollutant Discharge Elimination System (NPDES) permittees discharging to water bodies with domestic use classifications, underground storage tanks (USTs), Resource Conservation Recovery Act (RCRA) sites, as well as others included in databases maintained by local or county governments. Examples of the latter might include, but not be limited to, the location and densities of individual sewage disposal systems (septic tanks), landfills, and commercial enterprises that generate wastes of concern.

In addition to these sources, the contaminant inventory will include activities that would generate microorganisms (e.g. confined animal feeding operations, septic systems, and wastewater), including fecal coliform bacteria such as *Escheria coli*, viruses, *Giardia lamblia*, and *Cryptosporidium parvum*. The State will not attempt to include sewer lines as a PSOC due to

time and manpower problems associated with locating the vast networks of municipal sewer lines. In keeping with SDWA requirements concerning potential contamination from sewer lines, the State will note if past sewer line discharges have been a problem within the SWAA and discuss these incidences briefly in the narrative report for the susceptibility analysis.

Turbidity and total organic carbon sources will also be addressed in the SWAP assessments where possible. Turbidity, which can mask microbiological contaminants, occurs with disturbance to the river or stream, and can result from non-point source pollution loading. Total organic carbon, the result of the break down of organic matter, is usually associated with algal growth in water bodies, and may be affected by activities like confined animal feeding operations, wastewater treatment operations, and landfills or dumps. If total organic carbon is present at high enough levels in the source water, it can increase the presence of disinfection byproducts in treated drinking water. These disinfection byproducts are potentially carcinogenic. While total organic carbon currently is not a regulated contaminant, it will probably become of greater interest from a regulatory standpoint in the near future. Where these sources are positively identified in an SWAA they will be indicated on the assessment map if feasible or discussed in the narrative summary of the assessment report.

Non-point source pollution, which is diffuse in nature and is generated most commonly by activities such as agriculture, mining, and urban activities (e.g. construction, etc.), will also be identified within the SWAAs where feasible. Those sources with the potential to create significant adverse impacts to the source water will be identified in the contaminant inventory, and their locations will be indicated on a map of the SWAA or discussed in the narrative summary of the assessment report.

The information provided by citizens on historical land uses and disposal practices will be essential to ensuring that the inventory is complete. The PWS will be encouraged to interview or poll citizens for this information, and to record it on the map of the SWAA. All sources of contamination in the SWAA that meet the thresholds identified above will be considered significant PSOCs.

4.3 CONDUCTING THE CONTAMINANT SOURCE INVENTORY

Roles and Responsibilities

The task of conducting the contaminant inventory will be spearheaded by the State and its contractor(s), in cooperation with the PWS or a consortium of stakeholders including the PWS and citizens in the community. The contaminant inventory will attempt to identify the most significant PSOCs that could pose a threat to the water source. The contaminant inventory will begin with a topographical map of the SWAA with the PWS intakes and wells indicated. The SWAA is the focus area for the contaminant inventory. Each person working on the inventory should have a SWAA map to refer to and on which to indicate PSOCs.

During the initial phase of the contaminant inventory effort, the Division and its contractor(s) will pull information from existing state and federal regulatory databases to identify and locate the most significant or serious sources of contamination to the PWS. Once this information has been gathered and located on the SWAA map, the map will be given to the PWS to review for accuracy and completeness.

The next phase of the contaminant inventory will focus on local sources of information. In this phase, the PWS will be encouraged to take the lead on the inventory and to include citizens in the process. Where feasible, the PWS will be encouraged to work in concert with other PWSs and stakeholders located within the same SWAA. The PWS and/or interested stakeholders and citizens may help to gather additional data on activities regulated by local and county governments, as well as historical data that may not be contained within any database. This information will be added to the SWAP database.

Data Support/Iterative Approach

A list of PSOCs (Appendix E) to be considered in the contaminant inventory will be provided to the PWSs and other interested groups along with recommended methods for conducting the inventory. In addition, the State will provide a list and a map indicating the locations of state and federally regulated PSOCs within the SWAA. The lists and locations will be generated under cooperative arrangement with the state and federal agencies that collect and maintain them. Preliminary examples of the regulated activities and the databases that could be included appear in **Table 4.2**. The process for expanding the list will be iterative as additional databases are identified and reviewed, and the means for assessing the impacts of PSOCs improves.

The decision to limit the initial list of PSOCs to those of greatest concern was influenced by the time frame within which the contaminant inventory must be completed, and the ability of small PWSs, (the majority of those in the State), to become involved in the SWAP process. It is the Division's belief that providing too much information at the beginning of the effort would serve to discourage rather than encourage local involvement in SWAP. This is particularly true for attracting and sustaining citizen participation. For these reasons, an "iterative approach" will be used to allow the PWSs and the public to become familiar with the SWAP concept and develop a better understanding of the most serious types of threats to the water source. The list will be expanded as the ability of the State, the PWSs, and the citizens to generate, assimilate and evaluate pertinent information improves. It is important to emphasize that the initial assessment will be complete, and that it will include those sources with the most serious impacts on human health, and therefore of most immediate concern to the PWS.

Table 4.2 Examples of Regulated Databases That Might be Used in the Contaminant Inventory.

Ownership	Database Name
Colorado Dept. of Agriculture Colorado Dept. of Labor and Employment, Oil Inspector Colorado Dept. of Public Health And Environment	Pesticide Storage Facilities Underground Storage Tanks Hazardous Waste Generators Landfills Point Source Wastewater Permits PWS Location Data Superfund Sites
Colorado Dept. of Transportation Colorado Oil and Gas Control Commission Counties State Engineers Office	Salt and Sand Storage Facilities Oil and Gas Wells, Surface Facilities Individual Septic Disposal Systems Surface Diversion Structures Well Construction/Drilling Records
U.S. Environmental Protection Agency	Class V Injection Wells STORET

To help ensure that the delineations and PSOC inventories are completed within the allotted timeframes, the State proposes to use the nesting approach developed for the delineations with the contaminant inventories as well. The contaminant inventory will note SWAAs that contain large parcels of land such as National Forests and Parks, wilderness areas, and open spaces managed by the State or counties. These parcels will be noted and assessed similarly where they meet criteria that indicates that there are few PSOCs of concern. The nested approach will allow large expanses of land to be inventoried in the aggregate due to the limited amount of human activity. Given the size of many of these land parcels, the nested approach holds promise of saving significant time and energy. Approximately one-third of the landmass in Colorado falls into this category.

The iterative approach will bring together the key data sets from the state and federal regulatory databases, those databases maintained by local and county governments, and information provided by residents, businesses and other stakeholders familiar with the SWAA. The land uses and activities that will be evaluated in the initial phase of the contaminant inventory include those of greatest concern to the State and to surface and ground water systems. It is the intent of the State to make people aware of SWAP and to provide opportunities for them to become involved in all phases of the assessment. The iterative approach appears to be a logical strategy to achieve this goal and to fulfill the intent of the Safe Drinking Water Act amendments.

Citizen Participation

The State highly recommends that the PWS involve citizens in conducting the local contaminant inventory, and to advise them to be as thorough as possible in identifying PSOCs within the SWAA. Experience has demonstrated that motivated citizens with an interest in learning about the local water supply and how to protect it are excellent candidates to undertake the contaminant inventory.

Training is recommended to familiarize people with the SWAP concept and its aims. Once trained on the use of the PSOC checklist and the various other sources of information, citizens are typically very thorough in completing the inventory because of the vested interest they have in the water supply. The State has developed a guidebook for community involvement for the Wellhead Protection program that will be modified to assist PWSs in attracting public participation in SWAP.

A contact person within the PWS should be designated to coordinate the volunteers, teach them how to conduct the inventory, and meet with them afterwards to go over the results once the inventory is complete. Citizen volunteers will be encouraged to present the results of the inventory to the local governing or decision-making body that will be endorsing it and authorizing follow up actions. This contact person would also communicate the results of the local inventory to the State.

Once the inventory is complete, to the satisfaction of the PWS and the State, the vulnerability of the water source to the PSOCs will be ranked as high, moderate or low during the susceptibility analysis phase. This will be done in accordance with the susceptibility analysis matrices developed by the State to ensure equitable and consistent ratings of similar situations within the SWAAs. Those activities receiving high and moderate rankings will be indicated on a map of the SWAA. Public participation in collecting information for the ranking process and reviewing the rankings is highly recommended as an important preparatory step to the protection phase of SWAP.

Contaminant Inventory Methods

PHASE 1. During the initial phase of the contaminant inventory, the Division and its contractor(s) will pull information from existing state and federal regulatory databases to identify and locate the most significant or serious sources of contamination to the PWS. In addition, information will be pulled from these databases, if available, that will be useful in conducting the susceptibility analysis. The list of sources that emerge from the search of the regulated databases, along with the maps indicating their locations, will be forwarded to the PWS for verification. The PWS will use this information as the departure point for the next phase of the inventory where they may take the lead in assessing the local PSOCs in the SWAA.

PHASE 2. In addition to the data sets that the State will provide, a complete assessment will need to include an assessment of local activities and land uses that do not appear in the state and federal databases. During the second phase, the PWS may play an active role in organizing and

conducting the local contaminant inventory. The PWS, or other responsible party working with the PWS, is advised to pull this information together by establishing contact with the local governmental agencies that are responsible for managing these databases and initiating data searches and other types of searches of their files.

PHASE 3. The third step in the inventory is the survey of residents and businesses to determine historical land uses and current practices within the SWAA that could have an adverse impact on the source water. Again, the PWS is advised to direct and coordinate this activity to ensure consistency and reliability in the collection and analysis of the information. Methods recommended for conducting the survey include, but are not limited to:

1. Field, door-to-door, mail or windshield surveys;
2. Interviews with long-term residents and/or business owners;
3. Site identification from aerial and/or historical photos;
4. Researching directories and files such as telephone directories, regulatory files, local tax records, master plans, land use data bases, local health and fire departments, business records (i.e. fuel delivery schedules), and chemical storage records.

How, when, and by whom the information is collected must be recorded so that it may be verified. This will also be important in the event the data are used to apply for a vulnerability waiver.

Further guidance on the contaminant inventory methodology will be provided in the State's guidance document. This guidance should help to explain methods for recognizing, identifying and cataloguing the most significant sources of contamination. Checklists will be included to help guide public participation efforts.

It is anticipated that the inventory will be completed within a reasonable time frame following delineation of the SWAA. The inventory and the other elements of the assessment must be completed for all PWSs by the August 2003 revised deadline established in the Safe Drinking Water Act and the accompanying guidance.

4.4 INCENTIVES FOR LOCAL PARTICIPATION

Use and Susceptibility Waivers

Participating in the source water protection effort at the local level will be voluntary in Colorado. Incentives will be offered to PWSs to become involved, and to develop source water protection plans for their systems. PWSs willing to participate in SWAP improve the likelihood of qualifying for "use" or "susceptibility" waivers from sampling for synthetic and volatile organic chemicals. Interested PWSs must demonstrate to the State that the contaminants in question are

either not present in the source water protection area, or if present, are not a threat to the water source.

To qualify for a waiver, a PWS must first have a good compliance record. The PWS then must be willing to delineate the area to be protected, inventory potential contaminant sources within it, and document that the SOCs and VOCs for which the waiver is sought have not been used, or if used, that the water source is not susceptible to contamination from them. PWSs able to qualify for a waiver from synthetic organic chemical testing can realize significant savings.

A use waiver is awarded if the PWS can demonstrate to the satisfaction of the Division that the compound has not been used in the area. A susceptibility waiver applies where the compound(s) has been used, but the PWS can demonstrate that the water source and/or system are not susceptible to contamination from this compound(s).

Planning and Management Tools

SWAP will assemble and analyze data on the SWAAs that will be very useful to local and county governments in determining what is needed to protect their water sources. Over time, SWAP will provide dependable information on the hydrology and hydrogeology of the area, along with periodic updates of the PSOCs that could threaten the water source. Active participation in SWAP will bolster local decision-makers. The information that will be available will allow elected officials to use geologic and hydrogeologic information in deciding how to protect their water sources. The information gathered through the SWAP process will be organized by SWAA within the hydrologic unit and/or sub-unit, providing each PWS with a picture of the number and location of known potential contaminant sources in the SWAA. This information will be valuable to the local government and the PWS in determining what actions are needed to protect the water source.

4.5 INTEGRATION WITH OTHER WATERSHED EFFORTS

In the course of developing the State's SWAP strategy, the opportunity and advantages of integrating it with other watershed-wide water quality management programs became clearly apparent. The source water assessments that will be undertaken for the PWSs will be done on a watershed basis. To ensure that the assessments are complete, they will need to examine the 303(d) list of impaired streams, particularly where these streams serve as, or feed into, drinking water sources. Other programs that will be part of the SWAP assessments are the Unified Watershed Assessment and its influence on PWSs, the location and management of Class V wells within SWAAs, and the impacts of non-point sources, to cite a few. Ground water systems will be addressed in the context of the Comprehensive State Ground Water Protection Program and the sensitivity assessments that are being developed for the state's aquifers. The Non-Point Source Program and the use and susceptibility waivers will apply to both the surface and ground water sources within the watersheds. Meeting the SWAP requirements will provide a welcome opportunity to integrate these other programs on a watershed-wide basis. A discussion of how the integration with other programs will occur follows.

303(d) Listed Streams

The inventory of potential contaminant sources will include an assessment of the stream segments presented on the State's 303(d) list of threatened and impaired stream segments. These stream segments will need to have total maximum daily load (TMDL) allocations developed for them. This information will be compared with the location of surface water intakes to identify streams that may have a problem meeting drinking water standards. Where a link between an impaired stream and a drinking water source is found, PWSs will be among the stakeholders enlisted to work on assessing the problem and devising solutions.

Clean Water Action Plan/Unified Watershed Assessment

The Clean Water Action Plan was developed in response to concerns about meeting the goals of the Clean Water Act. The Plan places renewed emphasis on the restoration and protection of the country's waters. The original goal of the Clean Water Act was fishable and swimmable waters for all Americans. Benefits to drinking water sources will be a byproduct of the Clean Water Action Plan initiative.

A key element of the Clean Water Action Plan is the Unified Watershed Assessment which brings together, on a watershed basis, diverse assessment objectives that are being undertaken by the State, tribes, federal agencies, and others. The aim is to identify watersheds not meeting clean water and other natural resource goals and to work cooperatively to focus resources and implement effective strategies to resolve the problems. The information available through this process will be very valuable to the overall assessment of the watershed and the impacts on the quality of the water used for drinking water.

Comprehensive State Ground Water Protection Program

The strategy to protect the State's ground water reserves that will be outlined in the Comprehensive State Ground Water Protection Program, will address ground water sources of drinking water, and the integrated measures needed to protect them. The Comprehensive State Ground Water Protection Program will include the cooperative arrangements that will emerge among the various State agencies to protect ground water for domestic use and a number of other beneficial uses.

Section 319 - Non-Point Source Program

The State's non-point source program addresses diffuse forms of pollution to both surface and ground waters of the State. The sources fall into the categories of those generated by or associated with agriculture, urban and construction runoff, mining, and timbering. Funding on a 60/40 percent cost share basis is provided for demonstration projects to ameliorate or correct problems. The source water assessments should help to identify serious non-point source problems within the SWAAs and help to evaluate their impacts on the water sources. The ongoing non-point source projects will also emerge in the inventory, giving the PWS an opportunity to determine if the approaches are working. Conceivably, the approaches being

employed in the non-point source demonstration project could be used by the PWS to protect the water source.

Underground Injection Control Wells, Classes I through V

Although not technically a watershed-based program, Underground Injection Control can have a significant impact on area aquifers. These wells are regulated under the Safe Drinking Water Act to protect drinking water quality from underground injections. The Underground Injection Control regulations establish five classes of injection wells. Class I wells are used to inject hazardous and non-hazardous wastes beneath the lowermost formation containing an underground source of drinking water within one-quarter mile of the well bore. Class II wells are used to inject fluids associated with oil and natural gas recovery and storage of liquid hydrocarbons. In Colorado, the Oil and Gas Conservation Commission regulate these wells. Class III wells are used in connection with the solution mining of minerals, and are regulated by the State Division of Minerals and Geology. Class IV wells are used to inject hazardous or radioactive wastes into or above a formation that is within 1/4 mile of an underground source of drinking water. Class V wells are defined in the regulations as any well not included in Classes I through IV. The Class V Underground Injection Control Program is administered by the U.S. Environmental Protection Agency in Colorado.

The State will be looking at the location of the underground injection control wells within the SWAAs as part of the contaminant inventory. A preliminary evaluation of the regulation of these sources will be undertaken to determine the actual threats they pose to the source water within the different watersheds.