

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

In 1996, the federal Safe Drinking Water Act (SDWA) was reauthorized by Congress and signed into law. There were many innovative changes in the amendments, key among them the requirement for every state with primacy to develop a Source Water Assessment and Protection (SWAP) program as a means of protecting water used for public drinking water supplies. SWAP calls for the states to conduct an assessment, coordinated with existing information and programs, to determine the vulnerability of public drinking water sources within their boundaries. The concept was not new; it had been employed ten years before with the Wellhead Protection (WHP) program, a preventive approach to protecting ground water sources of drinking water. Source water protection expands the concept to include surface water sources as well.

Up to the point where wellhead protection and source water protection were introduced into the Safe Drinking Water Act, the principal options available to community water systems with contaminants in the water supply were treatment or the development of a new water supply. Both are often costly. Source water protection provides public water systems (PWSs) an opportunity to use preventive approaches that are simple and have the potential for containing costs.

SWAP is a two-phased process including an assessment phase and a protection phase. The assessment phase is the first step in the process and must include four elements: (1) involvement of the public in the design and implementation of the source water assessments; (2) delineation of source water assessment areas (SWAAs) for each PWS; (3) an inventory of significant potential sources of contamination (PSOCs) within the SWAA; and (4) a determination of the susceptibility of the PWS intake or well to the inventoried contaminants. The protection phase utilizes the information obtained from the assessment phase and encourages the public water providers to employ measures within the SWAA that will help ensure the long-term integrity of the water source. A SWAA becomes a source water protection area (SWPA) with the development of a protection plan and implementation of protection measures.

This preventative approach to protecting a PWS is generally more cost effective and efficient as it examines a multitude of factors that might influence the quality of the source water. It is a departure from the practice of managing system by system, without looking at the larger picture. As proposed, the preventive approach should provide a more thorough assessment and identification of potential problems. The PWS can then take action to avoid costly repairs or increased treatment costs, and should be able to improve the overall management of the system.

One key difference between the Wellhead Protection program and the Source Water Assessment and Protection program has been the emphasis on public participation as an essential element in the development and implementation of the programs. Under the WHP initiative, public participation was encouraged in all phases of program development and implementation. In SWAP, it is the first priority. State SWAP submittals will be evaluated on the amount of public

participation that occurred during the development phase and the commitment to involve citizens in subsequent phases. The State of Colorado (the State) has made a concerted effort to inform citizens about SWAP and to enlist their participation in protecting the sources of their drinking water.

The Water Quality Control Division (Division), an agency within the Colorado Department of Public Health and Environment (CDPHE) has assumed the responsibility for developing the State's SWAP program. Colorado formally entered the arena of SWAP in 1997 with the assignment of staff to develop the State's approach, and selection and appointment of the state-level Design Team to serve in an advisory capacity to the staff.

The 1996 amendments to the Safe Drinking Water Act provided dates by which the various components of SWAP are to be completed. The strategies that describe how SWAP will be undertaken in a given state had to be submitted to the U.S. Environmental Protection Agency (EPA) no later than February 8, 1999. The EPA has up to nine months from the date of submittal to approve the plan. The states then have two years to complete the assessments for all PWSs, community and non-community, with a possibility of an 18-month extension. Colorado, like most other states, requested the extension, as the additional time is needed to gather the information and complete the assessments for the 2,200+ PWSs in the state.

Each state was given the opportunity to set aside ten percent of its Safe Drinking Water Revolving Loan Fund FY 97 allocation to support the SWAP assessments. These funds are available for a specified time. Colorado has applied to use these funds (\$1.6 million) for this purpose.

1.2 DRINKING WATER IN COLORADO

Colorado is in a somewhat unique position geographically; the Rocky Mountains run like a spine from North to South and contain the headwaters of a number of rivers that flow out of the state. The Arkansas, Colorado, Platte, and Rio Grande Rivers originate in the mountains of Colorado. Snowmelt that fills the rivers, lakes, and streams each spring is the source of drinking water for most Coloradans.

The western slopes of the Rockies receive most of the precipitation in the form of snow. However, the demand for water is greatest in the urban and suburban areas along the Front Range. Therefore, in many cases, water is piped from the western slopes of the state, through and over the mountains to the Front Range where the majority of the population resides.

The use of ground water as a source of drinking water is concentrated primarily on the eastern plains and in the San Luis Valley in south central Colorado. The Eastern plains covers about one third the state's land mass, and are situated over the Ogallala and High Plains aquifers, the sole source of drinking water in this part of Colorado. The San Luis Valley, the world's largest intermountain valley, is also dependent on ground water for drinking water.

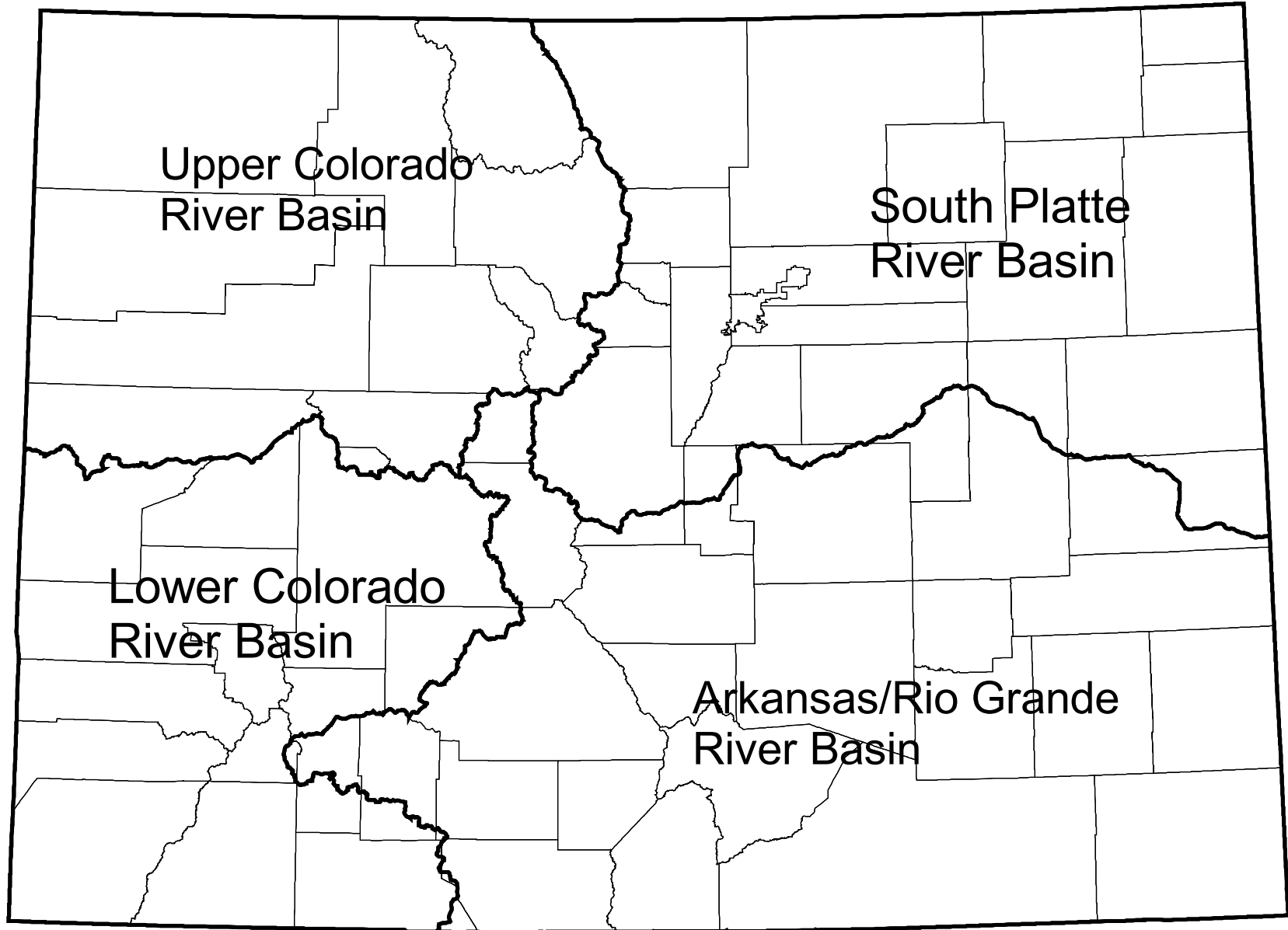
Colorado has an arid climate; the eastern plains average between 11 and 13 inches of precipitation a year, the mountains receive up to 70 to 90 inches. Most of the available water is used for agriculture, the remainder for domestic and industrial purposes. With the growth in population over the last 20 years, Colorado faces a challenge in the management of its water resources. An increased demand for drinking water has accompanied the population growth, and with it, comes greater threats to water quality. This demand is reflected in a breakdown of the number and type of Colorado's drinking water systems in each of the principal watersheds, which appears in **Appendix A**. The need to institute greater protections for the drinking water sources has become a serious concern for consumers and water providers alike. As a result, the introduction of the SWAP program is timely for Colorado

1.3 THE WATERSHED APPROACH

Source Water Assessment and Protection in Colorado will be organized by watershed. A map of Colorado's four principal watersheds appears as **Figure 1.1**. These principal watersheds will be subdivided into smaller hydrologic units and sub-units, within which the SWAAs will be defined. Organization of SWAP by watershed coincides with federal and state policies to manage water quality within this context. In recent years, the broad vision of the Clean Water Act and the Safe Drinking Water Act have focused on integrating traditional clean water activities and human health objectives within watersheds. The vision came together in the Clean Water Action Plan developed by the EPA in cooperation with the U.S. Department of Agriculture and a number of other federal agencies. The Plan brings together, on a watershed basis, various stakeholders to identify watersheds that are not meeting clean water goals, and to devise solutions. Examples of programs that are employing a watershed approach include the Non-Point Source (NPS) program, which addresses diffuse sources of pollution, the 303(d) listed streams that are unable to meet the water quality standards set for them, and the Unified Watershed Assessment (UWA). The result is a watershed assessment strategy in which SWAP will become a key component.

The watershed approach looks not only at an individual body of water, but at the entire basin in which it is located and at all contributing water sources. SWAP is a natural complement to the watershed approach because it advocates the integration of water quality management and drinking water protection measures. SWAP assesses the area surrounding the public wells, or the watershed above the surface water intakes, and involves stakeholders in deciding how best to protect the source. Watershed-wide management of this and other resources affords a more comprehensive picture of the positive and negative influences on water quality within the watershed, and helps ensure that critical factors will not be ignored, overlooked, or undervalued.

Figure 1.1 Map of Colorado's Four Major Watersheds



1.4 MISSION, GOALS, AND OBJECTIVES

Determining the direction for the SWAP program was an important step for the State. Early in the process, the Design Team, a citizen advisory group comprised of a cross-section of stakeholders, discussed the goals and direction for the State program and developed the following mission statement, goals and objectives for the state SWAP program:

MISSION STATEMENT:

The Colorado SWAP program delineates water supply source protection areas and supports community-based management strategies to ensure that all public drinking water sources are protected from undue sources of pollution.

GOALS:

1. To make relevant and appropriate information available to the public water providers, other interested parties, and the public, which can be used in either new or existing source water protection efforts;
2. To adopt criteria that can be used to delineate a preliminary set of source water protection areas throughout Colorado;
3. To establish a strategy for local government and public involvement that can lead to community-based programs;
4. To assist with projects or programs designed to provide safe public drinking water supplies;
5. To adopt methods for conducting assessments including contaminant inventories;
6. To make protection and preservation management strategies available to public water providers, other interested parties and the public;
7. To maintain a process for public input, education and responsiveness; and
8. To assist communities and PWSs in developing and implementing source water protection strategies tailored to local situations, needs and concerns.

OBJECTIVES:

The five objectives of the Colorado SWAP program are consistent with the basic elements of source water protection as defined in the federal Safe Drinking Water Act:

1. That public participation in the SWAP design process utilizes a diverse team and a responsive outreach and public participation program to assist the Division with the completion of the Colorado SWAP program goals;
2. That the Division, with assistance from the Design Team and the public, will establish criteria and guidance which can be used to delineate surface and ground water source areas that should be managed to ensure safe public drinking water supplies;
3. That the Division, with assistance from the Design Team and the public, will develop a preliminary list of contaminants and potential contaminant sources based on existing credible evidence and recommend a methodology that can be used by community-based programs to produce new or revised contaminant inventories;
4. That the Division, with assistance from the Design Team and the public, will establish methods of determining susceptibility of the drinking water source to contamination, and provide relevant and appropriate protection and preservation management strategies that can be used in community-based programs; and
5. That the Division will provide assistance to communities and PWSs in developing and implementing SWAP plans.

1.5 DATA COLLECTION AND MANAGEMENT

A key factor in the success of SWAP rests with the ability of the State to coordinate the collection and management of information needed to assess the threats to the PWSs. Information that must be assembled early in the process includes location coordinates of the surface water intakes and the ground water wells. The location information will be acquired with global positioning system (GPS) units which will accurately indicate the latitude and longitude readings for each well and intake. The Division is currently undertaking this task. The assistance of outside contractors may be sought to ensure that the location data are collected and entered into the Geographical Information System (GIS) in a timely manner within the time frames defined in the Safe Drinking Water Act amendments.

The hydrologic units will serve as the basis for grouping and selecting PWSs, which will be encouraged to partner during the assessment of, shared SWAAs. The locations of the surface water intakes and the ground water wells will be displayed on a map of the hydrologic units. The location and proximity of one PWS to another within a hydrologic unit will determine possible partnering arrangements among the PWSs. Where this occurs, and cooperative protective arrangements are feasible, the State will encourage and assist in coordinating partnering arrangements.

The size and configurations of the SWAAs may be altered depending on the outcome of the location display, and/or the desires of PWSs and other stakeholders to use pre-existing boundaries of a different configuration. In all cases, the State will review the alternative

proposals to ensure that the delineated SWAA adequately represents the area that provides water to the surface water intake and/or the well for the water supply. Any alternative proposal for the delineated SWAA must at least cover the area that provides water to the intake or well. The State will not approve SWAAs that do not meet this criterion.

Another important element in the data collection for SWAP will be the inventory of PSOCs within the delineated SWAAs. As a first step, the State will identify and assemble the data sets maintained by state and federal regulatory agencies on the activities that they regulate. These data will be augmented with information provided by local and county governments, and citizens to complete the contaminant inventories. Once all of the available data are collected, the principal sources will be indicated on maps of the SWAAs to illustrate their proximity to intakes and wells.

The information gathered will be organized by SWAA, providing each PWS with the number and location of known PSOCs within the SWAA. This information will then serve as the basis for determining the susceptibility of the water source to the contaminant sources identified.

The Division has assigned staff to work on the collection and integration of the data bases, and will enlist the help of the Department's and the Division's GIS offices to provide technical guidance in the selection of a SWAP contractor(s) and the development of standards for GIS map products and data integration. The State will select a contractor(s) to map the SWAAs, as well as the locations of the PSOCs, and to conduct the susceptibility analyses. The Technical Advisory Team, made up of state and federal agency and private sector representatives with knowledge about the various data sets and their utility to SWAP, have also been valuable in determining what data to collect and how to integrate and format the data so that they are useful to the local water providers.

Under the State's proposed program, SWAP will be an iterative process that starts with the basic, essential information needed for the assessment and then builds upon it as the capabilities at the State and local levels improve. The Division is cognizant of the need to structure the program to enhance public participation. This will mandate starting slow and building as participants' knowledge and confidence grow.

The State has assumed the responsibility to see that the SWAP assessments are completed. The assessments will be managed by the Division and performed by a selected contractor(s), in cooperation with the PWS and any interested stakeholder groups. The Division's contractor(s) will assume the lead in performing the delineations, identifying the PSOCs contained within existing state and federal databases, and conducting the susceptibility analyses. The contractor(s) will coordinate with the PWS to incorporate relevant existing data into the SWAP assessment. We anticipate more direct involvement by the PWSs during the contaminant inventory and susceptibility analysis phases in helping to identify additional PSOCs that may be contained in local governmental databases and to help review susceptibility ratings.

A limited number of site visits will be conducted to verify the accuracy of the location data collected on the intakes, wells, and PSOCs. The results of the delineation process and the

contaminant inventory will be forwarded to the PWS for verification. A random check will be performed before the information gathered in the assessment is furnished to the public. This approach will provide an incentive to make certain that the information contained in the source water assessment is accurate where the State or an entity other than the PWS has gathered it.

1.6 SOURCE WATER ASSESSMENT - KEY STEPS

The Safe Drinking Water Act specifies that the following tasks must be undertaken to adequately assess a PWS's source water.

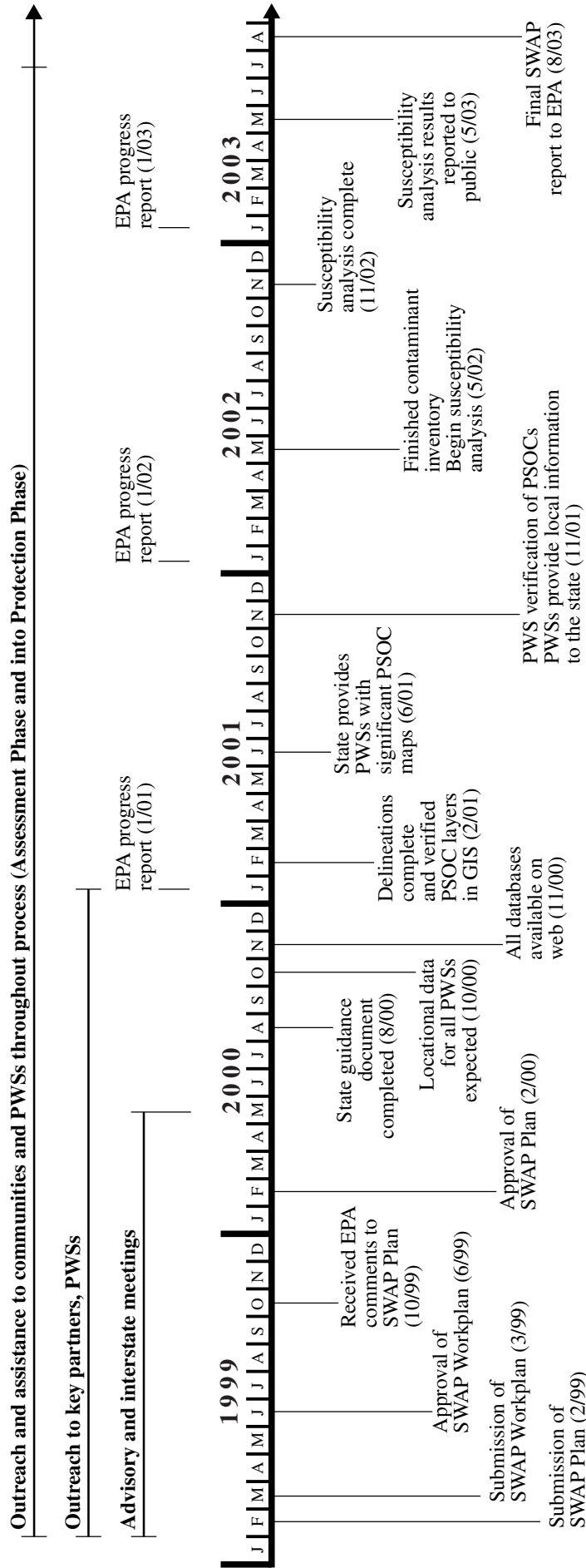
1. Delineate the source water assessment area (SWAA). The SWAA is the area or zone providing water to the surface water intake and/or the ground water well. This is also the area through or over which contaminants, if present, are likely to migrate and reach the drinking water well or surface water intake.
2. Inventory potential sources of contamination (PSOCs). Assemble data on regulated and unregulated PSOCs, along with information on the structural integrity of the wells and intakes, and the hydrogeology within the delineated SWAA.
3. Analyze the susceptibility of the drinking water source to the contaminants identified. Rate the PWS as having high, moderate, or low susceptibility to the type of contaminants or contaminant sources identified.

Public involvement is advocated in each of these steps during the assessment phase and in the protection phase of SWAP. The protection phase will use the assessment results to identify appropriate measures to protect the source water area. The PWS will use the results of the assessment to prioritize the most serious threats to the water source and to develop methods of managing or resolving them. Citizen and stakeholder involvement is strongly encouraged in this process.

1.7 SOURCE WATER ASSESSMENT AND PROTECTION TIMETABLE

The State of Colorado has developed a SWAP timetable to indicate the order and timeframes within which tasks must be undertaken to ensure that the assessments are completed for all PWSs by the newly revised August 2003 deadline. This timetable is presented in **Figure 1.2**. Reports of the State's progress to the EPA will be made yearly beginning January, 2001. This will be a stand alone report that will present a description of the progress that has been achieved in the four key element areas during the previous year, as well as a summary of the project budget.

Figure 1.2 Source Water Assessment and Protection Timeline



SWAP Program Plan, Work Plan, and State Guidance Document

The State SWAP program plan was completed and submitted to EPA in February of 1999. Formal review comments to the SWAP program plan by EPA were received in October 1999, and final approval of the SWAP program plan was received in February, 2000. The State submitted the SWAP work plan to EPA for approval in March, 1999. The SWAP work plan outlined how and by whom the tasks described in the SWAP program plan will be done. Since the SWAP work plan was approved initially by the EPA in June 1999 before the program plan was finalized, the work plan will be revised, as necessary, so that it is consistent with the finalized SWAP program plan. The State's guidance document outlining the methodology for conducting a SWAP assessment will be completed by the end of August, 2000. Copies of the State's guidance document will be distributed to PWSs and interested stakeholder groups. Selection of a contractor(s) to perform the various elements of the SWAP assessments is expected to begin by mid- to late June, 2000.

Delineation Efforts

Once the approved work plan has been revised the selected contractor(s) can begin delineating SWAAs for the PWSs which have location data in the State's database. The State currently has accurate location information for nearly all community PWSs. The current efforts to obtain these location data have included a mass mailing to all community PWSs requesting verification of current information; locating intakes and wells during ongoing site inspections by Division field engineers; and using contractors to collect well and intake locations throughout the state. Efforts to obtain the locations of non-community PWS intakes and wells will be similar and will commence once a contractor(s) is selected to perform the assessments. It is projected that the remaining location data will be obtained by October, 2000. Delineation of SWAAs and creation of SWAA maps is targeted for completion by February 2001.

Contaminant Inventory Efforts

The first part of the contaminant inventory, the identification of activities regulated by state and federal agencies was the focus of the Technical Advisory Team. Once the databases containing location information for these activities and PSOCs have been identified, they will be made available to the contractor(s) via the SWAP web site. If the participating agencies make their databases available over their own web page, these databases may be linked to the SWAP web site. All databases required for the contaminant inventory should be available to the contractor(s) via the web site by November, 2000. Preliminary GIS layers for each database will be created by February, 2001. The State or its contractor(s) will provide each PWS with a GIS map indicating the PSOCs assembled from the state and federal data bases and contained within their SWAA by June, 2001. This will allow a summer field season for the PWS to verify the indicated PSOCs and provide locally collected information to the State by November, 2001. The State and its contractor(s) will then be able to revise and add information provided by the PWSs to the GIS maps and complete the contaminant inventory. PWSs will be provided with a finalized map and a list of significant PSOCs in their SWAA by May, 2002.

Susceptibility Analysis Efforts

The State's contractor(s) will have approximately six months following submission of the results of the contaminant inventory to the PWSs to complete the susceptibility analyses. It is hoped that staggering the SWAA delineation and contaminant inventory efforts, as location data become available, will allow the entire assessment process to proceed ahead of schedule for those systems. This should allow all 2200+ systems to complete their susceptibility analyses in an orderly manner. It is anticipated that community PWSs will be able to complete the susceptibility analysis in sufficient time to report the assessment findings in the October, 2002 Consumer Confidence Reports. The State will ensure that assessment results have been posted or distributed to consumers no later than May, 2003. A final report to EPA will be prepared and submitted by August, 2003.

Ongoing Outreach Efforts

Formal meetings of the Citizen Advisory Team should be concluded by May, 2000. Their input into the design of the State guidance document will be very valuable and it is anticipated that they will continue to be consulted as the assessments are completed. The Technical Advisory Team and Design Team meetings will continue until such time as technical guidance is no longer needed, at least through the completion of the State's guidance document.

Outreach to key partners, including federal land management agencies, PWSs, county health departments, watershed initiative groups, etc., regarding the role of these entities in SWAP and what to expect when public interest in SWAP increases will need to continue during the next two years. Outreach and assistance to communities and PWSs will be needed throughout the assessment phase to provide training in assessment techniques, answer questions, provide guidance, and to develop local interest in the protection phase of SWAP.

1.8 PUBLIC PARTICIPATION

Public participation in the development and implementation of the SWAP is critical to the success of the program. Colorado has made a concerted effort to inform people of the program and to provide them opportunities to become involved. The State's experience with the Wellhead Protection program reinforced that source water protection efforts at the local level are enhanced when citizens choose to become actively involved in the assessment and protection of the drinking water source.

A series of volunteer citizen advisory teams were appointed to assist with the development of the SWAP program plan. Three separate teams worked on the design and development of SWAP, defining strategies for data collection and management, and the technical aspects of implementation. One team worked with staff to ensure Colorado's strategy will address the concerns of special needs populations and groups interested in drinking water quality and protection.

The Division has presented the SWAP program plan to numerous groups and individuals, and invited review and discussion at four regional public meetings. In addition, formal and informal reports and presentations were made to a variety of groups throughout 1998. A list of the presentations appears as **Appendix B**. Division staff attended a number of EPA-sponsored meetings and/or supported national and regional meetings on SWAP development and implementation. Copies of the draft SWAP program plan were posted on the State's SWAP web page, and were mailed upon request to interested groups and individuals. Responsiveness summaries were developed for the four publicly held meetings and prepared for the comments received from individuals. **Appendix C** contains the responsiveness summaries.

Colorado also participated in an EPA Region VIII meeting in Denver, in January, 1999 sponsored by Clean Water Fund, a non-profit citizen group that advocates for public health and environmental issues including drinking water initiatives.

1.9 INTEGRATION WITH OTHER PROGRAMS

In the course of developing its SWAP program, Colorado has examined the numerous other programs and initiatives to which SWAP is linked, and has developed ways to integrate them, where advisable, to more completely characterize source water areas. Examples of these include non-point source projects, the total maximum daily load (TMDL) effort, Clean Water Action plan, the Unified Watershed Assessments, the vulnerability waiver program, Underground Injection Control (UIC)-Class V wells, independent watershed groups, federal land management agencies, and special interest advocacy groups. An explanation of the actions taken with these programs is described in Chapter 4. The integration has and will serve to profile SWAP, draw desired attention to it, and involve groups that have not heretofore been involved with drinking water issues.