Idaho Source Water Assessment Plan

1999

Idaho Source Water Assessment Plan

State of Idaho
Division of Environmental Quality
Ground Water Program
October 1999

Source Water Assessment Advisory Committee Members

. . . . . *Policy Sub-Committee* . . . . .

Name	*Representing*
Glenn Thompson, Committee Chair	Potlatch Corporation Lewiston, Idaho
Donna West	Idaho Division of Environmental Quality Boise, Idaho
Jan Edgar	West Bonner Water District Oldtown, Idaho
Joe Qualls	City of Weiser Weiser, Idaho
Steve Highbarger	City of Buhl Buhl, Idaho
Bill Carr	United Water Idaho Boise, Idaho
Larry Annen	City of Orofino Orofino, Idaho
Mac Pooler	Central Shoshone Water District Kellogg, Idaho
Brian Whitlock	Office of Senator Kempthorne Boise, Idaho
Senator Grant Ipsen	Health & Welfare Committee Chair Idaho State Senate
Representative Delores Crow	Environmental Affairs Committee Chair Idaho House of Representatives
Sandy Hemenway	South West District Health Department Caldwell, Idaho
Beverley Ross	Soroptomist International Boise, Idaho
Sandra K. Harm	Retired Science Teacher Kuna, Idaho
Alex LaBeau	Idaho Association of Realtors Boise, Idaho

John Bokor	Idaho Rural Water Association McCall, Idaho
Ron Buatte	Potato Growers of Idaho Glenns Ferry, Idaho
Darrell Wilburn	Southeast Idaho Council of Governments Pocatello, Idaho
Art Brown	Jerome County Planning & Zoning Jerome, Idaho
Ann Puffer	U.S. Forest Service Region I Missoula, Montana

..... *Technical Sub-Committee* .....

Edward Hagan	Idaho Division of Environmental Quality Boise, Idaho
Maryann Helferty	EPA Region 10 Seattle, Washington
Mark Masarik	EPA Idaho Operations Boise, Idaho
Paul Castelin	Idaho Department of Water Resources Boise, Idaho
Gary Bahr	Idaho Department of Agriculture Boise, Idaho
Terril Stevenson	Natural Resource Conservation Service Boise, Idaho
Amy Owen	Nez Perce Tribe Lapwai, Idaho
Kirk Miller	Maxim Technologies Boise, Idaho
Brad Anderson	Lockheed Martin Idaho Falls, Idaho
Elizabeth Cody	City of Boise Boise, Idaho
Suzanne Buntrock	U.S. Forest Service Region IV Ogden, Utah

John Courtright	Bureau of Land Management Boise, Idaho
Deb Parliman	U.S. Geological Survey Boise, Idaho
John Welhan	Idaho Geological Survey/Idaho State University Pocatello, Idaho
Ron Golus	Bureau of Reclamation Boise, Idaho
J. P. Blickenstaff	Idaho Department of Commerce Boise, Idaho

. . . . . *Division of Environmental Quality Support Staff* . . . . . .

Significant time and resources were provided by the following personnel to support the Source Water Assessment Advisory Committee's development of this plan.

Water Quality & Remediation Division

Charlie Bidondo
Dave Schwarz
Dean Yashan
Scott Short
Ed Hagan
Angela Fisher
Marcie Grenda
Bruce Wicherski
Tonia Mitchell
Todd Maguire
Barry Burnell
Gary Dailey
Howard Woods

Environmental Information & Technology Bureau
Brandt Elwell

Boise Regional Office
Rob Howarth

Coeur d'Alene Regional Office
Steve Tanner

Many other individuals, agencies and entities contributed technical expertise and resources on specific issues during development of the Source Water Assessment Plan.

Introduction

The Idaho Source Water Assessment Plan was developed in response to requirements set forth by the Safe Drinking Water Act Amendments passed by Congress in 1996. The Safe Drinking Water Act Amendments require states to assess the water (called source water) from which public water systems draw to provide drinking water. Once completed, the source water assessments will provide information on potential contaminant threats to public drinking water systems. The Idaho Division of Environmental Quality, in conjunction with its public advisory committee, has developed the Source Water Assessment Plan to describe the major components of, and the procedures for, conducting source water assessments.

The Source Water Assessment Plan is a dynamic and evolutionary process; it provides a structure for planning and achieving consistent, rational assessments, while promoting public involvement. Source water assessment reports should be read with the understanding that hydrogeologic information and potential contaminant inventories may not have been confirmed by on site investigations. For example, contaminant time of travel calculations, soil characteristics, land use, and similar information are often estimates based on the results of previous analyses, information acquired from existing databases, or both. Nevertheless, assessment reports will be based on the best information available. Even with such estimates, the reports generated by this process represent a significant achievement in compiling a more thorough and comprehensive study of drinking water sources in Idaho.

Summary of the Source Water Assessment Process

The Idaho Division of Environment Quality is responsible for ensuring that source water assessments are conducted for all public water system. The assessments include: delineating the source water assessment area, inventorying potential contaminants within the delineated area, conducting a susceptibility analysis of the potential contaminants, and informing the public of the results. These steps are summarized below and detailed in the Source Water Assessment Plan.

The Idaho Division of Environment Quality encourages public water systems to take an active role in the assessment of their system. In fact, some public water systems may want to perform part or all of their own source water assessments. Reasons for doing so might include greater local control, better problem definition and delineation, and potentially better planning and protection decisions. For those public water systems, the Idaho Division of Environment Quality will also provide assistance to ensure that they meet

minimum requirements set forth by the EPA. Other public water systems may have already developed wellhead or watershed protection plans. The Idaho Division of Environment Quality will review those existing plans and determine what requirements of the Source Water Assessment Plan are met. If shortfalls are identified, the Idaho Division of Environment Quality will provide assistance or guidance to those public water systems to help them complete the source water assessment requirements.

The source water assessment process is detailed in ten (10) steps. Each of the major steps in the source water assessment process is summarized below with details available in the Source Water Assessment Plan.

Public Participation

Public participation is an important element of the Source Water Assessment Plan. Idaho employed the use of a citizen advisory committee, quarterly updates for all water systems on the development of the Source Water Assessment Plan, a point-to-multi point interactive audio/video workshop, targeted fact sheets, and an extensive formal comment period during the development and review of its plan. Participating in the planning and implementation phases of the assessment process will provide citizens and local officials with valuable information to use in local planning and decision making. Participating in the assessment process may provide communities with the incentive to develop locally sponsored source water protection efforts.

Collection, Analysis, and Management of Data

The efficient collection, analysis, and management of data are essential to the completion of the source water assessment process. To the maximum extent possible, all phases of the source water assessment will rely on the use of currently existing information and geographic information system (GIS) technology.

Notification

Each public drinking water system will be informed when the source water assessment process is to be initiated for their system. The systems will be requested to provide any information that may help in the delineation of their source water assessment area. This notice from Idaho Division of Environment Quality will also include an initial solicitation of interest from the drinking water system to participate in the potential contaminant inventory process or to act as the lead for its assessment.

Delineation Methods

The delineation process establishes the physical area around a well or surface water intake that will become the focal point of a source water assessment. The process includes mapping the boundaries of the zone of contribution (e.g., the surface and subsurface areas contributing water to the well, or surface water intake) into time of travel zones (e.g., zones indicating the number of years necessary for a particle of water to reach a well or surface water intake). The size and shape of the source water assessment area depend on the delineation method used, local hydrogeology, and volume of water pumped from the well or surface water intake.

The Idaho Division of Environment Quality will use three methods to delineate boundaries to ground water source areas. They are: fixed radius which corresponds to a two year time-of-travel boundary and used for transient systems; calculated fixed radius method used to determine a 3-, 6-, and 10-year times of travel boundaries when site specific data are not available; and a refined analytical method used to define the 3-, 6-, and 10-year time of travel boundaries. In the analytical process, the ground water source areas will be numerically modeled using ground water flow computer codes that are appropriate for the available hydrogeologic data and complexity of the aquifer systems being evaluated.

Surface water systems (including springs) represent about five (5) per cent of the total public water systems in Idaho. Methods that will be used to delineate these systems include a topographic boundary, streamflow time of travel, and buffer zone. The type of delineation to be performed will be specific to each source and may consist of a combination of methods. Large watershed areas will require a practical and cost-effective delineation dependent upon the type of water body. Springs and surface water sources influenced by ground water are addressed under the conjunctive delineation method.

Potential Contaminant Source Inventory Procedures

This process involves collecting, recording, and mapping existing data and GIS coverages to determine potential contaminant sources within the delineated source water assessment area. The potential contaminant source inventory is one of three factors used in the susceptibility analysis to evaluate the overall potential contaminant risk to the drinking water supply. The inventory process goal is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water or surface water contamination.

Susceptibility Analysis

This process determines the "susceptibility" or risk of each public water system well or surface water intake to potential contamination within the delineated source water assessment area. It considers hydrogeologic characteristics, land use characteristics, potentially significant contaminant sources, and the physical integrity of the well or surface water intake. The outcome of the process is a relative ranking of three susceptibility categories: high, moderate, and low. The rankings can then be used to set priorities for source water protection efforts.

Schedule, Report Format, and Availability of Results

The Idaho Division of Environment Quality has developed an implementation schedule for public water systems to have their assessments done. The agency may use one or any combination of three methods discussed in the plan.

For each public water system the source water assessment report will be provided in a public information package. The report will consist of a narrative and one or more maps illustrating the delineated source water area along with locations of potential contaminant sources. For each drinking water source, the report will describe the corresponding delineated area, the locations of potential contaminant sources, the susceptibility analysis, and guidance on interpreting results.

Copies of the final source water assessment report will be distributed and made available for public review. Public water system consumer confidence reports may be used to notify the community water system users that a source water assessment has been performed (for small systems, there are exceptions to this requirement). Assessments are recommended to be reviewed and updated by the public water systems and the served community at least every five years. When communities are experiencing rapid population growth and development, assessments may need to be updated more frequently.

Implementation of a Voluntary Source Water Protection Program

Local communities, working in cooperation with state agencies, can use the information gathered through the *assessment* process to create a broader source water *protection* program to address current problems and prevent future threats to the quality of their drinking water. One approach to protecting source water may be to limit certain types of land-based activities around the source. Local land use planning and related regulations are within the purview of local governments and not state or federal entities. Local citizens and

governments are uniquely poised to decide what protection methods are best suited to address their source water protection needs.

Source water protection is the ultimate goal for Idaho. A local protection program should maximize the use of existing data and draw on local knowledge to develop more detailed information. Strategies for carrying out local voluntary source water protection programs may include technical assistance, land use planning, pollution prevention, financial assistance, implementation of best management practices or other preventive measures, education, training, demonstration projects and contingency plans. The Idaho Division of Environmental Quality's goal through the implementation of source water assessments is to develop information which enables public water system owners, consumers, and others to initiate and promote actions to protect drinking water sources. The agency moves toward the goal of protection by encouraging a proactive approach to protecting and restoring drinking water sources; continuing to improve methods of informing communities and drinking water systems about contaminants that may negatively impact drinking water quality, and continuing to refine and target requirements for drinking water sources with a link to source water protection.

Summary

To find out more information about the Source Water Assessment Plan, please contact:

Ground Water Program
Idaho Division of Environmental Quality
1410 North Hilton, Boise, Idaho 83706
(208) 373-0502

The Idaho Division of Environmental Quality website at http://www.deq.state.id.us/water/water1.htm contains a copy of the source water assessment plan, source water assessment fact sheets, and other material pertinent to the drinking water of Idaho.

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CHAPTER 1
OVERVIEW OF IDAHO SOURCE WATER ASSESSMENT PROCESS

Idaho has over 2,100 public water systems that provide drinking water to homes, schools, businesses, and industries. Over 70 percent of the state's population depends on public water supply sources which are often vulnerable to contamination. Drinking water supplies are regulated through the IDEQ Drinking Water Program which has delegated primacy from EPA to regulate public water supply systems. A system (Figure 1-1) is considered a public water supply if it has at least fifteen service connections or serves at least twenty-five people.

Background

Comprehensive regulations designed to protect public drinking water supplies in the United States began with the enactment of the federal Safe Drinking Water Act (SDWA) in 1974. Specific amendments to the SDWA were passed in 1986, strengthening its provisions for ground water protection by requiring states to establish wellhead protection programs. The Idaho Division of Environmental Quality (IDEQ) has implemented an Environmental Protection Agency (EPA) approved Wellhead Protection Program (WHP) since 1996. This voluntary ground water program provides technical assistance to public water systems (PWSs) and local communities to help protect their drinking water supplies from contaminants.

The federal SDWA was further enhanced in 1996 with the passage of additional amendments which require states to develop a Source Water Assessment Plan (SWAP) for use with all public water supplies in the state. It expanded the 1986 SDWA Amendments by including preventative protection measures for public surface water supplies in addition to the ground water supplies which were addressed under the previous WHP program. The 1996 SDWA Amendments (See Appendix A Section 1453 of the SDWA) require states to conduct individual source water assessments for each public water supply in the state. The assessments will include: delineating the geographic area contributing water to the public water supply; conducting an inventory of potential contaminant sources in that delineated area; determining the public water supply susceptibility to contamination from the potential contaminant sources in the delineated area; and informing the public of the results. This nation-wide effort will result in the first comprehensive look at the nation's drinking water source from an assessment perspective. One of the outcomes of the nation-wide assessment will be information that PWSs can use to protect their sources of drinking water and help determine appropriate monitoring frequencies.

Purpose of Idaho Source Water Assessment Plan

EPA's SWAP guidance indicates that the intent of the 1996 SDWA amendments is to promote source water protection, with assessments being the initial step. The 1996 amendments embody the concept that new, responsible regulatory flexibility (within a baseline of national protection) is appropriate, if triggered by sound information on relevant local conditions. For instance, using good science, states can provide flexibility to monitoring systems based on contaminant occurrence data and the vulnerability of each hydrogeologic system. Similarly, states can allow small systems to achieve less than full compliance with the National Primary Drinking Water Regulations (provided there is no significant increase in risk to health), for variances based on consistent judgments of affordability and a full analysis of compliance alternatives. There are two key elements to the new prevention approach: a clear state lead, with flexibility and resources to achieve results, necessary because prevention is ultimately about land use and water management, which belong at the state and local levels; and a strong ethic of public information and involvement within the state decision-making processes.

The SDWA requires states to establish and implement a SWAP, which includes both of these elements. Again, a consistent theme in the new amendments is the empowerment of states with new flexibility and resources to tailor programs to their individual needs and conditions. This empowerment carries with it the obligation to solicit extensive public involvement and provide public information with special emphasis on prevention based efforts to ensure that states' choices respond to their constituents' needs and conditions.

In conjunction with this nation-wide effort, the primary goal of Idaho's SWAP is to develop information which enables PWS owners, consumers, and others to initiate and/or promote actions to protect their drinking water sources. The actual source water assessment is not an end product. Instead, it is a first step in providing a sound technical basis for the local public water supply system to consider protection measures appropriate for its particular situation. The long range goal of Idaho's SWAP is drinking water protection, not simply source water assessment.

Information derived from the source water assessments can be used by other environmental programs, both regulatory and non-regulatory, to develop and implement their program plans. Examples where this may occur include reducing drinking water sampling requirements through the monitoring waiver program, using the contaminant source inventory to assist in Class V injection well prioritization, and using the assessments to assist a new drinking water system in developing adequate technical capacity (Appendix B).

In addition to the programs already in existence which may benefit from the SWAP, Idaho's goals for the assessments include: further encouraging a proactive approach to protecting and restoring drinking water sources; continuing and improving methods of informing communities and drinking water systems about contaminants or potential contaminants that may negatively impact drinking water quality; and continuing to refine and target requirements for drinking water sources with a linkage to source water protection.

Roles In Developing and Implementing the Idaho Source Water Assessment Plan

A variety of entities at the local, state, or federal level have unique roles and responsibilities for managing ground and surface water quality (Appendix C). Many of these efforts are directly associated with source water assessments due to common goals and objectives. Table 1 illustrates the relationship many entities have to the Idaho SWAP. An underlying theme for implementing the SWAP is identifying common connections among entities/agencies and seeking opportunities to collaborate.

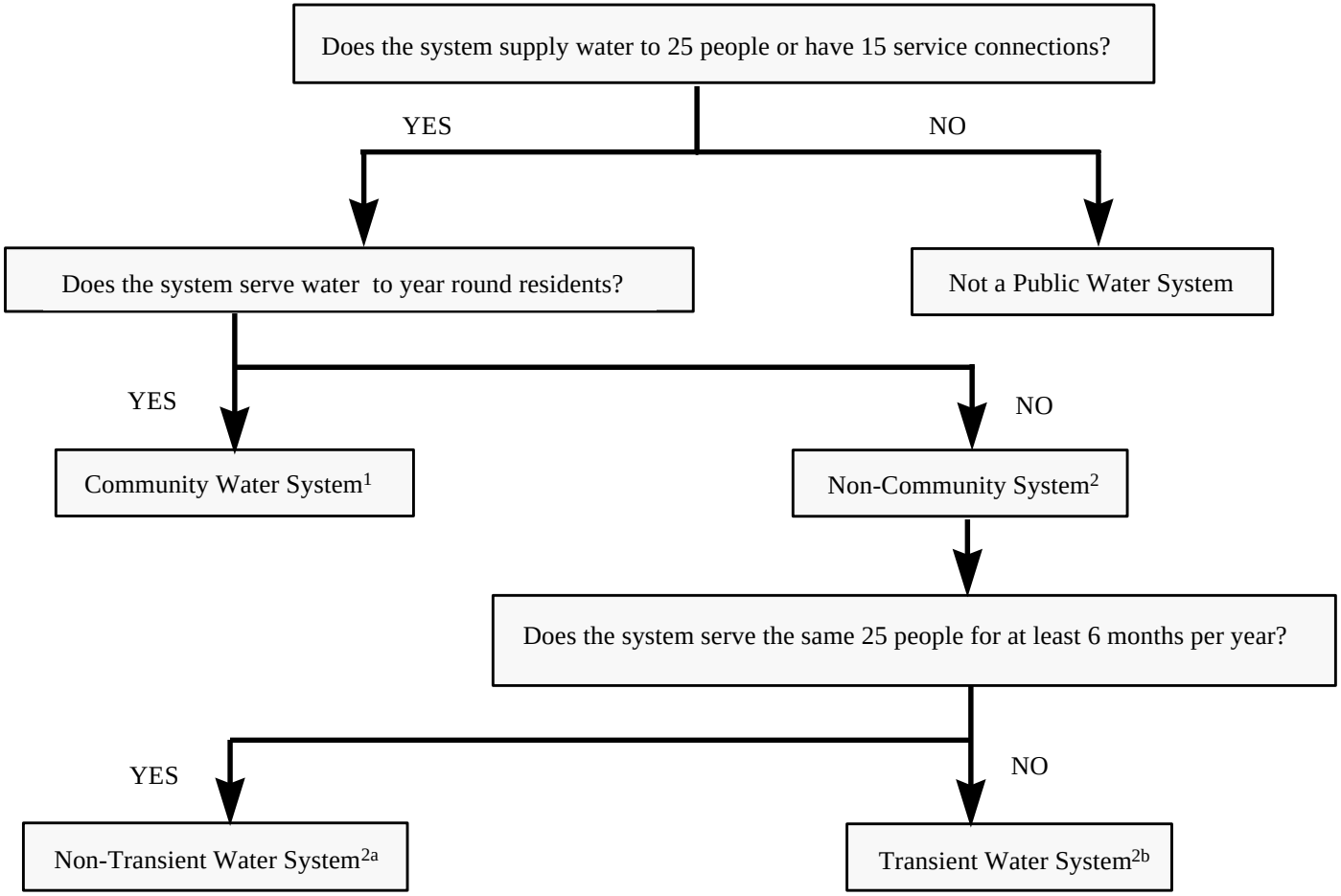
The successful implementation of the Idaho SWAP will require information sharing among these entities/agencies. Accessing useable databases and Geographic Information System (GIS) coverages will be crucial to the completion of the SWAP. Likewise, IDEQ intends to share source water database information and coverages with other agencies and the public.

Schedule for Idaho Source Water Assessments

States are required to submit a SWAP application to EPA within 18 months of the publication of its final guidance, or no later than February 1999. EPA will have nine months to approve a state program (until November 1999), after which the state will have two years to complete the assessments for all public water supply sources (November 2001), although an 18-month extension (to May 2003) is allowed under Section 1453(b) of the 1996 SDWA Amendments.

Idaho has requested and was approved for the 18-month extension to the two-year timetable for conducting the source water assessments. This request is based on limited financial and personnel resources available to conduct the over 2,100 public water system assessments required in Idaho.

Figure 1-1. Determining a Water System's Classification.



1. Community Water System - A PWS with at least 15 service connections used by year-round residents or which regularly serves 25 year-round residents.
2. Non-Community Water System - A PWS that is not a community water system. There are two types of non-community systems: a) Non-Transient and b) Transient
2a. Non-Transient - A water system that serves at least 25 of the same persons, fours hours or more per day, for four of more days per week, for 26 or more weeks.
2b. Transient - A water system that does not serve at least 25 of the same persons, fours hours or more per day, for four of more days per week, for 26 or more weeks.

Additional information concerning the proposed completion of required SWAP activities are discussed in the following chapters and appendices. Information regarding Idaho's timeline for completion of assessments can be found in the Idaho Implementation Schedule which accompanies this submittal.

Table 1-1. Roles of Various Entities/Agencies in Developing and Implementing Idaho's Source Water Assessment Plan.

Entity or Agency	Roles & Responsibilities						
	Assisted with Source Water Assessment Plan Development	Primarily Responsible for Source Water Assessments	May Perform Their Own Source Water Assessment (Case by Case Basis)	Provide Delineation Data	Provide Primary Contaminant Inventory Data	Responsible for Performing Optional Enhanced Contaminant Inventory	Provide Data Specific to the Susceptibility Analysis
City Government (community systems)	T		T	T	T	T	T
Tribes	T		T	T	T	T	T
Private Water Systems	T		T	T	T	T	T
Private Citizens	T						
Idaho Rural Water Association	T						
Idaho Division of Environmental Quality	T	T		T	T		T
Idaho Department of Water Resources	T			T	T		T
Idaho State Department of Agriculture	T				T		T
Idaho Geological Survey	T			T	T		T
Health Districts	T				T		T
Environmental Protection Agency	T				T		
Natural Resources Conservation Service					T		T
U.S. Geological Survey	T			T			T
U. S. Forest Service	T		T*	T	T	T*	
Bureau of Land Management	T		T*	T	T	T*	
Basin and Watershed Advisory Groups					T**		
Independent Districts					T		
Bordering States					T		
British Columbia, Canada					T		
Other Agencies or Entities	T			T	T		T

* Generally applies to transient systems that the particular agency is responsible for as the land owner
** Applies to those situations where Total Maximum Daily Load development efforts coincide with source water assessments.

CHAPTER 2
PUBLIC PARTICIPATION

The SDWA Amendments of 1996 require states to provide an opportunity for extensive public participation during the planning and implementing of the SWAP. The IDEQ has traditionally encouraged public participation in the development and implementation of new environmental programs, acknowledging the vital role the public plays in these efforts. The public participation process designed and utilized for the development of the Idaho SWAP was consistent with this philosophy. IDEQ recognizes that in order to gain public support in the implementation of source water assessments, it is important and necessary to involve the public in the SWAP development and implementation.

Public Involvement in the Source Water Assessment Plan Development

IDEQ developed and initiated a multi-faceted public participation strategy. The goals were to solicit public input on source water assessments in Idaho and to increase awareness among public water systems and their customers concerning the value of the assessment process in their local communities.

The strategy for Idaho included five major components: (1) convening one combined citizen and technical advisory committee to develop the state SWAP; (2) providing an extensive public comment period for review of the draft plan; (3) providing quarterly updates to all public water systems on the progress of the SWAP and its impact on Idaho drinking water systems through published articles; (4) conducting a point-to-multi point interactive audio/video conference to receive comments on the *draft* Plan, and (5) developing targeted fact sheets for impacted groups such as public officials, the agricultural community, water users, and water systems. Widespread distribution of these fact sheets was accomplished via mass mailings and during presentations conducted at meetings around the state. Additionally, IDEQ sent monthly agendas and meeting minutes to interested parties on the SWAP mailing list and posted the minutes and agendas on both the EPA and the IDEQ Internet homepages.

Formation of the Source Water Assessment Advisory Committee

During the latter part of 1997, IDEQ compiled a list of over 2,000 likely stakeholders interested in the development of the SWAP. This list consisted of representatives from: businesses; local, county, state, and federal governments; elected officials; drinking water systems; water users; natural resource and agricultural interests; professional associations; public health agencies; minority groups; environmental and

conservation groups; and special interest groups. Additionally, news releases were sent to over 150 press contacts announcing the formation of the committee. Over 240 individuals returned reply cards, many indicating interest in participating in the process.

From the final list, 35 people representing diverse backgrounds were appointed to a combined policy and technical advisory committee. In January 1998, IDEQ convened its first meeting of the Source Water Assessment Advisory Committee. The committee forum provided for combined meetings attended by policy and technical members.

Advisory Committee Role in Developing the Source Water Assessment Plan

The Source Water Assessment Advisory Committee provided recommendations and advice in developing the SWAP. Additionally, the committee made recommendations to IDEQ on ways to link source water assessments to local protection efforts. Finally, the committee members assisted in generating interest among their representative groups and other Idaho citizens, and also helped develop local support.

The Source Water Assessment Advisory Committee was actively involved in all aspects of the SWAP development, forming working groups for major components of the plan. Workgroups were formed to develop the following plan components: public involvement and notification; resource and financial issues; federal, tribal, intra-state and international relations; contamination source inventory; ground water source area delineations; surface water source area delineations; GIS and data management; and susceptibility analysis. During 1998, the full committee convened nine times to develop and comment on components of the SWAP. Additional workgroup meetings were held to develop complex technical chapters. The final meeting in January 1999 was structured to allow the Source Water Assessment Advisory Committee an opportunity to review and provide feedback on the comments received during the public review period.

Availability of the Draft Source Water Assessment Plan

The draft SWAP was distributed to the Source Water Assessment Advisory Committee and to the public for review and comment. Drafts were sent to appropriate agencies (local, state, and federal), and made available to those on the SWAP mailing list. The draft SWAP was made available over the Internet. Advertisements announcing the availability of the plan were placed in all major newspapers and a news

release was issued to press contacts across the state. IDEQ provided a 60 day period in which to submit written comments.

Statewide Meeting and Satellite Teleconference

On January 5, 1999, a multi point interactive audio/video satellite teleconference was conducted to provide additional opportunity for the public to comment on the *draft* Idaho SWAP. Participants at six sites around the state saw a source water assessment presentation and had the opportunity to ask questions and hear other comments. The video conference originated in Boise with down links to Post Falls, Lewiston, Twin Falls, Pocatello, and Idaho Falls. The teleconference was widely advertised by flyers, news releases, and personal contact. One hundred and one (101) participants attended, representing government entities, general public, industrial/commercial interests, drinking water providers, public interest groups, and agricultural interests.

The comments received from the audience were varied, ranging from concerns about source water protection to multi-jurisdictional issues. All comments and responses have been integrated into IDEQ's Responsiveness Summary and where appropriate have been addressed in the final SWAP.

Conclusion

Comments and recommendations for improvements from members of the advisory committee, and other comments that IDEQ received from the public (for example, during presentations or the teleconference) have been incorporated into the final Idaho SWAP. IDEQ believes that the use of the Source Water Assessment Advisory Committee was an effective means to involve stakeholders and others with specific interests and/or expertise helpful to the development of the plan. This was a particularly useful approach to exploring alternative solutions to difficult issues that arose during the plan development phase. All reasonable and diligent efforts have been made to reach the public so as to invite, value, and reflect public comment and participation. Additional information regarding IDEQ's continuing public participation strategy can be found in Chapter 4, Chapter 6 and Appendices B and G of the Idaho SWAP.

CHAPTER 3
DATA COLLECTION, ANALYSIS, AND MANAGEMENT

Data collection, analysis, and management are essential to the completion of the SWAP. To the extent possible, all steps of the assessment will rely on the use of existing available information and GIS technology. Each phase of an assessment has varying information requirements that benefit to different degrees from the integration of GIS technology.

GIS is a special-purpose digital database in which a common spatial coordinate system is the primary means of reference. A comprehensive GIS requires a means of data input from maps, aerial photos, surveys, and other sources; data storage; retrieval and query; data transformation and analysis; and data reporting in the form of maps. The GIS platform which will be utilized is the ARC/INFO and ArcView® applications by ESRI, Inc.

Data Collection

Currently available data sources are quite diverse and exist in a variety of formats and applications, and various locations depending on which agency or entity generates and maintains the information (Appendix D). Currently, inventories distinguish between information contained as part of a GIS coverage (Source Water Assessment 'Coverage' Information Inventory), and that contained in electronic databases or other data compilations (Source Water Assessment 'Database' Information Inventory). The inventories of existing information include both a prioritization and status rating, and varies widely in age and quality. The information contained in GIS coverages ranges from extensive attribute data sets to location data of varying degrees of accuracy.

Source water assessment delineations require precise location coordinates for the drinking water wells or surface water intakes. GIS coverage of all the existing public drinking water systems in the State provides the basis for the development of source water delineations.

Data Analysis and Management

The objective of data integration is to convert and compile database resources into a standard format and archive them in a central location. GIS coverages will be maintained in the Idaho Universal Transverse Mercator (UTM) projection and datum. New field information collected will be incorporated as requested into new or existing databases and GIS coverages. Documentation will be provided that describes the sources of data for all information used in the development of the source water assessments. For those GIS

coverages which are being updated, the accuracy of the location and attribute data will be verified. Although IDEQ cannot ensure data quality from every source, the IDEQ intends to reconcile conflicting data before the final report is issued.

GIS technology will be used to some degree in all steps of the assessment. There are three particular steps with special data analysis and management needs: delineation of the source water assessment area which can include either a surface water delineation or a ground water delineation, potential contaminant source inventory, and the susceptibility analysis.

C*Surface water delineations* will be defined by topographic and time of travel methods. These surface water delineations will be completed using GIS features and automated procedures in ArcView® Spatial Analyst (ESRI, 1996).

C*Ground water delineations*, numerical models incorporating groundwater flow computer codes appropriate for the level of hydrogeologic data available, and for the complexity of the drinking water and aquifer systems being evaluated will be used . The computer codes include EPA-approved packages such as WHPA (Blandford and Huyakorn, Version 2.0, 1991), and the *de facto* industry standard MODFLOW (McDonald and Harbaugh, 1988). There have been a variety of follow-on products developed for the MODFLOW code, including the Department of Defense "Groundwater Modeling System" (BOSS International, 1998), which integrates with ArcView. In particular, this application will enhance the transfer of information and products from the delineation phase to the contamination source inventory phase.

C*Potential contaminant source inventories* will emphasize the use of GIS technology. The source water delineation area, projected as a GIS coverage, will be overlain with coverages which portray various potential contaminant sources. Use of GIS technology will allow the identification of those sources which occur within the delineated area to provide a pictorial representation of threats to the water system under evaluation. Some of the GIS coverages which will be utilized during this phase of the assessment include, but are not limited to:

- LUST sites, both active and closed
- CERCLIS sites
- Wastewater land application sites
- Injection well locations
- Land use and land cover
- UST facilities
- RCRA sites
- SARA Title III sites
- NPDES discharge locations
- Landfills

Susceptibility analysis, consists of a stepwise evaluation and rating scheme. The evaluation process relies heavily on use of digital map products produced for the potential contaminant source inventory. These products will be evaluated with other specialized coverages which may include, but are not limited to the following:

- County-level nitrogen fertilizer and herbicide use estimates developed by the USGS (Battaglin and Goolsby, 1994);
- STATSGO and SSURGO (for selected counties) soils data (NRCS, 1998);
- FEMA floodzone delineations for selected counties;
- IDEQ delineations of ground water monitoring priority areas (These areas are based on evaluation of IDWR statewide groundwater monitoring network and drinking water system and state/regional/local water quality monitoring data);
- Statewide Fluvial Geology (IDWR database);
- DWIMs data; and
- Depth to ground water for selected aquifers in the state (from various sources).

Distribution of GIS Coverages and Products

There are three types of information and products which will be available for distribution to the public. These include:

- Base data used in the source water assessment;
- GIS coverages used in the source water assessment ; and
- Final source water assessment report and map products.

A limited amount of data will be made available to the public via the IDEQ website. The scope of the information made available will include reports associated with specific assessments and may include the ability to view source water assessment map products. All information related to source water assessments will be archived in digital format at IDEQ and will be made available to other IDEQ programs or other federal, state, or local agencies for use in various environmental projects. Public requests for the information could be easily retrieved and distributed in hardcopy format or in digital format on CD-ROM based upon the needs of the parties making the request. The availability and distribution of the final source water assessment reports is described in Chapter 5.

CHAPTER 4
SOURCE WATER ASSESSMENT ACTIVITIES

The SWAP will be used to conduct assessments at the state level in a consistent manner. This chapter provides an overview of the steps necessary to complete assessments (see Figure 4-1.) The steps would need to be followed should a municipal official, contractor, or consultant decide to conduct assessments on behalf of a public water system. Appendix E provides a technical overview for steps 3, 4, 5 and 6.

Step 1: Public Water System Notification

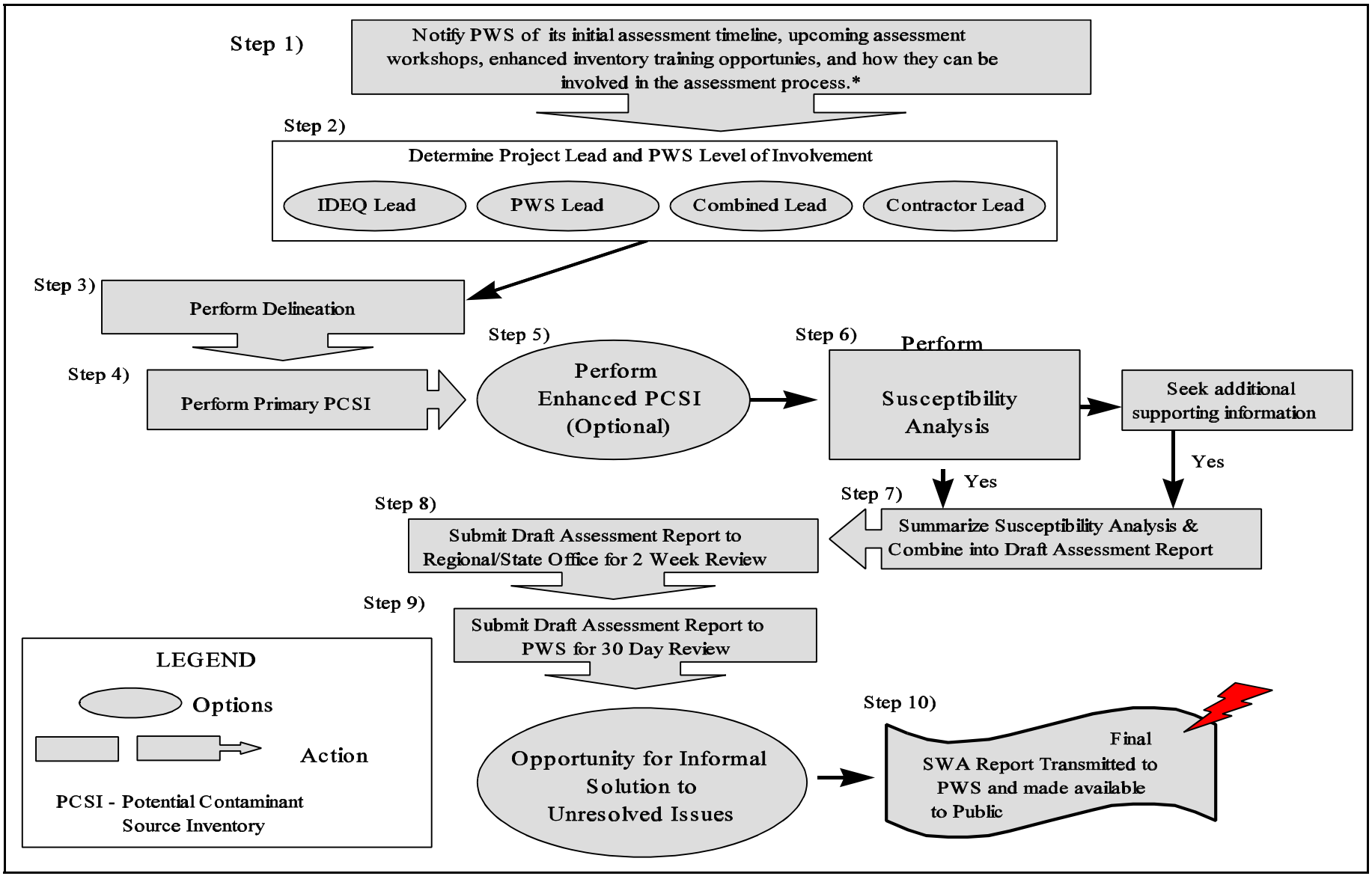
Project assignments will be made based on the implementation schedule priorities. Each PWS will receive a notification letter which informs them of the proposed time frame for system assessment.. The letter will ask whether the PWS would like to be involved in the assessment process and to what extent. The PWS will be asked to provide relevant information and be invited to a regional notification workshop.

All PWSs have the opportunity to conduct all or portions of their own assessments. While IDEQ will not delegate its SDWA authorities for source water, it does encourage communities to take on a range of tasks, recognizing that in some cases, it may be advantageous to a community to do so. While IDEQ will not provide funding to those systems that choose this alternative, the agency will oversee and review the assessment product to ensure consistency.

Step 2: Source Water Assessment Project Management

Public water systems are encouraged to take part in their own assessments. The assessment process is designed to be flexible enough to account for the interest and participation of the PWS. The IDEQ is prepared to accommodate the PWS on various levels, but anticipates some may not have the time or resources to participate in all steps. All of the steps, except the Enhanced Potential Contaminant Source Inventory (PCSI), will be conducted regardless of system participation. In some cases, larger PWSs may choose to conduct all steps. In these situations, IDEQ's involvement is to provide oversight and review of the final assessment report and accompanying data from the PWS owner, operator, or consultant. Task assignments will be agreed upon and the level of PWS involvement determined in consultation with the PWS at the beginning of the assessment process. It is recommended that a PWS that intends to complete an assessment independently, contact IDEQ (208-373-0502) to coordinate.

Figure 4-1. Source Water Assessment Activities



*PWS and/or its agent may participate in any or all of these steps as determined through prior collaboration/agreement with IDEQ.

Step 3: Perform Delineation and Summarize Results

Delineation is the fundamental step in defining a source water assessment area for both ground water and surface water sources. This step establishes the physical boundary around a source that becomes the focal point for the remainder of the assessment. It is within the delineated boundary or the "source water assessment area" that potential contaminants will be inventoried during Step 4.

Ground Water Delineations

The boundaries for a well or spring are defined by the time in years that it takes water to travel to that specific well or spring. For each community ground water source, the time-of-travel boundaries will be marked (delineated) on an appropriate base map and include the 3-, 6-, and 10-year time-of-travel zones. The three delineation methods are: arbitrary-fixed radius, calculated-fixed radius, and refined analytical.

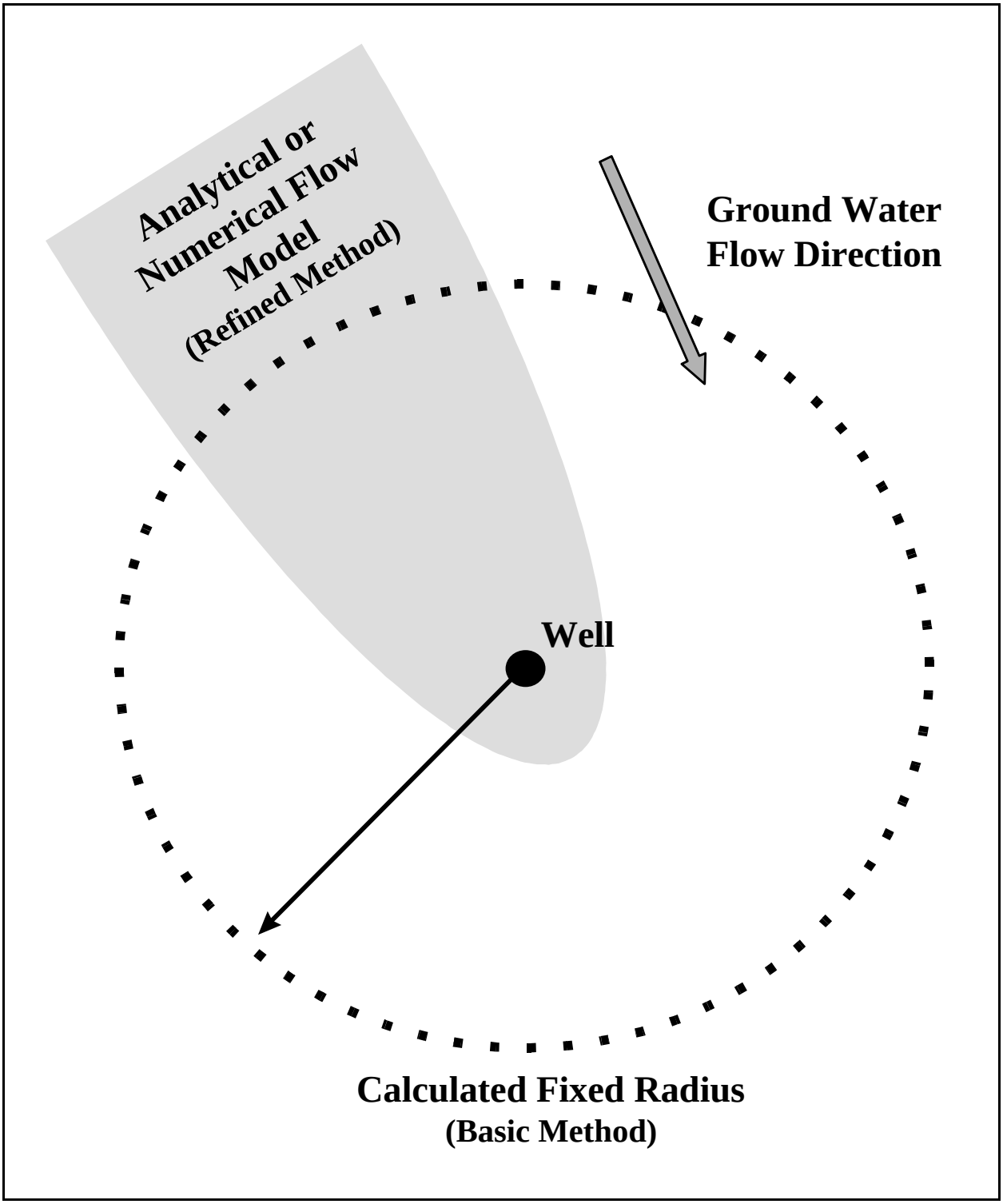
The arbitrary-fixed radius method consists of simply drawing a circle with a pre-determined fixed radius around the well located on an appropriate base map. This method does not require site-specific hydrogeologic data, is easier to implement and is less expensive. This will be the typical method used for transient systems (e.g., campgrounds, etc.).

The calculated-fixed radius method uses a radius from standard pumping rate tables found in the Idaho Wellhead Protection Plan (IDEQ, 1997) for each time of travel boundary that is determined. The tables are specific for five generalized Idaho aquifer types. This method does not require site-specific hydrogeologic data. Unfortunately, the method may result in extremely large source water assessment areas.

The refined analytical method uses numerical modeling of site-specific hydrogeologic data. The result is typically a smaller and more accurately delineated source water assessment area. The costs are somewhat comparable to the calculated-fixed radius method, but more time is involved to compile and analyze existing hydrogeologic data. Figure 4-2 illustrates the potential advantage to using the refined analytical method whenever possible.

This method typically results in cost savings during the potential contaminant inventory due to the smaller source water assessment area. Also, were a community to decide on local measures to protect the source water assessment area, the smaller delineated area would be more manageable. Since this method is more scientifically defensible and provides benefits to promote cost-effective source water protection initiatives, it is the preferred method of choice for PWSs when sufficient data is available.

Figure 4-2. Comparison of Different Delineation Method Shapes.



Surface Water Delineations

The boundaries of the delineated areas related to a creek, river, or lake that are associated with a PWS intake are defined in a two-tier fashion. First, for each drinking water source, the entire watershed boundaries will be determined on an appropriate base map from the intake structure, upstream to the watershed divide, this is called a topographic delineation method. The topographic method defines two sizes of watersheds: small mountain watersheds that can have drinking water intakes in creeks; and extremely large watersheds that can have intakes in rivers and lakes.

For practicality, a second-tier delineation will segment the extremely large watershed areas into buffer zones adjacent to the water body. These buffer zones will be the primary focus for the potential contaminant source inventory during Step 4, and the areas of greatest concern for local management of such potential contaminant sources. The size of buffer zones will vary; at a minimum, the width of buffer zones will extend out 500-feet parallel to the river bank or shoreline. The length of river buffer zones will extend from the intake upstream 25-miles or to the 4-hour streamflow time-of-travel boundary, whichever is greater. At a minimum, the 500-foot wide buffer zones on lakes will extend around the circumference of the lake.

Step 4: Perform Primary Potential Contaminant Source Inventory

An important requirement of the Idaho SWAP is to inventory potential contaminant sources within the delineated source water assessment area. This step is referred to as the potential contaminant source inventory (PCSI). Potential contaminant sources are generally those facilities, land uses, and environmental conditions which tend to handle, generate, store, apply, dispose of, or provide a pathway for contaminants of concern. When a facility or property is identified as a potential contaminant source during this process, it does not mean that the facility or property is in violation of any local state, or federal environmental laws or regulations. The PCSI serves three important purposes in the assessment process:

- helps evaluate the overall contaminant risk to the drinking water supply during susceptibility analysis;
- provides specific information that can be used to raise public awareness of potential contaminant sources that can impact drinking water supplies; and
- identifies potential contaminant sources that can be managed at the local level as part of the voluntary source water protection program to prevent or minimize potential threats to the drinking water supply.

There are several dimensions to this step based on the level of public involvement. To assure that source water assessments are completed on all PWSs, the PCSI is structured in two parts (Appendix E). The first part of step 4, called the primary inventory, is conducted on all PWSs. This will include a review of GIS coverages and databases that contain information on potential contaminant sources. This will provide a base level of information needed for the subsequent susceptibility analysis. For community ground water-based systems the potential contaminant source inventory will extent out to the 10-year time of travel. For stream or river based surface water systems the potential contaminant source inventory will extend 500-feet parallel to the river bank or shoreline upstream from the intake 25-miles or to the 4-hour streamflow time-or-travel boundary, which ever is greater. For lake-based systems, the potential contaminant source inventory will extend a minimum of 500-feet along the shoreline around the circumference of the lake. The second part is explained in Step 5.

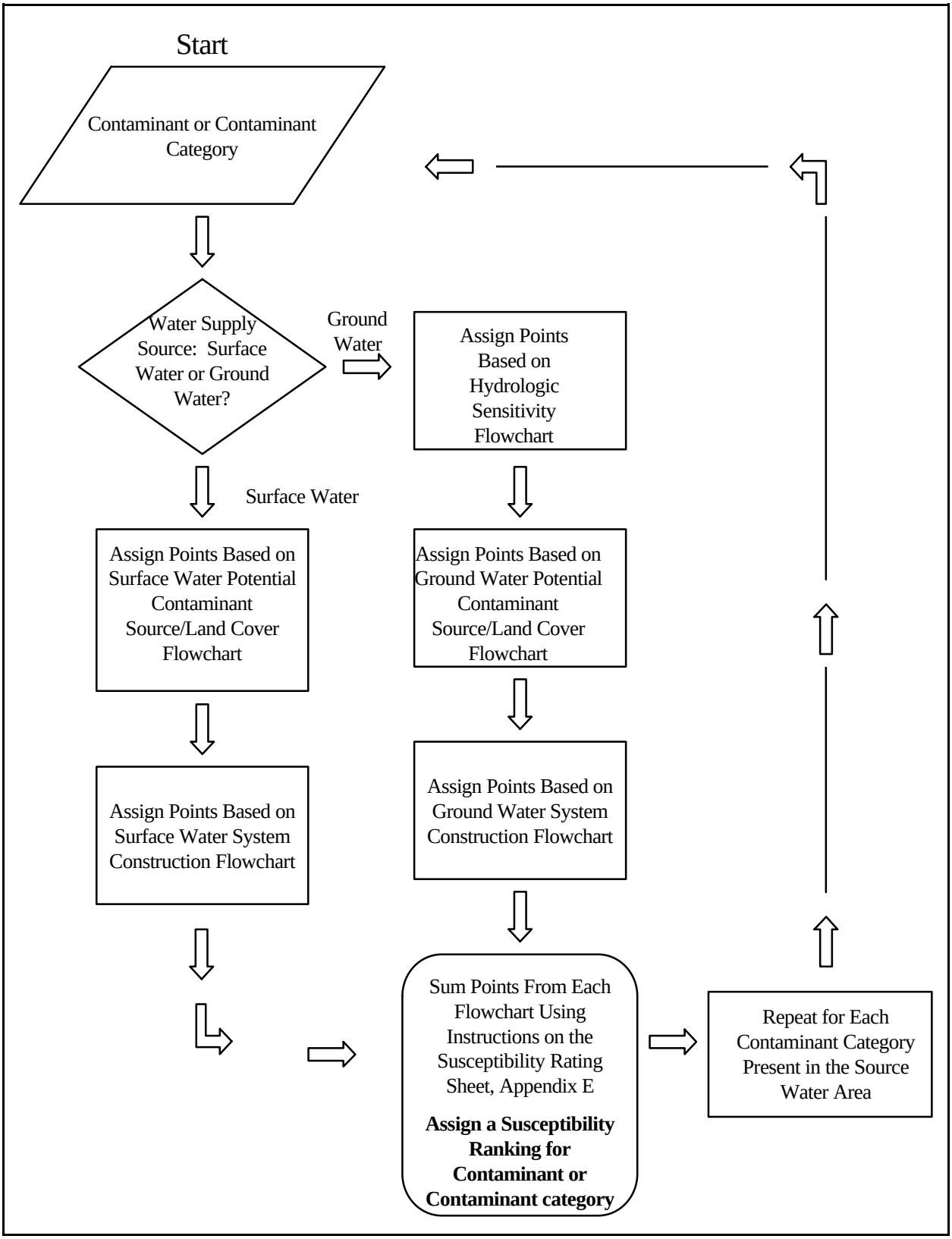
Step 5: Perform Enhanced PCSI (Optional)

The enhanced PCSI inventory is optional for PWSs. If a PWS does not choose to perform an enhanced inventory, then only the primary inventory will be done for that system. As part of this effort, the PWS will be provided with a base map showing the delineated source water assessment area and the results from the primary inventory. An enhanced PCSI inventory includes an on-the-ground survey for potential contaminant sources and an identification of historical sources. It may also include interviews with knowledgeable residents, a review of historical records, and a review of aerial photographs after completion of this step. The PWS will be given thirty days to complete the enhanced PCSI inventory. The same base map which shows the delineated source water assessment area will then be updated to show both the primary and enhanced potential contaminant sources.

Step 6: Perform the Susceptibility Analysis

A susceptibility analysis is a qualitative, screening-level determination of how susceptible a PWS well or surface water intake is to identified contaminant sources (Figure 4-3). Within each source water assessment area, the susceptibility analysis considers hydrologic and hydrogeologic characteristics, land cover characteristics, potentially significant contaminant sources, and the physical integrity of the well or surface water intake. A different set of factors is considered based on whether the system is ground water or surface water derived. Thus, susceptibility analyses performed on ground water systems should not be compared to susceptibility analyses for surface water systems.

Figure 4-3. Susceptibility Analysis Process Summary



The design of the susceptibility analysis (Appendix E) is based on a two-part definition involving hydrologic sensitivity and susceptibility to potential contamination. Hydrologic sensitivity involves the movement of water through the subsurface without consideration of contaminants or their properties. This is related to the relative ease with which surface or subsurface water can migrate to a PWS source. Part two of the definition focuses on the susceptibility to potential contamination sources; the relative ease with which a potential contaminant applied or released at or near the land surface can migrate to a PWS source. This takes into account hydrologic sensitivity, AND other site-specific factors such as:

- well or system intake construction;
- land use;
- potentially significant contaminant sources; and
- potential contaminant source characteristics and loading.

The outcome of the analysis is a relative rating of high, moderate, or low. The susceptibility ratings are specific to a particular potential contaminant or category of potential contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the PWS is at the same risk for all other potential contaminants.

Step 7: Summarize the Susceptibility Analysis and Complete Draft Report

The results of the susceptibility analysis will be summarized in a draft report. Where the susceptibility ratings are specific to a particular potential contaminant or category of potential contaminants, inter-relationships to contaminant sources will be discussed. Most of this discussion will be generalized based on relevancy to source water protection activity priorities.

Step 8: Submit Draft to the IDEQ Regional Office/State Office for Review.

The IDEQ regional and state offices will be given two weeks to review and comment on the draft report. Relevant local issues that have not been identified can be resolved during this step.

Step 9: Submit Draft to the Public Water System for Review

Relevant comments received from the regional and state offices will be incorporated into the draft and then sent to the PWS for review. Any interested party may comment on a pending source water assessment during this step. When finalizing an assessment, IDEQ will consider information bearing on a determination of significant potential sources of contamination. The PWSs will have thirty days to review the assessment

and submit additional information for consideration prior to IDEQ making the assessment results available to the general public. IDEQ anticipates relevant information may come from PWS operators, local government, local business operations and the public at large. Previously unknown information will be considered informally and incorporated into the final document as appropriate. If any party believes that a final assessment contains inaccurate or insufficient information, that party may submit any information that the party feels should be considered. If IDEQ receives relevant information after it has published a final source water assessment, IDEQ may revise and republish the document as necessary. IDEQ is responsible for notifying the public that a source water assessment has been done and that the results are available, regardless of who takes the lead on conducting the assessment.

Step 10: Final Report

Comments received from the PWS during the thirty-day review period will be incorporated into the final source water assessment report as appropriate. The report will be transmitted to the PWS and made available to the general public upon finalization. Based on the results, PWSs may wish to pursue source water protection activities.

A variety of mechanisms are in place to assist water systems and local communities with implementing protection activities. IDEQ will provide technical guidance and coordination assistance to communities implementing protection. Other state and federal agencies will be available to some extent to assist with implementing aspects of source water protection since many of their respective programs are focused on water quality protection and community assistance.

A specific linkage between source water assessment and protection likely will include presentation and explanation of source water assessment results to communities with high susceptibility. Also, these communities will have the greatest opportunity to receive technical assistance from IDEQ.

Additional guidance focusing on protection is being developed by IDEQ and should be available within six months of SWAP approval.

CHAPTER 5
REPORTING SOURCE WATER ASSESSMENT RESULTS

Understanding source water assessment results is a necessary first step toward source water protection. The results illustrate how much risk identified contaminants of concern pose to a PWS. For some systems, the results may indicate few immediate concerns. Where protection may be an immediate recourse for high susceptibility, pollution prevention becomes a more understandable and obtainable goal at the local level. The ultimate goal of the assessment process is to encourage the maximum use of results in such a way as to encourage local, voluntary initiatives for source water protection.

Report Format

For each PWS, a completed source water assessment will be provided in a report package. The package will include a fact sheet that introduces the purpose of the source water assessment, a narrative of the results, and one or more supporting maps illustrating the delineated source water assessment area along with locations of potential contaminant sources in a corresponding table . An example report is located in Appendix F. Initially, the final report will be provided in hard copy format. Summary reports and delineation information will be available electronically upon request only.

A limited amount of data will be made available to the public via the DEQ website at: www.deq.state.id.us/water/water1.htm. The scope of information made available will include reports associated with specific assessments and may include the ability to view source water assessment map data. Information related to source water assessments will be archived in digital format as it is created. Any public requests for this information could be retrieved and distributed in hardcopy format or in digital format such as on CD-ROM based upon the needs of the parties requesting information.

Availability of Results

Final source water assessment reports will be made available to the public in several ways. Initially, IDEQ will have worked with the PWS throughout the assessment process. They will receive an advance notice by having reviewed the final draft report prior to making it public. This will allow the PWS the opportunity to prepare for inquiries from the public. The availability of the source water assessment will be advertised

through several possible mechanisms: IDEQ news releases to local news media, by posting on the IDEQ Internet homepage; public outreach efforts; and through other agencies and associations.

For larger PWSs, the availability of the results of the source water assessment may be announced through the annual Consumer Confidence Report that is mailed to customers. The Safe Drinking Water Act requires each public water system to produce an annual Consumer Confidence Report starting in October 1999. The report outlines the compliance of the system with the SWDA and the overall water quality provided by the system. The disclosure of the final source water assessment report is mandatory as part of the Consumer Confidence Report. A PWS may also choose to use the executive summary that accompanies each final report to communicate the results of the source water assessment to its constituents. However, IDEQ will provide notice of the availability of the final source water assessment report through public notices or news releases as appropriate to ensure compliance with the Safe Drinking Water Act.

CHAPTER 6
ACHIEVING SOURCE WATER PROTECTION

The IDEQ is committed to providing leadership to help communities develop and implement protection activities. However, the ultimate goal of protection can be achieved only through local initiatives. The direction and strategies are driven at the local level based on the results of each assessment. IDEQ's vision is to provide technical assistance to those communities and PWSs with high susceptibility, and to maximize the use assessment results by assisting PWSs and communities in implementing protection strategies at the local level. Assessment results are helpful in determining strategies and degrees of application for protecting and preventing impacts to source waters.

Source Water Protection

Source water protection involves a variety of measures taken to ensure the continuing quality of drinking water whether it is supplied by ground water or surface water. It is up to the water system and the public to decide what form of protective measures are appropriate. Some methods may be as simple as ensuring well integrity or managing activities in a manner that is protective of water quality. IDEQ will promote protection through technical assistance, training, and education through its wellhead protection and drinking water programs.

Contaminant prevention is of great benefit to the public; versus the alternatives: greater health risks; expanded drinking water monitoring; new water treatment requirements; system replacements, or expensive environmental cleanup activities. Source water protection for PWSs supplied by ground water is not new to Idaho: it is the same as wellhead protection, which is described in the Idaho Wellhead Protection Plan (IDEQ, 1997). Many communities throughout Idaho are currently pursuing a voluntary wellhead protection program.

Incorporating all protection related details into the SWAP is outside the scope of this document and better addressed through additional guidance geared toward those who would be implementing local protection initiatives. Source water protection generally consists of five steps:

1. Form a Community Planning Team
2. Delineate the Land Area to be Protected
3. Identify Potential Sources of Contamination
4. Manage the Source Water Protection Area
5. Plan for the Future

In addition to the above five steps, a successful source water protection effort will include public education and participation components and an implementation strategy. Appendix G provides additional details concerning these five steps and how a community can pursue them as part of their efforts to achieve source water protection.

Connections Between Assessment and Protection

The primary goal of the assessment process is to provide a foundation for local implementation of source water protection. To help reach this goal, the Idaho SWAP addresses the following steps that can assist PWSs and communities to implement source water protection.

- Delineations will be completed for all existing PWSs, thus completing the source water protection step of identifying the land area to be protected for these systems.
- A primary contaminant inventory will have been performed for all existing PWSs, thus initiating and completing a significant portion of the source water protection step of identifying potential sources of contamination.
- Every PWS will have had the option to perform an enhanced inventory. Performing the enhanced inventory represents completion of the source water protection step of identifying potential sources of contamination. Since this involves participation at the local level, it also represents an opportunity to begin forming the community planning team that will be necessary to implement a successful source water protection program. This planning team, or a subset of the team, can be responsible for performing the enhanced inventory.
- A susceptibility analysis will have been performed for each PWS. This susceptibility analysis is not a previously identified source water protection step. Instead, the susceptibility analysis provides information that a community or water system owner/operator can use to assist making important protection related decisions, since the analysis identifies the overall risk to local contaminant sources, well or intake construction integrity, and hydrologic sensitivity for ground water systems.

Table 6-1 provides a summary of the connections between source water assessment and source water protection. One of the most important links the assessment will provide is a valuable public educational tool for encouraging source water protection. It is anticipated that the resulting educational link provided by the assessments will increase public involvement in water quality protection and in turn, lead to a number of local source water protection initiatives throughout the state.

Table 6-1 Connections Between Source Water Assessment and Source Water Protection.

	Connections to Source Water Protection								
Source Water Assessment Activities	Description of the land area to focus protection efforts on	Baseline inventory of potential contaminant sources	Enhances information on potential contaminant sources for subsequent protection efforts	Opportunity for a community to start implementing source water protection	Provides information on risk of contamination	Information that a community can use to prioritize source water protection efforts	Part of information made available to the public	Valuable educational tool for water quality protection	Information that government agencies and other entities can use to improve and prioritize their water quality protection efforts
Source Water Assessment Area Delineation & Resulting Maps	**T**					**T**	**T**	T	**T**
Primary Contaminant Inventory and Resulting Maps		**T**				**T**	**T**	**T**	**T**
Enhanced Contaminant Inventory and Resulting Maps			**T**	**T**		**T**	**T**	**T**	**T**
Susceptibility Analysis					**T**	T	**T**	T	**T**

Connections Between Various Organizations and Source Water Protection

Although source water protection is a voluntary program primarily implemented at the local level, there are many organizations with water quality protection responsibilities. Appendix C provides additional details concerning some of the specific organizational roles and responsibilities and the connections to source water protection.

Many organizations are available to assist with local source water protection efforts, especially in the area of voluntary and non-regulatory efforts. Some organizations such as the Idaho Rural Water Association, and public agency programs, such as the IDEQ Wellhead Protection Program, are focused directly on helping coordinate source water protection for ground water systems. IDEQ will continue to promote the development of local source water protection programs through technical assistance, training, education, and demonstration projects. Part of this assistance will include developing one or more source water protection assistance documents to complement the SWAP and assist communities and other types of PWSs to implement protection.

Source Water Assessment Advisory Committee Recommendations

Table 6-2 includes source water protection recommendations from the Source Water Assessment Advisory Committee. The preamble and recommendations were agreed upon by consensus.

Table 6-2. Source Water Assessment Advisory Committee Recommendations

With the understanding that no one citizen or agency can, alone, protect Idaho's drinking water, and recognizing that everyone in Idaho has a role in protecting public health, the Source Water Assessment Advisory Committee puts forth the following recommendations. These recommendations provide incentives and resources to educators, local communities, IDEQ, and many other agencies, to ultimately provide protection of our drinking water sources. The recommendations reflect the consensus of the broad cross-section of Idahoans which made up the Source Water Assessment Advisory Committee.
Recommend IDEQ consider use of set-asides from [1452 (k)(1)(D), 1452(g)(2)(B) and (D)] in the Intended Use Plan for wellhead protection and source water protection activities such as: **P** assisting public water systems in the application of source water assessment data in the development and implementation of WHP Plans and other appropriate source water protection strategies; **P** providing for education to public water systems and the public in general on the benefits of proactive source water protection; **P** providing assistance to local and county planners in the development and implementation of source water protection area management; and **P** supporting a clearing house for federal, state, and local program information to assist and promote protection activities (this provides a focal point for local governments, public water systems, and others to gain access to relevant source water protection resources).
Recommend that "water quality" public educators consider incorporating source water assessment and protection into existing training modules.
Adjust project ratings for SRF loans to more strongly weigh implementation of protection activities *(legality of this recommendation needs to be investigated).*
Seek opportunities to include source water protection information into state certified programs such as operator certification training.
Encourage cooperative efforts among governmental bodies for source water protection and cross-jurisdictional boundary issues.
Encourage the development of local management source control strategies and voluntary pollution prevention programs.
Evaluate and strengthen programs to address non-point source contaminants.
Establish an awards program to recognize public water system source water protection efforts.
Recommend that source water assessments be completed on a region-wide basis when possible. In addition to working with individual public water systems during assessments, IDEQ should take advantage of opportunities to also present a more regional compilation of assessment results to governmental bodies.
Encourage IDEQ to consider protection in their Environmental loan/grant programs and to look for ways to include more local input when funding projects within source water protection areas.

Analytical Model - A model that provides approximate or exact solutions to simplified forms of the differential equations for water movement and solute transport. Analytical models can generally be solved with calculators or computers.

Aquifer - A geological formation of permeable saturated material, such as rock, sand, gravel, etc., capable of yielding economically significant quantities of water to wells and springs.

Area of Influence - Area surrounding a pumping or recharging well within which the water table or potentiometric surface has been changed due to the well's pumping or recharge.

Attenuation - The process of diminishing contaminant concentrations in ground water, due to filtration, biodegradation, dilution, sorption, volatilization, and other processes.

APAP - Agriculture Pollution Abatement Plan

Beneficial Uses - Any of the various uses which may be made of the water of an area, including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics.

Best Management Practice (BMP) - A practice or combination of practices determined to be the most effective and practical means of preventing or reducing contaminations to ground water and/or surface water from nonpoint and point sources to achieve water quality goals and protect the beneficial uses of the water.

Buffer Zone - The area between a lake and a boundary some distance from the lake; or, the area within two boundaries, one on either side of a creek or river the extend along some portion of the creek or river.

CERCLIS - Comprehensive Environmental Response Compensation and Liability Information System

Community Water System - A public water system with at least 15 service connections used by year-round residents of the system area or which regularly serves at least 25 year-round residents.

Confined Aquifer - An aquifer bounded above and below by confining units of distinctly lower permeability than the aquifer media. An aquifer in which ground water is under pressure significantly greater than atmospheric and its upper limit is the bottom of a bed of distinctly lower hydraulic conductivity than that of the aquifer itself. The confined ground water within the aquifer will generally exhibit artesian characteristics.

Confining Unit - A hydrogeologic unit of relatively impermeable material, bounding one or more aquifers. This is a general term that has replaced aquitard, aquifuge, and aquiclude and is synonymous with confining bed. A body of material of low hydraulic conductivity that is stratigraphically adjacent to one or more aquifers. It may lie above or below the aquifer.

Consumer Confidence Reports (CCR) - An annual report submitted by all community drinking water systems describing the source and quality of water that the systems provide. The CCR was mandated by the 1996 Amendments to the federal Safe Drinking Water Act and becomes effective October 1999.

Contaminant - Any chemical, ion, radionuclide, synthetic organic compound, microorganism, waste or other substance which does not occur naturally in ground water or which naturally occurs at a lower concentration.

Contamination - The direct or indirect introduction into ground water or surface water or source water of any contaminant caused in whole or in part by human activities.

Cryptosporidium - Generic name - *Cryptosporidium pavum*, a parasitic protozoan that can be transmitted to humans via contaminated drinking water. The organism can cause an intestinal illness call cryptosporidiosis which may be life threatening to people with weak immune systems. The most common symptom is watery diarrhea but there may also be cramps, fever, nausea, vomiting, and loss of appetite. There is no specific medical treatment for cryptosporidiosis.

Delineation (delineate) - The process of defining or mapping a boundary that shows the areas that contribute water to a particular water source used as a public water supply. For surface waters, the land area usually consists of the watershed for a reservoir or stream. For groundwater sources, the boundary typically encompasses the areal extent of the aquifer that contributes water to the PWS.

Designated Beneficial Use or Designated Use - Those beneficial uses assigned to identified waters in Idaho Department of Health and Welfare Rules, Title 1, Chapter 2, Water Quality Standards and Wastewater Treatment Requirements:, Sections 110. through 160. and 299., whether or not the uses are being attained.

Discharge Area - An area in which ground water is discharged to the land surface, surface water, or atmosphere. An area in which there are upward components of hydraulic head in the aquifer. Ground water is flowing toward the surface in a discharge area and may escape as a spring, a seep, stream base flow, or by evaporation and transpiration.

DWIMS - IDEQ Drinking Water Information Management System

Drinking Water State Revolving Fund - Under Section 1452 of the Safe Drinking Water Act, EPA awards capitalization grants to states to develop drinking water revolving loan funds to help finance drinking water system infrastructure improvements, to enhance operations and management of drinking water systems, and other activities to encourage public water system compliance and protection of public health.

EPA - US Environmental Protection Agency

Effective Porosity (n_e) - The amount of interconnected pore space through which fluids can pass, expressed as a percent of bulk volume. Part of the total porosity will be occupied by static fluid being held to the mineral surface by surface tension, so effective porosity will be less than total porosity.

Entire Watershed Upstream of the Intake - The topographic boundary, up to the state border, that is the perimeter of the catchment basin that provides water to the intake structure.

Environment - Collectively, the surrounding conditions, influences, and living and inert matter that affect a particular organism or biological community.

Existing Beneficial Use or Existing Use - Those beneficial uses actually attained in waters on or after November 28, 1975, whether or not they are designated for those water in Idaho Department of Health and Welfare Rules Title 1, Chapter 2, "Water Quality Standards and Wastewater Treatment Requirements."

FEMA- Federal Emergency Management Agency

Flow Model - A digital computer model that calculates a hydraulic head field for the modeling domain using numerical methods to arrive at an approximate solution to the differential equation of ground-water flow.

Geographic Information System (GIS) - An organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information.

Giardia - Generic name for *Giardia lamblia*, a parasitic protozoan that can be transmitted to humans via contaminated drinking water. The organism can cause an intestinal illness called giardiasis of which the main symptom is mild or severe diarrhea. *Giardia* can be treated with anti-parasitic drugs.

GPD - Gallons per day, a commonly used measure of the withdrawal rate of a well.

Global Positioning System (GPS) - A system that allows users, with the proper equipment, to receive and analyze data broadcast from a network of satellites orbiting the earth, which determines their location according to latitude and longitude.

Ground Water - Any water of the state which occurs beneath the surface of the earth in a saturated geologic formation of rock or soil.

Ground Water Disinfection Rule - Under section 107 of the Safe Drinking Water Act Amendments of 1996, the statute reads, "...the Administrator shall also promulgate national primary drinking water regulations requiring disinfection as a treatment technique for all public water systems, including surface water systems, as necessary, ground water systems."

Ground Water Flow - The movement of ground water through openings in sediment and rock that occurs in the zone of saturation.

Ground Water Model - A simplified conceptual or mathematical image of a ground-water system, describing the feature essential to the purpose for which the model was developed and including various assumptions pertinent to the system. Mathematical ground-water models can include numerical and analytical models.

Ground water under the direct influence of surface water (GWUDI): Any water beneath the surface of the ground with (1) significant occurrence of insects or other macroorganisms, algae, or large diameter pathogens such as Giardia lamblia, or (2) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions.

HUC - Hydrologic Unit Code; refers to a United States Geological Survey classification system which designates watersheds or by hydrologic boundaries.

Hydraulic Conductivity (K) - The capacity of a rock or porous media to transmit water. The rate of flow of water in gallons per day through a cross section of one square foot under a unit hydraulic gradient, at the prevailing temperature (gpd/ft^2). The density and viscosity of the water must be considered in determining hydraulic conductivity.

Hydraulic Gradient (I) - Slope of a water table or potentiometric surface. More specifically, change in static head per unit of distance in a given direction, generally the direction of the maximum rate of decrease in head. The rate of change in total head per unit of distance of flow in a given direction. The change in

total head with a change in distance in a given direction. The direction is that which yields a maximum rate of decrease in head. The difference in hydraulic heads ($h_1 - h_2$), divided by the distance (L) along the flowpath. $I = (h_1 - h_2) / L$

Hydrogeologic - Those factors that deal with subsurface waters and related geologic aspects of surface waters.

Hydrogeologic Parameters - Numerical parameters that describe the hydrogeologic characteristics of an aquifer such as porosity, permeability, and transmissivity.

Hydrologic Basin - The area of land drained by a river system, a reach of a river and its tributaries in that reach, a closed basin, or a group of streams forming a drainage area. There are six basins described in the Nutrient Management Act (NMA) for Idaho -- Panhandle, Clearwater, Salmon, Southwest, Upper Snake, and the Bear Basin.

IDAPA - Idaho Administrative Procedures Act

IDEQ - Idaho Division of Environmental Quality

IDFG - Idaho Department of Fish and Game

IDHW - Idaho Department of Health and Welfare

IDL - Idaho Department of Lands

IDWR - Idaho Department of Water Resources

Infiltration Rate - Rate at which soil or rock under specified conditions absorbs falling rain, melting snow, or other forms of surface water; expressed in depth of water per unit time.

Land Application - A process or activity involving application of wastewater, surface water or semi-liquid material to the land surface for the purpose of disposal, pollutant removal, or groundwater recharge.

Loading - The quantity of a substance entering a receiving stream, usually expressed in pounds (kilograms) per day or tons per month. Loading is calculated from flow (discharge) and concentration.

LUST - Leaking Underground Storage Tanks

Maximum Contaminant Level (MCL) - Maximum permissible level of a contaminant in water that is delivered to the users of a public water supply system. MCL is defined more explicitly in Safe Drinking Water Act regulations (40 CFR Section 141.2).

MGD - Million gallons per day, a commonly used measure of the withdrawal rate of large wells.

Monitoring- the process of watching, observing, or checking (in this case water). The entire process of a water quality study including: planning, sampling, sample analyses, data analyses, and report writing and distribution.

Monitoring Waiver - A temporary reduction in sampling requirements for a particular contaminant. Even after a waiver is received, some monitoring at a reduced frequency will usually be required. Waivers must be applied for and granted in writing.

National Pollution Discharge Elimination System (NPDES) - A national program from the Clean Water Act for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits to discharge pollutants to water of the United States, including pretreatment requirements.

Noncommunity Water System - A public water system that is not a community water system. There are two types of noncommunity water systems: transient and non-transient.

Nonpoint Source - A potential source of contamination having diffuse or multiple discharges of contaminants that are spread over a large area.

Nontransient Noncommunity Water System - A water system that does not meet the definition of a community supply and which serves at least 25 of the same persons, four hours or more per day, for four or more days per week, for 26 or more weeks. Examples of nontransient noncommunity systems include schools, offices, and factories.

NPDES - National Pollutant Discharge Elimination Systems

Numerical Model - A model that provides approximate solutions to the specific forms of the differential equations for water movement and solute transport. Numerical models require computers for their solution but have greater flexibility in the range of real-world problems that can be solved, compared to analytical models.

Perched Ground Water - Unconfined ground water separated from an underlying main body of ground water by an unsaturated zone.

Percolation - Downward movement of water through the unsaturated zone; The act of water seeping or filtering through the soil without a definite channel.

Permeability - Ability of a porous medium to transmit fluids under a hydraulic gradient. The property or capacity of a porous rock, sediment, or soil for transmitting a fluid; it is a measure of the relative ease of fluid flow under unequal pressure.

Point Source - Any discernible, confined, and discrete conveyance, including, but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are, or may be, discharged. This term does not include return flows from irrigated agriculture, discharges from dams and hydroelectric generating facilities or any source or activity considered a nonpoint source by definition.

Potable Water - A water which is free from impurities in such amounts that it is safe for human consumption without treatment.

Potential Contaminant Source Inventory - The process of identifying and inventorying contaminant sources within delineated source water areas. Inventory steps include: using existing contaminant sources locations and description data, identifying likely sources for further information and verifying accuracy and reliability of the data sets.

Public Drinking Water System - A community, noncommunity, or nontransient noncommunity water system which provides piped water to the public for human consumption. The system must have at least 15 service connections or regularly serve at least 25 individuals daily for at least 60 days.

RCRA - Resource Conservation and Recovery Act

Radius of Influence - The radial distance from the center of a well bore to the point where there is no lowering of the water table or potentiometric surface (the edge of its cone of depression).

Recharge - The addition of water to the zone of saturation; also, the amount of water added. Can be expressed as a rate (i.e., in/yr) or a volume.

Recharge Area - An area in which water infiltrates into the soil or geological formation from sources such as precipitation, irrigation practices and seepage from creeks, streams or lakes, and percolates to one or more aquifers.

Recharge Boundary - An aquifer system boundary that adds water to the aquifer. Streams and lakes are typical recharge boundaries.

Riparian - Associated with aquatic (streams, rivers, lakes) habitats. Living or located on the bank of a water body.

Runoff - The portion of rainfall, melted snow or irrigation water that flows across the surface or through underground zones and eventually runs into surface water bodies.

SARA - Superfund Amendments and Reauthorization Act

Safe Drinking Water Act (SDWA) The federal law which authorizes the U.S. Environmental Protection Agency and states to oversee public water systems and set standards for drinking water.

Significant Potential Source of Contamination - A facility or activity that stores, uses, or produces chemicals or elements and that has the potential to release contaminants identified in a state program (contaminants with MCLs plus any others a state considers a health threat) within a source water area in an amount which could contribute significantly to the concentration of the contaminants in the source waters of the public water system.

Source Water or Water Source - Any aquifer, surface water body, or watercourse from which water is taken either periodically or continuously by a public water system for drinking or food processing purposes.

Source Water Assessment - A source water assessment provides information on the potential contaminant threats to public drinking water sources. Each source water assessment consists of a delineation of the water source area, a contaminant inventory, and a susceptibility analysis.

Source Water Assessment Area - The part of the watershed or ground water area that contributes to the water supply.

SCC - Soil Conservation Commission

Spring - Discrete discharge area where ground water flows naturally from rock or soil onto the land surface or into a surface-water body.

SSURGO - Soil survey geographic database, provides digitized detailed soil survey map units and associated soil and map unit properties..

STATSGO - State soil geographic database, provides digitized general soil map units and associated soil properties.

Stormwater runoff - Surface water that washes off land after a rainstorm. In developed watersheds it flows off roofs and pavement into storm drains which may feed directly into the stream; often carries pollutants.

Sub-watershed - Smaller geographic management areas within a watershed delineated for purposes of addressing site specific situations.

Surface Water(s) - All water which is open to the atmosphere and subject to surface runoff. Lakes, ponds, streams, rivers, and other water bodies which lie on the surface of the land. Surface waters may be partially or fully supplied by groundwater.

Surface Water Treatment Rule - A Safe Drinking Water Act rule that specified maximum contaminant level goals for Giardia lamblia, viruses and Legionellas, and promulgated filtration and disinfection requirements for public water systems using surface water sources or by ground water sources under the direct influence of surface water. The regulations also specified water quality, treatment, and watershed protection criteria under which filtration may be avoided.

Susceptibility Analysis - An evaluation of conditions in the source water area to determine the potential for contaminants to impact water quality at the wellhead or surface water intake.

SWAAC - Source Water Assessment Advisory Committee - A committee of public participants, formed to provide guidance and recommendations to the state of Idaho on the development of the Idaho Source Water Assessment Plan.

Time of Travel (TOT) - The time required for a contaminant to move in the saturated zone from a specific point to a well.

Total Maximum Daily Load (TMDL) - The sum of the individual wasteload allocations for point sources, load allocations for nonpoint sources, and natural background. Such load shall be established at a level

necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality.

Total Suspended Solids (TSS) - The material retained on a 2.0 micron filter after filtration.

Transmissivity (T) - Rate at which water of the prevailing kinematic viscosity is transmitted through a unit width of the aquifer under a unit hydraulic gradient. Transmissivity values are given in gallons per day through a vertical section of an aquifer 1 foot wide and extending the full saturated height of an aquifer under a hydraulic gradient of one. It is a function of properties of the liquid, the porous media and the thickness of the porous media.

Tributary - A stream feeding into a larger stream or lake.

Turbidity - A measure of the extent to which light passing through water is scattered due to suspended materials. Excessive turbidity may interfere with light penetration and minimize photosynthesis, thereby causing a decrease in primary productivity. It may alter water temperature and interfere directly with essential physiological functions of fish and other aquatic organisms, making it difficult for fish to locate for a food source.

USEPA - United States Environmental Protection Agency (also EPA)

USGS - United States Geological Survey

UST - Underground Storage Tanks

Water Pollution - Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to fish and wildlife, or to domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.

Water Quality Management Plan - A state or area wide waste treatment management plan developed and updated in accordance with the provisions of the Clean Water Act.

Watershed - A drainage area or basin in which all land and water areas drain or flow toward a central collector such a stream, river, or lake at a lower elevation. The whole geographic region contributing to a water body.

Watershed Approach - A coordinating framework for environmental management that focuses public and private sector efforts to address the highest priority problems within hydraulically-defined geographic areas, taking into consideration both ground and surface water flow.

Wellfield - An area containing two or more wells with overlapping zones of contribution that supply a public water supply system.

Wellhead - The physical structure, facility, or device at the land surface from or through which ground water flows or is pumped from subsurface water-bearing formations.

Wellhead Protection Area (WHPA) - The surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield.

Wellhead Protection Program - Under section 1428 of the Safe Drinking Water Act, states are required to adopt a program designated to protect ground water based sources of drinking water. The Idaho Wellhead Protection Program received EPA approval in 1996.

Well Yield - The rate of discharge of water from a well, measured in gallons per minute or cubic meters per day.

Wetlands - Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have the following three attributes: 1) at least periodically, the land supports predominately hydrophytes; 2) the substrate is predominantly undrained hydric soil; and 3) the substrate is on soil and is saturated with water or covered by shallow water at some time during the growing season of each year.

Zone of Contribution - The area surrounding a pumping well that encompasses all areas or features that supply ground-water recharge to the well.

Zone of Influence - The area surrounding a pumping well within which the water table or potentiometric surfaces have been changed due to ground-water withdrawal.

Zone of Transport - The area surrounding a pumping well through which a contaminant may travel and reach the well.

APPENDICES

APPENDIX A
1996 SAFE DRINKING WATER ACT AMENDMENTS

§. 300J-13. Source Water Quality Assessment

[PHSA § 1453]

(a) Source water assessment

(1) Guidance

Within 12 months after August 6, 1996, after notice and comment, the Administrator shall publish guidance for States exercising primary enforcement responsibility for public water systems to carry out directly or through delegation (for the protection and benefit of public water systems and for the support of monitoring flexibility) a source water assessment program within the State's boundaries. Each State adopting modifications to monitoring requirements pursuant to section 300g-7(b) of this title shall, prior to adopting such modifications, have an approved source water assessment program under this section and shall carry out the program either directly or through delegation.

(2) Program requirements

A source water assessment program under this subsection shall -

(A) delineate the boundaries of the assessment areas in such State from which one or more public water systems in the State receive supplies of drinking water, using all reasonably available hydrogeologic information on the sources of the supply of drinking water in the State and the water flow, recharge, and discharge and any other reliable information as the State deems necessary to adequately determine such areas; and

(B) identify for contaminants regulated under this subchapter for which monitoring is required under this subchapter (or any unregulated contaminants selected by the State, in its discretion, which the State, for the purposes of this subsection, has determined may present a threat to public health), to the extent practical, the origins within each delineated area of such contaminants to determine the susceptibility of the public water systems in the delineated area to such contaminants.

(3) Approval, implementation, and monitoring relief

A State source water assessment program under this subsection shall be submitted to the Administrator within 18 months after the Administrator's guidance is issued under this subsection and shall be deemed approved 9 months after the date of such submittal unless the Administrator disapproves the program as provided in section 300h-7(c) of this title. States shall begin implementation of the program immediately after its approval. The Administrator's approval of a State program under this subsection shall include a timetable, established in consultation with the State, allowing not more than 2 years for completion after approval of the program. Public water systems seeking monitoring relief in addition to the interim relief provided under section 300g-7(a) of this title shall be eligible for monitoring relief, consistent with section 300g-7(b) of this title, upon completion of the assessment in the delineated source water assessment area or areas concerned.

(4) Timetable

The timetable referred to in paragraph (3) shall take into consideration the availability to the State of funds under section 300j-12 of this title (relating to State loan funds) for assessments and

other relevant factors. The Administrator may extend any timetable included in a State program approved under paragraph (3) to extend the period for completion by an additional 18 months.

(5) Demonstration project

The Administrator shall, as soon as practicable, conduct a demonstration project, in consultation with other Federal agencies, to demonstrate the most effective and protective means of assessing and protecting source waters serving large metropolitan areas and located on Federal lands.

(6) Use of other programs

To avoid duplication and to encourage efficiency, the program under this section may make use of any of the following:

(A) Vulnerability assessments, sanitary surveys, and monitoring programs.

(B) Delineations or assessments of ground water sources under a State wellhead protection program developed pursuant to this section.

(C) Delineations or assessments of surface or ground water sources under a State pesticide management plan developed pursuant to the Pesticide and Ground Water State Management Plan Regulation (subparts I and J of part 152 of title 40, Code of Federal Regulations), promulgated under section 136a(d) of title 7.

(D) Delineations or assessments of surface water sources under a State watershed initiative or to satisfy the watershed criterion for determining if filtration is required under the Surface Water Treatment Rule (section 141.70 of title 40, Code of Federal Regulations).

(E) Delineations or assessments of surface or ground water sources under programs or plans pursuant to the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.).

(7) Public availability

The State shall make the results of the source water assessments conducted under this subsection available to the public.

(b) Approval and disapproval

For provisions relating to program approval and disapproval, see section 300h-7(c) of this title.

APPENDIX B
ASSOCIATIONS BETWEEN SOURCE WATER ASSESSMENT AND THE IDEQ DRINKING WATER PROGRAM

Introduction

Appendix B is devoted to an overview of the associations between the source water assessment plan and the IDEQ Drinking Water Program. Source water assessments required by the SDWA are for the "protection and benefit of public water systems and for the support of monitoring flexibility." The "protection and benefit of public water systems" clause has been interpreted by EPA to mean the protection of source waters for the benefit of public water systems. Therefore, the protection goals of the amendments are more appropriately associated with the wellhead protection program and other water protection programs than to the drinking water program. The remaining goal, which does connect the Drinking Water Program is for "support of monitoring flexibility."

Monitoring flexibility is already available for the states to use. Some flexibility was in place prior to the Amendments of 1996 being passed. New forms of flexibility are proposed in an EPA Advance Notice of Rulemaking [62FR 36100, July 3, 1997]. In the notice, EPA proposes to offer states the opportunity to adopt a new rule called the "Chemical Monitoring Reform Rule" (CMR) a second new program entitled "Permanent Monitoring Relief" (PMR).

It is important to note that should Idaho adopt the CMR rule, the monitoring flexibility already available would cease to be available and it would be replaced by the new rule. However, EPA proposes to allow States the choice as to whether or not to adopt CMR.

EPA also proposes that PMR would be available no matter which route the States choose. PMR would allow the States to propose their own monitoring requirements independent of the requirements specified in the regulations. However, completion of source water assessment work and susceptibility determination will be required before PMR is available. The IDEQ drinking water program expects source water assessments to provide an important new tool to ensure monitoring requirements are consistent with the risk of contamination.

For source water assessments to remain dependable as a tool for gauging monitoring frequency, it is important that the information be up-to-date. While the Safe Drinking Water Act only requires and funds the assessments a single time, monitoring waiver determinations must be made at least every 3, 6, or 9 years for SOCs, VOCs, and IOCs, respectively. In order to remain useful as a tool for evaluating monitoring waivers, some portions of the source water assessment information would need to be updated at appropriate times for the waiver evaluation process.

The IDEQ drinking water program's current waiver policy allows less frequent monitoring or facilitates the reduction of monitoring requirements for systems with an approved wellhead protection program. If source water assessment leads to more approved wellhead protection programs, waters systems may receive the additional benefit of less monitoring for some contaminants.

No matter what rule is adopted, monitoring must be maintained at a level likely to detect contaminants of concern before a risk to public health develops. To determine what contaminants are of concern, statistics on detections of contaminants from public water system compliance monitoring were compared with monitoring results from public water systems nation wide. The contaminants of concern were consistent with one another. The results were also compared with results from an IDWR study that provided results from sampling of both public and private wells statewide. The IDWR data indicated the same contaminants of concern as the IDEQ data and the nationwide data. IDEQ drinking water program staff used monitoring flexibility provided in the present rule to provide monitoring relief for the contaminants that were not being found anywhere near sufficient concentrations to present a risk to health. The present level of monitoring is appropriate for the near term future.

Even though there is no present requirement to associate source water assessment to monitoring waivers, such an association, given the flexibility to work, is appropriate. A fundamental element of ensuring safe drinking water is to provide multiple barriers against contamination. Multiple barriers such as protecting the source water from contamination, removal of contamination by treatment, and monitoring the water after treatment provide redundant protection so that drinking water might remain safe even if one or more of the barriers fail. Each barrier reduces the risk to the public. If a strong association between source water assessment and monitoring waivers is provided it strengthens this multiple barrier approach, thereby reducing risk to the public.

EPA Ground Water Rule

This rule is scheduled to be promulgated by EPA in November, 2000. The federal regulatory framework is still under development, but is likely to include an "innocent until proven guilty" approach to disinfection requirements. Therefore, water systems using a ground water source will not automatically be required to disinfect. If a system experiences repeated positive coliform samples or fails to correct defects identified during a sanitary survey, then it will be subject to an evaluation by the State. This evaluation, as currently envisioned, may consist of an update of the sanitary survey, a review of hydrogeologic factors, and an

inventory of microbial contamination sources in a two-year time of travel radius around the ground water source.

The Idaho SWAP will delineate a source contribution area that encompasses at least a two-year time of travel boundary. The potential contaminant inventory conducted during the source water assessment will include all sources of microbial contamination. Finally, the susceptibility analysis will address both the construction and the intrinsic hydrogeologic sensitivity of the source. These three elements of the source water assessment will provide the public water system with a majority of the information they will need if a disinfection evaluation is triggered under the ground water rule. Additionally, the water system will be able to use the results of their source water assessment to implement management strategies for controlling or eliminating microbial contaminant potential within the delineated source water area.

Enhanced Surface Water Treatment/Disinfection By-Products Rules

Compliance with these rules will require water systems to balance the need for disinfection against the risk of by-product formation. Source water assessments will provide surface water systems with a knowledge of microbial contaminants, nutrient influx, and certain by-product precursors within the delineated stream segment upstream of their water intake site. Examples of such sources are sewer treatment plant effluent discharges and surface run-off from confined animal feeding operations. Ground water sources that have been determined to be under the direct influence of surface water will also be supplied with this information, as well as data on hydrogeologic sensitivity. A knowledge of susceptibility to microbial sources will help systems in both categories to optimize treatment procedures. Where practical, source water protection programs involving management and control of upstream contaminant sources will be the best way to minimize treatment costs associated with these new rules.

Sanitary Surveys

Sanitary surveys have traditionally emphasized an examination of the physical infrastructure of drinking water systems, including source construction, treatment processes, treatment records, monitoring records, and distribution system. The survey also identifies sanitary defects that may result in contamination of the drinking water supply if not corrected. Sanitary surveys are currently performed every five years by IDEQ and District Health Department staff.

Information from existing sanitary surveys will be used in the source water assessments process. The information in these surveys will be particularly useful in the susceptibility analysis. However, conducting or updating sanitary surveys as part of source water assessments could increase both time and monetary costs associated with the latter. Additionally, the personnel conducting source water assessments may not have the skills required for conducting sanitary surveys. The SWAP does not include a provision for completing sanitary surveys as part of the source water assessment process.

However, it seems probable that sanitary surveys in the future may be expanded to include an evaluation of BMPs with respect to potential contaminant sources and a review of source vulnerability. This might involve interviews with water system officials on any land use changes that have occurred since the previous survey.

Capacity Development

The Idaho Capacity Development Strategy, as required under Section 1420 of the SDWA, will describe how the State intends to provide assistance to public water systems in improving their financial, managerial, and technical capabilities. The State will be looking at a variety of factors to decide which water systems are in need of capacity improvement. This program is scheduled for implementation early in the year 2000.

The manner in which a water system uses its source water assessment is likely to prove very useful as an indicator of capacity. Systems that use the source water assessment as a basis for managing contaminant sources and carrying out other protection related activities will be exhibiting clear evidence of managerial and technical capability. Conversely, systems that shelve the source water assessment and make little effort to keep it up to date or to use it as a basis for management initiatives will probably be identified as lacking capacity.

One form of capacity assistance may consist of training system operators and managers in prevention methodologies, including voluntary source water protection. Systems which adopt these strategies will protect their capital investment in system infrastructure and will also minimize source water quality problems that can greatly increase treatment costs.

Operator Certification and Training Associated with Source Water Assessment

Idaho has an excellent state-funded drinking water operator training program and a well established operator certification program; exams are given twice per year. Community and non-transient, noncommunity public water systems will be required to have certified operators. The importance of, and methods for assessing and protecting drinking water are taught in program workshops. More than 50 days of training is offered yearly at various locations around the state on a range of drinking water topics. Over the years, the Idaho training and certification programs have worked together to assure good correlation between training materials and related exams. The Idaho Water and Wastewater Certification Board (Board) shares " Need-to-Know" documents with trainers for preparation of workshop materials. The Board receives "Need-to-Know" documents from the Associated Boards of Certification (ABC) a national standardizing organization which provides guidance and exams to the Idaho Board. One "Need-to-Know" area that ABC recommends to be taught is assessment and protection of sources. The ABC exams for all levels of drinking water certification evaluate knowledge in these areas. Emphasis on assessment can be increased and additional units of training initiated in coming years. The training and certification year runs from October to September on any given year. Both programs will continue into the future and will change as needed to meet changing conditions. Operators can be taught to play an important role in assessing and projecting the states drinking water resources and the Idaho training and certification activities can be adjusted to assure this.

Source Water Assessment and State Revolving Fund Loans

The IDEQ recognizes the importance of source water assessment when setting priorities for the award of Drinking Water State Revolving Loan funds. Using a priority rating form developed several years ago, the IDEQ rates all projects that go on a list primarily on the basis of public health, compliance and affordability. Additional points are awarded to projects that have completed a source water assessment and are maintaining a protection area around their source. Each of the 114 projects that appear on the current list, the Approved—FY99 State Loan Drinking Water Project Priority List, has been evaluated using the rating form.

APPENDIX C
CONNECTIONS TO SOURCE WATER ASSESSMENT AND PROTECTION

Appendix C is devoted to providing an overview of all the numerous governmental entities and organizations that play important roles in completing source water assessments or achieving source water protection. A brief description of those roles and responsibilities is followed by an explanation of the connection.

Local Entities and Jurisdictional Bodies

Cities and Counties

Idaho has 44 counties and over 240 incorporated cities. These local entities possess a great wealth of knowledge that will be extremely helpful for performing source water assessments. The cities and counties also play a potential role in source water protection activities.

Several of the significant water quality related activities often undertaken by county and city governments include: land use planning and zoning; comprehensive planning; local ordinances; wellhead protection planning and implementation; wastewater treatment; hazardous materials management; spills and emergency response; waste disposal; and recycling and hazardous waste disposal.

The cities and counties either operate PWSs or rely on water from PWSs. These local governments depend upon the availability of high-quality ground or surface water supplies for the health of their residents and visitors, and for the economic viability of their business community. Their interest and involvement in source water protection efforts is vital to the success of a source water protection program.

Connections. The cities and counties involvement in source water assessment efforts may include providing information needed to perform the delineations and performing an enhanced contaminant inventory. Cities and counties also play the lead role in developing and implementing source water protection plans. Community leaders have the talents, skills, and rapport with their citizens to get the community involved in planning and implementing protection efforts. The cities and counties have critical local planning and zoning authorities needed to enact source water protection efforts.

Independent Districts

Idaho has hundreds of independent districts that undertake or have limited authority for activities related to source water assessment. Several of these districts that may have connections to source water

assessment or protection activities include: Soil Conservation Districts; Public Utility Districts; Sewer and Sewer Maintenance Districts; Groundwater Recharge Districts; Watershed Protection Districts; Storm Water Drainage and Maintenance Districts; Irrigation Districts; Mosquito Abatement Districts; and Weed Control Districts.

Connections. These districts may be involved with water quality projects, or involved with activities, such as pesticide or herbicide spraying, that represent a potential contaminant source. These districts may have valuable information necessary to perform the delineation of the local drinking water system. If communities in which these districts are located decide to implement source water protection, the districts will need to work closely on pollution prevention issues related to their specific activities.

Basin Advisory Groups and Watershed Advisory Groups (BAGs and WAGs)

For the purpose of developing pollution budgets or total maximum daily loads (TMDL) for surface water bodies in Idaho, BAGs and WAGs were formed (Idaho Code § 39 - 3601 et. seq.) These groups are composed of a diverse membership, including local representatives who have a vested interest in the protection of their watersheds. These advisory groups work closely with IDEQ on a routine basis and are very knowledgeable of water quality issues in their basin.

Connections. The TMDL development process includes identification of certain types of contaminant sources within impacted watersheds. These efforts may result in the collection of information that will be valuable in the source water assessment potential contaminant source inventory. Likewise, additional existing information about potential contamination sources is expected to be collected in the source water assessment process. This information will be shared with those working on the TMDL development. The TMDL implementation process and source water protection share an important common goal: reducing the actual or potential contamination of surface waters. Source water assessment or protection efforts within watersheds where TMDLs are being implemented can benefit from shared information and from related protection efforts.

Idaho Rural Water Association

Rural towns with populations under 10,000 are eligible for assistance programs provided by the Idaho Rural Water Association (IRWA). The IRWA offers training and on-site technical assistance to small water supply systems for developing and implementing wellhead protection. IRWA also provides technical training throughout the State for public water and waste water system operators.

Connections. The IRWA efforts represent a significant ongoing effort to promote and support wellhead protection. The IDEQ and IRWA have a long history of working together to assist communities to plan and implement wellhead protection. As source water assessments are completed, this information will be made available to the IRWA. The source water assessments will greatly assist the IRWA in providing improved outreach to small Idaho communities wanting to pursue source water protection.

State Agencies

There are numerous State agencies that have valuable links to source water assessment or protection activities. This section provides an overview of the various state agency roles and responsibilities. Phone numbers and points of contacts for most state agencies can be found at the Idaho State Internet Home Page: http://www.state.id.us.

Idaho State Department of Agriculture (ISDA)

The ISDA is charged with responsibility for regulating the application of fertilizers and pesticides (the term pesticides includes herbicides and fungicides), and is the lead State agency for Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) implementation (7 U.S.C. §§1701 TO 1784). Authority for ISDA's comes from Idaho Pesticide Law (Title 22, Chapter 34, Idaho Code), the Fertilizer Law (Title 22 Chapter 6, Idaho Code), the Chemigation Law (Title 22, Chapter 14, Idaho Code) and for the control of dairy waste in agriculture from the Idaho Dairy Industry regulation (Title 37, chapters 3, 4, 5, and 7, Idaho Code). ISDA works closely with the Natural Resources Conservation Service (NRCS) and IDEQ in reducing water pollution caused by agricultural point and non-point sources. Specific ISDA responsibilities pertaining to ground water quality protection from agricultural sources are defined within the *Ground Water Quality Plan* (Idaho Code §39-102). Per the *Ground Water Quality Plan*, ISDA is the lead agency for implementing the agricultural BMP feedback loop for ground water quality protection and shares responsibilities with IDEQ for regional and local monitoring efforts associated with potential agricultural impacts to ground water quality. ISDA, through a Memorandum of Understanding (MOU) with the EPA and the IDEQ, has responsibility for oversight of the dairy waste program.

Connections. Fertilizer and pesticide applications in Idaho represent a potential source of contamination that may be incorporated within contaminant inventories and susceptibility determinations. Where agricultural practices are present in a source water protection area, ISDA program personnel can be a helpful source for BMP implementation and thus assist in source water protection efforts.

The ISDA regional and local ground water quality monitoring data may be useful for susceptibility determination purposes, and for source water protection efforts where monitoring sites are located within or near a source water area. This data can identify threats to the PWS as well as providing feedback concerning the success of protection measures. ISDA efforts to implement the BMP feedback loop represents a potential form of source water protection, especially in areas with known dairy contamination from agricultural practices.

Where dairies are located in source water areas, ISDA program personnel may be able to provide additional source water protection assistance.

Idaho Department of Lands (IDL)

The IDL is specifically charged with responsibility for the public land trust protection of the beds and banks of navigable streams and lakes (Title 58, Chapter 13, Idaho Code). IDL is the lead agency in administering the State's surface, dredge, and placer mining laws (Title 47, Chapter 13 and 15, Idaho Code) and also administers laws associated with forest practices on state and private land (Title 38, chapter 1, Idaho Code).

Connections. Mining and silvicultural activities represent potential sources for contaminant inventories and susceptibility determinations, especially within surface water drainage areas. IDL's efforts to implement mining, and forest laws can be an important connection for source water protection activities.

Idaho Division of Military

Idaho State Division of Military is responsible for two bureaus: the Bureau of Disaster Services (BDS), Title 46 Chapter 10, Idaho Code and the Bureau of Hazardous Materials (BHM). BDS is responsible for the State's emergency response to natural or man-caused disasters and operates the State Emergency Operations Center. BHM is responsible for the State's hazardous materials program. BHM collects and maintains all required registrations of businesses owning/storing reportable quantities hazardous material as required by the Superfund Amendments and Reauthorization Act (SARA) Title III, the Emergency Planning and Community Right to Know Act. The BHM also records any releases of hazardous materials from these registered facilities.

Connections. Businesses storing reportable quantities of hazardous materials under SARA Title III and locations where significant spills have occurred represent information needed for the potential contaminant

inventories and susceptibility determinations. Existing databases will be utilized and potentially expanded upon to assist with source water assessments. Information contained within the BDS or BHM reporting databases and files could be useful for source water protection efforts where more data about a specific source of interest is desirable. The delineations of source waters will also provide invaluable information to the State Division of Military to help design and implement appropriate responses to spills.

Idaho Department of Transportation (IDOT)

The IDOT is responsible for State highway maintenance and related road work as well as for the oversight of the transport of hazardous materials along state highways.

Connections. The IDOT can provide valuable information to PWSs about transportation corridors that are used to haul hazardous materials. The IDOT can also provide useful information on their operations such as maintenance facilities, underground injection wells, construction activities, and road maintenance efforts that may represent potential sources of contamination particularly for surface water systems. Communities can work with the IDOT to create special transportation routes for the movement of hazardous materials around source water protection areas and to improve the condition of the roads to reduce the likelihood of road spills in protection areas.

Idaho Department of Water Resources (IDWR)

IDWR is the primary State agency for surface and ground water allocations (through water rights) and is responsible for several surface and ground water protection programs. IDWR routinely works with IDEQ and ISDA on issues affecting water quality. IDWR's authority is derived from several sections of the Idaho, Code Title 42, including: Chapters 2, 17, 38 and 39.

Connections. Several significant IDWR responsibilities in relation to source water assessment or protection and their associated connections include:

- *Well driller licensing, well construction and operating permitting, and well driller report inventory:* Public water system well drilling logs at the IDWR provide information useful for susceptibility determinations. Drilling logs for domestic wells located in a source water (wellhead) area can be useful for refined delineation efforts when used in conjunction with other information such as site specific hydrogeological or ground water quality data. Programmatic efforts to identify

areas of drilling concern based on ground water quality concerns are useful for contaminant inventory and susceptibility determinations.

- *Well abandonment:* Programmatic guidance pertaining to the proper abandonment of wells is a useful application for source water protection purposes. Improperly abandoned wells, where identified, can also represent a potential source of contamination for inventory purposes.

- *Underground Injection Control Program which includes permitting and inventory efforts for certain types of injection wells allowed in Idaho:* Underground injection wells represent potential ground water sources for contaminant inventory and susceptibility purposes and are underway to use existing database and permit information relating to these wells. The underground injection control program can provide helpful information for source water assessment efforts where injection wells are located in source water areas.

- *Statewide Ambient Ground Water Quality Monitoring Program:* This program provides a statewide picture of ground water quality in addition to site specific data, all of which is being applied to susceptibility determinations. Ground water quality data from this network can also be very useful information for source water protection efforts where monitoring sites are located within or near a source water area. The collected data may help identify threats to the PWSs or provide feedback concerning the success of protection measures.

- *State Environmental Data Management System (EDMS):* This database provides a compilation of historical ground and surface water data from many different programs and may provide useful background or historical water information. EDMS is Idaho's designated data management system for past, present, and future ground water quality data.

- *Water quantity allocations, both surface and ground water (including geothermal waters):* The water quantity allocation process has led to numerous studies which have provided valuable hydrogeologic information which can be used for ground water system (wellhead) delineations.

- *Artificial (Managed) ground water recharge involvement:* Artificial ground water recharge represents a potential source for contaminant inventory purposes. IDWR provides oversight of recharge projects that utilize injection wells.

Idaho Division of Environmental Quality (IDEQ)

The IDEQ has its authority to operate under the Idaho Environmental Protection and Health Act (EPHA) Idaho Code Title 39 Chapter 1. IDEQ is the primary state agency to administer the Federal Water Pollution Control Act (33 U.S.C. §§1251 to 1387) also known as the Clean Water Act, the federal Safe Drinking Water Act, (42 U.S.C. §§ 7401 et seq.) and other environmental protection and water quality programs. IDEQ is the lead state agency responsible for source water assessments.

Activities related to source water assessment are not new to IDEQ. The agency has numerous environmental programs that are dedicated to protecting the quality of surface and ground water. Many existing programs focus on particular aspects of water quality by concentrating on: particular sources of contamination (e.g., leaking underground storage tanks, hazardous waste, septic systems, land application of waste water, and municipal solid waste); particular watersheds (e.g., Cascade Reservoir, Mid Snake River, and Payette Lake); or locations with significant environmental problems (Idaho National Environmental and Engineering Laboratory Assessment and Remediation, Bunker Hill, and Superfund sites). Other existing programs address either broader ranges of contaminant sources (e.g., nonpoint sources, pollution prevention), or water quality protection from a statewide perspective (e.g., watershed management, water quality standards, and ground water protection).

Many of the programs within IDEQ will be able to contribute to source water assessment and protection efforts. Programs with water quality protection or assessment responsibilities have accomplishments that can be directly utilized. For example IDEQ programs has numerous databases that list actual or potential contaminant source sites.

Drinking Water Program

The purpose of the drinking water program is to protect public health by ensuring that public drinking water is safe as defined under the SDWA. This is primarily accomplished through infrastructure planning and technical assistance to Idaho water purveyors, including system plan and specification review and compliance assistance activities. Appendix B provides additional details about EPA-specified program requirements of the IDEQ Drinking Water Program.

Connections. The Drinking Water Information Management System (DWIMS) is the State database for all PWSs data and is operated by IDEQ. This database provides monitoring results for contaminants regulated under the SDWA (1996). This monitoring information is useful for susceptibility determinations and helpful for source water assessment efforts since it identifies existing contaminant concerns and provides important feedback concerning the success of any assessment program.

Sanitary survey information concerning potential significant sources in the immediate vicinity of a PWS can be used to assist with potential contaminant inventory and subsequent susceptibility determinations. This information, depending on the size and type of system, is maintained at either IDEQ or one of the various local health districts. Conversely, potential contaminant inventory results can be used to supplement existing sanitary surveys.

The Drinking Water Program is involved with PWSs ground water under the influence of surface water determinations. Public water systems which fall within this category have special considerations that must be addressed during the source water delineations phase.

Wellhead Protection Program

The IDEQ Wellhead Protection Program is a voluntary program that provides technical assistance to PWSs in planning and implementing wellhead protection. Technical assistance offered through this program includes delineation of local wellhead protection areas based on hydrogeologic information and recommendations and/or training on contaminant source inventory and management protection activities.

Connections. The program is different from source water assessment in that it moves beyond assessment activities into protection measures. Wellhead protection is the same as source water protection for ground water systems. The EPA-approved *Idaho Wellhead Protection Plan* includes methods for delineating wellhead protection areas which were adopted in the Source Water Assessment Plan for delineating source water areas for ground water systems. Existing wellhead delineation methods and associated wellhead protection efforts, such as contaminant inventories, will be incorporated into source water assessments. The WHP program promotes and provides assistance to drinking water systems and communities in planning and implementation, protection efforts, including contingency and emergency planning. Program outreach activities are performed cooperatively with the IRWA. As source water assessments are performed, the susceptibility ranking of the PWSs will be used to prioritize wellhead protection assistance.

Ground Water (Aquifer) Protection Program

Comprehensive protection of the ground water resource is provided through the implementation of the *Ground Water Quality Protection Act of 1989*, the *Idaho Ground Water Quality Plan*, and the *Ground Water Quality Rule*. Ground water quality programmatic efforts include monitoring and site assessment, public education, pollution prevention, technical and financial assistance, remediation of contaminated sites, and outreach.

Connections. The Ground Water Quality Plan and Rules provide a regulatory framework to protect all source water areas from ground water contamination. Protection can be achieved through a variety of processes outlined in the Idaho Ground Water Quality Plan and the Ground Water Quality Rule, including, if necessary, the re-categorization of aquifers or portions of aquifers to ensure stricter controls.

Regional and Local Ground Water Quality Monitoring

Regional and local ground water quality monitoring is used to investigate ground water contamination. The IDEQ administers this program with the assistance of a multi-agency Ground Water Monitoring Technical Committee. IDEQ also works closely with the ISDL and SCC in areas impacted by agriculture.

Connections. Ground water quality information from regional and local monitoring projects can be used to assist with susceptibility determinations and efforts and can identify threats within a source water assessment area. Through the Ground Water Monitoring Technical Committee, ongoing and historical monitoring study areas and areas of contamination concern have been identified, and will be used to help prioritize source water assessments. Contaminant inventory and susceptibility determinations may also be useful in determining monitoring needs within a priority area.

Nonpoint Management Source Program

The Idaho Nonpoint Management Source Program (NPS) works to implement BMPs for nonpoint sources of pollution impacting impaired or threatened surface or ground waters. The NPS program provides coordination and project funding to improve water quality. NPS Program challenges include developing a systematic way to assess NPS problems statewide; providing a clear prioritization process that helps provide solutions to areas of concern; ensuring coordination and collaboration among state, federal, and local entities committed to water quality protection and restoration; and documenting lasting water quality improvements in project areas. The NPS program is closely tied to watershed management activities including TMDL development and implementation. The program involves multiple agencies and projects, with the IDEQ as the lead.

Connections. Nonpoint sources of pollution can be significant cause of surface and ground water impairment in Idaho. It is recognized that such sources will need to be identified as part of the contaminant inventory process and considered within the susceptibility determination. NPS program personnel can help provide expertise or information pertaining to the significance of nonpoint sources identified within source water delineation areas and also provide information concerning the applicability of BMPs for source water protection efforts. Conversely, source water areas, especially those with protection programs, can be used

to drive nonpoint source program priorities, including funding assistance for source water assessment efforts and BMP implementation.

Watershed Management Program

The Federal Clean Water Act provides the direction to IDEQ and establishes many of the programs that are implemented to protect and restore the quality of surface waters. Idaho's watershed management programmatic activities include: identification of impaired or threatened surface waters; development and implementation of TMDLs; water quality standards including beneficial use water quality criteria determinations; and surface water reconnaissance monitoring. The IDEQ is the lead agency for the watershed management program.

Connections. Surface water bodies supplying drinking water are protected for human health criteria under Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 16, Title 01 Chapter 2). This provides a framework for source water protection in appropriate watersheds.

Some source water assessment areas may include water bodies where TMDLs are being developed. Although these problems may often be associated with aquatic versus human health standards or criteria, the assessment efforts associated with TMDL development can provide important GIS coverages and other source related information that can be directly incorporated into the source water assessment process.

Surface water quality monitoring information, where available, can be helpful in identifying threats or trends and providing additional susceptibility or implementation assistance. The source water assessment team will coordinate with personnel involved with watershed management, particularly where TMDLs are being developed. Existing or ongoing watershed protection plans will be used whenever possible in the development of source water protection plans.

Wastewater Land Application

The IDEQ authority to regulate the land application of <u>all</u> types of wastewater is found in IDAPA 16.01.02, Section 600, Land Application of Wastewater(s) Or Recharge Waters. Wastewater is defined as "Unless otherwise specified, sewage, industrial waste, agricultural waste, and associated solids or combinations of these, whether treated or untreated, together with such water as is present". Requirements for wastewater land application include restricting wastewater to the premises, no creation of hazard or nuisance conditions and development of a ground water monitoring program. Wastewater land application proposals are evaluated based on the type and quantity of wastewater to be applied, the nature of the soils and geologic formations underlying the application site and the ability of the soil and vegetation to treat the wastewater.

A permit is required for land application of certain types of wastewater, in accordance with the Wastewater Land Application Permit Regulations (IDAPA 16.01.17). Wastewater land application permits are issued to ensure the wastewater treatment system is designed, constructed, maintained and operated to prevent degradation of surface water and ground water, and to protect public health and the environment.

Connections. All wastewater land application sites represent potential sources of contamination to ground water. Existing programmatic information for permitted sites, including GIS point coverages, used during the contaminant inventory process. Data associated with specific sites may include wastewater characteristics that can be useful for assessment purposes. Ground water quality monitoring information associated with the sites may be helpful for susceptibility determinations and future protection efforts. Once source water assessments have been completed, this information can be used in the review of proposed new wastewater land application sites.

Petroleum Pollution Prevention and Remediation Program

Under the Federal 1984 Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act (RCRA), Subtitle I, owners and operators of certain underground storage tanks that contain petroleum or hazardous substances must register their tanks, meet specific financial responsibility requirements, conduct inventory control, monitor tanks and piping for leaks, prevent spill and overfills, provide corrosion protection of tank systems, and report removals and changes of the tank systems. Although the EPA maintains formal enforcement and inspection authority of underground storage tanks prior to releases, the State provides pollution prevention assistance, technical assistance to owners/operators, and maintains and operates the underground storage tanks registration data base system and has full regulatory authority governing the investigation and remediation of known or suspected petroleum releases from leaking underground storage tanks and all other sources.

Connections. Inventory information identifying locations of underground storage tanks and leaking underground storage tanks is important for contaminant inventory and subsequent susceptibility determination. Existing information is being used to update and expand GIS coverages of these sites, and includes site specific information such as the number of tanks, fuel volume, and contaminated media. Monitoring data from the remediation programs may also be useful for source water protection activities. The improved knowledge of where community drinking water supplies are located may be useful in determining the risk levels that petroleum releases pose to the public and assist in the Risk Based Corrective Action Process (RBCA).

Mining Program

IDEQ issues permits for the construction and operation of ore processing by cyanidation facilities as specified under the Rules for Ore Processing by Cyanidation (IDAPA 16.01.03). Permit program activities include design and operation plan approvals, review of monitoring results, review of mine closure and reclamation, and technical assistance. In addition, IDEQ maintains a technical contact for mining operations to assist with coordination and technical assistance efforts among the various regulatory agencies involved with mining operations. This is accomplished in part through participation in the Interagency Mine Task Force and the Mining Advisory Committee.

Connections. Mines represent a potential contaminant source that need to be identified within source water assessment areas. Monitoring information from these sites can be helpful for all aspects of source water assessment. Where information resides within other agencies, the IDEQ mining contact can provide assistance in obtaining the information and may also serve as a liaison to other agencies and/or mine operators where needed for assessment or protection purposes. The accurate delineation of source waters maybe useful in helping design mine site cleanups as well as for planning emergency responses to catastrophic failures at mine sites.

Hazardous Waste Program

The IDEQ regulates hazardous waste generators, transporters, and treatment, storage and disposal facilities to meet the requirements of RCRA. Program goals are to ensure that hazardous waste is properly handled to prevent hazardous waste releases to the environment and to ensure that clean-ups of prior releases occur. Program activities include facility permits, inspections, compliance assistance, outreach, and enforcement actions.

Connections. Facilities regulated under RCRA represent potential contaminant sources, and relevant information on these facilities will be used for contaminant inventory efforts. Information concerning facility wastes, including quantities and types, may be helpful for inventory, susceptibility, and protection efforts. Other information that may have value includes monitoring, inspection, and contamination information associated with specific facilities.

Remediation Program

There are a variety of programmatic activities at the IDEQ associated with remediation. These include the following:

- A voluntary state remediation program comprised of sites where responsible parties have volunteered to undertake assessment and remediation activities. Although some of these sites have the potential to be placed on the National Priority List (NPL) associated with the superfund project. However, the vast majority do not meet federal criteria for listing.
- Site specific remediation programs include: Bunker Hill, the Idaho National Engineering and Environmental Laboratory, the Coeur d'Alene Basin, and the Lowman Uranium Mill Tailings.
- Superfund assessment and remediation activities require IDEQ to work with EPA and responsible parties to satisfy federal requirements. Sites suspected to be in need of remediation have been identified in Idaho. Those sites with a sufficiently high hazard ranking are placed on the NPL and may become superfund sites. Idaho currently has 70 sites on this list a number of sites undergoing clean-up activities.
- IDEQ is a signatory of the Idaho Hazardous Materials Incident Command and Response Support Plan. The plan was created to provide an efficient coordinated response, by all applicable agencies, to spills and releases of hazardous materials. IDEQ's role in the plan and program is to provide technical support for local incident commanders during hazardous materials incidents, and to provide regulatory oversight of responsible parties during site remediation.

Connections. Applicable remediation or release sites need to be identified as part of the contaminant inventory and susceptibility determination processes. Most sites are available on a GIS coverage. The completed source water delineation may be used by remediation programs to help determine clean-up requirements based on the risk to drinking water sources. Geologic information collected at release sites may also provide useful information in performing the source water delineations.

Storm Water Program

The Storm Water Program provides TMDL support, technical assistance, education, and information transfer to communities and local stakeholders. The program goal is to protect both surface and ground water quality from the effects of this form of NPS pollution.

Connections. Storm water represents a potential source to be addressed within contaminant inventory, often through the identification of injection wells which provide conveyance to ground water, or through storm water conveyance discharge locations to surface waters. Preventing water quality problems from storm water most likely will be an important source water protection area of focus. The Storm Water Program can provide source water assessment technical assistance and education in the form of helping

characterize community NPS pollutant loads (existing and forecasted) from storm water. The Storm Water Program can also help in source water protection efforts by helping develop pollutant reduction strategies including applicable BMPs.

Solid Waste Management Program

This program ensures that municipal solid waste landfills (those receiving household waste) are properly located, designed, constructed, and monitored to prevent contamination of air, land, and water. Management of the program is divided between the IDEQ and the seven District Health Departments. The solid waste rules are being revised to address composting/biological processing, chemical processing/incinerators, non-municipal solid waste landfills, and material recovery facilities.

Connections. Landfills and other sites regulated by solid waste rules represent potential sources pertinent to contaminant inventories and susceptibility determinations. Program information concerning landfill locations will be used to help develop a GIS coverage. Additional information concerning site specific characteristics such as waste types and ground water monitoring data can also be useful for susceptibility determinations and for source water protection purposes. The knowledge of where drinking water system source waters comes from can also be used in the consideration of the site consideration of future landfill sites.

Pollution Prevention Program

The Pollution Prevention Program promotes incorporation of pollution prevention into businesses, industry, public practices, IDEQ programs, and other government entities.

Connections. Pollution prevention represents a potential management strategy for source water protection. Pollution prevention technical support and reference materials can be useful for those implementing source water protection activities at the local level. Assistance is available to communities and businesses to help them implement recycling, waste minimization, solvent substitution, and other pollution prevention programs.

Confined Animal Feeding Operations (CAFO) Program

The objective of this program is to prevent contamination of surface and ground waters from runoff or seepage of animal waste from confined animal feeding operations. IDEQ works with the EPA, SCC, ISDA, NRCS and representatives of industry to develop nutrient management guidelines that utilize BMPs to minimize and prevent water pollution. The EPA has the responsibility of issuing and tracking point source permits for large animal feeding operations that discharge to surface waters.

Connections. Animal feeding operations represent potential contaminant sources that need to be identified in the contaminant inventory and susceptibility determinations. Existing and new GIS information on CAFO locations will be used in the source water assessment. If animal feeding operations are located within source water delineation boundaries of communities, IDEQ and the facilities can work together to ensure source waters will not be impacted. The results of the source water delineation may also be used by communities in their review of proposals for new animal feeding operations.

Septage System/Septage Disposal Program

Implementation of the State Rules for Individual/Subsurface Sewage Disposal Systems (Title 1 Section 03, Idaho Code) is primarily through the seven health districts with program oversight and technical assistance provided by IDEQ. Program oversight involves training of installers and pumpers, alternative system design development, and applicable rule updates. Technical assistance includes plan and specification reviews and a technical contact within the IDEQ for the public and industry.

Connections. Septic systems are found throughout Idaho, and under certain conditions typically relating to system size, density of systems, or proximity to a drinking water well, can represent a significant source for contaminant inventory and susceptibility determinations. The IDEQ and Health District personnel can assist in identifying locations and potential threats associated with septic systems. The location of source water delineations may also be used by the health districts in their review of proposals to build new septic systems.

Other IDEQ Programs

There are other IDEQ programs that will be connected with source water assessment when applicable. These programs are listed below.

- Wastewater Facilities Review
- Public Wastewater Management Assistance
- 401 Wetlands Certification
- Rathdrum Prairie Aquifer Protection
- Water Quality Certifications
- NPDES Inspections
- Managed Aquifer Recharge
- Complaint and Emergency Response

Connections. Some of these programs address potential sources of surface water pollution through permitted discharges and wetland alterations, or ground water contamination through managed aquifer recharge (for surface applied recharge waters). Where such activities are located in delineated source water areas, these activities need to be identified for contaminant inventory and susceptibility determination purposes.

Idaho Geological Survey (IGS)

The IGS is the lead agency in the state for the creation of geologic maps and management of information on the geology, geologic hazards, and environmental geology of the State of Idaho. The agency works cooperatively with the U.S. Geological Survey, the U.S. Forest Service, other federal and state agencies, and the state universities in researching and reporting on these and other facets of Idaho's natural resources.

Connections. The IGS maintains large databases on abandoned mine lands and on active and historic mines and mining areas which are potential contaminant sources within source water assessment areas. The agency's digital geologic mapping and GIS lab creates and manages geologic map data for the state, information which is directly useful in the analysis of hydrologic sensitivity, and the research conducted by the agency on surficial geologic deposits, environmental geology, ground water hydrology, and source water assessment and protection provides detailed, site-specific information that is directly useful in source water delineations and susceptibility analysis.

Health Districts

The seven Health Districts, of the Idaho Department of Health and Welfare, administer environmental health programs at the community level. The health districts are involved in the oversight of small federally regulated drinking water systems, the approval and oversight of municipal and non-municipal landfills, investigating water quality in privately owned drinking water wells and providing assistance when contamination is detected, inventorying non-permitted injection wells, and implementation of state septic system rules, and complaint response.

Connections. Health District information on the locations of injection wells, septic systems, and contaminated private wells is useful information for contaminant inventory and susceptibility determinations, and efforts are underway to utilize some of this information. The Health Districts possess important information on small public drinking water systems and this information will be needed to perform many of the source water assessments. Health District involvement with a variety of sources as described above, and related experience and expertise in these areas make them a valuable information source for local entities implementing source water protection.

Idaho Soil Conservation Commission (SCC)

The SCC provides direction, coordination, and assistance to the fifty-two Soil Conservation Districts (SCDs) as organized in Soil Conservation District Law (Title 22, Chapter 27, Idaho Code). The SCC is the designated State entity for the conservation of resources (soil and water) associated with grazing and agricultural activities. The SCC is also responsible for the development of the State Agricultural Pollution

Abatement Plan (APAP) which identifies many of the BMPs applicable to soil and water conservation. These BMPs lead directly to both surface and ground water quality protection. The SCC administers the State Agricultural Water Quality Program where state assistance is used to implement water quality BMPs in agricultural areas. The SCC is also the lead agency for coordinating implementation of the anti-degradation policy for agriculture through SCDs.

Connections. The SCC expertise and associated efforts to protect water quality, such as BMP development and implementation, will provide valuable source water assistance to communities, particularly to those communities with a significant amount of grazing and agriculture operations occurring in their source water assessment area.

Idaho Soil Conservation Districts (SCD)

The SCDs are governmental subdivisions of the state and are authorized under Idaho Code, Title 22 Chapter 27. Fifty-two SCDs cover the entire State of Idaho, including private, state, and federal land, with the exception of some incorporated cities and portions of the Idaho National Engineering and Environmental Laboratory. SCDs have been identified in the APAP as the local management agency for agricultural NPS pollution activities. They are responsible for the conservation of soil and water resources through erosion protection and proper water use. These conservation activities ultimately lead to water quality protection, which is another SCD responsibility.

Connections. The SCD expertise and associated efforts to protect water quality through resource conservation and BMP implementation can be a very important protection tool where land use within a source water assessment area includes either agriculture or grazing.

Idaho Cooperative Extension Service (ICES)

The ICES is the off-campus component of the University of Idaho and is the educational arm of the U.S. Department of Agriculture, and is authorized under the Smith Lever Act of 1914. The ICES is not a state agency, but has county offices in 42 of 44 counties in Idaho. The ICES devotes significant effort to water quality programs. The ICES' role in water quality is educational and informational, with contributions made in such as areas as crop and livestock management, soil fertility, and proper use of chemicals. The ICES cooperates with various state and federal agencies in conducting educational programs and provides them with research-based information for updating technical guides in water quality.

Connections. The ICES can be an important reference for impacts from agricultural activities within a specific source water assessment area and potential activities that can be undertaken to protect water quality, including educational approaches. The ICES can also play an important assistance role in helping communities implement source water protection.

Federal Agencies

IDEQ Coordination Efforts with Federal Government Agencies

The IDEQ recognizes the importance of federal government agencies in helping protect Idaho water quality. This is reflected in the selection of numerous federal government representatives on the Source Water Assessment Advisory Committee. The IDEQ has a well-established working relationship with these federal government agencies. Many existing source water assessment efforts, such as the improvement or creation of databases and GIS coverages of potential contaminant sources, have partly come from information provided by federal agencies. The IDEQ intends to readily share information collected during source water assessment or protection activities openly with the pertinent federal agencies.

Since over sixty-seven percent of the land in Idaho is federally owned, federal land managers will be important partners to the state in performing source water assessments and implementing source water protection. Idaho has actively participated with the EPA and other key federal agencies to coordinate source water assessment activities and to share sources of information for local and state-wide studies. Idaho will continue to cooperate with these federal agencies to foster source water assessment and protection efforts.

Federal agencies own and operate approximately 140 PWSs in Idaho. Most of these are noncommunity transient systems located on Forest Service and Bureau of Land Management lands. The PWSs on federal properties will be assessed using the same standard as other PWSs. The IDEQ anticipates that many federal agencies with public drinking water systems on Idaho federal lands will take an active role in performing all or parts of the source water assessment for their systems. In addition to the federally owned and operated drinking water systems on federal lands, there are numerous PWS supplied with waters coming partially or totally from federal lands. For these systems, the full cooperation from the appropriate federal agencies will be key to the IDEQ's source water assessment efforts. IDEQ expects that federal agencies with responsibilities or linkages to water quality will openly and willing share their agencies information and expertise in assist the State in performing source water assessments.

Most federal water quality programs are administered primarily by the EPA. However, there are numerous other federal agencies that play important complementary roles. A short summary of federal agencies with potentially significant connections to source water assessment is provided below.

Bureau of Land Management

Federal lands in Idaho account for about sixty-seven percent of the land area. The Bureau of Land Management (BLM) manages approximately twenty-three percent of lands in Idaho. The BLM manages or provides oversight of forestry practices, watershed management, road building and maintenance, livestock grazing, fire restoration, abandoned mine reclamation, active mines (environmental concerns) and other activities within the BLM jurisdiction that may affect surface or ground water quality. The BLM also performs cleanup of illegal dumps, often consisting of a variety of pesticides and herbicides found on BLM properties. The BLM works with the State of Idaho and other agencies on issues where there are multiple jurisdiction responsibilities. The BLM manages a significant number of small PWSs located at campgrounds and parks. There are also a number of PWSs with surface water intakes located on BLM properties.

Connections. Many existing or historical activities BLM lands represent potential sources for contaminant inventories and susceptibility determinations. These activities can include livestock grazing, mining, illegal dumping, BLM maintenance areas, logging and associated roads, and some recreational activities. In many cases, the BLM may have GIS coverages and/or associated databases, as well as technical expertise pertaining to specific contaminant sources, that can be readily used to support source water assessment.

The BLM land management responsibilities make them an important agency with which to partner, particularly for those PWSs that have source water assessment areas within BLM boundaries or those PWSs managed by the BLM.

Bureau of Reclamation

The Bureau of Reclamation (BOR) has developed projects and manages large volumes of water in 17 western states generally through storage reservoirs for irrigation and domestic purposes. Many Idaho projects are associated with the use of surface or ground water for irrigation of agricultural lands. Project components include dams, irrigation canals, ground water irrigation wells, and ground water injection wells.

Connections. The BOR has been actively involved with water quality assessment activities in areas of the state such as the A/B Irrigation District located in south central Idaho where they have been monitoring ground water quality for several years. The BOR can be an important agency to coordinate source water assessment or protection activities with BOR projects and where related efforts overlap source water areas. BOR knowledge and data pertaining to water quantity or quality may also be useful references for statewide applications of source water assessment. As source water delineations are completed, this information will be shared with BOR to ensure that their future projects do not negatively impact PWSs. Additionally, in some western states, the BOR is responsible for the operation and maintenance of open air conveyances (canals) of water including drinking water. However, in Idaho no such open air conveyance structures exist which provide communities with public drinking water.

Environmental Protection Agency

Several federal programs related to drinking water quality source water assessment and protection are administered by the EPA including the SDWA. The primary purpose of the SDWA is to ensure the safety of drinking water served to the public. The Safe Drinking Water Act includes the Wellhead Protection, Sole Source Aquifer Protection, Underground Injection Control, and Source Water Assessment and Protection. All of these programs, except the Underground Injection Control Program have been delegated to the State to implement.

Another major environmental law that EPA administers is the Clean Water Act (CWA), which provides protection for the many uses of surface water which include drinking water use. The CWA includes surface water quality standards, anti-degradation, the watershed approach, non-point source program, wetlands protection, and the National Pollutant Discharge Elimination System (NPDES) permitting process.

The EPA also programs administers or provides oversight of state for other programs which protect water quality, including the Resource Conservation and Recovery Act (RCRA) (including Underground Storage Tank and Leaking Underground Storage Tank); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), otherwise known as “Superfund”; Spill Prevention Control and Countermeasure (SPCC); and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). EPA also provides oversight of federal environmental programs on Indian reservation lands.

Connections. Laws administered by the EPA and associated programs provide authorities, financial support, and technical assistance to protect sources of drinking water. Many of the specific regulatory components that EPA administers have an Idaho counterpart where the state addresses regulatory requirements, typically through primacy, with technical assistance, oversight, and financial support provided by the EPA. These connections involve utilization of existing EPA programmatic information such as locations of key sources.

There are some program areas where the EPA maintains primary responsibility for implementation in Idaho. This includes the following three programs and associated connections to source water assessment.

The NPDES program requires permits for point sources discharging to waters of the U.S. which are generally limited to surface waters. These permitted sources are being located for contaminant inventory and susceptibility determination purposes, and can represent an important focus point for source water protection where discharges may threaten drinking water quality.

Sole Source Aquifer Protection: There are three sole source aquifers in Idaho (Rathdrum Prairie, Eastern Snake River Plain, and Lewiston Basin) where additional reviews for federally funded activities were undertaken by the EPA Region 10 program personnel to ensure drinking water quality protection. This represents a management approach for source water protection efforts, and the EPA personnel represent a valuable information source pertaining to potential impacts from a variety of sources such as injection wells and methods to limit water quality degradation from these sources.

The EPA maintains a database of all registered USTs on Indian reservation lands in Idaho. These registered tanks are being located for contaminant inventory and susceptibility determination purposes and can represent an important focus point for source water protection where leaks may threaten drinking water quality.

Chapter 5 of the EPA *State Source Water Assessment And Protection Programs Guidance*; August 1997, publication EPA 816-R-97-009, also elaborates in more detail on many of the EPA program connections to source water assessment.

Another important EPA connection is in the area of coordination among the various Federal agencies involved with water quality activities and between Idaho and other States or Indian Reservations where delineated source water areas cross jurisdictional boundaries.

U.S. Forest Service

The U.S. Forest Service (USFS) National Forest lands in Idaho makeup approximately thirty-eight percent of the lands within the State. The USFS manages or provides oversight of forestry practices, watershed management, road building and maintenance, livestock grazing, fire restoration, abandoned mine reclamation, active mines, and other activities within the National Forests that may affect surface or ground water quality. The USFS works with the State of Idaho and other agencies on issues where there are multiple jurisdiction responsibilities.

The USFS manages a significant number of small PWSs located at campgrounds and Forest Service facilities. There are also several PWSs with surface water intakes located on forest service properties.

Connections. Many existing or historical activities within the National Forests represent potential sources for contaminant inventories and susceptibility determinations. These activities can include logging and associated forest roads, livestock grazing, mining, forest service maintenance areas, and some recreational activities. In many cases the USFS may have GIS coverages and/or associated databases, as well as technical expertise pertaining to specific contaminant sources, that can be readily used to support source water assessments.

The USFS land management responsibilities make them an important agency with which to partner, particularly for those PWSs that have source water assessment areas within the USFS boundaries or those PWSs managed by the USFS.

U.S. Geological Survey

The role of the U.S. Geological Survey (USGS) is to serve as the primary earth sciences research agency in the United States. The USGS principally collects and compiles information that assists others, such as agencies with water quality regulatory and management responsibilities. The USGS has been involved with numerous water quality projects, including a large National Water Quality Assessment (NAWQA) Project for the Upper Snake River Basin. The USGS maintains a database of water quality data from their monitoring work in Idaho.

Connections. The USGS water quality monitoring data can be useful for susceptibility determination purposes, and can also be useful information for source water protection efforts where monitoring sites are located within or near a source water area. Some of the USGS data is from PWSs, thus providing important historical information for trend and BMP implementation efforts that could be associated with source water protection. A significant portion of the USGS NAWQA work has been to identify potential

contributions to ground water contamination and contaminant transport information in the Snake River Plain area. Many of the USGS projects throughout the state also provide hydrogeologic information that may be useful for source water area delineations or for further studies involving contaminant fate and transport in association with a specific problem(s) within a delineated source water assessment area. The USGS expertise in water quality monitoring, hydrology, and hydrogeology represents a potential form of assistance for many aspects of source water assessments.

Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS), previously known as the Soil Conservation Service, has a long history of addressing non-point source pollution by working with farmers and communities through voluntary implementation programs. The NRCS provides technical and financial assistance with primary focus on nutrients, pesticides, sediment, and animal waste issues in surface and ground water. Technical assistance includes development of BMPs addressing practices such as nutrient management or irrigation water management. Financial assistance includes Environmental Quality Incentives Program (EQIP) grants and loans for members of the agriculture community to improve water quality and the Conservation Reserve Program (CRP) that can provide funds to set aside agriculture lands.

Connections. The NRCS's expertise, funding mechanisms, and existing agricultural BMPs can be important management tools and resources for local entities involved with source water assessment and protection, particularly where agricultural activities are located within a source water assessment area.

Other Federal Agencies

There are several other Federal Agencies that have potential connections to source water assessment and protection. These include the following:

- The Department of Defense (DOD) which includes the U.S. Army Corps of Engineers. The Corps of Engineers is responsible for wetland modifications permits and associated ecosystem activities which could relate to drinking water quality. Mountain Home Air force Base (MHAFB) is also under the DOD, and represents a potential source of contamination where water quality clean-up efforts are underway. MHAFB also has significant geologic information about the area surrounding the base.
- The Department of Energy owns the Idaho National Engineering and Environmental Laboratory (INEEL) which is a location where existing ground water contamination has been documented and clean up efforts are underway. The INEEL conducts research on new technologies and practices that can be used to perform remedial investigations and cleanup. INEEL also possesses valuable geologic information for the areas surrounding INEEL.

- The Fish and Wildlife Service can provide wetland inventory information that could be useful for some source water assessment efforts, particularly for surface water systems.

Source Water Assessment and Protection Program Federal Agency Agreement.
The federal government recently acknowledged the importance of helping states establish a cooperative approach to restoring and protecting water quality in which state, federal, tribal and local governments all have a valuable role to play. In support of this effort , in late 1998, ten federal departments developed the Source Water Assessment and Protection Program Federal Agency Agreement to encourage federal, state, and local partnerships nationwide to promote state and tribal government efforts to complete their source water assessments. This agreement states that whenever possible, and within resource constraints, federal field offices agree to assist states and tribes in the development of cooperative management strategies or plans to complete source water assessments and address the protection of drinking water sources based on the assessment results. Federal agencies signing this agreement include: EPA, Postal Service, and the Departments of Agriculture, Defense, Energy, Health and Human Services, Interior, and Transportation. The IDEQ hopes that this agreement will encourage federal agencies in Idaho to be progressive in their support of source water assessment and future protection efforts.

Indian Tribes
There are five Indian Tribes in Idaho: the Shoshone Bannock Tribe, located on the Fort Hall Reservation; Shoshone-Paiute Tribe, located on the Duck Valley Reservation (includes land in Nevada); Nez Perce Indian Tribe, located on the Nez Perce Reservation; Coeur d'Alene Tribe, located on the Coeur d'Alene Indian Reservation, and the Kootenai Indian Tribe of Idaho, for which no formal reservation was set aside. There are over 800,000 acres of land in Idaho that belong to individual members of the tribes, are held in trust by the federal government, or owned by the tribes.

When discussing potential tribal regulatory jurisdiction, lands may be of two types. "Trust lands" are lands that the United States government holds in trust for exclusive tribal occupancy; trust lands may be within or outside the boundaries of a formal reservation. "Fee lands" are lands that lie within the boundaries of a reservation and are owned by private, rather than tribal entities. Many reservations are characterized by a "checkerboard" pattern of fee and trust land ownership. The fact that there are fee lands within the boundaries of existing or former reservations is, for the most part, a result of the historical policies of the federal government.

Connections. The Indian Tribes in Idaho have direct interest in source water assessment and protection activities. The Tribes have responsibilities for activities on tribal lands that may include: land management; environmental protection programs such as wellhead/source water protection, water and wastewater treatment, spills and emergency response, solid waste disposal, and recycling and hazardous waste disposal. The Tribes also have some land use planning authorities.

Despite the complicated jurisdiction issues often encountered between the State and the Tribes, the IDEQ has good working relationships with Tribes within Idaho. Both the State and the Tribes share similar goals in ensuring that quality surface and ground waters are maintained in aquifers and watersheds that cross jurisdictional boundaries. The IDEQ expects that a free exchange of information between the Tribes and the agency will greatly assist the IDEQ in the performance of source water assessments as well in the Tribes' pursuit of source water protection. The Tribes possess information about their tribal lands, water systems, and potential contaminant sources that will very useful in performing source water assessments. The IDEQ's experience, knowledge and expertise in wellhead protection will be shared with the Tribes to help them plan and implement source water protection.

Bordering States

Idaho is bordered by six states: Montana, Nevada, Oregon, Utah, Washington, and Wyoming. A few watersheds or wellhead contribution areas for Idaho drinking water systems cross state boundaries. Although the number is unknown, there will also be a small number of source waters flowing from Idaho to PWSs located in other states.

Connections. If an Idaho drinking water system has source waters that come from outside of Idaho, the neighboring state may be requested to provide information that would be useful in conducting source water assessments or protection. The IDEQ intends to share pertinent information gained from performing source water assessments with other interested bordering states. The IDEQ has maintained good working relationships with these bordering states and expects a free exchange of source water assessment information between them. The IDEQ will provide bordering states notice when source water assessments are performed and delineations of the drinking water systems confirm that the source water watershed or wellhead assessment area crosses the Idaho border into their state. On a system by system basis, the IDEQ will work with their counterparts in the adjacent states' environmental programs to ensure that two-way informational flow occurs.

The IDEQ intends to foster this relationship by advance notification of the other state source water assessment contacts regarding Idaho's assessment activities. The IDEQ does not anticipate the need of formal agreements with other states to implement source water assessments that cross state lines.

The IDEQ expects EPA Region 10 will assist in fostering productive and cooperative relationships Montana, Nevada, Utah, and Wyoming through Region 10's relationship with their sister EPA Regions. The IDEQ currently works with EPA Region 10 and its representatives from Washington and Oregon on watershed and ground water issues.

British Columbia, Canada

Idaho has a few drinking water systems that have watersheds or wellhead contribution areas that extend into British Columbia, Canada. The IDEQ does not anticipate the need for formal agreements with British Columbia to work cooperatively on source water assessment issues as they may arise. The IDEQ intends to notify the appropriate environmental agency in British Columbia of Idaho's wellhead assessment areas or watersheds that extend into their province.

Connections. Idaho will work with British Columbia to exchange information that may be useful in performing source water assessments or protection. IDEQ and their British Columbia counterparts can and will benefit from a cooperative relationship in assessing and protecting drinking water sources.

APPENDIX D
COLLECTION OF DATABASES AND COVERAGES

Introduction

Immediately following are two inventories that list existing information sources that could be used in the assessment process. The inventories distinguish between information contained as part of a GIS coverage (Table D-1.—Source Water Assessment 'Coverage' Information Inventory), and that contained in electronic databases or other data compilations (Table D-2.—Source Water Assessment 'Database' Information Inventory). These inventories include both a prioritization and relative status rating.

The "priority" rating was developed by IDEQ to describe the usefulness for a source water assessment purposes (i.e., high, medium, and low categories). It was developed using best professional judgement and wide-ranging experience that considered criteria such as: data quality and accessibility; the extent to which the data would be directly used in the assessment process; whether the data has statewide use or only limited regional value; and the potential for the data to significantly alter the outcome.

The "status" rating was developed to describe the current condition of the coverage or database. It used criteria such as: the current status of the information (where it resides and in what form and format); an estimate of the time and resources that would be necessary to convert the information into a form which is readily used in the assessment process (such as converting paper files into electronic files and address location information into GIS location information); the size of the coverage or database; and the effort required to check and verify the accuracy of the data. The "status" rating corresponds to: (1) use as is, or with only minor effort (i.e., changing the projection of a coverage); (2) will require moderate effort (i.e., adding attribute information to an existing coverage); and (3) will require significant effort (i.e., geocoding of address information for a database of several thousand locations). These ratings allow IDEQ to: prioritize efforts to upgrade information sources; convert and integrate data information sources; and focus on information of greatest use.

To the extent practicable, IDEQ will utilize those databases or coverages which indicate a status of "1" on Tables D-1 and D-2 in its primary contaminant source inventory evaluation. IDEQ will also utilize those databases or coverages with a status of "2" or "3" listed in Tables D-1 and D-2 as they are developed.

Some concern has been expressed regarding the adequacy of using the data sources listed in this appendices. EPA's State Source Water Assessment and Protection Programs Guidance (August 1997) stipulates that "a state SWAP must... (3) identify, to the extent practical, the origins of regulated and certain

unregulated contaminants in the delineated area to determine the susceptibility of PWSs to such contamination." IDEQ believes that its utilization of state, federal, and local databases and coverages contained in this appendices fully meets this provision of the EPA guidance. Additionally, as more information is added or obtained by IDEQ (septic density or sewer line coverages), the new information will be included in the databases or coverages in an adaptive management approach.

Table D-1. Source Water Assessment 'Coverage' Information Inventory

ID	Name	Description	Category	Priority	Status	Needs	Database References(s)
3001	CERCLIS sites: Boise	CERCLIS sites in the City of Boise	Source	M	1	70% Complete	EPA CERCLIS
3002	Depth to Water: Treasure Valley	Treasure Valley Depth to Water	Hydro	M	1	Study ongoing. Expected completion January 2000.	
3003	Injection Wells: Deep	IDWR permitted deep injection wells (geothermal not included)	Source	H	1	Add shallow wells however significant effort is required	
3004	CFOs: SC Idaho	Dairies & Feedlots for Jerome, Gooding (draft), and Twin Falls (draft) counties	Source	H	1	Add statewide data	ISDA dairy list, feedlot list (?)
3005	Wastewater Land Application Permitted Sites	Wastewater Land Application Permitted Sites	Source	H	1	Completed	
3006	TRI Facilities	Toxic Release Inventory	Source	H	1	Completed	
3007	RCRA TSD Facilities	RCRA TSD Facilities	Source	H	1	Completed	
3008	CERCLA	CERCLA Sites in Idaho	Source	H	1	Completed	
3009	NPDES	Permitted NPDES Facilities in Idaho	Source	H	1	Completed	
3010	NAWQA Sites	Snake R. Plain NAWQA ground water sample sites with some corresponding sample results	Sample	M	1		
3011	Treasure Valley DEQ/USGS Ground Water Studies	Four coverages of ground water sample sites from four projects in the Treasure Valley area	Sample	H	1		project specific dBase files primary source used in coverage
3012	Monitoring Priority Areas	Three shape file themes (nitrate, organics, inorganics) showing areas of ground water quality concern for regional/local monitoring program planning purposes	Sample	H	1	Ongoing	Access database joined to attribute table; coverage directly related to data from 4004, 4001, & 4007
3013	Monitoring Priority Sites	One point file theme showing sites of ground water quality concern for regional/local monitoring program planning purposes	Sample	H	1	Ongoing	Access database joined to attribute table; coverage directly related to data from 4004, 4001, & 4007
3014	Cities	Idaho cities	General	M/L	1	Completed	
3015	Nitrate Probability	Nitrate probability for Snake River Plain area predicting areas of nitrate degradation areas	Sample	H	1	Completed	4001 & 3016 attribute data utilized
3016	STATSGO	Generalized Soil Map Units and Soil Properties	Hydro	H	1	Completed	Numerous database tables included within coverage folder that cross reference with attribute table

Table D-1 Source Water Assessment Coverage Information Inventory, Continued

ID	Name	Description	Category	Priority	Status	Needs	Database References(s)
3017	Aquifers	A general coverage of the 70 major flow systems identified by Graham & Campbell	General	M/L	1	Completed	
3018	GCAQ	General lithologies of the major ground water flow systems in Idaho	Hydro	L	1	Completed	complete metadata in the coverage 'log' file
3019	Public Water Supply - GW C& NC/NT	Coverage showing the location of Public Water Supply (PWS) wells and springs for community and noncommunity, nontransient systems	Sample	H	1	95% Completed. Acquiring remaining source sites. Expected completion date October 1999.	limited information within DWIMS found in attribute table, some water quality data joined to coverage
3020	Public Water Supply - SW	Coverage showing the location of PWS surface water systems	Sample	H	1	Completed	limited information within DWIMS found in attribute table
3021	Ground Water Vulnerability	Coverage(s?) showing ground water quality vulnerability	Hydro	H/M	1	Potentially update	
3022	Burley Demo Project	Ground water quality sample locations for the Burley Demo Project, recent nitrate data tables joined to attribute table	Sample	L	1		Demo project spreadsheets and tables exist
3023	Sole Source Aquifers	Locations of Idaho's three sole source aquifers, including drainage areas, etc.	General	L	1	Completed	
3024	Statewide Monitoring Network	Ground water sample locations for the Statewide Monitoring Network	Sample	H	1	Sites are gradually being GPS'd	DEQ version of 4004 used for ArcView; also cross references to 4005, 4006, 4001 & 4007 for data and/or sample sites
3025	LUST	Leaking Underground Storage Tank Sites	Source	H	1	Completed	
3026	Ongoing, Historical and Planned GW Monitoring	Locations of Ongoing, Historical, and Planned GW Monitoring Activities	Sample	M	1	Update to present	
3027	SSURGO	Digitized Detailed Soil Survey Areas	Hydro	H	1	Expand to other areas of the state	
3028	Nitrogen Fertilizer	County Level Nitrogen Fertilizer Sales Data from 1985-1991	Source	H	1	Collect local scale information. Ongoing	
3029	Herbicide Use	County Level Use information for the 100 most used herbicides Nationally	Source	H	1	Collect local scale information. Ongoing	
3030	Mineral Production	Mineral Production Facilities	Source	H	1	Completed	

ID	Name	Description	Category	Priority	Status	Needs	Database References(s)
3031	Mineral Hazard	Estimated Potential Risk to Human Health from Mineral Production Facilities	Source	H	1	Completed	
3032	Census	1990 Census Data by Census Block Group	General	M	1	Completed	
3033	Snake Plain DTW	Depth to Water Contours for the Snake Plain Aquifer	Hydro	H	1		
3034	Rathdrum Prairie DTW	Depth to Water Contours for the Rathdrum Prairie Aquifer	Hydro	H	1		
3035	Big Wood DTW	Depth to Water Contours for the Big Wood River Aquifer	Hydro	M	1		
3036	Big Lost DTW	Depth to Water Contours for the Big Lost Aquifer	Hydro	M/L	1		
3037	Little Lost-Pasimeroi DTW	Depth to Water Contours for the Little Lost-Pasimeroi Aquifers	Hydro	M/L	1		
3038	Birch Creek DTW	Depth to Water Contours for the Birch Creek-Lemhi Aquifers	Hydro	M/L	1		
3039	FEMA	Floodzone Delineations for selected Idaho counties	Hydro	H	1	Completed	
3040	Mineral Sites	Locations of mining sites	Source	H	1	Completed	
	General Land use	Land use data	Source	H	1	Completed	
	Remote Recharge	Ground water recharge sites	Source	M	2/3	No action to date.	
	Municipal Sewer	Location of municipal sewer systems	Source	M	1	Data expected to be complete December 1999	
	High Density Septic	Location of high density septic system	Source	M	2/3	completion date June 2000	
	Dairy	Location of large dairy facilities	Source	H	1	Completed	
	Landfills	Location of landfills	Source	H	1	Completed	

Table D-2. Source Water Assessment 'Database' Information Inventory

ID	Name	Description	Format	Category	Priority	Status	Coverage Reference	Needs
4001	Drinking Water Information Management System (DWIMS) master database	Numerous tables on water quality data and other PWS location information; SDWA compliance information; sample requirements, etc.	dBase	Sample	H	1	also 3020 and an old coverage based on addresses	Tie more data to coverage; include transient systems in coverage; coverage improvements
4002	Underground Injection Control (UIC) Database	Information on more than 7000 deep (permitted) and shallow injection wells	Access	Source	H	1 / 2	3003 only includes the deep wells portion of database	Locational info for shallow wells
4003	Wastewater Land Application Program Database	Information about wastewater land application sites, general permitting, water quality, and wastewater quality.	dBase	Source	M/H	1 / 2	3005 includes some of the information in attribute table and joined table	Coverage of actual application fields, sites, etc (some or most GPS work done for this)
4004	Statewide Monitoring Network (SMN) Database	SMN sampling results and well log information.	1990 thru 1995 - dBase; 96 & 97 - Access	Sample	H	1	much of shape files 3012 & 3013 developed from this database and 3024 coverage	Maybe some fine tuning and additions (such as radionuclides) of attribute table and joined tables.
4005	USGS QW (Quality of Water) database	All water quality analyses (ground and surface)	Unix/Ingres	Sample	H	2	3010, 3011, 3024, and 3019 will all include sites with QW data, minimal QW coverage	Can make into GIS coverages with data; maybe develop DWIMS cross-references
4006	Environmental Data Management System (EDMS)	The State's data management system for housing past, present, and future ground water quality monitoring data		Sample	M	2/3	3010, 3011, and 3024 probably include sites where data was entered into EDMS, minimal EDMS coverage	GIS capability exists but of limited accuracy.
4007	Regional and Local Monitoring Projects	Various hard copy files, spreadsheets, and databases from regional and local ground water quality monitoring projects	Varies from none to spreadsheets to dBase, etc	Sample	M	2/3	3010, 3011, 3012, 3013, 3015, 3022, and 3024; most projects have no coverage, minimal all encompassing coverage	Database entry and/or GIS coverage development for high priority studies
4008	UST Access Database	Database of UST Facilities and LUST Sites	Access	Source	H	1		95% Complete

Table D-2. Source Water Assessment 'Database' Information Inventory

ID	Name	Description	Format	Category	Priority	Status	Coverage Reference	Needs
4009	Sara Title III Facilities	Database of SARA Title III Facilities in the 11 most Populated Counties in Idaho	Access	Source	H	2/3		Geocoding of Address Information Associated with Facilities. Addition of Other Idaho Counties
4010	Dairies	Database of Dairies in Idaho	Foxpro	Source	H	1	Completed	Geocoding of Address Information Associated With Facilities
4011	Landfills	Database of Active and Closed Solid Waste Facilities in Idaho	Tabular	Source	H/M	1	Completed	Locational Information Requires Verification and digitizing.
4012	Spill Incidents	Database of Spill Incidents Logged by SERC since about 1993.	Access	Source	M	3		Database is not completed at this time (7/98). Geocoding of the database would be required.
4013	Coliform Bacteria	Mortgage Survey Results of Bacteria Testing	????	Source	M	3		Geocoding of Home Address Information
4014	Road Density	Road Density for HUC Field 6 Sub-watersheds	Dbase	Source	H	1	Completed	Linking of database to HUC coverage
4015	Community On-Site	Community Size (>2500 gpd capacity) on-site wastewater treatment systems	Tabular	Source	H	3	Ongoing	Compilation of data from individual health districts and development of locational information.
4016	Cyanidation Facilities	Permitted Ore Processing by Cyanidation Facilities	Tabular	Source	H	2		Locational information and attribute database.
4017	RCRIS	RCRA regulated and non-regulated, large and small quantity generators, and conditionally exempt facilities	Tabular	Source	H	3		Geocoding and location of facilities

APPENDIX E
TECHNICAL ASSESSMENT METHODS

Appendix E provides detailed technical guidance to complete steps 3, 4, 5, and 6 of the source water activities discussed in Chapter 4.

Appendix E—Table of Contents

Step 3: Delineation of the Source Water Assessment Area

Delineation is a fundamental step in developing a source water assessment area for ground and surface water sources. Delineation establishes the physical area around a well, spring, or surface water intake that will become the focal point of the source water protection process. A potential contaminant released within the source water assessment area may ultimately reach the well, spring, or surface water intake. Therefore, it is within the boundary of the source water assessment area that management activities would be concentrated to eliminate or reduce the threat of potential impacts to drinking water.

There are two possible variations for performing delineations under this step. For ground water sources, the step identifies (delineates) the surface area around the well or spring that is directly above that portion of the aquifer which supplies groundwater to the well or spring. Idaho has an EPA-approved Wellhead Protection Plan (IDEQ, 1997). Therefore, as introduced in the Idaho Wellhead Protection Plan, this delineated surface area around a well is known as the *wellhead protection area*. In contrast, for surface water sources, the step would delineate the entire watershed area upstream of the intake. This area is known as the *surface water protection area*.

Within the delineated area, potential contaminant sources will be inventoried (Steps 4 and 5), and these specific potential contaminant sources will undergo a determination of susceptibility (Step 6).

Delineation of Ground Water Sources

In Idaho, approximately 2,000 of 2,100 regulated PWSs rely upon over 2,900 wells as their source of drinking water (IDEQ DWIMS, Oct., 1999). Public drinking water is pumped from all 70 major hydrogeologic systems in Idaho (Figure 1-1, Chapter 1). Some of these hydrogeologic systems contain multiple aquifers, such as the Lower Portneuf River Valley system, which consists of shallow alluvial, shallow basalt, and deep alluvial aquifers. In addition, about 90 ground water and spring sources for drinking water exist in four additional hydrogeologic mountainous terrain settings that include aquifers and spring recharge areas in fractured carbonate rock, and weathered and fractured granitic intrusive rock of the Idaho Batholith. This enormous hydrogeologic complexity requires flexibility on how ground water delineations are performed.

Ground Water Delineation Basics

Delineation includes mapping the boundaries of the *zone of contribution* into *time-of-travel zones*. The *zone of contribution* is the surface and subsurface areas of an aquifer that contribute water to the well or spring. *Time-of-travel zones* are marked on appropriate base maps as time boundaries that indicate the number of years necessary for a particle of water already in an aquifer to travel some distance to reach a well or spring from within the delineated area. The time of travel is primarily dependent on how fast ground water moves (known as the ground water flow velocity). For example, consider the three year time-of-travel boundary in an aquifer composed of sand and gravel. If the ground water moves at the rate of one foot per day, then the three year time of travel boundary would be calculated as: one foot per day, multiplied by 365 days, multiplied by three years. Therefore, the three year time-of-travel boundary within the zone of contribution would extend 1,095 feet beyond the well.

For community and non-transient noncommunity PWSs, the source water assessment areas will be delineated using 3-, 6-, and 10-year time-of-travel boundaries. For transient noncommunity PWSs, a two year time-of-travel boundary will be used. It will be delineated as a fixed 1,000 foot radius from the well.

The size and shape of the source water assessment area depends on the delineation method used, local hydrogeology, and the volume of water pumped from the well or spring. For ground water systems, the proposed delineation techniques vary from the simple and inexpensive method of drawing a circle around a wellhead, to complex and costly computer-assisted models that account for site-specific characteristics of the aquifer. Generally, the simple, inexpensive methods result in less accurately delineated source water assessment areas. Conversely, the complex and costly methods typically result in smaller and more accurately delineated source water assessment areas. Though costing more initially, these complex delineation methods are more scientifically defensible and often encompass a smaller area. The smaller delineated area results in costs savings during the enhanced potential contaminant inventory. Also, if a community decides on local measures to protect the source water assessment area, the smaller delineated area is more manageable.

The Idaho Wellhead Protection Plan is currently being implemented by IDEQ as a voluntary program. To maintain consistency with this existing program, the delineation of source water assessment areas for ground water based systems will be performed in accordance with guidance contained in the Idaho Wellhead Protection Plan (IDEQ, 1997). The Idaho Wellhead Protection Plan uses four time-of-travel zones (Figure E-1): Zone IA , the sanitary setback based on state law; Zone IB, the 3-year time-of-travel zone; Zone II,

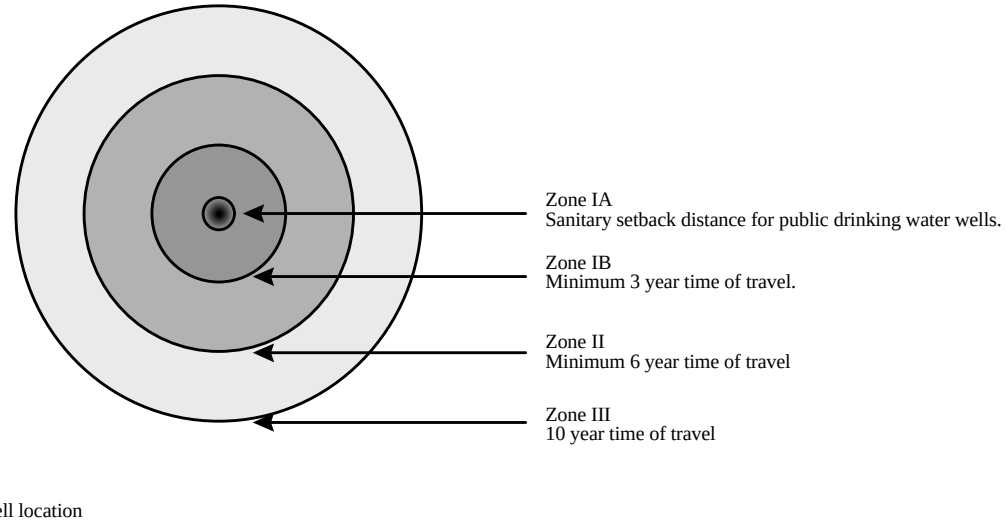
the 6-year time-of-travel zone; and Zone III, the 10-year time-of-travel zone. The source water assessment area delineation for transient noncommunity PWSs will use a 2 year time-of-travel zone fixed at a 1,000 foot radius from the well (discussed under Delineation Methods).

The time-of-travel zones are based on a hierarchy of three goals: prevention, response, and protection. The primary goal is to prevent contamination of ground water that is used for drinking water. If prevention fails, then a secondary goal is to provide a response action area. The third goal is to protect all or part of the area of ground water contribution to a public well. The following briefly summarizes the purposes of the four areas established in the Idaho Wellhead Protection Plan (IDEQ, 1997) and the yet-to-be implemented EPA Ground Water Rule.

Zone 1A: Sanitary setback - The goal of this zone is to prevent microbial contamination of ground water used for drinking water. The sanitary setback distance is established in the Idaho Rules for Public Drinking Water Supplies (IDAPA 16.01.08). The Rules require two minimum setbacks: 50 feet from sewer lines, livestock, canals, and streams; and 100 feet from home septic tanks, seepage pits, disposal fields, and privies.

Zone 1B: 3-year time-of-travel boundary - The primary goal within this zone is to prevent contamination of ground water. Within this zone, potential sources of contamination should be strictly managed to eliminate or reduce the possibility that contamination of the water supply will occur.

Figure E-1. Source Water Assessment Zones for Community Sources (Calculated Fixed Radius Method)



Zone II: 6-year time-of-travel boundary - The goal of this zone is to allow adequate time to identify and respond to ground water contamination before it reaches the public water well. Since prevention of ground water contamination is not always effective, or because existing contamination may be present, the 6-year time-of-travel boundary is necessary.

Zone III: **10-year time-of-travel boundary** -The outer border of this zone is the boundary of the source water assessment area. The primary purpose of this zone is to encourage decision makers and planners to understand the long-term affects to the source of the drinking water supplying the community. This allows the community to plan for and properly site future high risk activities outside of this boundary.

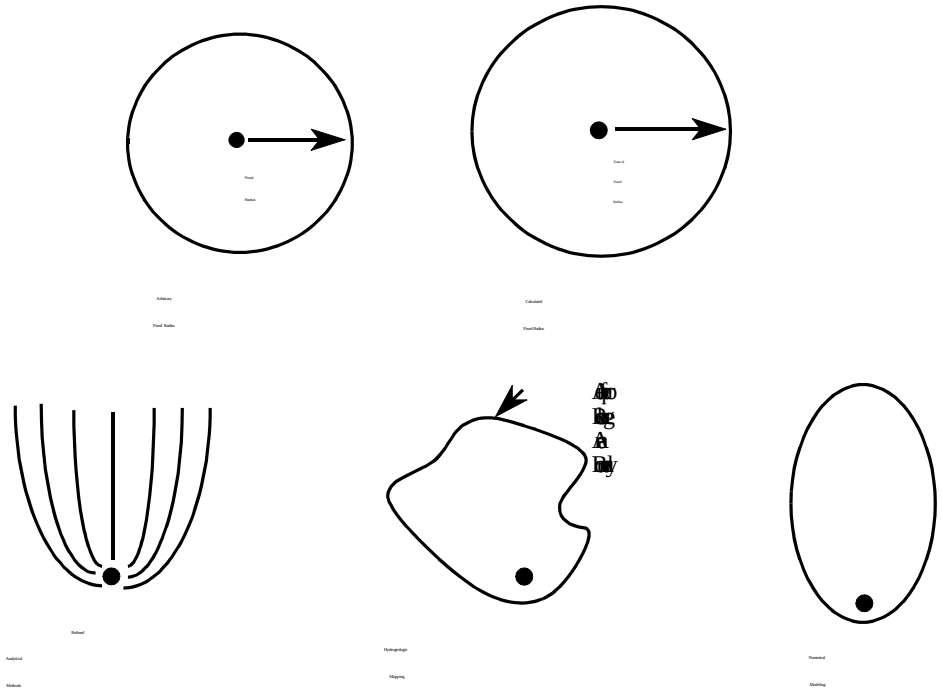
The division of source water assessment areas into zones allows flexibility in the management of potential sources of contamination. Sources that lie in the zones closest to the well need to be managed as stringently as possible. Sources that lie within Zone II can be managed less stringently. Finally, sources within Zone III should be managed, at a minimum, with public education efforts.

EPA Ground Water Rule - The EPA Ground Water Rule may require IDEQ to evaluate ground water-based drinking water systems that experience repeated coliform contamination. This evaluation would include transient noncommunity PWSs. For each of these sources, Idaho will use a fixed 1,000 foot radius from the well that encompasses the 2-year time-of-travel boundary (described under Ground Water Delineation Methods).

Ground Water Delineation Methods

In Idaho, the methods that will be used to delineate ground water source water assessment areas are: (1) a 1,000-foot fixed radius boundary for transient noncommunity wells; and for community and noncommunity non-transient wells, either the (2) calculated fixed radius method, or the (3) refined analytical method (Figure E-2).

Figure E-2. Overview of Ground Water Delineation Methods



Additionally, an arbitrary fixed radius, as determined by Idaho Rules for Public Drinking Water Systems (IDAPA 16.01.08), is used to determine the sanitary setback distance. In special cases, other delineation methods may be used where delineation of an entire aquifer is necessary for the protection and benefit of a PWS (e.g., Rathdrum Prairie Aquifer). The delineation methods that will be used to delineate source water assessment areas are briefly summarized below. More information can be found in Chapter 4 of the Idaho Wellhead Protection Plan (IDEQ, 1997) for the calculated fixed radius method and the refined analytical method.

Arbitrary Fixed Radius Method: 1,000 Foot Radius for Noncommunity Transient Systems The delineation of a source water assessment area using the arbitrary fixed radius method involves drawing a

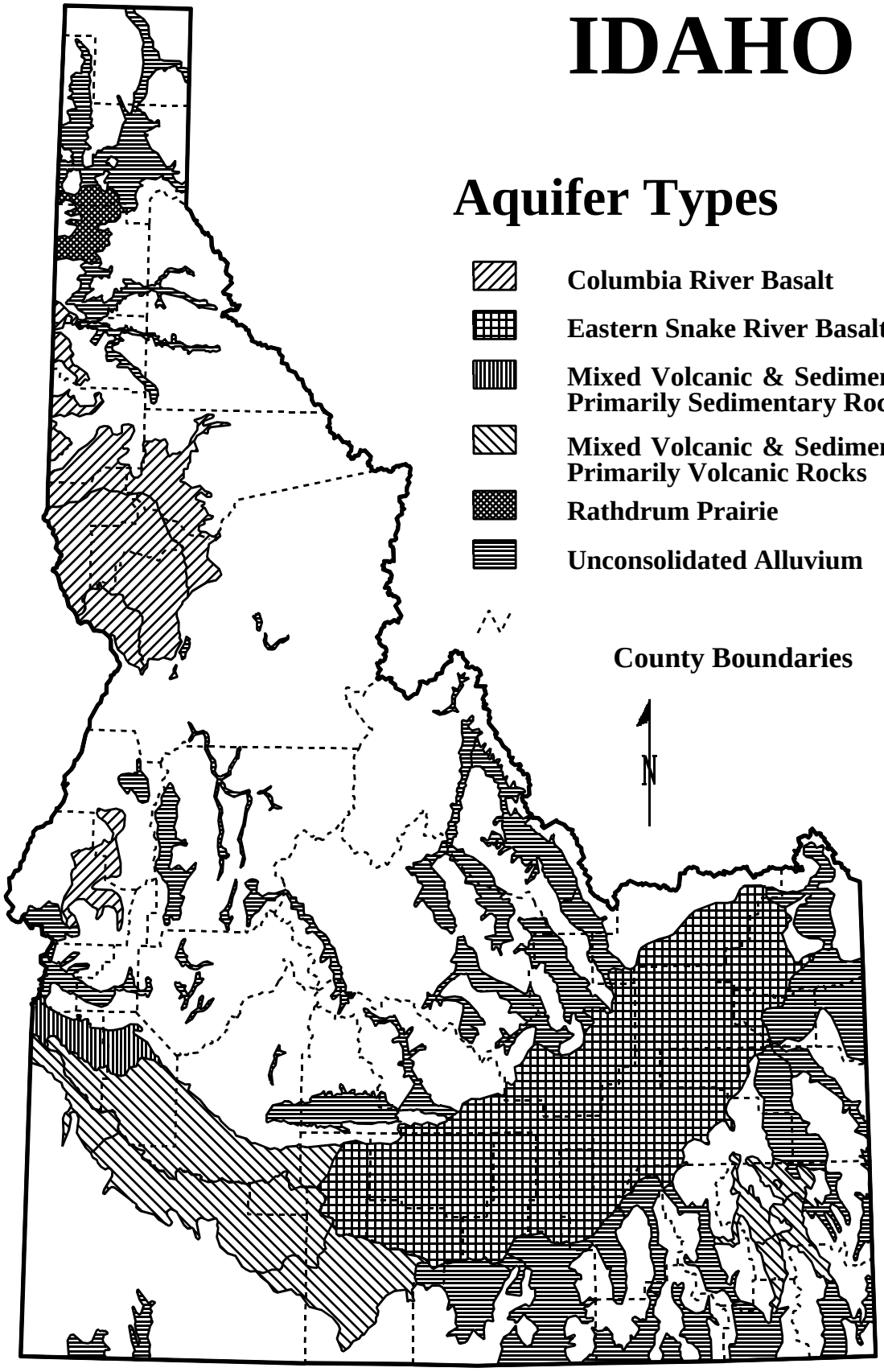
circle around a well using a fixed distance that is identical for every well. The distance is typically set by statute and is often based on economic and political justification, as opposed to technical merit. This method is easy to implement, inexpensive, and the data requirements are minimal. The major disadvantage is the degree of uncertainty due to the lack of scientific basis for the selection of the distance. An additional disadvantage is that the application of a single standard to a wide range of PWSs with different characteristics can lead to delineations that inadequately represent the source water assessment area.

There are over 1,000 transient noncommunity wells in Idaho (IDEQ Drinking Water Information Management System, Jan., 1999). These wells (e.g., US Forest Service campgrounds) will be delineated using a time-of-travel boundary that is fixed at a radius of 1,000 feet. A Minnesota study showed that one-year time-of-travel capture zones of transient noncommunity wells completed in unconfined porous sediments are unlikely to exceed 155 feet in the upgradient direction (MDH, 1998). EPA recommends a one year travel time to protect wellheads from bacterial and viruses. Therefore, a 1,000-foot radius should be protective for transient noncommunity wells. Additionally, it is impractical to develop more intensive delineations for these systems because of limited resources for protection, and lack of jurisdiction over land use outside property boundaries.

Calculated Fixed Radius Method for 3-, 6-, and 10-year Times-of-Travel Boundaries- The calculated fixed radius method uses generalized, existing, hydrogeologic data for the major aquifer types in Idaho, and data from the well pump rate. The delineation of a source water assessment area involves drawing circles around a well for the 3-, 6-, and 10-year time-of-travel boundaries. The radius for each time-of-travel boundary is determined from pumping rate tables that are specific for each generalized Idaho aquifer type. This method is used when site-specific data are not and will not be available. This method can provide a relatively low cost, easily understood, and easily applied delineation procedure. Unfortunately, delineations that use this method can result in extremely large source water assessment areas.

The calculated fixed radius method is identical to the Basic I method described in Chapter 4 of the Idaho Wellhead Protection Plan (IDEQ, 1997). This method uses the average linear velocity equation to derive a radius from generalized, existing, hydrogeologic data for the generalized aquifers in Idaho (Figure E-3), and from the well pump rate (or the spring flow rate). The data and equation used for the calculated fixed radius method are discussed in detail in Appendix F of the Idaho Wellhead Protection Plan (IDEQ, 1997).

Figure E-3. Map of Generalized Aquifers in Idaho.



The delineation of a source water assessment area using the calculated fixed radius method involves drawing a circle around a well for a specified time-of-travel threshold. The time-of-travel distance from the well to the bounding circle is calculated assuming that the contaminant particle is already present in the aquifer. This method is more accurate than the arbitrary fixed radius method because it is based on some scientific reasoning. However, the calculated fixed radius method has one major limitation: it does not use site specific data, but instead, utilizes average aquifer parameters from similar type aquifers across the state. This method can provide a relatively low cost, easily understood, and easily applied delineation procedure. Unfortunately, delineations that use this method can result in extremely large source water assessment areas.

The calculated fixed radius time-of-travel calculations are based on the following five generalized aquifer types prevalent in Idaho:

- Eastern Snake River Plain Basalt;
- Columbia River Basalt;
- Unconsolidated alluvium;
- Mixed volcanic and sedimentary rocks - primarily sedimentary rocks; and
- Mixed volcanic and sedimentary rocks - primarily volcanic rocks.

The distance for the various time-of-travel calculations for pump rates between 50 gallons per minute (gpm) and 7,000 gpm are given in Tables E-1a through E-1e. The available data, the rationale for the data selected for the calculation, and the method of calculation are discussed in Appendix F of the Idaho Wellhead Protection Plan (IDEQ, 1997).

The general procedure for delineating source water assessment areas using the calculated fixed radius method is to:

1. Locate the well on Figure E-3 and then identify the aquifer type;
2. Determine the pumping rate of the well; and
3. Use the information from steps 1 and 2 in conjunction with Tables E-1a through E-1e to determine the 3-, 6-, and 10-year time-of-travel boundaries.

Tables E-1a to E-1e. Fixed Radii for the Generalized Aquifers in Idaho

Table E-1a Eastern Snake River Plain Basalt (TOT = Time of Travel)

Zone	Peak Pumping Rate (Gallons per Minute)									
	50 GPM	**100 GPM**	**500 GPM**	**1000 GPM**	**2000 GPM**	**3000 GPM**	**4000 GPM**	**5000 GPM**	**6000 GPM**	**7000 GPM**
Zone IA	Sanitary setback distance									
Zone IB (3 Yr. TOT)	2700'	2700'	3000'	3300'	3700'	4200'	4600'	5000'	5300'	5700'
Zone II (6 Yr. TOT)	5300'	5300'	5600'	5900'	6400'	6900'	7400'	7800'	8200'	8600'
Zone III (10 Yr. TOT)	8800'	8800'	9100'	9500'	10,100'	10,600'	11,100'	11,600'	12,000'	12,500'

Table E-1b Columbia River Basalt (TOT = Time of Travel)

Zone	Peak Pumping Rate (Gallons per Minute)									
	50 GPM	**100 GPM**	**500 GPM**	**1000 GPM**	**2000 GPM**	**3000 GPM**	**4000 GPM**	**5000 GPM**	**6000 GPM**	**7000 GPM**
Zone IA	Sanitary setback distance									
Zone IB (3 Yr. TOT)	300'	400'	1000'	1500'	2400'	3200'	4100'	4800'	5600'	6400'
Zone II (6 Yr. TOT)	500'	800'	1400'	2000'	3100'	4000'	4800'	5700'	6500'	7300'
Zone III (10 Yr. TOT)	600'	800'	1800'	2600'	3800'	4800'	5700'	6600'	7500'	8300'

Table E-1c Unconsolidated Alluvium (TOT = Time of Travel)

Zone	Peak Pumping Rate (Gallons per Minute)									
	50 GPM	**100 GPM**	**500 GPM**	**1000 GPM**	**2000 GPM**	**3000 GPM**	**4000 GPM**	**5000 GPM**	**6000 GPM**	**7000 GPM**
Zone IA	Sanitary setback distance									
Zone IB (3 Yr. TOT)	10,000'	10,000'	10,600'	11,200'	12,300'	13,400'	14,500'	15,600'	16,700'	17,700'
Zone II (6 Yr. TOT)	19,600'	19,700'	20,200'	20,900'	22,100'	23,300'	24,400'	25,500'	26,600'	27,700'
Zone III (10 Yr. TOT)	32,700'	32,800'	33,400'	34,000'	35,300'	36,500'	37,700'	38,800'	40,000'	41,100'

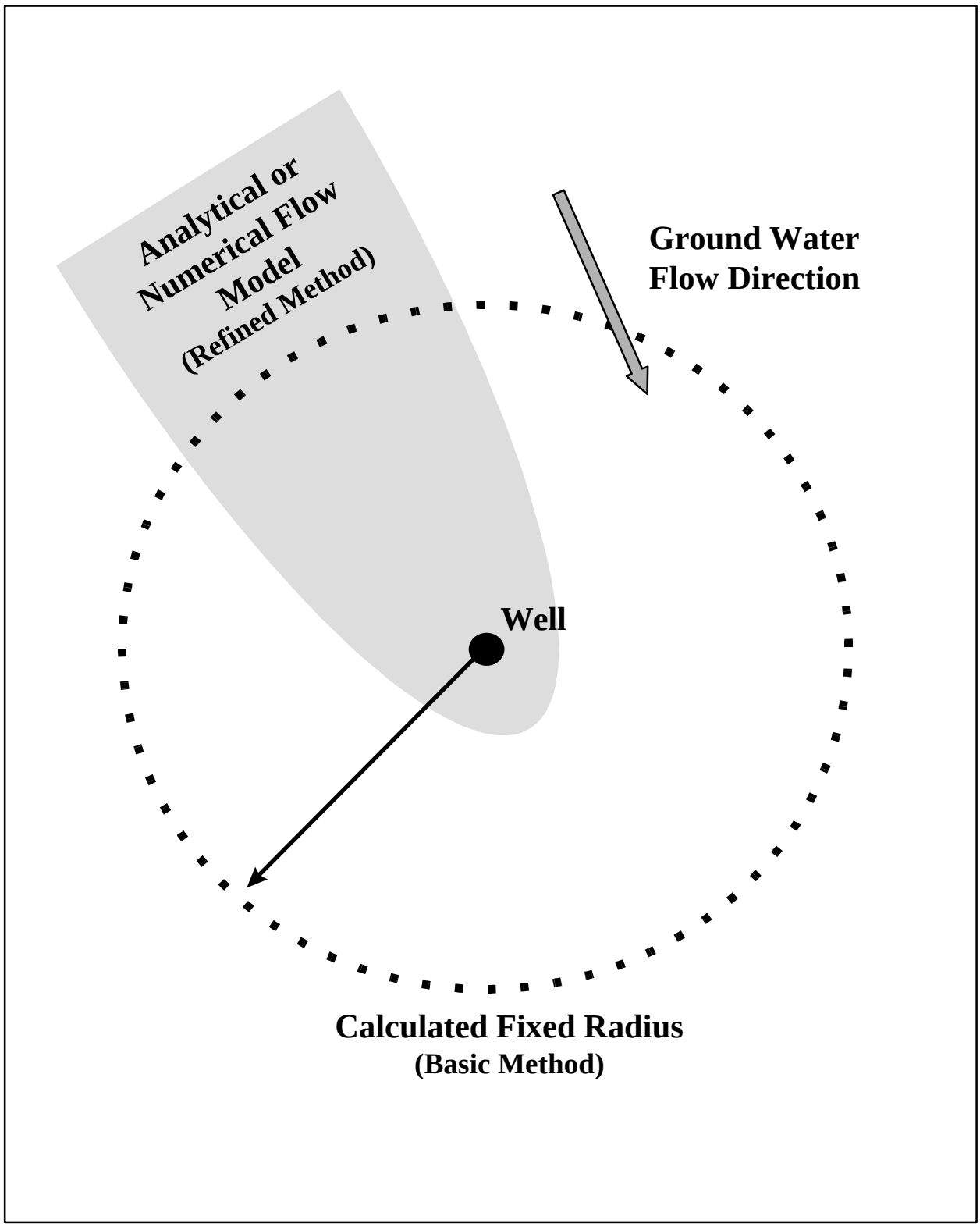
Tables E-1a to E-1e. Fixed Radii for the Generalized Aquifers in Idaho, continued

Table E-1d Mixed Volcanic and Sedimentary Rocks - Primarily Sedimentary Rocks (TOT = Time of Travel)										
Zone	**Peak Pumping Rate (Gallons per Minute)**									
	50 GPM	**100 GPM**	**500 GPM**	**1000 GPM**	**2000 GPM**	**3000 GPM**	**4000 GPM**	**5000 GPM**	**6000 GPM**	**7000 GPM**
Zone IA	Sanitary setback distance									
Zone IB (3 Yr. TOT)	200'	300'	500'	700'	1100'	1300'	1600'	1800'	2000'	2300'
Zone II (6 Yr. TOT)	300'	400'	800'	1100'	1500'	1800'	2100'	2400'	2600'	2900'
Zone III (10 Yr. TOT)	500'	600'	1000'	1400'	1900'	2300'	2700'	3000'	3300'	3600'

Table E-1e Mixed Volcanic and Sedimentary Rocks - Primarily Volcanic Rocks										
Zone	**Peak Pumping Rate (Gallons per Minute)**									
	50 GPM	**100 GPM**	**500 GPM**	**1000 GPM**	**2000 GPM**	**3000 GPM**	**4000 GPM**	**5000 GPM**	**6000 GPM**	**7000 GPM**
Zone IA	Sanitary setback distance									
Zone IB (3 Yr. TOT)	5000'	5000'	5200'	5400'	5700'	6000'	6400'	6700'	7000'	7200'
Zone II (6 Yr. TOT)	9800'	9800'	10,000'	10,200'	10,600'	11,000'	11,300'	11,600'	11,900'	12,300'
Zone III (10 Yr. TOT)	16,400'	16,400'	16,600'	16,800'	17,200'	17,600'	18,000'	18,300'	18,700'	19,000'

Refined Analytical Method- The refined analytical method delineations are numerically modeled using groundwater flow computer codes that are appropriate for the level of hydrogeologic data available, and for the complexity of the drinking water and aquifer systems being evaluated. These computer codes used by IDEQ include the EPA-approved packages called WHPA (Well Head Protection Area, Version 2.0 by Blandford and Huyakorn, 1991), WhAEM (Wellhead Analytical Element Model by Haitjema et al., 1994) and the *de facto* industry standard MODFLOW (McDonald and Harbaugh, 1988). The computer models delineate the source water assessment areas around a well into 3-, 6-, and 10-year time-of-travel boundaries. If the site-specific data are readily available, the refined analytical method is comparable in cost with the calculated fixed radius method. Often, delineations determined using this method yield source water assessment areas that are much smaller in size than those determined using the calculated fixed radius method (Figure E-4).

Figure E-4. Comparison of Different Delineation Method Shapes



The refined analytical method requires knowledge of site specific data. These data include:

- hydraulic conductivity,
- aquifer thickness,
- porosity,
- hydraulic gradient,
- direction of ground water flow, and
- pumping rate.

Of the above-listed parameters, hydraulic gradient and the direction of ground water flow can significantly increase the accuracy of the delineation.

There have been a variety of follow-on products developed for the MODFLOW code, including the Department of Defense Groundwater Modeling System (BOSS International, 1998), which integrates with ArcView GIS. In particular, this application will enhance the transfer of information and products from the delineation phase to the potential contaminant source inventory phase.

Special Cases- In some instances, it may be beneficial to use other delineation methods than those described above. In areas where the ground water velocity within the aquifer is exceptionally high (approximately 1 foot per day), it may be necessary to identify the entire regional aquifer as a source water assessment area. In urban areas with a high density of wells (20 to 30 wells or more per 10 square miles), it may be more feasible to use a regional ground water flow model to conduct a regional source water assessment area delineation.

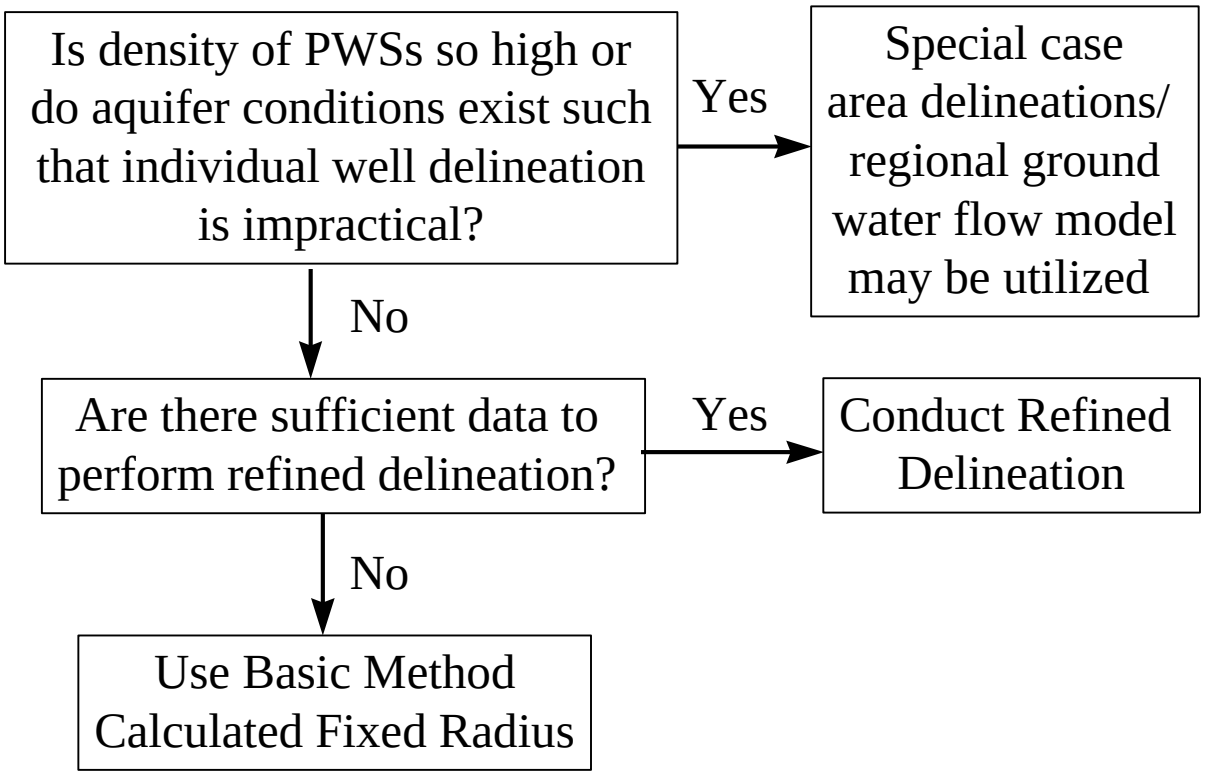
Delineation Method Selection

The method used to delineate source water assessment areas will be determined using a qualitative evaluation that relies primarily on the availability of hydrogeologic data. Before any source water assessment area delineations are performed, hydrogeologic data concerning regional ground water systems will be collected from local, state, and federal agencies. Public water systems will then be contacted for site-specific sources of information including:

- well logs,
- sanitary surveys,
- pumping rates,
- published reports,
- unpublished reports, and
- aquifer tests.

Initially, the number of PWS wells in an area will be counted to estimate the well density per square mile. The general hydrogeology of the area will then be evaluated to determine if an area delineation is feasible. If the well density and hydrogeology do not justify a regional delineation, a site specific source water assessment area will be delineated. The hydrogeologic data will be reviewed to determine if the aquifer parameters (including hydraulic conductivity, aquifer thickness, porosity, ground water flow direction and gradient) are sufficient to conduct a refined analytical delineation. If some of these parameters are unknown, a calculated fixed radius delineation will be performed using the best available data. The method selection is outlined in Figure E-5.

Figure E-5. Source Water Assessment Area Delineation Method - Ground Water Systems



Whenever possible, the refined analytical method will be used as the preferred delineation method because it offers the following advantages over the calculated fixed radius method.

- It represents delineated areas more accurately;
- The refined areas are typically smaller than calculated fixed radius areas;
- Smaller areas are easier to manage and have less impact on the community.

Delineation of Surface Water Sources

Surface Water Delineation Basics

Surface water sources provide public drinking water to about 40,000 Idahoans (about 5 percent of the total public drinking water population in Idaho). There are 93 surface water sources that serve 61 PWSs. The surface water intakes are located in lakes (7 systems, 28 intakes), rivers (12 systems, 12 intakes), and creeks in small protected watersheds (42 systems, 53 intakes). The use of these sources varies between full-time, part-time during the year, and standby use during emergencies. All of these public drinking water systems are susceptible to potential contaminant sources. Typically, potential contaminant sources can enter a surface water system directly by spills into water bodies, and indirectly by overland runoff. Surface water bodies can also be impacted by seepage from contaminated ground water.

To protect surface water systems from such potential contaminant pathways, the EPA required that the entire drainage basin be delineated upstream from the intake to the hydrologic boundary of the drainage basin (U.S. EPA, 1997b). The EPA recognized that an intake on a large water body could have an extensive drainage basin. Therefore, the EPA recommended that large drainage basins be segmented into smaller areas for the purpose of implementing a cost-effective potential contaminant inventory and susceptibility analysis.

Surface Water Delineation Methods

Surface water delineation methods were developed by the Surface Water Subcommittee of the Source Water Assessment Advisory Committee. The subcommittee included water system operators, U.S. Bureau of Reclamation and U.S. Geological Survey hydrologists, public-elected officials, and IDEQ technical staff. The following methods and rationale were derived by subcommittee consensus.

Topographic Method- IDEQ will use a two-tiered approach to delineate surface water source areas (Table E-2). First, for each drinking water source, the entire watershed area from the intake structure, upstream to the watershed divide will be delineated by the topographic method. The location of the surface water intake will be the lowest point on the watershed boundary. The remainder of the boundary will encompass the land area draining to the intake, as defined by the topography of the land (Figure E-6).

Table E-2. Two-tiered Approach to Delineate Surface Water Source Areas

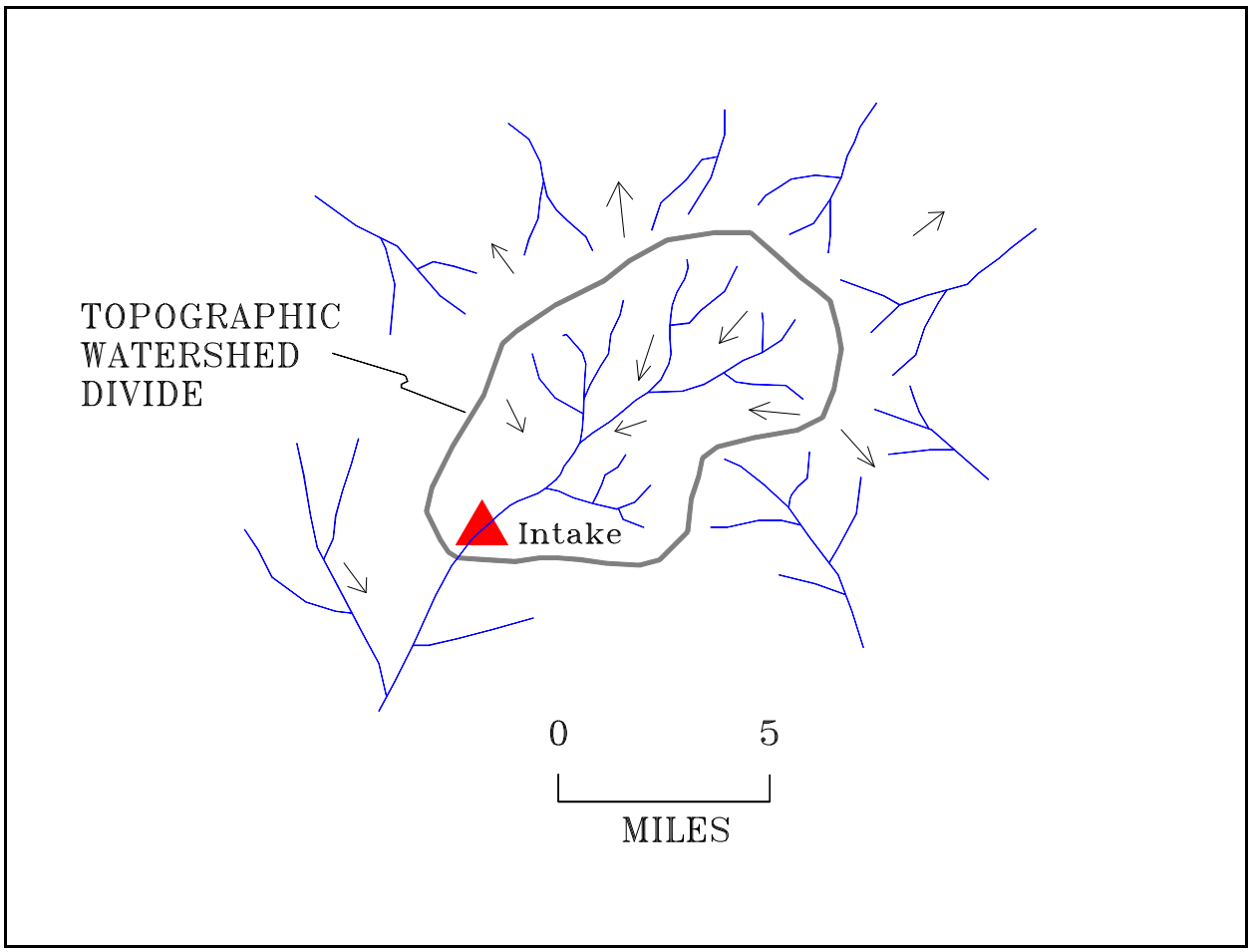
TIER 1 DELINEATION Defines the boundaries for the entire watershed upstream from each surface water intake.			
Source Type	All Sources (creeks, rivers, lakes)		
Method	Topographic Boundary		
TIER 2 DELINEATION Segments the topographically delineated watershed into areas for focusing the potential contaminant inventory, performing susceptibility analysis, and instituting local protection efforts.			
Source Type	Creeks	Rivers	Lakes
Method	Topographic Boundary	Buffer Zone	Buffer Zone
Boundaries (upstream from intake)	to the watershed divides	min. of 500 ft. along banks to the 4 hour streamflow time-of-travel boundary[1]	min. of 500 ft. from the shoreline around the circumference of the lake
# of systems	42	12	7
# of sources	53	12	28

[1] or to the 25 mile boundary, whichever is greater.

[2] streams that discharge inside the 500 ft. lake buffer boundary will also be delineated in an identical fashion to rivers. As discussed in text, these are minimums.

The topographic method defines two sizes of watersheds. Small, easily-defined mountain watersheds include 53 public water sources with intakes located in creeks. For example, the town of Mullan derives its drinking water from an intake located in Boulder Creek. This topographically-delineated watershed area is about 4-square miles in size. For sources such as the Mullan example, the topographically-delineated small mountain watersheds will be the area in which the potential contaminant inventory will occur. In contrast are the extremely large watersheds that supply 19 systems with 40 intakes located in large water bodies. For example, the watershed area for Lake Pend Oreille is 22,309 square miles. For practicality, such extremely large watersheds will be segmented into buffer zones.

Figure E-6. Topographic Method Used for All Surface Water Sources



Buffer Zone Method- Buffer zones will be the primary focus for the potential contaminant inventories, and the areas of greatest concern for local management of such potential contaminant sources. High-risk potential contaminant sources inside the watershed area, but outside the buffer zones will also be inventoried and included on the delineation map. These will include National Pollutant Discharge Elimination System dischargers, large animal feed lots and other large agricultural activities, superfund sites, large mining operations, major highways, pipelines, railroads, and any other potential contaminant sources determined to be a potential threat to the drinking water intake.

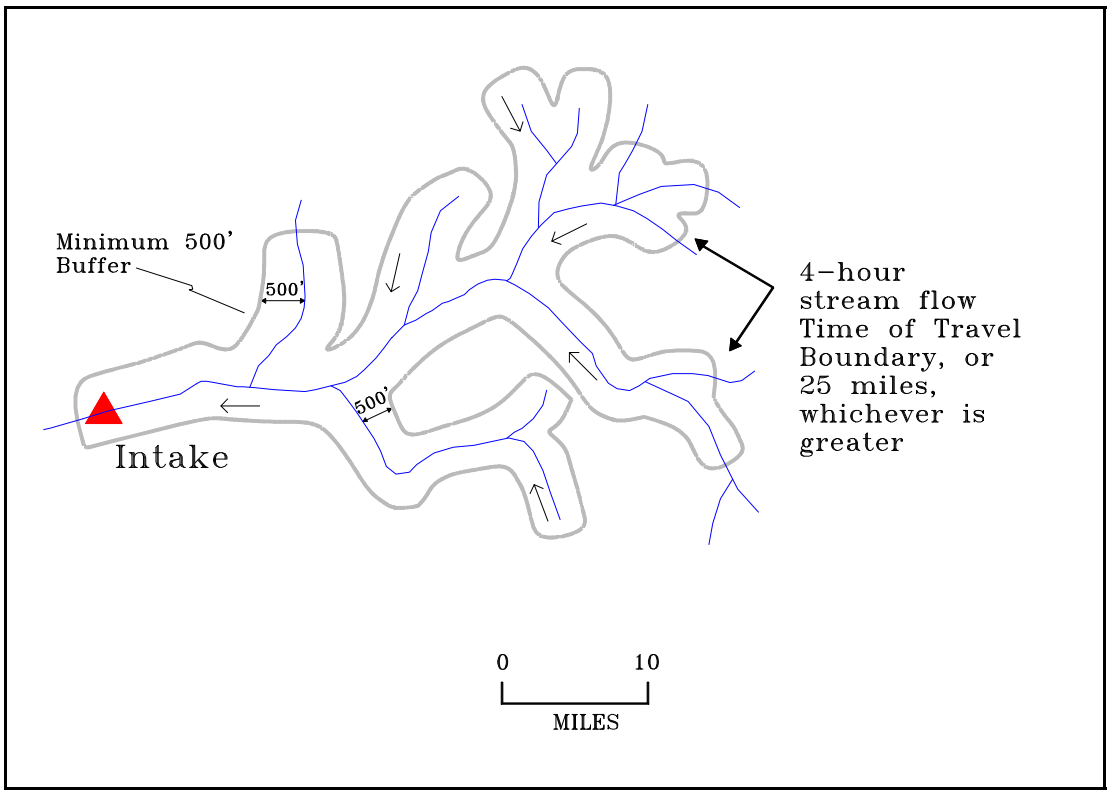
Width of River and Lake Buffer Zones- The size of buffer zones will vary. At a minimum, the width of a river or lake buffer zone will extend out 500 feet parallel to the river bank or shoreline (Figures E-7 and E-8). IDEQ and local governments may extend the width of the zone as needed, based on local knowledge, features specific to the river, and best professional judgement.

Rationale- Initially, the subcommittee discussed using a half-mile wide buffer zone for rivers and lakes. However, it was noted that most areas encompassed by a half-mile buffer zone contained no more additional development (and therefore, no additional potential contaminant sources) than what exists in a 500 foot wide buffer zone. For example, many rivers and lakes are incised into steep terrain, and a buffer width greater than 500 feet added only additional steep slopes. Subcommittee members expressed concern over local resources being adequate to perform the enhanced potential contaminant inventory within an area greater than 500 feet wide. Subcommittee members did want to give the option of increasing the width of the buffer zone when it was needed, such as in developed areas. Such a decision would be left to local authorities, with input from the water utility and IDEQ. Finally, subcommittee members expressed concern over the ability for local authorities to implement protection efforts in large buffer zones. For example, a 500 foot buffer zone for the City of Lewiston intake on the Clearwater River is over 34 square miles in area. Therefore, the subcommittee determined through consensus that a minimum 500 foot wide buffer zone would be appropriate.

Length of River Buffer Zones- The length of river buffer zones will extend from the intake upstream 25 miles or to the 4-hour streamflow time-of-travel boundary, whichever is greater (Figure E-7). This 4-hour streamflow is calculated from the 10 year flood event. River buffer zones will also extend up tributaries to the remainder of the 25 mile boundary, or the 4-hour streamflow time-of-travel boundary, whichever is greater.

Rationale- The Surface Water subcommittee recommended using the 4-hour streamflow time-of-travel method. The method uses the stream velocity to determine the arrival time for a contaminant released from a site to an intake structure (assuming the contaminant travels at the stream velocity). The subcommittee decided to use a 4-hour travel time, factored at day one of a 10-year flood, or a stream reach of 25 miles, whichever is greater. A 4-hour streamflow time of travel would allow system operators adequate time for response planning. The 10-year flood event was selected, because such a flood event typically has the capacity of inundating potential contaminant sites and causing a release during flooding.

Figure E-7. River Buffer Zones



(Length of River Buffer Zones- *Rationale*, continued)

The U.S. Bureau of Reclamation provided IDEQ with gaging station information from both their agency records, and from the U.S. Geological Survey records for the larger streams and rivers in Idaho. Included in the data are summary discharge measurement tables, and tables listing the magnitude and frequency of annual high flow based on period of record. The information in these tables was derived from the basic discharge equation:

q = **va** where

q = discharge (cubic feet/second);

v = velocity (feet/second); and

a = cross-sectional area (feet squared).

[Note: The U.S. Geological Survey may have implemented current meter, Price-type meter, weir, or Manning Equation variables into parameters of the equation in determining the discharge, depending upon how long ago measurements were obtained, ice conditions, construction, and the measuring equipment or technique used.]

The U.S. Bureau of Reclamation provided IDEQ with the velocity converted into miles per second for most gaging stations. This data was then converted to velocity in miles per hour.

IDEQ prepared EXCEL spreadsheets for each gaging station along some of the larger streams and rivers to be delineated by the streamflow time-of-travel method, using data available at the time of preparing the SWAP. Spreadsheet parameters included: observation date, stream area (feet squared), velocity (feet/second), discharge (cubic feet/second), and velocity (miles/hour). Scatter plots were generated, plotting velocity in miles/hour against discharge in cubic feet/second. The plots were extended (as a trend-line) to include the discharge at day one of a ten year flood. A variety of statistical methods were used to determine the "best-fit" curve of the data. The equation for the curve generated with the best fit was then used to calculate the velocity when the discharge of the stream reached day one of a 10-year flood. This velocity in miles per hour was then multiplied by 4 hours to determine the distance in miles that a contaminant would travel under a high-velocity flood condition.

The results showed that the 4-hour streamflow time-of-travel stream reach of the 10-year flood event ranged from 17 to 37 miles upstream from intakes for the large Idaho rivers for which data were available. The subcommittee then decided to include a minimum 25 mile distance upstream for the intake. Therefore, the length of river buffer zones will extend from the intake upstream 25 miles or to the 4-hour streamflow time-of-travel boundary, whichever is greater.

Length of Lake Buffer Zones- At a minimum, buffer zones on lakes will extend 500 feet inland from the shoreline around the circumference of the lake (Figure E-8). In addition to the buffer zone around the lake itself, creeks and rivers that discharge within the 500 foot buffer zone will also have a buffer zone delineated. This buffer zone will extend from where the creek or river flows into the lake, as outlined above in the length of river buffer zone section .

Rationale- There are 28 lake intakes, 19 of which are intakes for community water systems that serve a total of about 7,000 PWS users (Table E-3). This population represents less than one percent of the state PWS users. The development of a buffer zone around each of Idaho's lakes is consistent with other EPA Region 8, 9, and 10 states per communication with Region 10 hydrogeologist..

Figure E-8. Lake Buffer Zones

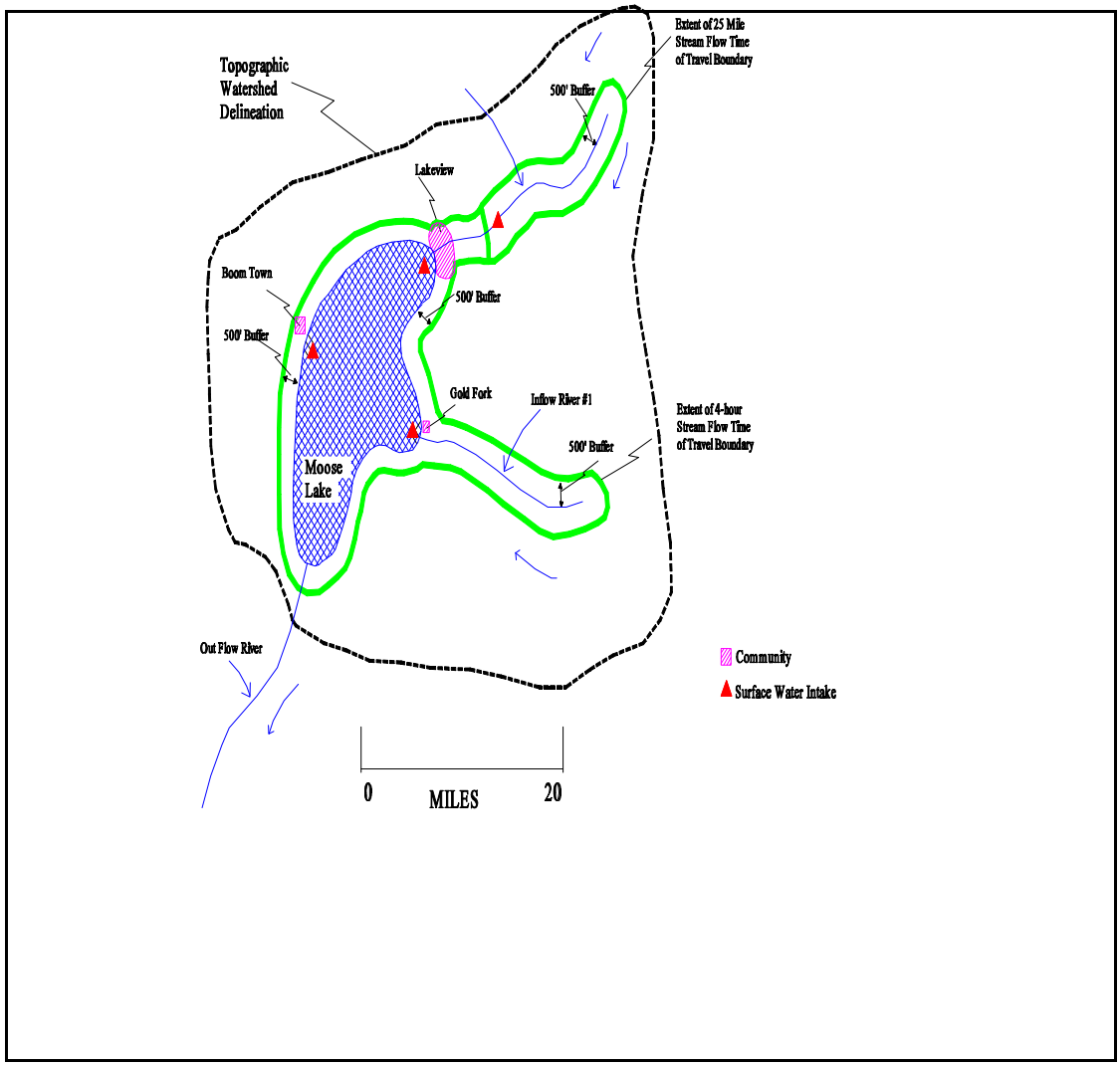


Table E-3. Lakes with Community Water System Intakes

Lake Name	PWS users[1]	intakes	surface area (square miles)
Payette	3,500	6	8.4
Coeur d'Alene	1,200	6	50.0
Pend Oreille	1,100	5	126.0
Hayden	400	1	6.6
Williams	200	1	0.3

[1] PWS users = number of Public Water System users

The buffer zone sizes for lakes are minimums and will be expanded as necessary based on best professional judgement to incorporate additional area concerns. As indicated in Table E-3 this type of delineation may create a delineated area too large for the individual community to manage. As such, IDEQ will work with each individual community as necessary to develop manageable protection areas for each community.

24-Hour Emergency Response Delineation- In addition to the two-tier delineation method described above, drinking water utilities also need water bodies delineated to facilitate emergency-response activities. If a potential contaminant spills directly into a water body, the drinking water utility needs appropriate notification in order to turn off an intake, or switch to an alternative source. Therefore, for each surface water source, an emergency response area will be delineated on a map. From each river intake, the upstream emergency-response distance will be calculated from the 24-hour streamflow time-of-travel. This 24-hour streamflow will be based on average seasonal flow rates. For lakes, this process will not be necessary as the entire water surface area of the lake along with a 500 foot buffer around the lake will be included in the delineation. The 24-hour emergency-response delineations for rivers, stream and creeks will be plotted on a map, along with locations of highways, railroads, pipelines, or other facilities which could pose a threat to the source water intake. The captured information will also be included as part of the final assessment report.

Delineation Methods for Conjunctive Sources- In addition to the obvious surface water sources, there are ground water sources in Idaho that derive either all or part of their water from surface water, and there are surface water sources that derive some or all of their water from ground water. To delineate these conjunctive sources, the methods will be similar to those previously described for either the surface or ground water sources, or both. However, conjunctive sources are complex, and some modifications of the delineation processes may be required by site specific conditions. The two types of systems in this conjunctive source category are: ground water with direct hydraulic connection to surface water, and ground water under the direct influence of surface water.

Ground Water with Direct Hydraulic Connection to Surface Water- The IDEQ Drinking Water Program uses an internal guidance document to make the following distinction between ground water that is hydraulically *connected* to surface water versus ground water that is *directly influenced* by surface water (IDEQ, 1998). Some ground water sources have a direct hydraulic connection to a surface water body, but <u>are not</u> at risk of protozoan microorganisms being transported to the well because of the natural filtration provided by soil and rock. This category is called ground water with direct hydraulic connection to surface water. Placed in this category are wells for which the determination of direct influence of surface water to ground water has not been completed.

In this category, source water assessment areas for wells will be limited to the ground water delineation area. The hydraulically-connected surface water body will be identified as a potential source of microbial contamination. The source water assessment area for surface water could be delineated, followed by a potential contaminant inventory of this larger area; however, the potential benefit to PWSs is insufficient to

justify the additional expense. Based on historical surface water quality in Idaho, other surface waterborne chemicals of concern rarely impact these types of PWSs unless large catastrophic releases occur to surface water. In such rare instances, the impact levels would typically be significantly diluted due to the mixing with surface water, along with the short duration of the chemical release.

Ground Water Under the Direct Influence of Surface Water- Other ground water systems have a direct hydraulic connection to a surface water body, and a risk that pathogenic protozoans such as *Cryptosporidia* can be transported in a viable state to the spring, infiltration gallery, or well intake. This category is known as ground water under the direct influence of surface water.

Source water assessment areas for these systems will be delineated using the appropriate ground and surface water delineation methods. For example, wells located in smaller stream and river watersheds could have the wellhead assessment area delineated by ground water methods. From where the wellhead assessment area intersects the surface water body, the topographic method could be used to delineate the entire watershed upstream of the smaller stream or river.

Delineation Methods for Springs- In Idaho, there are 236 spring water sources that provide drinking water to about 2 percent of the total public drinking water population. Of these, about 70 sources provide water for 43 community water systems (IDEQ Drinking Water Information System, January, 1999).

Most springs will need to be delineated using the refined analytical method. In addition, hydrogeologic mapping may be needed to assess the recharge area boundaries that are influenced by the locations of surface water divides, geologic structures (fractures and folds), and stratigraphic relationships (e.g., Soliman, et al., 1998). However, many of Idaho's hydrologic provinces lack sufficient geologic mapping at an appropriate scale to be useful in the delineation of the spring source. Additionally, if IDEQ were to go out and map or remap these sites at an appropriate scale, significant costs for which IDEQ has inadequate resources or time to complete would be incurred . IDEQ will examine all possible data sources for geologic mapping at a scale appropriate for use in hydrogeologic mapping. Each spring will then be delineated using the best available data and professional judgement of IDEQ staff.

Potential Contaminant Source Inventory Overview of Steps 4 & 5

After the source water assessment area has been delineated, the next two steps involve inventorying potential contaminant sources to ground water or surface water within the delineated area. Inventorying sources in a source water assessment area is essentially creating a map of certain features and land uses, and documenting the inventory on an accompanying list or inventory forms. Potential contamination, and resulting threats to drinking water, can occur as a result of many types of land uses and activities. However, identification of a facility or industry as a potential contaminant source in the potential contaminant source inventory does not mean that facility or industry identified is out of compliance with any local, state, or federal regulation. A potential contaminant source is simply a location where there is any activity having the potential to release contaminants into the environment at a level of concern. Those activities may include transporting, storing, manufacturing, or use of potential contaminants.

An inventory of potential contaminant sources can:

- Provide a very effective means of educating the local public about potential contaminants;
- Provide information on the locations of potential sources, especially those that present the greatest risks to the water supply; and
- Provide a reliable basis for developing a local management plan to reduce the risks to the water supply.

Contaminants of Concern

There are three broad categories of contaminants that reduce the quality of ground water and surface water in Idaho. The three categories, with subcategories and common examples of each, are as follows:

(1) Microorganisms:
- Viruses (Hepatitis);
- Protozoa (*Cryptosporidium, Giardia lamblia*);
- Bacteria (Coliform - *Escherichia coli*).

(2) Inorganic Chemicals:
- Nitrates;
- Metals (lead, arsenic, chromium).

(3) Organic Chemicals:
   - Volatile organic compounds:
     - Chlorinated solvents (trichloroethylene - TCE, tetrachloroethylene - PCE);
     - Aromatics (benzene, toluene);
   - Petroleum compounds:
     - Fuels (diesel, gasoline);
     - Lubricants (oil).
   - Synthetic organic compounds:
     - Pesticides, Herbicides, Insecticides;
     - Polynuclear aromatic hydrocarbons (PAHs);
     - Phenols (pentachlorophenol - PCP).

Ground water and surface water can be contaminated from a single point source or on an area-wide basis. Major contaminants of concern on an area-wide or "nonpoint source" basis includes nitrates and pesticides. Nitrates are currently one of the most prevalent nonpoint source pollutants in Idaho. Sources that potentially contribute nitrates to ground water and surface water include high densities of septic systems, agricultural activities such as fertilizer application and confined animal feeding operations, and disposal of food processing wastes.

Major point source contaminants of concern include volatile organic compounds and petroleum compounds. Point source contamination can come from industrial facilities, waste disposal sites, and large accidental spills. Additionally, point sources can be associated with small businesses, abandoned single family water supply wells, and other residential activities commonly located in every community.

The contaminants of concern will generally be the same for all types of PWSs. According to the EPA final guidance (U.S. EPA, 1997a), contaminants of concern must include those chemicals that are regulated under the Safe Drinking Water Act (SDWA). Chemicals regulated under the SDWA have established maximum contaminant levels (MCLs). The EPA final guidance also indicates that *Cryptosporidium* is a pathogenic contaminant that must be included in the inventory. Based on these federal requirements, *Cryptosporidium* and all regulated chemicals under the SDWA will be considered contaminants of concern for all PWSs in the Idaho SWAP. Table E-4 lists these contaminants of concern, and also identifies the applicable MCL and Chemical Abstract Service Number (CAS Number). CAS numbers or unique and used to eliminate confusion between various trade names.

Table E-4. Idaho Source Water Assessment Area Contaminants of Concern

Chemical Abstract Service Number	Chemical/Contaminant	Maximum Contaminant Level (mg/l unless otherwise specified)
7440-36-0	Antimony	0.006
7440-38-2	Arsenic	0.05
1332-21-4	Asbestos	7 million fibers/l longer than 10 um
7440-39-3	Barium	2
7440-41-7	Beryllium	0.004
7440-43-9	Cadmium	0.005
7440-47-3	Chromium	0.1
7440-50-8	Copper	1.3
57-12-5	Cyanide	0.2
16984-48-8	Fluoride	4
7439-92-1	Lead	0.015
7439-97-6	Mercury	0.002
*	Nitrate (as N)	10
*	Nitrite (as N)	1
*	Nitrate and Nitrite (both as N)	10
7782-49-2	Selenium	0.05
7440-28-0	Thallium	0.002
15972-60-8	Alachlor	0.002
1912-24-9	Atrazine	0.003
71-43-2	Benzene	0.005
50-32-8	Benzo(a)pyrene (PAH)	0.0002
75-27-4	Bromodichloromethane (THM)	0.1
75-25-2	Bromoform (THM)	0.1
1563-66-2	Carbofuran	0.04
56-23-5	Carbon Tetrachloride	0.005
57-74-9	Chlordane	0.002
124-48-1	Chlorodibromomethane (THM)	0.1
67-66-3	Chloroform (THM)	0.1
94-75-7	2,4-D	0.07
75-99-0	Dalapon	0.2
103-23-1	Di(2-ethylhexyl) adipate	0.4
96-12-8	Dibromochloropropane	0.0002
541-73-1	Dichlorobenzene m-	0.6

Table E-4. Idaho Source Water Assessment Area Contaminants of Concern, continued

Chemical Abstract Service Number	Chemical/Contaminant	Maximum Contaminant Level (mg/l unless otherwise specified)
95-50-1	Dichlorobenzene o-	0.6
106-46-7	1,4(para)-Dichlorobenzene or Dichlorobenzene p-	0.075
107-06-2	1,2-Dichloroethane	0.005
75-35-4	1,1-Dichloroethylene	0.007
156-59-2	cis-1, 2-Dichloroethylene	0.07
156-60-5	trans-1, 2-Dichloroethylene	0.1
75-09-2	Dichloromethane	0.005
78-87-5	1,2-Dichloropropane	0.005
117-81-7	Di(2-ethylhexyl)phthalate	0.006
88-85-7	Dinoseb	0.007
85-00-7	Diquat	0.02
145-73-3	Endothall	0.1
72-20-8	Endrin	0.002
100-41-4	Ethylbenzene	0.7
106-93-4	Ethylene dibromide	0.00005
1071-83-6	Glyphosate	0.7
76-44-8	Heptachlor	0.0004
1024-57-3	Heptachlor epoxide	0.0002
118-74-1	Hexachlorobenzene	0.001
77-47-4	Hexachlorocyclopentadiene	0.05
58-89-9	Lindane	0.0002
72-43-5	Methoxychlor	0.04
108-90-7	Monochlorobenzene	0.1
23135-22-0	Oxamyl (Vydate)	0.2
87-86-5	Pentachlorophenol	0.001
1918-02-1	Picloram	0.5
1336-36-3	Polychlorinated biphenyls (PCBs)	0.0005
122-34-9	Simazine	0.004
100-42-5	Styrene	0.1
1746-01-6	2,3,7,8-TCDD (Dioxin)	3.0 x 10-8
127-18-4	Tetrachloroethylene	0.005
108-88-3	Toluene	1

Table E-4. Idaho Source Water Assessment Area Contaminants of Concern, continued

Chemical Abstract Service Number	Chemical/Contaminant	Maximum Contaminant Level (mg/l unless otherwise specified)
*	Total Trihalomethanes [the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform), and trichloromethane (chloroform)]	0.1
8001-35-2	Toxaphene	0.003
93-72-1	2,4,5-TP (Silvex)	0.05
120-82-1	1,2,4-Trichlorobenzene	0.07
71-55-6	1,1,1-Trichloroethane	0.2
79-00-5	1,1,2-Trichloroethane	0.005
79-01-6	Trichloroethylene	0.005
75-01-4	Vinyl Chloride	0.002
1330-20-7	Xylenes (total)	10
*	Gross alpha particle activity (including radium-226, but excluding radon and uranium)	15 pCi/l
*	Combined beta/photon emitters	4 millirems/year effective dose equivalent
*	Combined Radium -226 and radium 228	5 pCi/l
*	Strontium 90	8 pCi/l
*	Tritium	20,000 pCi/l
*	Total Coliform	1 colony forming unit/100 ml
*	Cryptosporidium	Not Applicable

* No Chemical Abstract Service Number exists for this chemical.

Other contaminants of concern that do not have established maximum contaminant levels under the SDWA could threaten public drinking water systems. Many pathogenic organisms can pose substantial risks to drinking water, including *Giardia* and certain viruses and bacteria. These pathogenic organisms often are the principal contaminants of concern to noncommunity transient PWSs (e.g., campgrounds and restaurants) because they pose an acute health risk. People drinking only a single glass of water containing pathogens may become ill. In addition, sediment (soil) creates turbidity in surface water systems. Turbidity can affect the efficiency of treatment systems and can act as an indicator of other contaminant problems such as pathogens which tend to attach to soil particles.

Potential Contaminant Sources

Table E-5 provides a good overview of potential contaminant sources and the contaminants that are associated with each source. It lists both point and nonpoint sources of potential contamination. The sources represent many of the facilities, land uses, and environmental conditions that handle, generate, store, apply, dispose of, or provide a pathway for any contaminants of concern. The sources are separated into four categories: 1) Commercial/Industrial, 2) Agricultural/Rural, 3) Residential/ Municipal, and 4) Miscellaneous. These sources can apply to either ground water or surface water, and many can apply to both ground and surface water. Where a potential contaminant source generally applies to only ground water or surface water, it is noted within Table E-5.

Although Table E-5 is a fairly comprehensive list, it may not represent all potential contaminant sources that may exist within the source water assessment area. Examples of other potential contaminant sources may include historical activities, spills, or existing water contamination.

Some chemicals, such as arsenic and fluoride, occur naturally at elevated concentrations from the geologic formations underlying the area. For instance, in Southwest Idaho, ground water in areas of the Glenns Ferry Formation contains high concentrations of arsenic. The arsenic is assumed to have naturally leached from the Glenns Ferry Formation. The existence of these areas where naturally occurring chemicals are elevated at concentrations approaching or exceeding an MCL will be documented as part of the potential contaminant inventory. This can help local water systems make important decisions concerning the use of certain source waters to supply drinking water.

Table E-5. Potential Contaminant Sources (Ground Water and Surface Water)

Source		Potential Contaminants [1,2,3]
Commercial/Industrial		
Automobile	Body Shops/ Repair Shops	Waste oils, gasoline and diesel fuels; solvents, acids, paints, automotive wastes[4], miscellaneous cutting oils.
	Car Washes	Soaps, detergents, waxes, miscellaneous chemicals, hydrocarbons.
	Gas Stations	Petroleum fuels, oil, solvents, miscellaneous wastes.
Boat Services/Repair/Refinishing		Gasoline and diesel fuels, oil, septage from boat waste disposal area, wood preservative and treatment chemicals, paints, waxes, varnishes, automotive wastes[4].
Cement/Concrete Plants		Diesel fuel, solvents, oils, miscellaneous wastes.
Chemical/Petroleum Processing/Storage		Hazardous chemicals, solvents, hydrocarbons, heavy metals, asphalt.
Dry Cleaners		Solvents (tetrachloroethylene, petroleum solvents, Freon), spotting chemicals (trichloroethane, methyl chloroform, ammonia, peroxides, hydrochloric acid, rust removers, amyl acetate).
Electrical/Electronic Manufacturing		Cyanides, metal sludge, caustic (chromic acid), solvents, oils, alkalis, acids, paints and paint sludges, PCBs.
Fleet/Trucking/Bus Terminals		Waste oil, solvents, gasoline and diesel fuel from vehicles and storage tanks, fuel oil, other automotive wastes[4].
Food Processing		Nitrates, salts, phosphorus, miscellaneous food wastes, chlorine, ammonia, ethylene glycol.
Furniture Repair/Manufacturing		Paints, solvents, degreasing and solvent recovery sludges, lacquers, sealants.
Hardware/Lumber/Parts Stores		Hazardous chemical products in inventories, heating oil and fork lift fuel from storage tanks, wood-staining and treating products such as creosote, paints, thinners, lacquers, varnishes.
Home Manufacturing		Solvents, paints, glues and other adhesives, waste insulation, lacquers, tars, sealants, epoxy wastes, miscellaneous chemical wastes.
Junk/Scrap/Salvage Yards		Automotive wastes[4], PCB contaminated wastes, any wastes from businesses[6] and households[7], oils, lead.
Machine Shops		Solvents, metals, miscellaneous organics, sludges, oily metal shavings, lubricant and cutting oils, degreasers (tetrachloroethylene), metal marking fluids, mold-release agents.
Metal Plating/Finishing/Fabricating		Sodium and hydrogen cyanide, metallic salts, hydrochloric acid, sulfuric acid, chromic acid, boric acid, paint wastes, heavy metals, plating wastes, oils, solvents.
Mines/Gravel Pits		Mine spills or tailings that often contain metals, acids, highly corrosive mineralized waters, metal sulfides, metals, acids, minerals sulfides, other hazardous and nonhazardous chemicals[9], petroleum products and fuels.
Photo Processing/Printing		Biosludges, silver sludges, cyanides, miscellaneous sludges, solvents, inks, dyes, oils, photographic chemicals.

Table E-5. Potential Contaminant Sources (Ground Water and Surface Water), continued

Source	Potential Contaminants [1,2,3]
Plastics/Synthetics Producers	Solvents, oils, miscellaneous organic and inorganics (phenols, resins), paint wastes, cyanides, acids, alkalis, wastewater treatment sludges, cellulose esters, surfactant, glycols, phenols, peroxides, etc.
Research/University/Hospital Laboratories	X-ray developers and fixers[8], infectious wastes, radiological wastes, biological wastes, disinfectants, asbestos, beryllium, solvents, infectious materials, drugs, disinfectants, (quaternary ammonia, hexachlorophene, peroxides, chlornexade, bleach), miscellaneous chemicals.
Wood Preserving/Treating	Wood preservatives: creosote, pentachlorophenol, arsenic, heavy metals.
Wood/Pulp/Paper Processing and Mills	Metals, acids, sulfides, other hazardous and nonhazardous chemicals[9], organic sludges, sodium hydroxide, chlorine, hypochlorite, chlorine dioxide, hydrogen peroxide, methanol, paint sludges, solvents, creosote, coating and gluing wastes.
Agricultural/Rural	
Livestock Auction Lots/Boarding Stables	Nitrates, phosphates, bacteria, and viruses, total dissolved solids.
Confined Animal Feeding Operations Slaughter House and Butcher Facilities	Nitrates, phosphates, chloride, chemical sprays and dips for controlling insect, bacteria and viruses, total dissolved solids.
Farm Machinery Repair	Automotive wastes[4], welding wastes, fuel.
Crops - Irrigated and Non-irrigated	Pesticides[11], fertilizers[12], nitrates, phosphates, salts, sediment
Wastewater/Sludge/Manure Land Application or Disposal Locations	Nitrates, metals, salts, bacteria and viruses.
Lagoons/Liquid Wastes	Nitrates, livestock sewage wastes, salts, bacteria.
Pesticide/Fertilizer/Petroleum Storage & Transfer Areas	Pesticides[11] , fertilizers[12], petroleum residues.
Crop Storage/Disposal Areas	Nitrates, Phosphates, Total Dissolved Solids
Residential/Municipal	
Airports (Maintenance/Fueling Areas)	Jet fuels, deicers, diesel fuel, chlorinated solvents, automotive wastes[4], heating oil, building wastes[6].
Camp Grounds/RV Parks, Marinas	Septage, gasoline, diesel fuel from boats, pesticides[11, 13], household hazardous wastes from recreational vehicles (RVs)[7].
Drinking Water Treatment plants	Treatment chemicals, pesticides[11.]
Golf Courses	Fertilizers[12], pesticides[11], arsenic.
Landfills/dumps	Organic and inorganic chemical contaminants; waste from households[7] and businesses[6], nitrates, oils, metals, solvents.
Motor Pools	Automotive wastes[4]: solvents, waste oils, fuel storage.
Railroad Yards/Maintenance/Fueling Areas	Diesel fuel; herbicides for rights-of-way[11], creosote from preserving wood ties, solvents, paints, waste oils.
School Maintenance Facilities	Machinery/vehicle serving wastes, gasoline.[11,13].

Table E-5. Potential Contaminant Sources (Ground Water and Surface Water), continued

Source	Potential Contaminants [1,2,3]
Septic Systems (only identify large community systems or areas where there are more than 10 individuals systems in any 40 acre tract of land)	Bacteria, viruses, nitrates, salts, dissolved solids, improperly disposed of household or business wastes.
Utility Stations/Maintenance Areas	PCBs from transformers and capacitors, oils, solvents, sludges, acid solution, metal plating solutions (chromium, nickel, cadmium).
Waste Transfer/Recycling Stations	Residential and commercial solid waste residues.
Wastewater Effluent to Surface Waters (primarily surface water concern)	Municipal wastewater, sludge[16], treatment chemicals, nitrates, heavy metals, bacteria, nonhazardous wastes[16]
Miscellaneous	
Above Ground Storage Tanks	Diesel fuel, gasoline, other chemicals.
Construction/Demolition Areas (Plumbing, Heating, and Air Conditioning, Painting, Carpentry, Flooring, Roofing and Sheet Metal etc.)	Solvents, asbestos, paints, glues and other adhesives, wastes insulation, lacquers, tars, sealants, epoxy waste, miscellaneous chemical wastes, explosives, sediment.
Historic Gas Stations	Diesel fuel, gasoline, kerosene.
Historic Waste Dumps/Landfills	Leachate, organic and inorganic chemicals, waste from households[7], and businesses[6], nitrates, oils, heavy metals, solvents.
Injection Wells/Dry Wells/Sumps (primarily ground water concern)	Storm water runoff[3], spilled liquids, used oils, antifreeze, gasoline, solvents, other petroleum products, pesticides[11], and a wide variety of other substances.
Storm Water Drainage to Surface Waters (primarily surface water concern)	Storm water runoff, oils, antifreeze, metals, sediment, and pesticides, and a wide variety of other substances.
Military Installations	Wide variety of hazardous and nonhazardous wastes depending on the nature of the facility and operation[3,9], diesel fuels, jet fuels, solvents, paints, waste oils, heavy metals, radioactive wastes, explosives.
Surface Water - Stream/Lakes/Rivers/Recharge Sites	Ground Water: bacteria and viruses, cryptosporidium Surface Water: nitrates, pesticides, sediment from agricultural return drains.
Transportation Corridors	Herbicides in highway right-of-way[11, 5], road salt (sodium and calcium chloride), anti-caking additives (ferric ferrocyanide, sodium ferrocyanide), road salt anti-corrosives (phosphate and sodium ferrocyanide), automotive wastes[4], fertilizers.
Forest Roads (primarily surface water concern)	Sediment, fuel spills.
Landslides/Burn Areas (primarily surface water concern)	Sediment.
Underground Storage Tanks	Diesel fuel, gasoline, heating oil, other chemical and petroleum products.
Unsealed or Abandoned Wells, and Test Holes (primarily ground water concern)	Storm water runoff, solvents, nitrates, septic tanks, hydrocarbons, and a wide variety of other substances.

Table E-5. Potential Contaminant Sources (Ground Water and Surface Water), continued

1 In general, surface or ground water contamination stems from the misuse and improper disposal of liquid and solid wastes; the illegal dumping or abandonment of household, commercial, or industrial chemicals; the accidental spilling of chemicals from trucks, railways, aircraft, handling facilities, and storage tanks; or the improper siting, design, construction, operation, or maintenance of agricultural, residential, municipal, commercial, and industrial drinking water wells and liquid and solid waste disposal facilities. Contaminants also can stem from atmospheric pollutants, such as airborne sulfur and nitrogen compounds, which are created by smoke, flue dust, aerosols, and automobile emissions, fall as acid rain, and percolate through the soil. When the sources list in this table are used and managed properly, water contamination is not likely to occur.

2 Contaminants can reach ground water from activities occurring on the land surface, such as industrial waste storage; from sources below the land surface but above the water table, such as septic systems; from structures beneath the water table, such as wells; or from contaminated recharge water.

3 This table lists the most common potential contaminants, but not all potential contaminants. For example, it is not possible to list all potential contaminants contained in storm water runoff or from military installations.

4 Automobile wastes can include gasoline; antifreeze; automatic transmission fluid; battery acid; engine and radiator flushes; engine and metal degreasers; hydraulic (brake) fluid; and motor oils.

5 Common pesticides used for lawn and garden maintenance (i.e., weed killers, and mite, grub, and aphid controls) include such chemicals as 2,4-D; diazinon; and glyphosate.

6 Common wastes from public and commercial buildings include automotive wastes; and residues from cleaning products that may contain chemicals such a xylenols, glycol esters, isopropanol, 1, 1, 1, -trichloroethane, sulfonates, chlorinated phenols, and cresols.

7 Household hazardous wastes are common household products which contain a wide variety of toxic or hazardous components.

8 X-ray developers and fixers may contain reclaimable silver, glutaldehyde, hydroquinone, potassium bromide, sodium sulfite, sodium carbonate, thiosulfates, and potassium alum.

9 The *Resource Conservation and Recovery Act* (RCRA) defines a hazardous waste as a solid waste that may cause an increase in mortality or serious illness or pose a substantial threat to human health and the environment when improperly treated, stored, transported, disposed of, or otherwise managed. A waste is hazardous if it exhibits characteristics of ignitability, corrosivity, reactivity, and/or toxicity. Not covered by RCRA regulations are domestic sewage; irrigation waters or industrial discharges allowed by the *Clean Water Act;* certain nuclear and mining wastes; household wastes; agricultural wastes (excluding some pesticides); and small quantity hazardous wastes (i.e., less than 220 pounds per month) generated by businesses.

10 Coliform bacteria can indicate the presence of pathogenic (disease-causing) microorganisms that may be transmitted in human feces. Diseases such as typhoid fever, hepatitis, diarrhea, and dysentery can result from sewage contamination of water supplies.

11 Pesticides include herbicides, insecticides, rodenticides, fungicides and avicides. EPA has registered approximately 50,000 different pesticide products for use in the United States. Many are highly toxic and quite mobile in the subsurface. An EPA survey found that the most common pesticides found in drinking water wells were DCPA (dacthal) and atrazine.

12 The EPA National Pesticides Survey found that the use of fertilizers correlates to nitrate contamination of groundwater supplies.

13 Common household pesticides for controlling pests can contain ingredients such as naphthalene, phosphorus, xylene, chloroform, heavy metals, chlorinated hydrocarbons, arsenic, strychnine, kerosene, nitrosamines, and dioxin.

14 Swimming pool chemicals can contain free and combined chlorine; bromine; iodine; mercury-based, copper-based, and quaternary algaecides; cyanuric acid; calcium or sodium hypochlorite; muriatic acid; sodium carbonate.

15 Septic tank/cesspool cleaners include synthetic organic chemicals such as 1, 1, 1,-trichloroethane, tetrachloroethylene, carbon tetrachlorine, and methylene chloride.

16 Municipal wastewater treatment sludge can contain organic matter, nitrates; inorganic salts; heavy metals; coliform and noncoliform bacteria; and viruses.

17 Municipal wastewater treatment chemicals include calcium oxide; alum; activated alum, cabon, and silics: polymers; ion exchange resins; sodium hydroxide; chlorine; ozone; and corrosion inhibitors.

Source: Adapted from EPA (1993).

Methodology

The methodology for accomplishing the potential contaminant source inventory is structured in two steps. These steps, with subcategories, can be summarized as follows:

(1) Step 4 Perform Primary potential contaminant inventory (performed by IDEQ)

- < Collect existing sources of information on potential sources of contamination, including land use information; and
- < Develop a base map of the delineated area, showing identified potential contaminant sources.

(2) Step 5 Perform Enhanced potential contaminant inventory (optional: performed by the PWS, its agent or the community)

- < Review primary inventory and additional information on potential contaminant sources; and
- < Conduct an "on-the-ground" survey and plot the data on the base map using corresponding inventory forms.

Step 4: Perform Primary Potential Contaminant Source Inventory

This step is conducted by IDEQ on all PWSs. The primary potential contaminant inventory will include the use of GIS coverages and associated databases that contain information on potential contaminant sources. Many of the potential contaminant sources within each delineated source water assessment area will be identified during this step. Therefore, the primary potential contaminant inventory will provide a base level of information needed for the subsequent susceptibility analysis.

Information Sources.- Table E-6 is a listing of many of the information sources that will be used in the primary potential contaminant inventory. The Table E-6 information sources can be used to identify potential contaminant sources that fall into several categories such as those listed below.

- < Facilities that generate, store, use, or handle toxic or hazardous wastes, materials, and substances. Information sources used to identify these include databases associated with RCRA facilities and SARA Title III locations.
- < Businesses and activities that are generally unregulated but still represent a potential source of contamination. A key information source used to identify these include the digital version of the Yellow Pages.

- Locations or sites where there are existing water quality concerns. Information sources used to help identify these include the Statewide Ground Water Quality Monitoring Program databases, the U.S. Geological Survey water quality database, CERCLA sites, and LUST sites.
- Facilities or activities that are at least partially regulated. Information sources to help identify these include a database of dairies, mine site databases, and the Wastewater Land Application Program database.

Table E-6. List of Information Sources for the Potential Contaminant Inventory

CERCLA List (Superfund Sites) – EPA
CERCLIS List - EPA
RCRA List (Hazardous Waste Management Program) - EPA
Underground Storage Tank List (UST list) - IDEQ
Leaking Underground Storage Tank List (LUST list) - IDEQ
National Pollutant Discharge Elimination System (NPDES) Locations - IDEQ, EPA
Solid Waste and Commercial Landfill locations - IDEQ, Idaho Regional Health Districts
Waste Water Land Application Program Database & Files - IDEQ
Digital Versions of the Yellow Pages
Regional and Local Ground Water Monitoring Databases and Files - USGS, ISDA, IDEQ
Underground Injection Well Database – IDWR
SARA Title III Facilities - State Hazardous Materials Bureau, Division of the Military
Toxic Release Inventories - State Hazardous Materials Bureau, Division of the Military
Total Maximum Daily Load (TMDL) Assessments - IDEQ
Mine sites – Interior Columbia Basin Ecosystem Management Project (ICBEMP), IDEQ
Statewide Ground Water Monitoring Program Databases – IDWR
Reports on contaminated drinking water systems – Idaho Regional Health Districts
Dairies and Feedlots - ISDA, IDEQ, EPA
Artificial Recharge Sites - IDWR, IDEQ
Confined Animal Feeding Operations (CAFOs) - IDEQ, EPA, ISDA
American Business Listing for Selected Standard Industrial Classifications (SIC)
Septic Systems (Community and Areas of Higher Density) - Idaho Regional Health Districts
Military/Department of Energy Facilities
Land Use Coverages - IDWR

Table E-6 also indicates the appropriate government agency that is generally responsible for initial preparation of the various information sources. As identified by Tables D-1 and D-2 in Appendix D, many of the Table E-6 information sources are being modified or updated to better accommodate the potential contaminant source inventory, particularly in regards to the use of GIS. Some agencies routinely update the information as necessary for their own programmatic purposes. Where necessary, IDEQ will continue to work with these agencies to help prepare the databases for potential contaminant inventory purposes and to incorporate updated information as needed.

Land use within the source water assessment area will also be included as part of the potential contaminant inventory effort. Land use generally falls under the nonpoint source category of potential contaminant sources. Examples of land uses that could represent potential contaminant sources include both irrigated and non-irrigated agriculture, urban or commercial development, and golf courses. Additional nonpoint potential contaminant sources can include areas that have many point sources of equal risk, such as a large number of septic systems within one area. These areas can be addressed as a land use consideration versus trying to identify each and every individual source. Within the source water assessment area, GIS coverages will be used to illustrate land uses.

Other information sources, besides those listed in Table E-6, will be reviewed and evaluated for incorporation into the potential contaminant source inventory. This can include databases or GIS coverages from local community representatives when provided in a useable format.

In addition, significant surface water features will be identified. In many cases, surface water bodies act as potential sources of pathogens, including *Giardia* and *Cryptosporidium,* to ground water systems. Surface water can also transport viruses and other bacteria harmful to human health.

Base Maps.- The base map will show the delineated source water assessment area, the PWS wells or intakes, and the potential contaminant sources, including land uses, identified through existing databases and GIS coverages. The land uses will generally be mapped as a shape (polygon) to show the extent of the land use of concern. Other sources, generally identified as a point on the base map(s), will be listed with corresponding map reference numbers and some general descriptive information. By showing all of these items together on one map, the spatial relationships can be evaluated. This mapped potential contaminant inventory information will then become an important tool used during the susceptibility analysis to help evaluate potential contaminant risks to the PWS. The mapped potential contaminant inventory information will also be made available to the public through the final source water assessment report.

Step 5: Perform Enhanced Potential Contaminant Source Inventory

The enhanced potential contaminant inventory is a voluntary effort that provides an opportunity for community involvement with the source water assessment process. Having the PWS owner perform the enhanced inventory represents an important step toward source water protection. The enhanced inventory will create an improved awareness of potential contaminant sources due to the hands-on experience and the possibility of identifying sources not previously identified during the primary potential contaminant

inventory. The enhanced inventory may also provide for a more accurate susceptibility analysis. Most important of all, information obtained from the enhanced potential contaminant inventory can then be used to more effectively implement a voluntary source water protection program at the local level.

A community or system pursuing an enhanced inventory may wish to form a community team to assist with inventory efforts. Enhanced inventories can also be done as a combined effort among several systems or communities in areas where there are overlapping source water assessment areas. The IDEQ will provide training and additional guidance to help communities and PWS owners with enhanced inventories. To finish inventories in a timely manner, IDEQ will need to limit the amount of time for completion of the enhanced potential contaminant inventory once a system is notified.

The enhanced inventory, when performed for ground water systems, generally follows the intent of the potential contaminant inventory step defined in the Idaho Wellhead Protection Plan (IDEQ, 1997). The enhanced inventory should, at a minimum, include an on-the-ground survey and attempt to identify historical sources of potential contamination. Once the enhanced inventory is completed, the information is provided to IDEQ so it can be combined with the existing primary potential contaminant inventory information to produce updated base maps for subsequent susceptibility analysis purposes.

Information Sources.- Reviewing aerial photographs and interviewing knowledgeable residents can greatly improve the results of an enhanced inventory. The community or water system owner will be provided with the primary potential contaminant inventory list(s) and base map(s) to refer to and build on during the enhanced inventory.

Conduct an "on-the-ground" survey and check the existing data.- The level of actual field reconnaissance or "on-the-ground" survey will depend upon the complexity and size of the source water assessment area. PWSs will need to conduct an on-the-ground survey using the inventory forms provided (Figures E-09 and E-10). The on-the-ground survey simply involves a reconnaissance of the source water assessment area, field checking locations of potential sources identified during the previous data collection, and noting any new potential sources that are seen during the survey. Some of the important things to look for during the on-the-ground survey include old gas stations (evidence of pump islands), lagoons or basins where water is ponding, locations of long-term machine or auto repair sites, and obvious storage areas for chemicals, pesticides, wastes, etc. It may be helpful to review the Table E-5 list of potential sources in order to realize that there are wide varieties of potential contaminant sources in virtually every community.

Prepare Inventory Forms.- IDEQ has created two separate forms to be completed during the enhanced potential contaminant source inventory: the "Point Source Inventory" Form (Figure E-9) and the "Historical Potential Contaminant Source Inventory" Form (Figure E-10). The forms are to be used in conjunction with base map(s) provided by IDEQ showing the primary potential contaminant inventory results and the delineated source water assessment area. Table E-5 and any subsequent guidance provided by IDEQ should be used to help identify potential contaminant sources during the enhanced inventory.

Both forms have instructions to help the user collect the pertinent information and identify corresponding locations on a base map in a manner that will make it easier to incorporate the information into the source water assessment process. Although no form is provided for land uses, it is recommended that these be identified directly on the map if they are different from land uses already identified during the primary potential contaminant inventory. On a separate sheet of paper it may be necessary to provide a narrative keyed to the mapped locations. The completed forms, corresponding maps, and land use information should be shared with IDEQ so the information can be combined with the primary potential contaminant inventory and incorporated into the susceptibility analysis and final report.

During the enhanced inventory, it may be desirable to document additional characteristics observed during the inventory. Additional characteristics are those conditions beyond what is suggested by the forms and can include secondary containment details, evidence of spills, evidence of poor water quality protection practices, or evidence of management practices that appear to set good examples of water quality protection. This additional information does not need to be sent to the IDEQ as part of the enhanced inventory, but should instead be kept by the those performing the enhanced inventory to assist with future source water protection implementation.

Potential Point Source Inventory Form Instructions.- Figure E-9 is the form used to identify those potential contaminant sources generally considered a point source within the delineated area. A point source refers to any potential source of contamination that is individually identifiable in terms of release and zone of impact in the aquifer or drainage basin, and generally includes facilities, businesses, or other activities that can be identified by a point on a map.

The form is to be mainly filled out during the on-the-ground-inventory, although database searches, aerial photographs, and interviews with knowledgeable residents can also provide information to be added to the form. The following is a description and explanation for each column on the form.

Map Number- Enter the map number that corresponds to the number used to identify the potential contaminant source on the base map(s). It is recommended that all point source sites should be identified with a "P" prefix followed by the number of the site.

Type of Facility- Enter the type of facility as classified in Table E-5. Classification of the facility determines the types, general quantities, and uses of potential contaminants at the location. If the facility type is not included in Table E-5, but it still appears to represent a potential contaminant source, then provide a descriptive name or information under the *Comments/Description* column that will help determine the types of chemicals associated with the potential source.

Facility Name/Address- Provide the name of the company, organization, or individual and the street address. The address may be used to cross-reference primary potential contaminant inventory database information. If there are or have been multiple names for the facility, provide the additional facility names also.

Comments/Description- Include any comments, such as quantities of certain potential contaminants stored or used, about the site that could be used to help identify the potential contaminants of concern if the information is not consistent with Table E-5 or any subsequent guidance. For example, a small private repair shop may have a large fuel tank that one may not normally equate for such a business, or a rinse disposal location could be from tanks used to transport agrichemicals. Also note additional information concerning historical uses of the site, known historical releases at the site, or other considerations that may be pertinent to source water protection.

Historical Potential Contaminant Source Inventory Form Instructions.- Figure E-10 is used to list and identify historical sources or other existing situations that have not been identified in the primary potential contaminant inventory, within the Point Source Potential Contaminant Inventory forms, or through the land use mapping effort. Examples of historical sources might be an old landfill or any old dumping ground, a former food processing plant, a former gas station, a large disposal site for failed crops, or a historical spill of significance. It is desirable to interview or include knowledgeable citizens for this part of the enhanced inventory. Reviewing aerial photographs or researching historical records can also be beneficial.

Map Number- Enter the number that corresponds to the appropriate site or area on the delineation map. It is recommended that all historical sites be identified with a "H" prefix followed by the number of the site.

Type of Facility/Historical Use- Enter the type of facility or historical land use, using Table E-5 where possible. Classification of the facility helps determines the types, general quantities, and uses of potential contaminants at the location.

Map Identification- Use your judgement to determine whether the site was a point or nonpoint source. If the source can be identified by a point on the map, then consider it a point source and identify it on the map as such. If the source is best identified by a polygon encompassing the area of concern, then consider it a nonpoint source and identify it on the map as such.

Years in Service- Input the approximate dates that the facility/business was in service or that an area had been used. Example: Joe's Garage operated from 1952 -1973 (estimated).

Comments/Description - Include comments about the site including present and other historical uses of the site and any observations made during the field survey that may be useful for source water protection purposes.

Frequency of Potential Contaminant Source Inventories

IDEQ will perform the primary potential contaminant source inventory only once for each PWS. PWSs will only have one opportunity to incorporate information from an enhanced inventory into the steps of source water assessment described by the SWAP. After source water assessments are completed, it will be the responsibility of the PWS to review and update their potential contaminant source inventory on an as-needed and voluntary basis as part of their source water protection effort.

For those communities and system owners pursuing source water protection for ground water systems, the Idaho Wellhead Protection Plan (IDEQ, 1997) recommends that the inventory within Zones 1A and IB be updated on a regular basis and that the inventory within Zones II and III be updated at least every two years. Updating the potential contaminant inventory is especially desirable for PWSs in areas experiencing rapid growth or in areas with dramatic land use changes.

Figure E-9. Potential Contaminant Inventory Form for Source Water Assessments -Point Source Form

Point Source - Potential Contaminant Inventory Form			
System Name:		**Source Name/ID:**	
PWS #:		**Source Tag #:**	
Inventory completed by:			**Date:**
Map #	**Type of Facility**	**Facility Name & Address**	**Comments/Description**
P -			
P -			
P -			
P -			
P -			
P -			
P -			
P -			

Note: When a facility or property is identified as a potential contaminant source it does not mean the facility or property is in violation of any local, state, or federal environmental laws or regulations.

Figure E-10. Potential Contaminant Inventory Form for Source Water Assessments - Historical Source Form

Historical - Potential Contaminant Inventory Form				
System Name:			**Source Name/ID:**	
PWS #:			**Source Tag #:**	
Form completed by:				**Date:_____**
Map #	**Type of Facility/Historical Use**	**Map Identification (Point Source or Nonpoint Source)**	**Yrs in Service**	**Comments/Description**
H -				
H -				
H -				
H -				
H -				
H -				
H -				
H -				

Note: When a facility or property is identified as a potential contaminant source it does not mean the facility or property is in violation of any local, state, or federal environmental laws or regulations.

Step 6: Perform Susceptibility Analysis

The analysis for determining the "susceptibility" of each PWS well or surface water intake to contamination is presented in this section. The analysis is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. The outcome of a susceptibility analysis can be updated or revised if additional or new site-specific information becomes available. For the purpose of each source water assessment, IDEQ will use a very conservative approach when dealing with contaminant categories. Once a potential contaminant source has been identified through the process outlined in steps 4 and 5, it is assumed to have the same potential to produce a release to the environment, regardless of the size of the facility, which could unduly affect the public water supply well or intake should a release occur.

Within each delineated source water assessment area, the susceptibility analysis considers hydrologic and hydrogeologic characteristics, land use characteristics, potentially significant contaminant sources, and the physical integrity of the well or surface water intake. A different susceptibility analysis was developed for ground water and surface water systems. Susceptibility analyses performed on ground water systems cannot be compared to susceptibility analyses for surface water systems and *vice versa*. The outcome of the analysis is a relative rating of three susceptibility categories: high, moderate, and low. The susceptibility ratings are specific to a particular potential contaminant or category of potential contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the PWS is at risk for all other potential contaminants.

Definition of Susceptibility Analysis

The Idaho susceptibility analysis is based on the following two-part definition.

(1) Hydrologic Sensitivity involves the movement of water through the subsurface without consideration of contaminants or their properties. It is the relative ease with which surface or subsurface water can migrate to a PWS source. For subsurface systems, it includes the intrinsic geologic characteristics of the saturated zone, and the unsaturated zone. For surface systems, it also includes the intrinsic characteristics of the water-bearing geologic materials, along with stream flow and slope attributes.

(2) Susceptibility to Potential Contamination combines the factors of part one with the consideration of potential sources of contamination, contaminant properties, and construction characteristics of a well or surface water intake. It is the relative ease with which a potential contaminant applied near the land surface,

or to the subsurface, can migrate to a PWS source. This includes consideration of hydrologic sensitivity and other site-specific factors such as:

- well or system intake construction;
- potential contaminant sources; and
- potential contaminant characteristics and loading.

How Susceptibility Analyses Will Benefit Public Water Systems

A susceptibility analysis provides benefits to each PWS by relating the risk of contamination to the natural physical features of the delineated source water assessment area, to man-made features, and to potentially significant contaminant sources around the PWS. The benefit resulting from the susceptibility analysis is the presentation of scientifically-founded information that can be used by the PWS to evaluate the potential risk of contaminants impacting the system.

All reasonably available information sources will be used in the performance of the susceptibility analysis. These information sources include GIS coverages of delineated source water assessment areas, potential contaminant sources, land use features, soil properties, surface geological features, and hydrologic features (such as depth to ground water). Table E-7 provides a summary of suggested information sources for performing susceptibility analyses.

Each susceptibility analysis achieves a level of detail governed by the availability of information on hydrologic and hydrogeologic characteristics, land use, potential contaminant sources, and well or surface water intake construction. The factors considered in the susceptibility analysis are based, in part, on experience in developing potential contaminant probability maps in portions of southern Idaho (Rupert, 1997, 1998) and on similar experience gained in other parts of the United States and in Europe (e.g., Tesoriero and Voss, 1997; Jorgenson et al., 1998; Madl-Szonyi and Fule, 1998; Soutter and Musy, 1998). Any assumptions used will be conservative so that a worst-case potential for contamination is represented.

Table E-7. Recommended Data Sources for Susceptibility Analyses.

Information Source	Used to Assess
STATSGO soil GIS coverage	soil properties
SSURGO soil GIS coverage	soil properties
Idaho Department of Water Resources Well Drillers' Reports	depth to water, geology, vadose zone properties, well construction properties
Idaho Department of Water Resources Land Use GIS coverage	land use characteristics
United States Geological Survey geology GIS coverage	surface geology
Spatial Data in Geographic Information System Format on Agricultural Chemical Use, Land Use, and Cropping Practices in the United States (Battaglin and Goolsby, 1994).	farm chemical usage for each county, land use
Idaho Division of Environmental Quality DWIMS database	water quality and contaminant detections
Idaho Department of Water Resources Statewide Ground Water Quality Monitoring Program database	ground water quality and contaminant detections
United States Geological Survey well construction and water quality database	well construction and ground water quality
Various potential contaminant source GIS coverages and databases	potential contaminant sources in source water areas
Source water delineation GIS coverage	delineated source water areas for each PWS
Division of Environmental Quality Drinking Water Program Files	PWS construction, wellhead characteristics
Federal Emergency Management Agency (FEMA) floodplain GIS coverages	floodplains

NOTE: SSURGO = Soil Survey Geographic Data Base; STATSGO = State Soil Geographic Data Base

Implementation

The detection of a synthetic chemical in a drinking water source negates the need to perform the susceptibility rating for that particular chemical or chemical category: the source is automatically given a high susceptibility rating for that contaminant.

Susceptibility analyses will be performed on an individual basis for each PWS well or intake unless information common to a group of wells or intakes allows some area-wide characterizations to be made. For example, the density of PWSs in a certain area may be such that the available information on hydrologic sensitivity, land use, and potentially significant contaminant sources would apply to each PWS. The only variable needing individual consideration among this group of PWSs would be their specific construction characteristics.

Susceptibility analyses are different for ground water and surface water systems and therefore require different criteria. The ground water susceptibility analysis assesses: 1) hydrologic sensitivity, 2) land use and potential contaminant sources, and 3) well construction integrity. Surface water systems inherently lack the natural protection afforded by subsurface geologic materials and are not evaluated using the hydrologic sensitivity criteria. The surface water susceptibility analysis assesses (1) land use and potential contaminant sources and (2) intake construction integrity.

Numerical "scores" for each of these factors are summed together to provide a susceptibility rating for each water source comprising a PWS. The susceptibility rating is specific to a particular potential contaminant or category of potential contaminants. Because a different rating system exists for ground water and surface water systems, the susceptibility rating between the two types of systems cannot be compared.

The three factors that contribute to a susceptibility rating for a ground water system (hydrologic sensitivity, land use with associated potential contaminant sources, and well construction integrity) are considered to have equal importance in the susceptibility rating. However, the susceptibility analysis has the tendency to allocate many more points to the land use and potential contaminant source factor (30 points possible) when compared to the hydrologic sensitivity and the well construction integrity factors (each with six points possible). For this reason, the numerical scores associated with each susceptibility factor are normalized before tallying the final susceptibility rating for ground water PWSs.

A similar normalization procedure is not performed for surface water susceptibility analyses because the two susceptibility factors, land use with associated potential contaminant sources, and intake construction integrity, are not considered to have equal importance.

The susceptibility rating may vary depending upon the potential contaminant under consideration. In some cases, it may only be possible to provide a susceptibility rating for a broad category of potential contaminants, based on chemical characteristics. For example, a leaking gasoline storage tank could result in the release of around 200 different organic chemicals which comprise gasoline. The exact potential contaminants present will rarely be known; therefore, it will be much more efficient to provide a susceptibility rating for the broad category of volatile organic compounds associated with gasoline.

The general contaminant categories will be consistent with terminology and potential contaminant categories used in the Idaho Drinking Water Program. The general contaminant categories are: volatile organic compounds (VOCs), synthetic organic compounds (SOCs), inorganic compounds (IOCs), radionuclides, and microbials (Table E-8). The documentation supporting the susceptibility analysis will reference the specific potential contaminants, or categories of potential contaminants, on which the susceptibility rating is based.

Consideration of Potential Contaminant Properties

Ground Water Systems- The relative mobility of different potential contaminants through soil is a consideration in the susceptibility analysis. In order to determine how readily a potential contaminant will move (leach) through the soil layer and into a ground water source, two convective mobility models were used (Jury, et al., 1983, 1984, and United States Department of Agriculture (USDA) National Agricultural Pesticide Risk Analysis (NAPRA).

The Jury et al. model divides potential contaminants into three leachability ranges (Table E-9). Class I includes potential contaminants likely to move through soil at velocities less than 24 inches per year. Class II represents those potential contaminants with mobility velocities between 24 and 84 inches per year. Class III potential contaminants have a high mobility/leachability range of greater than 84 inches per year. Table 10 represents the USDA NAPRA model currently being used by the Idaho State Department of Agriculture for registered herbicides, fungicides, and pesticides within the State of Idaho. For purposes of susceptibility analyses, Class II and Class III potential contaminants represented in Table 9, and pesticides represented in Table 10 with a medium to high categorization are of highest concern and can add susceptibility points as shown in Figure E-11.

The Jury et al. modeling procedure used to assess the leachability of the regulated organic compounds and a discussion regarding the categorization of inorganic compounds can be found at the back of this appendix. The leachability of the regulated inorganic compounds and metals were assessed qualitatively taking into consideration knowledge of their occurrence and fate in the environment. Potential contaminants lacking mobility information were placed into Class III. Information on the USDA NAPRA model can be found on the USDA website at http://www.wcc.nrcs.usda.gov/water/factsheets/factfina.html

Table E-8. Contaminant Categories

VOC Contaminants	**SOC Contaminants**
1,2,4-trichlorobenzene	2,4-D (2,4-dichlorophenoxyacetic acid)
1,1-dichloroethylene	2,4,5-TP (2,4,5-trichlorophenoxypropanic acid) or (Silvex)
1,1,2-trichloroethane	2,3,7,8-tetrachlorodibenzodioxin (dioxin)
1,2-dichloroethane	Alachlor
1,2-dichloropropane	Atrazine
1,1,1-trichloroethane	Benzo (a) pyrene
Benzene	Carbofuran
Bromodichloromethane	Chlordane
Bromoform	Dalapon
Carbon tetrachloride	Di(2-ethylhexyl)adipate
Chlorodibromomethane	Di(2-ethylhexyl)phthalate
Chloroform	Dinoseb
cis-1,2-dichloroethylene	Diquat
Dibromochloropropane	Endothall
Dichlorobenzene o- (1,2-dichlorobenzene)	Endrin
Dichlorobenzene p- (1,4-dichlorobenzene)	Ethylene dibromide (EDB)
Dichlorobenzene m- (1,3-dichlorobenzene)	Glyphosate
Dichloromethane	Heptachlor
Ethylbenzene	Heptachlor epoxide
Ethylene dibromide (EDB)	Heptachlor
Monochlorobenzene	Hexachlorobenzene
Styrene	Hexachlorocyclopentadiene
Tetrachloroethylene	Lindane
Toluene	Methoxychlor
trans-1,2-dichloroethylene	Oxamyl (Vydate)
Trichloroethylene	Pentachlorophenol (penta)
Vinyl chloride	Picloram
Xylenes (total)	Simazine
	Toxaphene
Radionuclides	
Combined beta/photon emitters	**IOC Contaminants**
Combined radium-226 and radium-228	Asbestos
Gross alpha particle activity	Barium
Strontium 90	Cadmium
Tritium	Chromium
	Copper
Microbial Contaminants	Cyanide
Cryptosporidium	Fluoride
Total coliform bacteria	Lead
	Mercury
	Nickel
	Nitrate
	Thallium

Surface Water Systems- Because surface water systems do not have a protective soil cover through which potential contaminants migrate, mobility properties of potential contaminants have less meaning for determining susceptibility. However, soil sediments can reach surface water through overland transport as a result of human activity that enhances erosion, or as a result of natural land surface characteristics such as steep slopes and highly erodible soils. Sediment is a major concern for surface water systems: it creates turbidity which can affect the efficiency of treatment systems; and it can act as a surrogate for other contamination problems. Therefore, both natural or human-caused land surface characteristics which create turbidity are considered in the susceptibility analysis for surface water systems.

Table E-9 Contaminant Leachability Classes[†]

Class I	Class II	Class III
1,1,1-trichloroethane (1,1,1-TCA)	1,1-dichloroethylene (1,1-DCE)	1,2-dichloroethane (1,2-DCA)
1,2-dichlorobenzene (o-…)	1,2-dibromo-3-chloropropane (DBCP)	
1,2,4-trichlorobenzene	1,2-dibromoethane (EDB)	bis(2-ethylhexyl) adipate*
1,3-dichlorobenzene (m-…)	1,2-dichloropropane	Dalapon*
1,4-dichlorobenzene (p-…)	Benzene	Dichloromethane (DCM)
2,3,7,8-tetrachlorodibenzodioxin (Dioxin)	Bromodichloromethane (THM)	Dinoseb
Benzo[a]pyrene (PAH)	Chloroform (THM)	
bis(2-ethylhexyl) phthalate	cis-1,2-dichloroethylene (c-1,2-DCE)	
Carbon tetrachloride	Lead	
Chlorobenzene	Vinyl chloride	Antimony
Ethylbenzene		Asbestos
Heptachlor epoxide		Beryllium
PCBs (as decachlorobiphenyl)		Fluoride
Pentachlorophenol		Nickel
Styrene		Mercury
Tetrachloroethylene (PCE)		Nitrate
Toluene		Nitrite
Toxaphene		Selenium
Trichloroethylene (TCE)		Thallium
Xylenes, total		
		Gross alpha particle activity
Total coliform bacteria		Combined beta/photon/emitters
Cryptosporidium		Combined radium-226 and radium-228
		Strontium-90
		Tritium

[†]This table presents only a relative comparison of leachability. It reflects a simplistic characterization of leachability that does not take into account many environmental factors that control leachability, such as the percentage of organic material and clay in the subsurface.

*Organic contaminants for which the leachability model could not be used due to insufficient information.

Table E-10 NAPRA Leachability Information for Registered Idaho Pesticides

HERBICIDES			HERBICIDES		
BRAND NAME	**COMMON NAME**	RATING	**BRAND NAME**	**COMMON NAME**	**RATING**
2,4-D amine	2,4-D dimethylamine	High	Bronate	MCPA acid + bro-moxynil	High
2,4-D esters	2,4-D esters	High	Bronco	alachlor + glyphosate amine salt	Medium
AAtrex	atrazine	High	Brush Buster	dicamba	High
Accent	nicosulfuron	High	Buckle	triallate	High
Acclaim	fenoxaprop	Low	Buctril	bromoxynil octanoatester	Low
Accord	glyphosate	Low	Bueno	MSMA sodium salt	Medium
Alanap	naptalam sodium salt	High	Butoxone	2,4-DB dimethylamine	High
Ally	metsulfuron	High	Butyrac	2,4-DB	Low
Amber	triasulfuron	High	Campaign	glyphosate +2,4-D	High
Aquathol	endothall	Medium	Canopy	chlorimuron ethyl + metribuzin	High
Arsenal	imazapyr	High	Casoron	dichlobenil	High
Assert	Imazamethabenz	High	Cheat Stop	Atrazine	High
Assure	quizalofopethyl	High	Cheyenne	tribenuron-methyl	Medium
Asulox	asulam sodium salt	High	Chipco Turf	2,4-D dimethylamine	High
Atrazine	atrazine	High	Chiptox	MCPA	High
Avenge	difenzoquat methyl-sufate salt	Low	Chopper	imazapyr	High
Avid	abamectin	Low	Clarity	dicamba	High
Balan	benefin	Low	Classic	chlorimuron ethyl	High
Banvel	dicamba salt	High	Clout	MSMA sodium salt	Medium
Banvel/2,4D	2,4-D acid + dicamba salt	High	Confront	clopyralid, Triclopyr	High
Barricade	prodiamine	Low	Crabgrass Preventer	benefin	Low
Basagran	bentazon sodium salt	High	Crossbow	2,4-D + triclopyr ester	High
Basis	rimsulfuron	Low	Curtail	2,4-D, Clopyralid	High
Beacon	primisulfuron	High	Cyclone	paraquat	Low
Betamix	desmedipham + phenmedipham	High	Daconate	MSMA sodium salt	Medium
Betamix Progress	desmedipham	High	Dacthal	DCPA	High
Betanex	desmedipham	Low	Des-I-Cate	endothall salt	High
Betasan	bensulide	Low	Devrinol	napropamide	High
Bicep	altrazine + metolachlor	Low	Dimension	dithiopyr	Medium
Bladex	cyanazine	Medium	Diquat	diquat dibromide salt	Low
Blazer	acifluorfen	High	Direx	diuron	High
		High	Drexel Diuron	diuron	High
		High	Dual	metolachlor	High

Table E-10 NAPRA Leachability Information for Registered Idaho Pesticides

HERBICIDES			HERBICIDES		
BRAND NAME	**COMMON NAME**	**RATING**	**BRAND NAME**	**COMMON NAME**	**RATING**
Endurance	prodiamine	Low	Prism	clethodim	Low
Eptam	EPTC	Medium	Prograss	ethofumesate	Medium
Eradicane	EPTC	Medium	Pronone	hexizinone	High
Evik	Ametryn	High	Protocol	glyphosate	Low
Fallowmaster	dicamba, glyphosate	High	Proturf Goosegrass	bensulide + oxadiazon	High
Far Go	triallate	Low	Prowl	pendimethalin	Low
Finale	glufosinate-ammonium	Low	Pursuit	imazethapyr	High
Finesse	chlorsulfuron	High	Pyramin	pyrazon	Medium
Formula	2, 4-D dimethlamine	High	Quadmec	2,4-D dimethylamine + dicmba salt	High
Fusilade 2000	fluazifop-butyl	Low	Ramrod	propachlor	Medium
Gallery	isoxa-ben	Medium	Rattler	glyphosate	Low
Carlon	triclopyr	High	Redeem	triclopyr	High
Glean	chlorsulfuron	High	MCP amine	MCPA	High
Kerb	pronamide	Medium	Metho-O-Gas	methyl bromide	High
Kleenup	glyphosate amine salt	Low	Micro-Tech	alachlor	Medium
Krenite S	fosamine Ammonium	Low	MSMA	MSMA sodium salt	Medium
Laddok	atrazine + bentazone + bentazon sodium salt	High	Nortron	ethofumesate	Medium
Landmaster BW	2,4-D, Glyphosate	High	Omamec	fluazifop-butyl	Low
Goal	oxyfluorfen	Low	Oust	sulfometuron	Medium
Harness	acetochlor	High	Paraquat	paraquat dichloride	Low
Herbicide 273	endothall	Medium	Partner	alchlor	Medium
Hi-Dep	2,4-D	High	Pennant	metolachlor	High
Hoelon	diclofop-methyl	Low	Pentagon	pendimethalin	Low
Honcho	glyphosate amine salt	Low	Permit	halosulfuron	Medium
Hydrothol	endothall	Medium	Poast	sethoxydim	Medium
Hyvar L	bromacil lithium salt	High	Pramitol	prometon	High
Hyvar X	bromacil acid	High	Predict	norflurazon	Medium
Karmex	diuron	High	Prefar	bensulide	High
Lasso	alachlor	Medium	Pre-M	pendimethain	Low
Lesco	2,4-D dimethylamine	High	Princep	simazine	High
Lexone	metribuzin	High	Resource	flumiclorac	Medium
Linex	linuron	High	Reward	Vernolate	Medium
Lorox	linuron	High	Rhomence	MCPA	Low
Magnacide H	acrolein	High	Ro-neet	cycloate	Medium
Gramaxone Extra	paraquat dichloride	Low	Rhonox	MCPA soluble salt	High
Halt	pendimethalin	Low	Sonar	fluridone	Low
Harmoney	tribenuron-methyl	Medium	Spike	tebuthrion	High

Table E-10 NAPRA Leachability Information for Registered Idaho Pesticides

HERBICIDES		
BRAND NAME	**COMMON NAME**	**RATING**
Spin-out	copper Hydroxide	Medium
Sprout Nip	chlorpropham	Medium
Stinger	clopyralid	High
Surflan	oryzalin	Medium
Surpass	acetochlor	Medium
Surpass 100	atrazine	High
Sword	MCPA	Low
Team	benefin + oryzalin + trifluralin	Medium
Tetar	chlorosulfuron	High
Terflan	trifluralin	Low
Thistrol	MCPB	High
Tillam	pebulate	Medium
Tiller	2,4-D, MCPA	High
Topnotch	acetochlor	Medium
Tordon	picloram	High
Rodeo	glyphosate	Low
Roundup	glyphosphate amine salt	Low
Rout	oxyfluorfen	low
Rubigan	fenarimol	High
Salvo	2,4-D	High
Savage	2,4-D	High
Scepter	imazaquin acid	High
Scythe	pelargonic acid	High
Select	clethodim	Low
Sencor	metribuzin	High
Shotgun F	altrazine, 2,4-D	High
Silhouette	glyphosate	Low
Simazine	simazine	High
Sinbar	terbacil	High
Snapshot 2.5TG	isoxaben	Medium
Soil-Prep	metham-sodium	High
Solicam	norflurazon	Medium
Sonalan	ethalfluralin	Low
Touchdown	sulfosate	Low
Tough	pyridate	Medium
Transline	clopyralid	High
Trimec	2,4-D dimethylamine+dicamba	High

HERBICIDES		
BRAND NAME	**COMMON NAME**	**RATING**
Tupersan	siduron	Medium
Turbo EC	metolachlor + metribuzin	High
Turflon II Amine	2,4-D dimethylamine + triclo=pyr amine salt	High
Vanguish	dicamba	High
Vantage	sethoxydim	Medium
Vapam	metham-sodium	High
Vegiben	chloramben	High
Velpar	hexazinone	High
Vine Der	2,4-DB	High
Weed-B-Gon	2,4-D dimethylamine + mecoprop amine salt	High
Weedar	2,4-D dimethylamine	High
Weedmaster	dicamba salt + 2,4-D dimethylamine	High
Weedone	2,4-D dimethylamine	High

INSECTICIDES/MITICIDES		
BRAND NAME	**COMMON NAME**	**RATING**
Abamectin	avid	Low
Abate	temphos	Low
Acetellic	pirimphos-methyl	Low
Admire	imidacloprid	Medium
Ag 500	diazinon	Medium
Aldicarb	aldicarb	High
Allethrin	pynamin	Low
Altosid	methoprene	High/*
Alluminum Phosphide	aluminum phosphide	Low
Amaze	isofenfos	Medium
Ambush	permethrin	Low
Amitraz	amitraz	Low
Ammo	cypermethrin	Low
Apollo	clofentezine	Low
Apron	metalaxyl	High
Aqua	parathion	Low
Asana	esfenvalerate	Low
Avitrol	evitrol	High
Award	fenoxycarb	Low
Azatin	azadirachtin	Medium
Azinphosmethyl	azinphosmethyl	Low
Bay 29493	fenthion	Low

Table E-10 NAPRA Leachability Information for Registered Idaho Pesticides

INSECTICIDES/MITICIDES			INSECTICIDES/MITICIDES		
BRAND NAME	**COMMON NAME**	**RATING**	**BRAND NAME**	**COMMON NAME**	**RATING**
Baygon	propoxur	High	Drione	pyrethrin	Medium
Baytex	fenthion	Low	Duo-kill	crotoxyphos	Medium
Baythroid	cyfluthrin	Low	Dursban	chlorpyrifos	Low
Benzoipin	endosulfan	Low	Dycarb	bendiocarb	Low
Bioallethrin	allethrin	Medium	Dyfonate	fonofos	Medium
Borax	borax	High	Dylox	trichlorfon	High
Boric Acid	boric acid	High	DZN Diazinon	diazinon	Medium
Brigade	bifenthrin	Low	Ectrin	fenvalerate	Low
Capture	bifenthrin	Low	Enstar, Enstar II	kinoprene	High/*
Carbaryl	carbaryl	High	Ethion	ethion	Low
Carzol	formetanate	Low	Ethoprop	ethoprophos	High
Celfume	methyl bromide	High	Ficam	bendiocarb	Low
Chlordane	chlordane	Medium	Furadan	carbofuran	High
Chloropicrin	chloropicrin	Low	Grandslam	methiocarb	Medium
Ciodrin	crotoxyphos	Medium	Guthion	azinphosmethyl	Low
Ciovap	crotoxyphos	Medium	Heptachlor	heptachlor	Low
Ciofentizine	clofentizine	Low	Hopkins	parathion	Low
Comite	propargite	Low	Hydroprene	gentrol	Medium
Commodore	lambda-cyhalothrin	Low	Imidan	phosmet	High
Co-Ral	coumaphos	Medium	Isotox	lindane	High
Counter	terbufos	Low	Kelthane	dicofol	Low
Creosote	creosol, coal tar	Low	Kemolate	phosmet	Low
Cryolite	cryolite	Low	Knox Out	diazinon	Medium
Cyfluthrin	baythroid	Low	Lannate	methomyl	High
Cygon	dimethoate	High	Larvadex	cyromazine	High
Deadline	metaldehyde	Medium	Lindane	lindane	High
Defend	dimethoate	High	Lorsban	chlorpyrifos	Low
Demon	cypermethrin	Low	Malathion	malathion	Low
Diazinon	diazinon	Medium	Marlate	methoxychlor	Low
Dibrom	naled	Low	Maverik Aquaflow	fluvalinate	Low
Dicofol 4 EC	dicofol	Low	Max Force	hydramethylon	Low
Dimethoate	dimethoate	High	Mesurol	methiocarb	High
Dimilin	diflubenzuron	Low	Metaldehyde	metaldehyde	Medium
Dinocap	midane	Low	Metasystox-R	oxydemetonmethyl	High
Dipterex	trichlorfon	High	Methidathion	methidathion	Low
Di-Syston	disulfoton	High	Methoxychlor	methoxychlor	Low
Dri-Die	ammonium flusilicate	High	Mocap	ethoprop	High

Table E-10 NAPRA Leachability Information for Registered Idaho Pesticides

INSECTICIDES/MITICIDES			INSECTICIDES/MITICIDES		
BRAND NAME	**COMMON NAME**	**RATING**	**BRAND NAME**	**COMMON NAME**	**RATING**
Monitor	methamidphos	Medium	Taktic	amitraz	Low
Morestan	oxythioquinox	Low	Talstar	bifenthrin	Low
Neguvon	trichlorfon	High	Tame	fenpropathion	Medium
Nemacur	fenamiphos	High	Target	cyromazine	High
Nicotine	nicotine	High	Telone II	dichloroprepene	Medium
Oftanol	isofenphos	Medium	Temik	aldicarb	High
Omite	propargite	Low	Tempo	cyfluthrin	Low
Orbit	propiconazole	High	Thimet	phorate	Medium
Orthene	acephate	High	Thiodan	endosulfan	Low
Pageant	chlorpyrifos	Low	Topsin	thiophanate-methyl	Low
Paraton	methyl parathion	Low	Trapex, Vortex	methyl isothiocynate	High
Penncap M	methyl parathion	Low	Trichlorfon	dylax	High
Pentac	dienochlor	High	Trigard (IGR)	cyromazine	High
Phaser	endosulfan	Low	Triumph	Isazophos	High
Phosdrin	mevinphos	Medium	Turcam	bendiocarb	Low
Phostoxin	aluminum phosphide	Low	Vapam	metham sodium	Medium
Pounce	permethrin	Low	Vapona	dichlorvos	Low
Primetrin, Persect	permethrin	Low	Vectrin	resmethrin	Low
Propetamphos	seraphos	Low	Vitavex	carboxin	Low
Propoxur	propoxur	High	Vydate	oxamyl	High
Proxol	trichlorfon	High	**FUNGICIDES**		
Pyrenone	permethrin	Low	**BRAND NAME**	**COMMON NAME**	**RATING**
Pyrethrins	pyrethrins	Low	Aliette	fosetyl-aluminum	Low
Pyrethoids	pyrethrins	Low	Apron	metalaxyl	High
Rabon	tetrachlorvinphos	Low	Banner	propiconazole	High
Reldon	chlorpyrifos methyl	Low	Banol	propamocarb	Low
Safrotin	seraphos	High	Banrot	etridiazole + thiophanate-methyl	High
Savey	hexythiazox	Low	Bayleton	triadimefon	Medium
Scout	tralomethrin	Low	Benlate	benomyl	Medium
Sevin	carbaryl	Medium	Botran	DCNA	High
Sniper	metiltriazotian	Medium	Bravo	chlorothalonil	Medium
Spectracide	diazinone	Medium	Captan	captan	Low
Sunspray Oil	mineral oil	Low/Med	Carbamate	ferbam	Medium
Super-Tin	triphenyltin hydroxide	Low	Chipco 26019	iprodione	Low
Supracide	methamidophos	High	Cleary's 3336-F	thiophanate-methyl	Low
Supreme Oil	mineral oil	Low/Med	Cleary's 3336-WP	thiophanate-methyl	Low
Swat	phosphamidon	High	Daconil	chlorothalonil	Medium

Table E-10 NAPRA Leachability Information for Registered Idaho Pesticides

FUNGICIDES			FUNGICIDES		
BRAND NAME	**COMMON NAME**	**RATING**	**BRAND NAME**	**COMMON NAME**	**RATING**
Dithane	mancozeb	Medium	Systhane	myclobutanil	High
Duosan	mancozeb	Medium	Terraclor	PCNB	Low
Duosan	mancozeb + thiophanate-methyl	Medium	Terraguard	triflumizole	High
Ferbam	ferbam	Medium	Terrazole	etridiazole	High
Flo-Pro	imazalil	Medium	Thiram	thiram	Medium
Fore	mancozeb	Medium	Tilt	propiconazole	High
Funginex	triforine	Medium	Topsin M	thiophanate-methyl	Low
Fungo	thiophanate-methyl	Low	Truban	etridiazole	High
Griffen Manex	maneb	Medium	Vitavax	carboxin	Low
Gustafson 42S	thiram	Medium	Vorlan	vinclozolin	High
Helena Bravo	chlorothalonil + sulfur	Medium	Ziram	ziram	Medium
Koban	etridiazole	High	Zyban	mancozeb + thiophanate-methyl	Medium
Lanco Captan	captan	low	**NEMATICIDES**		
Lesco	PCNB	Low	**BRAND NAME**	**COMMON NAME**	**RATING**
Lesco	thiram	Medium	Basamid	dazomet	High
Lorsban	chorpyrifos	Low	Counter	terbufos	Low
Maneb	maneb	Medium	Furadan	carbofuran	High
Manex	mancozeb	Medium	Mocap	ethoprop	High
Manzate	mancozeb	Medium	Nemacur	fenamiphos	High
Mertect	thiabendazole	High	Ridomil	metalaxyl	High
Mocap	ethoprop	High	Temik	aldicarb	High
Orbit	propiconazole	High	Thiram	thiram	Low
Ornalin	vinclozolin	High	Telone C-17	1,3-dichloropropene + chlo-ropicrin	Medium
Pace (M)	mancozeb	Medium	Telone II	1,3-dichloropropene	Medium
Pace (M)	metalaxyl	High	Vydate L	oxamyl	High
Penncozeb	mancozeb	Medium	**FUMIGANTS**		
Pipron	piperalin	Low	**BRAND NAME**	**COMMON NAME**	**RATING**
Plantvax	oxycarboxin	High	Brom-O-Gas	methyl bromide	High
Polyram	metiram	Low	Busan	metham sodium salt	High
Pro-Tex	maneb + triphenyltin hydroxide	High	Chlor-O-Pic	chloropicrin	Low
Ridomil MZ	mancozeb + metalaxyl	High	MC(M)	methyl bromide	High
Ridomil/Bravo	chlorothalonil + metalaxyl	High	Meth-O-Gas	methyl bromide	High
Ronilan	vinclozolin	High	Methyl Bromide	methyl bromide	High
Rubigan	fenarimol	High	Terr-O-Gas	chloropicrin + methyl bromide	High
Spotrete	thiram	Medium	Vapam	metham sodium salt	High
Subdue	metalaxyl	High			
Super-Tin	triphenyltin hydroxide	Low			

Using the Susceptibility Rating Flowcharts

Each susceptibility analysis will consider all sources that could potentially contribute regulated contaminants, *Cryptosporidium*, and turbidity (for surface water systems) to a PWS. The outcome of each susceptibility analysis will be a susceptibility rating that is specific to a certain potential contaminant or category of potential.

Susceptibility analyses on **ground water sources** involve three flowcharts:

Figure E-11: Hydrologic Sensitivity,

Figure E-12: Potential Contaminant Source/Land Use, and

Figure E-13: System Construction.

Susceptibility analyses on **surface water sources** involve two flowcharts:

Figure E-14: Potential Contaminant Source/Land Use, and

Figure E-15: System Construction.

The interim point totals from each flowchart are added together to arrive at an overall susceptibility rating. For ground water systems, the interim point totals are normalized to make each of the three flowchart susceptibility factors an equal proportion of the overall rating.

In general, the analysis involves navigating a series of flowcharts that results in an accumulation of points leading to an overall susceptibility score. The susceptibility analysis begins at the top of each flowchart with an initial point value labeled "X". Each factor (i.e., box) in the flowcharts is presented as a question to be answered by the evaluator using all available information sources, including those listed in Table E-7. The pathway out of each box is indicated as "yes" or "no." Certain pathways out of each box result in the addition of one or more points to the initial X value. As the flowchart is traversed, points accumulate based on the responses to the questions posed until the flowchart is completed. The greater number of points accumulated, the higher the susceptibility rating will be. An example of the actual susceptibility rating sheets used by IDEQ for a ground water source has been included in the sample report located in Appendix F.

Ground Water Systems- The factors pertinent to the susceptibility of ground water-based sources to potential contamination are summarized below.

Ground Water Hydrologic Sensitivity (Figure E-11)-

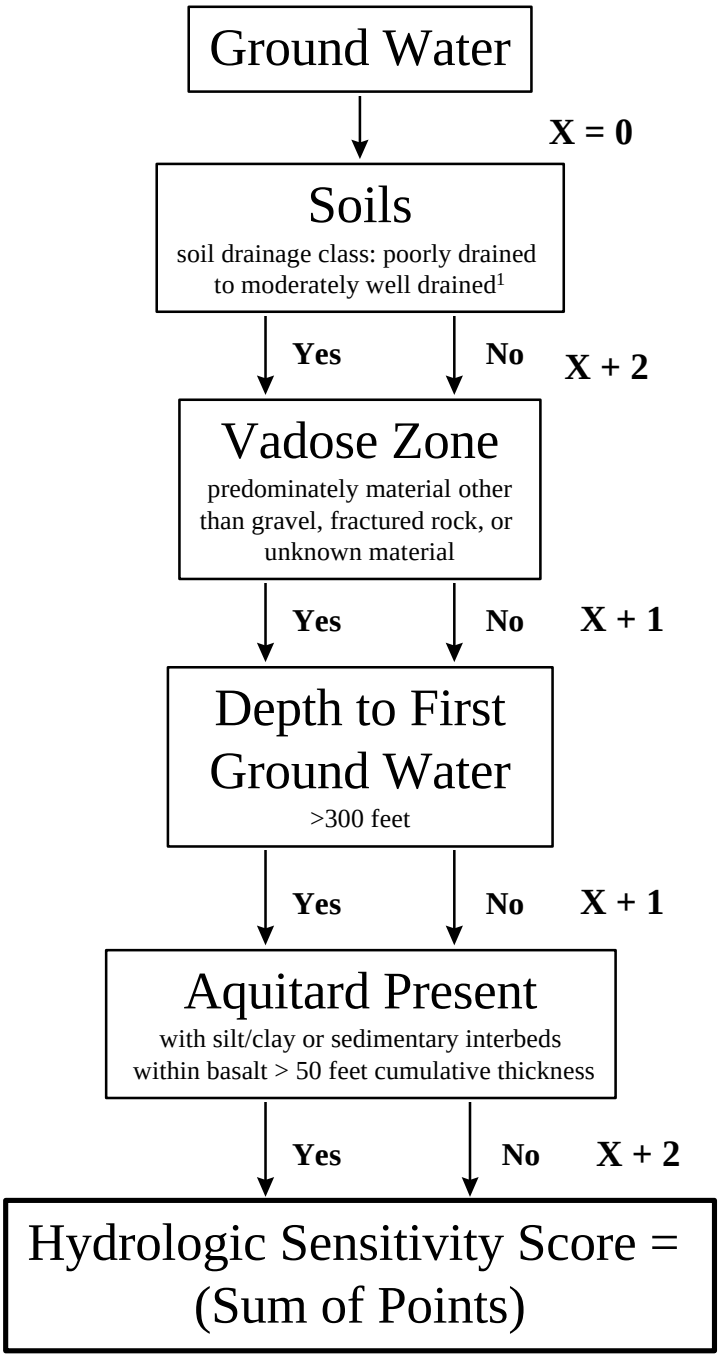
Soils.- Soil drainage classes (defined in soil surveys published by the NRCS) ranging from *poorly drained* to *moderately well drained* are deemed more protective of ground water than soils which drain faster (well drained).

Vadose zone.- Vadose zone materials comprised of gravel or fractured rock provide less protection from contamination than finer-grained sedimentary materials. Unknown vadose zone characteristics will also result in a higher sensitivity score.

Depth to first ground water.- All other factors being equal, a greater depth to ground water provides greater opportunity for potential contaminant attenuation through adsorption and other mechanisms (e.g., EPA, 1985; Rupert, 1994, 1997, 1998).

Aquitard.- The presence of at least 50 feet of cumulative thickness of silt or clay-rich geologic materials, or fine-grain sedimentary interbeds within basalt settings, is considered protective of ground water.

Figure E-11. Ground Water Hydrologic Sensitivity



0 or 1 = Low Hydrologic Sensitivity Score
2 to 4 = Moderate Hydrologic Sensitivity Score
5 or 6 = High Hydrologic Sensitivity Score

[1] Terminology based on NRCS description of soil drainage classes for natural soil.

Ground Water Potential Contaminant Source/Land Use (Figure E-12)-

Land use.- Areas dominated by urban, commercial, and irrigated agricultural land uses are thought to experience higher incidences of ground water contamination (EPA, 1985; Tesoriero and Voss, 1997; Rupert, 1998).

Farm chemical use.- All other factors remaining equal, the increased use of farm chemicals is thought to increase the potential for these chemicals to contaminate ground water (EPA, 1985; Rupert, 1994, 1997, 1998; Ritter, et al., 1998; Soutter, and Musy, 1998).

Potential contaminant sources in Zone IA[1].- IDAPA 16.01.08, *Idaho Rules for Public Drinking Water Systems* require that all public drinking water wells be located at least 50 feet from potential sources of contamination. Any potential contaminant source in this delineation zone results in the PWS receiving a high susceptibility rating for potential contaminants associated with that source.

Potential contaminant sources in Zones IB, II, or III[2].- The presence of potential contaminant sources adds to the susceptibility of the PWS. A higher susceptibility score is given to potential contaminant sources nearest the well as represented by the various delineation zones. For potential contaminant sources found in Zones IB or II, the susceptibility score increases with the number of these sources that are found. For example, three potential sources of a given contaminant discovered in Zone IB would result in six points being added to the susceptibility score for that potential contaminant (i.e., X+2 iterated three times). It is important to note that consideration of the number of potential contaminant sources in the various travel time zones is specific to the potential contaminant or potential contaminant category being evaluated. For example, potential sources of VOCs found in Zone IB would result in points being added to the susceptibility score when VOCs are being considered. The presence of these VOC sources would not affect the PWS susceptibility as it relates to IOCs or any other category of potential contaminants.

Agricultural land.- Nonpoint source contaminants are considered by evaluating the land area occupied by agricultural land uses within Zones IB, II, and III. The potential for nonpoint source

[1]Zone IA is the sanitary setback distance for public drinking water wells (50-foot radius).

[2]Zones IB, II, and III are represented by the three-year, six-year, and ten-year time of travel (the time necessary for ground water to move from the zone boundary to the well), respectively.

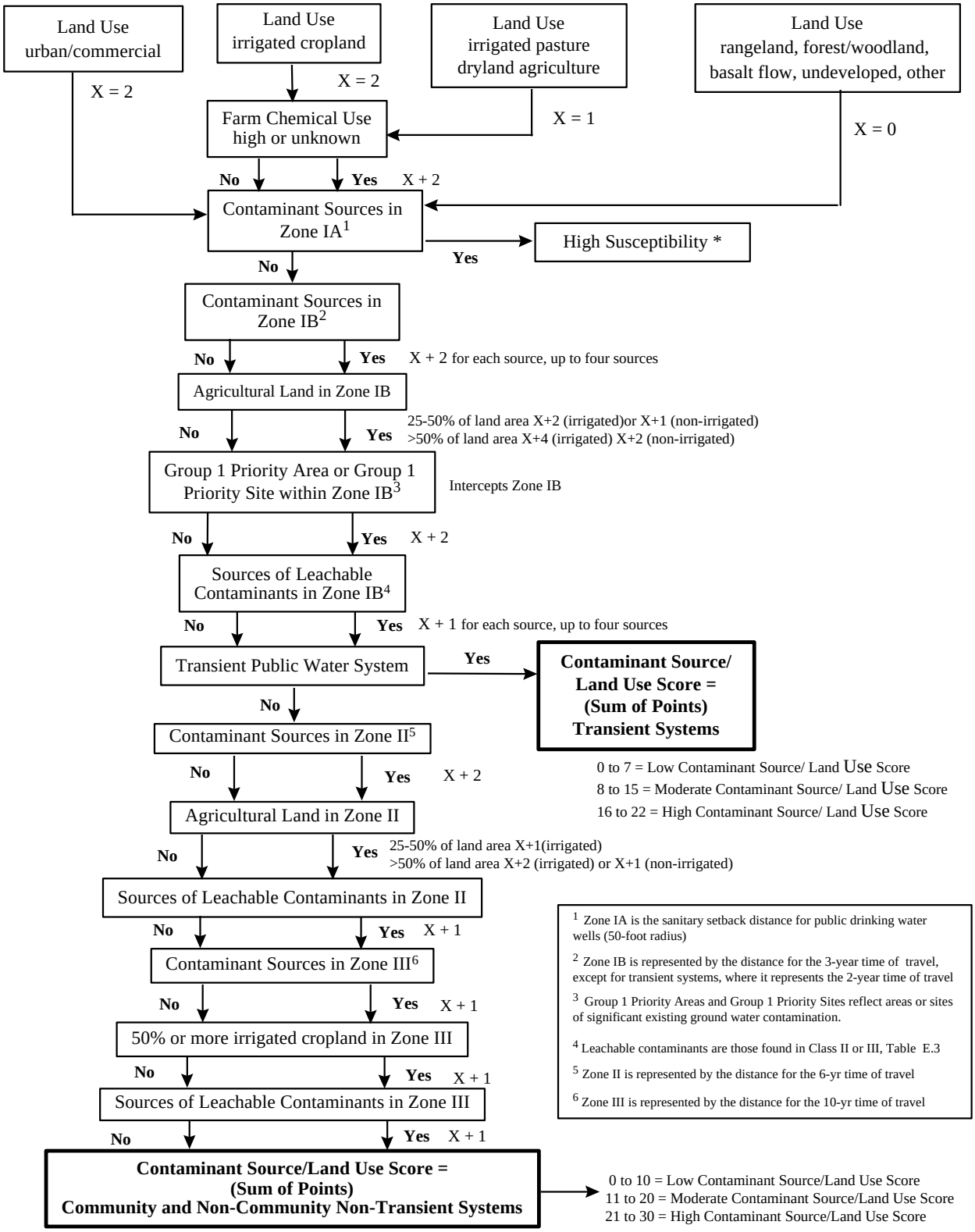
contamination to occur is considered to increase with the amount of land under agricultural land uses. Agricultural land nearest the PWS well is believed to represent a higher risk of contamination than agricultural land farther away from the well. Irrigated agricultural land is thought to represent a higher potential for contamination than non-irrigated land due to the downward hydraulic driving force of the irrigation water.

Noncommunity Transient Systems.- Source water delineations are performed differently for transient PWSs than for community and noncommunity nontransient PWSs. For transient PWSs, there is no consideration of potentially significant contaminant sources or other susceptibility factors farther away than Zone IB. The distance represented by Zone IB for transient PWSs is based on the two-year time of travel, rather than the three-year time of travel as it is for other types of PWSs.

Existing Contamination.- Existing ground water contamination is also factored into the susceptibility rating. Statewide ground water monitoring priority areas in Idaho have been established by the Ground Water Monitoring Technical Committee. Group I Priority Areas (or Sites) are considered to represent the areas of most significant ground water contamination. The prioritization of these areas takes into account existing ground water quality, vulnerability, and potential impacts to human health or other beneficial uses. The susceptibility score is increased if a Group I Priority Site is located within Zone IB or if Zone IB intercepts a Group I Priority area.

Sources of leachable potential contaminants.- After considering the presence and location of the potential contaminant sources, the relative leachability of the potential contaminants associated with the potential sources is factored into the susceptibility rating. The presence of sources of highly leachable Class II or III potential contaminants (Table E-3) results in higher risk to the PWS.

Figure E-12. Ground Water Potential Contaminant Source/Land Use



*Public water systems may petition IDEQ to revise susceptibility rating based on elimination of contaminant sources or other site-specific factors.

Ground Water Source Construction. (Figure E-13)-

Current minimum well construction standards.- Compliance with current construction standards defined by the IDWR (or some other standard engineering practice applicable to PWSs) is deemed a positive factor in terms of protecting the PWS from contamination. The results of sanitary surveys performed by IDEQ or any of the Idaho District Health Departments will also be considered a positive factor.

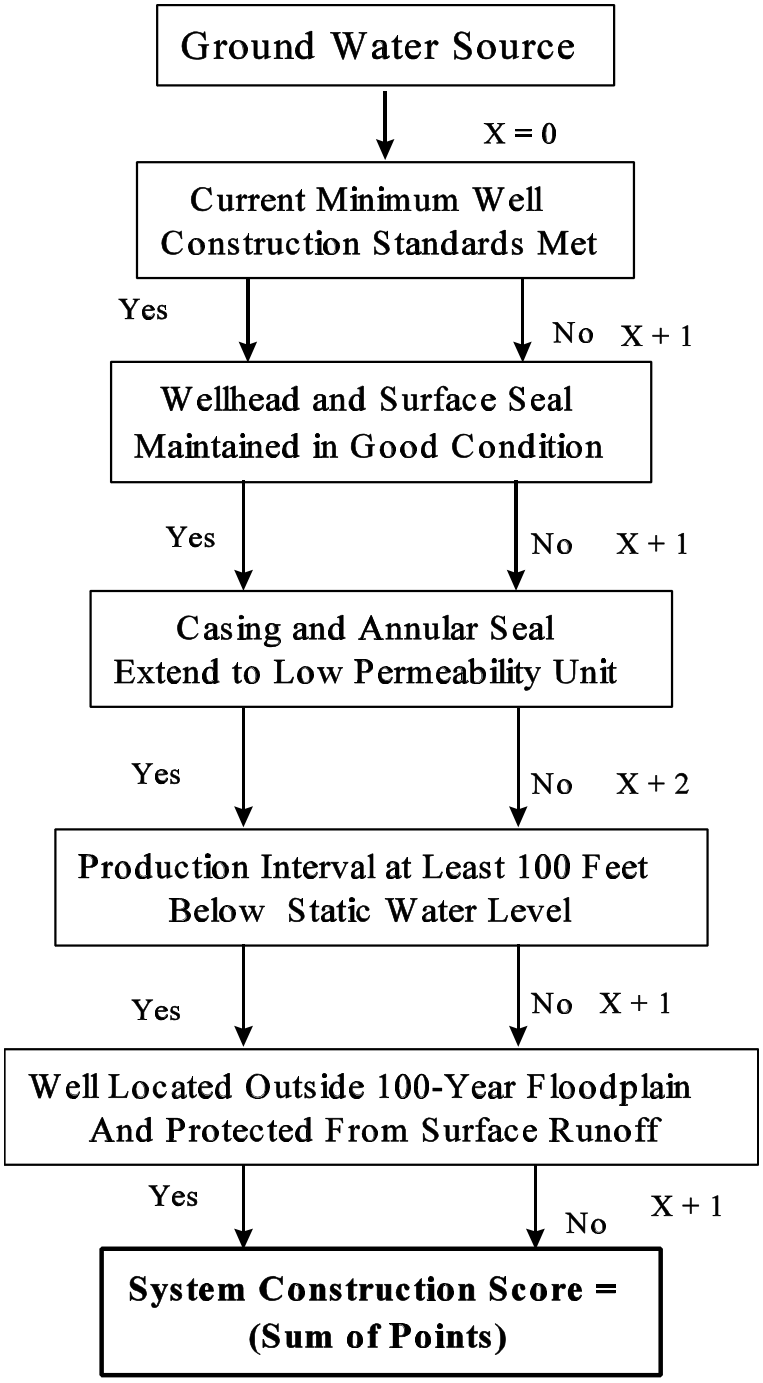
Wellhead and surface seal.- No points are added to the susceptibility score if the wellhead and surface seal are shown to be maintained in good condition.

Casing and annular seal extending to a low-permeability unit.- Documentation (i.e., from well driller reports or equivalent) that the well includes casing and an annular seal extending to a low-permeability unit prevents the addition of points to the susceptibility score.

Production interval at least 100 feet below the static water level.- Water drawn from deeper portions of an aquifer is typically buffered from most potential contaminants introduced at the land surface. Rupert (1994) observed lower nitrate concentrations in wells where water was withdrawn from levels greater than 100 feet below the static water level. Further scientific support for this idea is reported by Tesoriero and Voss (1997).

Well located outside 100-year floodplain and protected from surface runoff.- Location and construction characteristics can help prevent direct contact between the wellhead and storm, flood or irrigation water. These are deemed important in protecting the well from contamination.

Figure E-13. Ground Water Source Construction



0 to 1 = Low System Construction Score
2 to 4 = Moderate System Construction Score
5 to 6 = High System Construction Score

Surface Water Sources.- The factors pertinent to the susceptibility of surface water-based source to contamination are summarized below.

Surface Water Potential Contaminant Source/Land Use. (Figure E-14)

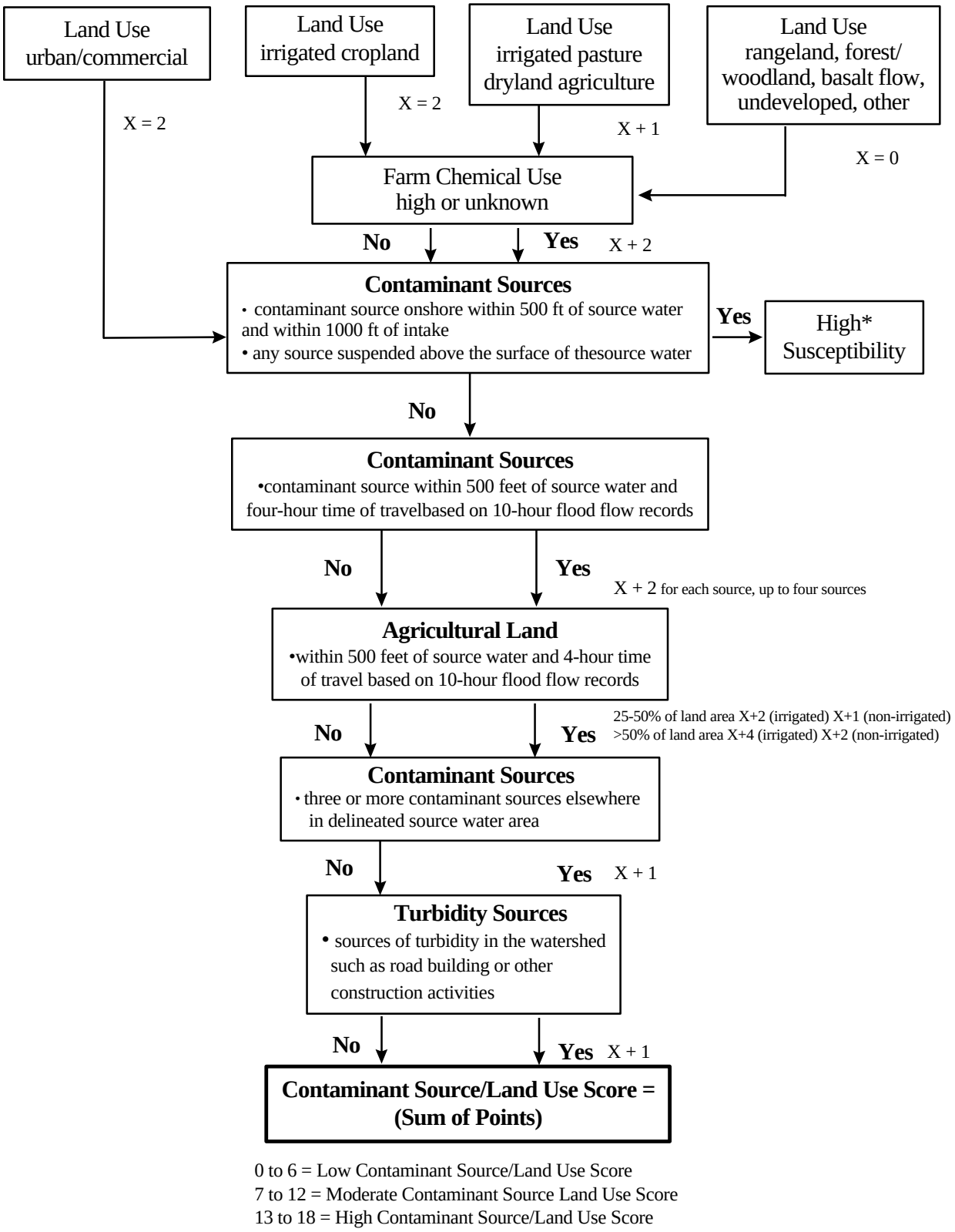
Land use.- Areas dominated by urban, commercial, and irrigated agricultural land uses are thought to provide significant contributions of potential contaminants to surface water (Martin et al., 1996; Low, 1991).

Farm chemical use.- All other factors remaining equal, the increased use of farm chemicals is thought to increase the potential for these chemicals to contaminate surface water (Martin et al., 1996; Low, 1991).

Potential contaminant sources.- The presence of potential contaminant sources is of extreme importance in determining the susceptibility of surface water systems to contamination. The susceptibility analysis employs the concept that potential contaminant sources located closer to the intake pose more risk to the PWS. Dilution and other attenuation mechanisms decrease the risk to the PWS for those potential contaminant sources located a greater distance from the intake (e.g., Martin et al., 1996; Barber et al., 1995; Pereira et al., 1994). Potential contaminant sources located within 500 feet of the bank or shore of the source water or within 1000 feet of the system intake result in the PWS receiving a high susceptibility rating for those potential contaminants associated with those sources. Potential contaminant sources suspended above the surface of a source water, such as on a dock or a pipeline crossing, also result in the PWS receiving a high susceptibility rating.

Potential contaminant sources located within 500 feet of the shoreline, and within a distance from the intake represented by the four-hour streamflow time-of-travel during a ten year flood event, results in a relatively high susceptibility score. For potential contaminant sources found in this zone, the susceptibility score increases with the number of these sources that are found. For example, two potential contaminant sources discovered in this zone would result in four points being added to the susceptibility score (i.e., X+2 iterated twice).

Figure E-14. Surface Water Potential Contaminant Source/Land Use



0 to 6 = Low Contaminant Source/Land Use Score
7 to 12 = Moderate Contaminant Source Land Use Score
13 to 18 = High Contaminant Source/Land Use Score

*Public water systems may petition IDEQ to revise susceptibility rating based on elimination of contaminant sources or other site-specific factors.

One additional point is added to the susceptibility score if three or more potential contaminant sources are found in the delineated source water assessment area, outside of the 100-year floodplain and either the 25 mile upstream or the four-hour streamflow time-of-travel zone, whichever is greater.

Agricultural land.- Nonpoint source contaminants are considered by evaluating the land area occupied by agricultural land uses within 500 feet of the source water and within a four-hour time-of-travel upstream from the PWS intake. The potential for nonpoint source contamination to occur is considered to increase with the amount of land under agricultural land uses. Irrigated agricultural land is thought to represent a higher potential for contamination than non-irrigated land due to the increased potential for irrigation water runoff.

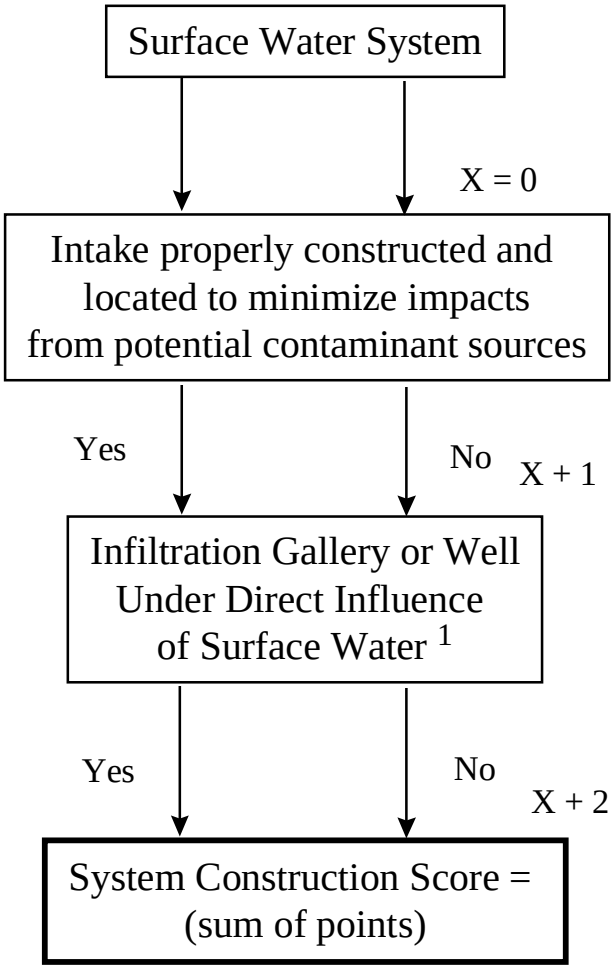
Turbidity Sources.- High turbidity is recognized as a detrimental property to many surface water PWSs as it can affect the efficiency of treatment systems and can be considered a surrogate for other contamination problems. Therefore, sources of turbidity such as intense road building or other construction activities cause an increase in the susceptibility score.

Surface Water Source Construction. (Figure E-15)-

Intake properly constructed and located to minimize impacts from potential contaminant sources.- The risk to the PWS is considered less if the intake is constructed with the proper material and in such a fashion as to prevent the infiltration of unwanted water with the potential to carry contaminants. Furthermore, the location of the intake with respect to vulnerable areas of the source water body is deemed an important consideration.

Infiltration gallery or well under the direct influence of surface water.- Any amount of soil, riverbed, or lakebed material between the source water and the intake may add some level of protection from potential contaminants. PWSs with these features are assessed a lower susceptibility score. The infiltration gallery or wells determined by IDEQ criteria to be under the direct influence of surface water will be subject to susceptibility analyses by both ground water and surface water rating schemes.

Figure Surface Water System Construction



0 = Low System Construction Score
1 or 2 = Moderate System Construction Score
3 = High System Construction Score

[1] Wells under the direct influence of surface water are evaluated both as ground water and surface water systems.

Special Considerations for Noncommunity Transient Systems

For noncommunity transient PWSs, susceptibility analyses are performed with minor modifications due to the fixed-radius method used to delineate their source water assessment area. In the case of noncommunity-transient ground water systems, the boundary of Zone IB represents the two-year time-of-travel boundary rather than the three-year time-of-travel boundary, as it does for other types of PWSs. In the flowchart evaluating potential contaminant sources and land use, potential contaminant sources are considered only if they fall within Zones IA or IB.

Without the consideration of Zones II and III, noncommunity-transient PWSs are subject to fewer susceptibility points. This difference in available points is reflected in the factors used to normalize the Potential Contaminant Source/Land Use scores for ground water systems. Noncommunity transient ground water systems have a normalization factor of 0.27. Other types of PWSs using ground water have a normalization factor of 0.20. These factors appear on the Idaho Source Water Protection Susceptibility Rating Sheet, Figure E-16.

Adjustment of a Susceptibility Rating

The analysis described above relies heavily on generalized information about a PWS and the factors leading to its susceptibility to potential contamination. It is viewed as a qualitative, screening-level procedure leading to a susceptibility rating that is, in essence, a scientific estimate. The susceptibility rating for a PWS source may be revised based on the acquisition of additional or updated information. For example, hydrogeologic data originally obtained from an existing regional study may be replaced by a site-specific, detailed assessment commissioned by the PWS owner or a natural resource agency. All factors considered in the susceptibility analysis are subject to modification if more detailed information becomes available during the review process.

Figure E-16. Idaho Source Water Assessment Plan Susceptibility Rating Sheet

Date _____ **Potential Contaminant/Contaminant Category** _____

PWS Name _____ **PWS #** _____

PWS Well/Intake Identification _____

Person Conducting Assessment _____

Ground Water Source

Community and Noncommunity, nontransient systems	Transient Systems
Hydrologic Sensitivity Score = _____	Hydrologic Sensitivity Score = _____
Potential Contaminant Source/ Land Use Score _____ × 0.20 = _____	Potential Contaminant Source/ Land Use Score _____ × 0.27 = _____
Source Construction Score = _____	Source Construction Score = _____
Total (round to nearest whole number): _____	Total (round to nearest whole number): _____

(circle the rank) Rank: Low = 0-5; Moderate = 6-12; High = 13-18

Surface Water Source

Any Surface Water Source
Potential Contaminant Source/Land Use Score = _____
Source Construction Score = _____
Total: _____

(circle the rank) Rank: Low = 0-7; Moderate = 8-15; High = 16-21

Comments:

Potential Contaminant Leachability Categorization

The relative propensity of an organic compound leaching to ground water was estimated using the convective mobility model of Jury, et al. (1983, 1984). This model accounts for the partitioning of an applied chemical between its vapor, liquid and adsorbed phases, and estimates an effective solute convection velocity based on the equation: $V_E = J_w/(D_bK_D + aK_H)$ where:

V_E = effective solute convection velocity
J_w = water flux (infiltration)
D_b = soil bulk density
K_D = soil-liquid distribution coefficient
a = volumetric air content in soil
K_H = Henry's Law constant

This approach neglects degradation, transport of organic vapors to ground water, and losses to the atmosphere due to volatilization. Degradation was not included in the susceptibility analysis because the variety of contamination degrading mechanisms under different site conditions has led to a wide range of literature values for the potential contaminant half-lives. Volatilization to the atmosphere is similarly dependent on the assumed conditions of application. Vapor transport in the subsurface will be most significant for volatile compounds, but the most volatile compounds are often the ones least prone to partitioning into water. The convection mechanism is expected to be the most significant transport mechanism for most of the compounds of interest.

For a given chemical, this simple model requires the soil-liquid distribution coefficient, K_D, and Henry's Law constant, K_H. These parameters were available for about two-thirds of the compounds of interest from the Superfund Chemical Data Matrix (EPA, 1997c). The leachability of compounds and metals for which model input parameters were not available were assessed qualitatively taking into consideration knowledge of their occurrence and fate in the environment. In several cases, potential contaminants lacking fate and transport information were placed into Class III as a conservative estimate of their mobility.

Site characteristics incorporated into the model are infiltration, soil bulk density, volumetric water content, and volumetric air content. Previous modeling of the leaching of petroleum hydrocarbons using the model SESOIL (Seasonal Soil Compartment Model, Bonazountas and Wagner, 1982) indicated

that two infiltration classes, typical of Boise and of Coeur d'Alene climatic conditions, were adequate for modeling hydrocarbon leaching at 105 stations in Idaho (IDEQ, 1996). In the Jury model, leaching is proportional to the water infiltration rate, so the rank order would not depend on the infiltration rate. For susceptibility ranking, 30 inches per year infiltration and 26 percent volumetric soil moisture content, similar to the Coeur d'Alene infiltration class were adopted. The soil bulk density was assumed to be 110 pounds per cubic foot, a value in the range typically used in engineering calculations. A soil porosity of 35 percent was assumed, and the volumetric air content was calculated by difference to be nine percent.

A frequency distribution analysis was performed on the calculated convection velocities. The distribution showed discontinuities suggesting a division into three relative leachability ranges. Convection velocities less than 24 inches per year correspond to relatively low leachability (Class I), while V_E values between 24 and 84 inches per year exhibit medium relative leachability (Class II) and V_E values greater than 84 inches per year represent high relative leachability (Class III).

If K_D and K_H were unknown for any compound, its relative leachability was assumed to be high. Table E-3 lists the potential contaminants according to their leachability groups. Inorganic substances such as metals, anions and radionuclides can each assume various chemical forms (oxidation states), each with a different leachability. However, in most cases it is expected that it will be impractical to obtain information about the oxidation states of these substances during a contaminant inventory. For this reason, these substances have been assigned to Class III. This is a conservative approach, intended to be protective of human health. For some drinking water sources, detailed site-specific data may be available regarding the oxidation states of inorganic/radionuclide contaminants present and related environmental conditions. If so, this information could potentially be used in individual cases to justify a site-specific assignment of some of these substances to Class II or Class I.

APPENDIX F
EXAMPLE SOURCE WATER ASSESSMENT FINAL REPORT

SOURCE WATER ASSESSMENT FOR VALLEYTOWN, IDAHO

Executive Summary

The Safe Drinking Water Act Amendments of 1996 require that a source water assessment be completed for all public water systems by the year 2003 based on the Idaho Source Water Assessment Plan. The Source Water Assessment Plan provides for a number of tasks to be completed by IDEQ to determine the risk of present and future contamination for the Valleytown, Idaho public water system. The source water assessment tasks for your system completed by IDEQ include:

- development of a delineation area around your water source to demonstrate the potential flow of water through your aquifer;

- potential contaminant source inventory within the delineated area;

- determination of the susceptibility of your system to the potential contaminants found during the inventory;

- development of this report to inform the constituents of the Valleytown, Idaho public water system of the results of the assessment.

The results indicate that the Valleytown public water system well #1 has a high susceptibility to contamination from a number of potential contaminant sources. However, this does not mean that any activity, past, present, or future being conducted within Valleytown, Idaho is not in full compliance with current environmental regulations.

What this does mean is that IDEQ would recommend that Valleytown, Idaho take additional precautions to ensure the continued health of its public water system supply. IDEQ recognizes that prevention is, and probably will continue in the future to be, a cheaper alternative than treatment for most public water systems. Protection efforts could take on a number of options including, but not limited, to the development of a wellhead protection plan, changes to the city's comprehensive land use plan, or the purchase of land surrounding the city's well field to act as a buffer to contaminants. Should you desire additional help in developing one of these options, contact your IDEQ regional office.

SOURCE WATER ASSESSMENT FOR VALLEYTOWN, IDAHO

Section 1. Introduction

The Idaho Division of Environmental Quality (IDEQ), in conjunction with a public advisory committee, prepared the 1999 Idaho Source Water Assessment Plan in response to requirements set forth by the 1996 Safe Drinking Water Act Amendments. The Amendments require states to assess the source water from which public water systems draw their drinking water supplies. Once completed, source water assessments provide information on potential contaminant threats to public drinking water systems and its relative susceptibility to contaminants regulated by the Act. The susceptibility determination is a qualitative, screening-level analysis, which uses general assumptions and best professional judgement. Within each delineated source water assessment area, the susceptibility analysis considers hydrogeologic sensitivity, potentially significant contaminant sources, land use and land use characteristics, and well construction integrity. The outcome of the susceptibility analysis can be updated or revised as additional or new site-specific information becomes available. The plan describes the major components of, and the procedures for, conducting source water assessments. The assessment include:

- development of a delineation area around your water source to demonstrate the potential flow of water through your aquifer;
- potential contaminant source inventory within the delineated area;
- determination of the susceptibility of your system to the potential contaminants found during the inventory;
- development of this report to inform the constituents of the Valleytown, Idaho public water system of the results of the assessment.

The ultimate goal of the Source Water Assessment Plan is to provide data to local communities to develop a protection strategy for their drinking water supply system. IDEQ recognizes that pollution prevention activities generally require less time and money to implement than does treatment of a public water supply system once it has been contaminated. As such, the initial assessment report may not by itself provide all the information needed to develop a comprehensive local source water protection initiative. For instance, local entities may wish to include additional considerations into local land use planning and zoning such as:

- existing or proposed buffer zones
- high rates of commercial lawn care or fertilizer application
- high volumes of ponding storm water runoff
- areas of high ground water/shallow bedrock and dense septic systems
- zoning overlays and/or existing local land use information
- community septic systems or industrial/commercial-oriented systems
- lands identified for acquisition or easement
- important land ownership information
- 100-year floodplain boundary

The decision as to the amount and types of data necessary to develop a source water protection program may be limited by the local community.

Section 2. Conducting the Assessment

Prior to beginning the assessment, existing water quality data for Valleytown, Idaho was compiled. This data consisted of a number of water quality studies conducted by IDEQ in 1992, and data from the IDEQ Drinking Water Information Management System. Elevated levels of nutrients, primarily nitrate-nitrogen, were detected in 68% of the private water wells and both public drinking water supply wells sampled.

Water sampling by Valleytown public water system officials indicate seasonally elevated nitrate-nitrogen and agricultural pesticide concentrations in both the raw and finished water. There have been no occasions when the observed concentrations have been above the established maximum contaminant levels for these parameters.

The first step in completing an assessment is determining the time of travel for fluids in the aquifer. IDEQ used a refined computer model approved by the Environmental Protection Agency in determining the 3-, 6-, and 10- year time of travel for fluids associated with the Valleytown, Idaho aquifer. The computer model used site specific data collected by IDEQ in making this determination. The delineated source water assessment area for Valleytown, Idaho has a long narrow shape and has a total drainage area of approximately 1632 acres. The actual data used by IDEQ in determining the source water assessment delineation area is available upon request.

Another important requirement of conducting a source water assessment is to develop a potential contaminant source inventory within the delineated source water assessment area (see attached map and inventory list for specific types of potential contaminant sources.). This involves collecting, recording, and mapping known contaminant and potential contaminant sources and various land use activities within the delineation area.

The inventory process goal is to locate and describe those facilities, land uses, and environmental conditions which are potential sources of ground water contamination. For example, several facilities may be identified as potential contamination sources, characterized for the types of activities take place on-site: using, producing, handling, or storing contaminants of concern. These types of activity cause the facilities to be identified as potential contamination sources. When a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation with any local, state, or federal environmental law or regulation.

The vast majority of members of the Source Water Assessment Advisory Committee felt very strongly that the names and addresses of potential significant contaminant sources should not be distributed on a routine basis. While that information will be available from the IDEQ upon request, members of the committee felt that actively distributing this level of detail would have the potential to create hard feelings with the owners of those potential significant contaminant sources. Because local business communities tend to be more

organized and active than other segments of most communities, that antagonism could actually inhibit the implementation of local protection activities. Overall, providing the names and addresses of potential significant contaminant sources is not needed to promote local support for protection activities. A map of general categories of potential contaminant sources in the source water assessment area, along with the assessment report, provides good information on the relative susceptibility of a public water system.

The potential contaminant source locations were derived from IDEQ databases and statewide Geographic Information System coverages maintained by the IDEQ. In contrast, known contamination sources are also identified during the inventory, where contaminants are known to have been released onto or into the ground. The review of the available databases indicate that a total of 18 potential significant contaminant sources exist in the source water assessment area for the community of Valleytown, Idaho. Seven potential significant contaminant sources (38%) are located in the 3-year time of travel zone with eleven potential significant contaminant sources, (55%) being located within the 6-year time of travel zone. The remaining sources (7%) are located in the 10-year time of travel zone.

The IDEQ based the susceptibility analyses on the delineation, primary potential contaminant source inventory, and additional information derived from an on-site, enhanced potential contaminant source inventory. Generally, a high susceptibility ranking means that there were multiple identified contamination sources of concern within the delineation area. Susceptibility analyses were conducted for each chemical category. The following are factor summaries describing the rationale for the susceptibility ranking.

1) Hydrologic Sensitivity

The hydrologic delineation of the source water area indicates that the sources are potentially sensitive due to well-drained soil types, near-surface permeable volcanic materials, and the lack of significant confining layers within the depth range of the wells being completed. All of these factors offer little filtering capacity for removing potential contaminants of concern prior to their impacting the drinking water source. These hydrologic sensitivity characteristics are natural conditions for the vicinity and therefore, cannot be minimized.

2) Well Construction

The construction of the Valleytown, Idaho public water system wells directly affects the ability of the wells to protect the aquifer from contaminants. In particular, the Valleytown, Idaho well #1 and #2 do not contain an annular seal, and well #2 was not cased into a low permeability geologic formation. As such, any spill that might occur next to the wells is liable to move down the annular space between the casing and the ground and contaminate the aquifer.

3) Potential Contaminant Source/Land Use

The factor associated with potential contaminant sources and land use are dependent upon the number and types of sources found within the delineated area. The delineation area for Valleytown, Idaho consists of the eastern one third of the city and irrigated agricultural cropland.

The potential contaminant sources associated with the assessment include industrial, municipal, residential, agricultural, and commercial sites.

Susceptibility analyses are conducted on ground water systems for each chemical category: volatile organic compounds (e.g., petroleum related products), synthetic organic compounds (e.g., pesticides), inorganic compounds (e.g., nitrate, nitrite), and microbial (bacteria) contaminants. Each analysis involves completion of three flowcharts: hydrologic sensitivity, potential contaminant source/land use, and system construction (Tables X-1, X-2, and X-3 respectively). The interim point totals from each flowchart are added together to arrive at an overall susceptibility rating (Table X-4) for the source. The summary table listed below indicates the relative susceptibility of the Valleytown, Idaho public water system.

SUMMARY TABLE OF FINAL SOURCE WATER ASSESSMENT RESULTS, WELL #1, VALLEY TOWN, IDAHO:		
Category		**Susceptibility Ranking**
Hydrologic Sensitivity		High
Potential Contaminant Source/Land Use		
	Volatile Organic Compounds	High
	Synthetic Organic Compounds	High
	Inorganic Compounds	High
	Bacteria (Microbial)	High
System Construction		High
Final Source Water Assessment Ranking		**High**

Section 4. Options for Source Water Protection

The susceptibility analysis indicates that Valleytown, Idaho's well field has a high susceptibility to contamination, which is confirmed by the presence of a number of regulated contaminants in drinking water monitoring samples. This points Valleytown to placing a high priority on protecting their drinking water supply from current contamination and from the potential of other contaminant sources impacting their water supply.

Present land use practices appear to be having an adverse impact on the drinking water supply. This is evidenced by the relative "poor" health of the water quality with a significant quantity of the private wells and both city wells showing impacted water quality from a number of regulated contaminants.

Protection activities should focus on the collection of additional information on the sources present in the 3- and 6- year time of travel zones to evaluate their risk. In addition, water quality data collect by IDEQ

in 1992 indicate that the potential exists for other contaminant sources to impact the water supply. Potential significant contaminant sources present in the 3-year time of travel zone need to be properly managed to prevent further degradation. Protection options need to be actively considered to further evaluate and manage all potential sources and Valleytown should place a high priority on protecting its drinking water supply. Protection efforts could take on a number of options including, but not limited to the development of a wellhead protection plan, changes to the city's comprehensive land use plan, or the purchase of land surrounding the city's well field to act a buffer to contaminants. Should you desire additional help in developing one of these options, contact your IDEQ regional office.

Figure X-X. Valleytown, Idaho Source Water Delinaeation & Contaminant Source Inventory

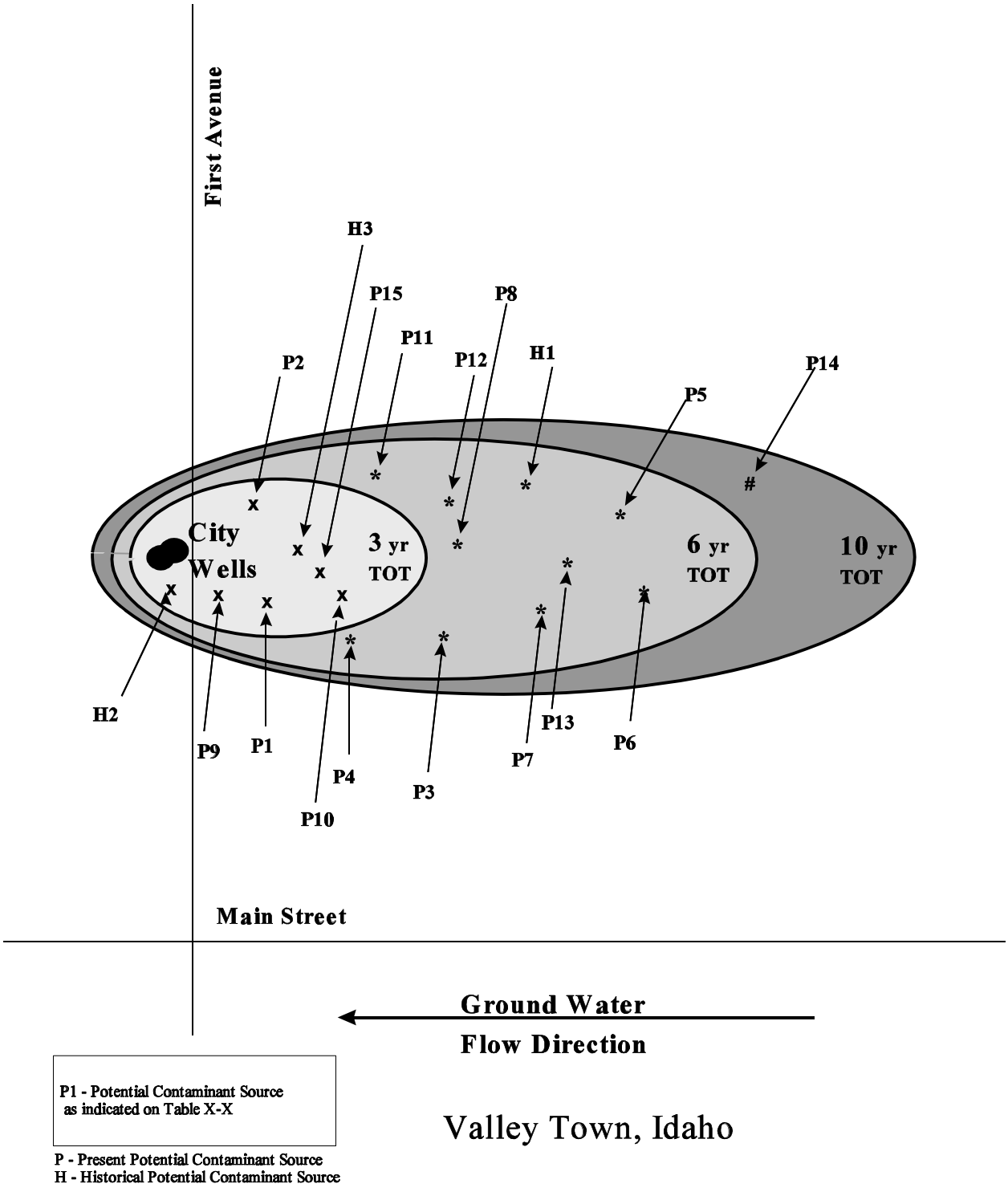


Table X-X. Valleytown, Idaho Potential Contaminant Source Inventory				
Map #	**Source Category**	**TOT Zone**	**Source**	**Source of Information**
H1	Agricultural	6	Pesticide Storage, AST	Aerial Photographs
H2	Commercial	3	Failed Septic System	Database Search
H3	Municipal	3	WWTP	Database Search
P1	Agricultural	3	Storm Water Runoff	Enhanced Inventory
P2	Residential	3	Junk Vehicles, Tires,	Enhanced Inventory
P3	Commercial	6	Heating Oil, AST	Database Search
P4	Municipal	6	Salt Storage	Database Search
P5	Agricultural	6	Nutrients, Pesticides, Petroleum Products, UST	Enhanced Inventory
P6	Municipal	6	Salt Storage, Petroleum Products, AST	Database Search
P7	Municipal	6	Industrial Chemicals	Database Search
P8	Agricultural	6	Nutrients	Database Search
P9	Municipal	3	Pesticides, AST	Windshield Survey
P10	Commercial	3	Petroleum Products, UST	Enhanced Inventory
P11	Commercial	6	Petroleum Products, LUST	Enhanced Inventory
P12	Industrial	6	Hazardous Waste	Database Search
P13	Industrial	6	Explosives	Database Search
P14	Industrial	10	Junk Vehicles, Tires, Batteries, Antifreeze	Enhanced Inventory
P15	Agricultural	3	Nutrients, Pesticides, Petroleum Products, AST	Aerial Photographs, Enhanced Inventory

AST - Above ground Storage Tank UST - Underground Storage Tank
LUST - Leaking Underground Storage Tank WWTP - Waste Water Treatment Plant
TOT - Time of Travel P - Present Potential Contaminant Source
H - Historical Potential Contaminant Source

TABLE X-XX. VALLEYTOWN, IDAHO LAND USE AND SOILS STATISTICS

Soil Drainage Data

	Acres		Total Acres of Zone
	Well Drained	Poorly to Moderately Well Drained	
3-Year Time of Travel	473	39	512
6-Year Time of Travel	800	41	841
10-Year Time of Travel	279	0	279
Acres Total	**1552**	**80**	**1632**

	Percentages	
	Well Drained	Poorly to Moderately Well Drained
3-Year Time of Travel	93%	7%
6-Year Time of Travel	95%	5%
10-Year Time of Travel	100%	
Percentage of Total Acres	**95%**	**5%**

Land Use Data (Acres)

	Urban/Residential	Irrigated Agriculture	Dryland Agriculture	Total Acres
3-Year Time of Travel	128	311	73	512
6-Year Time of Travel	0	621	220	841
10-Year Time of Travel	0	214	65	279
Total Acres	**128**	**1146**	**358**	**1632**

Percentage of Land Use Type

	Urban/Residential	Irrigated Agriculture	Dryland Agriculture
3-Year Time of Travel	25%	61%	14%
6-Year Time of Travel	0%	74%	26%
10-Year Time of Travel	0%	77%	23%

TABLE X-XX. VALLEYTOWN, IDAHO LAND USE AND SOILS STATISTICS				
Percentage of Total Acres	**8%**	**70%**	**22%**	
Flood Plain Determination:	3-, 6-, 10-year time of travel zones outside 100 year floodplain			
Priority Area Determination:	Priority area for inorganic compounds (Nitrates)			
County Farm Chemical Use (Zone 1A)	Low			

TABLE X-1, HYDROLOGIC SENSITIVITY WORKSHEET

Public Water System Name: Valley Town, Idaho
Public Water System Number: XYZ123
Well Number: 1
Date: 8/5/99
Person Conducting Assessment: Ima Hydro Geologist

Version 2.1
5/19/99

		Value	Comments
(1) Do the soils belong to drainage classes in the poorly drained through moderately well drained categories?	○ Yes ◉ No	2	
(2) Is the vadose zone composed predominantly of gravel, fractured rock; or is unknown?	◉ Yes ○ No	1	
(3) Is the depth to first groundwater greater than 300 feet?	◉ Yes ○ No	0	
(4) Is an aquitard present with silt/clay or sedimentary interbeds within basalt with greater than 50 feet cumulative thickness?	○ Yes ◉ No	2	

Hydrologic Sensitivity Score = 5

Final Hydrologic Sensitivity Ranking: High Hydrologic Sensitivity Score (5 to 6 points)

TABLE X-2, POTENTIAL CONTAMINANT SOURCE/LAND USE WORKSHEET

Public Water System Name: Valley Town, Idaho
Public Water System Number: XYZ123
Well Number: 1
Date: 36377
Person Conducting Assessment: Ima Hydro Geologist

Version 2.1

5/19/99

Land Use/Zone IA

			IOC Score	VOC Score	SOC Score	Microbial Score	Comment
(1)	Land Use (Pick the Predominant Land Type)	Urban/Commercial	2	2	2	2	
(2)	Is Farm Chemical Use High or Unknown? (Answer No if (1) = Urban/Commercial)	○ Yes ◉ No	Stop: Go Directly to Step 3				
2a	Indicate appropriate chemical category	☐ IOCs ☐ VOCs ☐ SOCs	0	0	0	0	
(3)	Are IOC, VOC, SOC, Microbial or Radionuclide contaminant sources Present in Zone IA? OR Have SOC/VOC contaminants been detected in the well? OR have IOC contaminants been detected above MCL levels in the well? If Yes, please check the appropriate chemical	○ Yes ◉ No ☐ IOCs ☐ VOCs ☐ SOCs ☐ Microbials					
		Land Use Subtotal	**2**	**2**	**2**	**2**	

Zone IB

				IOC Score	VOC Score	SOC Score	Microbial Score	Comment
(4)	Contaminant Sources Present in Zone IB?	◉ Yes ○ No						
	Number of Sources in Zone IB in Each Category? (List sources by Category up to a Maximum of Four per Category)	**# IOC Sources**	4	8	8	4	6	
		# VOC Sources	4					
		# SOC Sources	2					
		# Microbial Sources	3					
(5)	Are there Sources of Class II or III Leachable Contaminants or Microbials in Zone IB? (List Sources up to a Maximum of Four per Category)	◉ Yes ○ No						
		# IOC Sources	4	4	4	2	0	
		# VOC Sources	4					
		# SOC Sources	2					
(6)	Does a Group 1 Priority Area Intercept or Group 1 Priority Site Fall Within Zone IB?	◉ Yes ○ No ☑ IOCs ☐ VOCs ☐ SOCs ☐ Microbials		2	0	0	0	
(7)	Pick the Best Description of the Amount and Type of Agricultural Land in Zone IB.	Greater Than 50 % Irrigated Agricultural Land		4	4	4	4	
		Zone IB Subtotal		**18**	**16**	**10**	**10**	

TABLE X-2, POTENTIAL CONTAMINANT SOURCE/LAND USE WORKSHEET, Cont.

				IOC Score	VOC Score	SOC Score	Microbial Score
(8)	Is this a Transient Public Water System?	○ Yes ◉ No	**Continue to (9)**				
	Zone II						
(9)	Are Contaminant Sources Present in Zone II?	◉ Yes ○ No	**Complete Step 9a**				
9a	What types of chemicals?	☑ IOCs ☑ VOCs ☑ SOCs		2	2	2	0
(10)	Are there Sources of Class II or III Leachable Contaminants in Zone II?	◉ Yes ○ No	**Complete Step 10a**				
10a	What type of contaminant?	☑ IOCs ☑ VOCs ☑ SOCs		1	1	1	0
(11)	Pick the Best Description of the Amount and Type of Agricultural Land in Zone II.	Greater Than 50 % Non-Irrigated Agricultural Land		1	1	1	0
		Zone II Subtotal		**4**	**4**	**4**	**0**
	Zone III			**IOC Score**	**VOC Score**	**SOC Score**	**Microbial Score**
(12)	Contaminant Sources Present in Zone III?	◉ Yes ○ No	**Complete Step 12a**				
12a	What types of contaminant?	☑ IOCs ☑ VOCs ☑ SOCs		1	1	1	0
(13)	Are there Sources of Class II or III Leachable Contaminants in Zone III?	◉ Yes ○ No	**Complete Step 13a**				
13a	What types of contaminants?	☑ IOCs ☑ VOCs ☑ SOCs		1	1	1	0
(14)	Is there Irrigated Agricultural Land That Occupies > 50% of Zone III?	◉ Yes ○ No		1	1	1	0
		Zone III Subtotal		**3**	**3**	**3**	**0**

	IOC Score	VOC Score	SOC Score	Microbial Score	Comment
Community and Non-Community, Non-Transient System Contaminant Source/Land Use Score	**27**	**25**	**19**	**12**	

Final Community/NC-NT System Ranking

IOC Score = High Contaminant/Land Use Score (21 to 30 points)
VOC Score = High Contaminant/Land Use Score (21 to 30 points)
SOC Score = Moderate Contaminant/Land Use Score (11 to 20 points)
Microbial Score = Moderate Contaminant/Land Use Score (11 to 20 points)

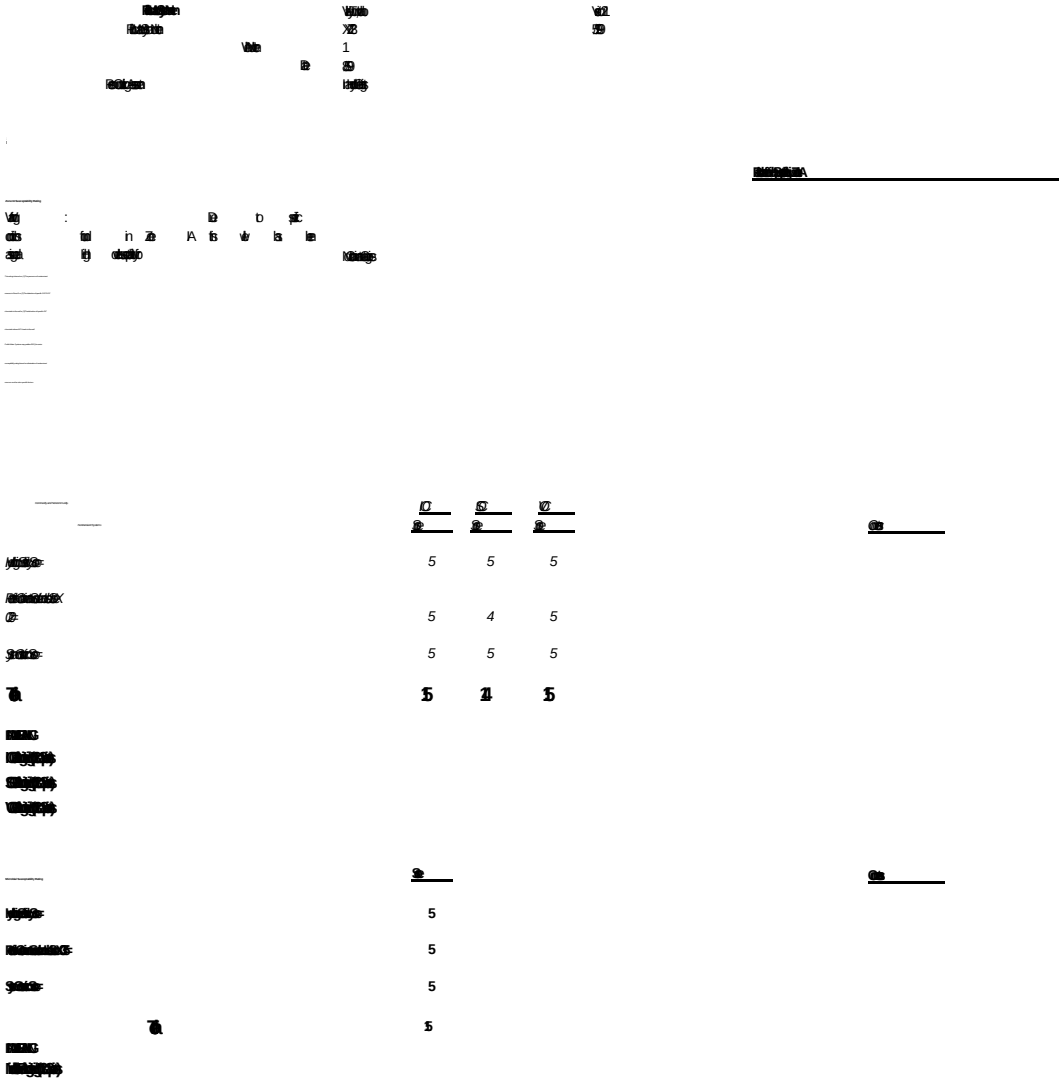
TABLE X-2, SYSTEM CONSTRUCTION WORKSHEET

			Year	Value	Comments
(1)	Well Drill Date	Input Date: July 17, 1955			
(2)	Well Drillers Log Available?	(●) Yes ( ) No			If no well log is available answers to (4) and (6) are assumed to be NO and points are added to score.
(3)	Sanitary Survey Available? If Yes, for what year?	(●) Yes ( ) No	1998		If no sanitary survey is available answer to Questions (5) and (8) Is assumed to be NO and points are added to score.
(4)	Are current IDWR well construction standards being met?	( ) Yes (●) No		1	
(5)	Is the wellhead and surface seal maintained in good condition?	( ) Yes (●) No		1	
(6)	Do the casing and annular seal extend to a low permeability unit?	( ) Yes (●) No		2	
(7)	Is the highest production interval of the well at least 100 feet below the static water level?	( ) Yes (●) No		1	
(8)	Is the well located outside the 100 year floodplain and is it protected from surface runoff?	(●) Yes ( ) No		0	

System Construction Score = 5

Final System Construction Ranking = High System Construction Score (5 to 6 points)

TABLE X-4, FINAL SWA SUSCEPTIBILITY RANKING SHEET



This is an example report for discussion purposes only, it should not be cited or referenced.

APPENDIX G
GENERAL DESCRIPTION OF SOURCE WATER PROTECTION

Steps to Source Water Protection

Once a community, the PWS owner/operator as the case may be, decides to pursue source water protection, the delineated source water assessment area now becomes the source water protection area for the community. As discussed in Chapter 5, source water protection consist of five steps. It is important to remember that certain steps will be completed as part of Idaho's SWAP prior to a community's decision to pursue source water protection. Because of this, formation of a community planning team may occur after delineation of the area to be protected, and sometimes after completion of the contaminant inventory. A community planning team should always be formed prior to making decisions about managing the source water protection area and developing the associated protection strategy.

Step 1: Form a Community Planning Team

To be successful, a local source water protection program needs the cooperative efforts of people within the community. This includes input and ownership of people who make decisions that affect the community, are interested in the quality of their drinking water, and/or will be affected by the program. To satisfy these needs, a community planning team (planning team) should be established prior to development of a local source water protection program. As part of this effort, the community planning team should develop an overall protection strategy and a written plan. The planning team should also be responsible for and involved with initiating many of the protection related activities and for updating and revising the local plan or strategy as needed.

Inter-jurisdictional cooperation is often essential for effective source water protection since many source water assessment areas will lie, at least in part, outside of the jurisdiction of the community initiating the source water assessment plan. To help resolve multi-jurisdictional issues, the planning team should include representatives from those jurisdictions with land use controls over the source water protection area. This may include local, city, state, county, tribal, or federal agency representatives. In addition, it may be beneficial for neighboring communities to work together or exchange information on common delineated protection areas in shared aquifers or watersheds.

The makeup of the planning team will vary depending on the nature of the community. Planning team member examples include city officials, county officials, water system operator(s), business community representatives, agricultural community representatives, members of the general public, and technical experts from within the community. The planning team can also include a representative from the Idaho Rural Water Association and an IDEQ representative. In some situations, there may already be a planning

team formed to address wellhead protection for ground water systems, or there may already be a watershed advisory group formed to address some of the protection aspects for surface water systems.

Step 2: Delineate the Land Area to be Protected

This step will have been completed as part of the source water assessment process described within this plan. The community or water system owner will have had the opportunity to assist with this effort by providing the IDEQ with information such as well logs where needed.

Step 3: Identify Potential Sources of Contamination

A good portion of this step will be completed for all systems as part of the primary contaminant inventory. To adequately complete this protection step, a community should perform the enhanced inventory (reference Step 5, Chapter 4 and Appendix E) or an equivalent contaminant inventory. By performing the enhanced inventory at the proper time during the source water assessment process, a community can best utilize available state resources to help implement source water protection since the information will be incorporated into the susceptibility analysis and final source water assessment report.

Step 4: Manage the Source Water Protection Area

The planning team should develop a protection strategy that can revolve around the many available management tools that can be used to help protect their community's drinking water supply. Table G-1 is a listing of many of these management tools, which can be non-regulatory or regulatory in nature, along with additional details associated with these tools. The planning team's strategy can involve utilizing non-regulatory tools, regulatory tools, or some combination of both. Some tools that are generally considered non-regulatory can become regulatory if required by city ordinance or through other methods. The resulting strategy should be tailored to the needs of the community and level of support provided from within the community. It is recommended that public participation be a part of protection strategy development, and that any final source water protection strategy include, at a minimum, public education as a non-regulatory tool to help implement source water protection.

As part of the overall strategy, the planning team may want to prioritize protection measures and apply a stricter approach to address potential contaminant sources that present the most significant risk to the PWS. These high risk activities may be located close to the system wells or surface water intakes. The susceptibility analysis and final source water assessment report will be important tools to assist communities

with this prioritization effort in addition to assisting with overall protection strategy development. By pursuing source water protection, a community can effectively reduce the risk of contamination identified through the susceptibility analysis.

Once an overall protection strategy has been developed, it will be important to identify responsibilities and specific objectives needed to coordinate and implement the different management tools and associated protection measures that the community is pursuing.

Step 5: Plan for the Future

Planning for the future is an important part of the source water protection program. A community involved in source water protection activities should include the development of the following:

- A contingency plan should be developed to address the potential need to pursue alternative drinking water supplies in the event of loss due to contamination or drought; and
- Plans for locating new water system wells or intake locations, and incorporating these new wells or intakes into the local source water protection plan.

A contingency plan provides the backup mechanism in the event protective measures are unable to prevent disruptions to the water supply delivery system due to contamination, flooding, drought, or other disturbances. A contingency plan is developed by local government in cooperation with other appropriate agencies. The contingency plan should be included in the local emergency response committee plan which communities have developed in order to respond to chemical releases. Additional information concerning contingency plans can be found in Chapter 7 of the Idaho Wellhead Protection Plan (IDEQ, 1997).

Local governments and the water system purveyor should be involved in the effort to plan, site, and protect future surface or ground water systems. Future wells and surface water system intakes should be located in areas with as few sources of potential contaminants as possible. Ideally, the site could be reserved and protected for source water use. Future expansion of the source water protection area should be incorporated into local plans. The community will be responsible for delineation and contaminant inventory for new systems constructed after completion of the source water assessment process. The IDEQ will likely have information that can be used by the community to assist with this effort.

Protection Tools and Measures

Local governments have the authority to manage potential sources of contamination within their jurisdiction, and can therefore implement regulatory tools which protect water quality. In Idaho, zoning ordinances which apply to a community's wellhead (source water) protection area represents one of the more commonly used regulatory tools. Several counties have also developed or are developing ordinances which apply to the portion of a delineated wellhead protection area that happens to fall within county jurisdiction.

As part of the effort to implement non-regulatory tools, residents and businesses can be educated on water quality, pollution prevention, spill prevention and response, and applicable BMPs. This is a common and often successful approach for many existing source water protection efforts in Idaho, and it generally relies on increased awareness and voluntary efforts to avoid drinking water contamination.

When addressing a potential contaminant source identified during the contaminant inventory, a community may take several protective measures which utilize more than one available management tool. For example, a community may implement the following ground water quality protective measures to address injection wells within the source water protection area:

- develop a zoning ordinance to prevent the use of certain types of injection wells which pose a high risk of ground water contamination;
- require that any new injection wells meet certain design standards associated with generally accepted best management practices for ground water quality protection;
- educate injection well owners on specific threats associated with injection wells and their improper use;
- supply injection well owners with information on BMPs that can be incorporated into existing injection wells; and
- label injection wells used for storm water disposal to help educate the public on the threats associated with illegal disposal of oils and other wastes.

There are often several protection measures that can be applied to each type of potential contaminant source identified within a source water protection area. In addition, a community can also develop protection measures for new sources that could end up being located within the source water protection area. For example, these measures can prohibit certain types of operations such as a landfill, require BMPs for injection wells as discussed above, or require ground water monitoring for sources such as an animal

feeding operation. Identifying optional protection measures that a community can take for specific potential contaminant sources is important. IDEQ will provide additional assistance through a source water protection guidance document.

Table G-1. Management Tools for Source Water Protection Areas

REGULATORY TOOLS	
Zoning Overlay	Overlay zones can be used in conjunction with conventional zoning and to create special districts to protect the source water protection area. Overlay zones are applied to areas singled out for special protection, such as the source water protection area itself, and add regulations to those controls already in place. This method helps address "grand-fathered" potential contaminant sources in source water protection areas.
Zoning Ordinances	Zoning ordinances typically are comprehensive land-use requirements designed to direct the development of an area. Many local governments have used zoning to restrict or regulate certain land uses, which have the potential to contaminate water within source water protection areas.
Subdivision Ordinances	Subdivision ordinances are applied to land divided into two or more subunits for sale or development. Local governments use this tool to protect source water areas in which ongoing development is causing contamination. An example of a subdivision ordinance would be to require a minimum lot size for single family homes using septic systems so as to limit septic system density and subsequent ground water contamination.
Potential Source Prohibitions or Restrictions	Source prohibitions or restrictions are regulations that prohibit or place restrictions on the use of certain chemicals that pose a high risk to water contamination such as Atrazine or trichloroethene; or prohibit or place restrictions on the placement of some high-risk potential contaminant sources such as underground storage tanks, underground injection wells, lagoons, feedlots, and/or landfills.
Building Codes	Local building codes offer protection through special standards applicable to facilities which are remodeled or constructed in the source water protection area. Building codes can require low flow fixtures, backflow preventers and other design features to conserve and protect water quality.
Design Standards	Design standards typically are regulations that apply to the design and construction of buildings or structures. This tool can be used to ensure that new buildings or structures placed within a source water protection area are designed so as not to pose a threat to the water supply, such as requiring an impermeable liner on a settling pond.
Operating Standards	Operating standards are regulations that apply to ongoing land-use activities to promote safety or environmental protection. Such standards can minimize the threat to the source water protection area from ongoing activities such as the storage and use of hazardous substances through requirements such as secondary containment and spill response capabilities, or requiring that septic systems be properly maintained.
Site Plan Review	Site plan reviews are regulations requiring developers to submit for approval plans for development occurring within a given area. This tool ensures compliance with regulations or other requirements made within a source water protection area.

Table G-1. Management Tools for Source Water Protection Areas

Performance Standards	Performance standards are used to regulate development within source water protection areas by enforcing predetermined standards for water quality. They may be applied at a predetermined ground water monitoring compliance point, at the point of injection of storm water runoff, or through the use of contaminant source modeling. One example is the requirement that the amount of storm water runoff be the same before and after construction when developing or improving a site.
Special Permitting	Special permits are used to set conditions for certain uses and activities that pose a high risk to water contamination within source water protection areas if left unregulated. One example is to require that new feedlots within some of the source water protection area zones be required to have a city or county permit that may require ground water quality monitoring and/or the use of certain water quality protection management practices.
Bonding	Facilities may be required to post a bond prior to operation in a source water protection area. Bond can cover costs associated with spill response or remediation efforts.
Transport Prohibitions	The transport of chemical compounds which pose a high risk to water quality if spilled can be restricted within a source water protection area by requiring alternative transportation routes.
NON-REGULATORY TOOLS	
Public Education and Information	Public education and information should be an important component of any source water protection program. Public education often consists of brochures, pamphlets, seminars or presentations which address water quality protection. This tool promotes the use of voluntary protection efforts and builds public support for a community protection program.
Water Conservation Program	Implementing water conservation measures can significantly benefit ground water (wellhead) protection efforts by reducing pumping rates. Lower pumping rates mean reduced flow rates and less risk of moving any contamination toward the wellhead. Conserving water for ground or surface water systems may also help reduce the need for additional water sources in the near future. Water conservation can be accomplished through steps such as promoting the use of native vegetation, improved irrigation methods, and through public education.
Household Hazardous Waste Collection	Establishing a permanent location or holding one-day events to collect hazardous wastes from community residents is an effective way to reduce risks posed by storing hazardous materials within the source water protection area. This would reduce the risk of improper disposal into septic systems not designed to handle such wastes or from improper disposal to the ground or nearby surface drainages, and may also help protect a community's wastewater treatment plant from harmful chemicals.
Pollution Prevention	A pollution prevention program can include reducing the amount of chemical wastes or reducing the usage of certain chemicals by replacing them with chemicals that are less threatening to ground water quality. Pollution prevention is often accomplished through education and information, such as through the distribution of pollution prevention booklets specific to a type of source such as an automobile repair shop.
Purchase of Development Rights or Property	The purchase of property or development rights is a tool used by some localities to ensure complete control of land uses in or surrounding key locations within a source water protection area. This tool may be preferable if regulatory restrictions on land use are not politically feasible and the land purchase is affordable.

Table G-1. Management Tools for Source Water Protection Areas

Spill Response Planning	Local governments can develop their own emergency spill response programs to minimize potential impacts of spills to water quality.
Best Management Practices (BMPS)	BMPS are practices or combination of practices which ultimately prevent or reduce contamination to water. Although often associated with agricultural activities, BMPS can apply to any activity that has the potential to impact ground water or surface water. BMPS can be encouraged through voluntary methods or can be required through regulations which may further define what a BMP is and how it is to be used.
Water Quality Monitoring	Water quality monitoring includes selecting appropriate sampling sites upgradient of the well or intake, and developing an ongoing water quality monitoring program. Monitoring can also be a regulatory requirement for high risk contaminant sources within a source water protection area.
Training and Demonstrations	These programs can complement many of the regulatory or non-regulatory tools. Examples include training of local emergency response teams or demonstration of agricultural BMPS.
Inspection Programs	Inspection of facilities and other contaminant sources can be developed as a voluntary program or through regulatory requirements. Voluntary inspection of businesses for pollution prevention and contaminant control ideas and recommendations is one example of a non-regulatory approach.

INFORMATION SOURCES

The following organizations and agencies are valuable sources of information for communities seeking assistance in implementing source water protection.

- Idaho Rural Water Association, 1916 ‘G” Street, Lewiston, ID 83501, (208)743-6142 http://users.lewiston.com/IRWA/

- National Rural Water Association, 2915 S. 13th Street, Duncan, OK 73533, (580)252-0629 www.nrwa.org

- The Groundwater Foundation, P.O. Box 22558, Lincoln, NE 68542-2558, (800)858-4844 www.groundwater.org/

- National Drinking Water Clearinghouse, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064, (800) 624-8301 www.estd.wvu.edu/ndwc/ndwc_homepage.html

- Farm*A*Syst/Home*A*Syst National Program, B142 Stenbock Library, 550 Babcock Drive, Madison, WI 53706-1293, (608) 262-0024 www.mda.state.mi.us/environm/groundwater/local

- Idaho Home*A*Syst Project, Idaho Association of Soil Conservation Districts, P.O. Box 2637, 802 Hoff Building, Suite 1006, Boise, ID 83701, (208) 338-5900 www.iascd.org/

- U.S. EPA Region 10, 1200 Sixth Ave., Seattle, WA 98101, (206)553-1200 www.epa.gov,

- Idaho Division of Environmental Quality, 1410 N Hilton, Boise, ID 83706 (208) 373-0502 www.deq.state.id.us/water/water1.htm

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