

## **Chapter 6**

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# **Management of Ground Water Quality**

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As discussed in Chapter 2, many communities in the Yakima River Basin rely upon ground water for municipal and domestic water supplies. The Planning Unit's Watershed Assessment characterized overall water quality conditions of ground water supplies used for these purposes. Working with the Water Quality Work Group, EES reviewed ground water quality protection programs developed in other areas, as well as management procedures under State law. Findings were documented in a technical memorandum. A set of actions was identified to accomplish the goal of protecting ground water from contamination in the Yakima Basin. This chapter presents those actions. For more detailed background information, see the technical memorandum (EES 2002d).

### 6.1 Goals for Ground Water Quality Protection

The results of the Watershed Assessment indicated that large and medium-sized public water systems in the Yakima Basin have the ability to adequately manage and protect the quality of their ground water supplies. However, small water systems and individual households that rely on ground water supplies for drinking water were found to be more susceptible to ground water contamination. In addition, shallow and/or unprotected ground water supplies were found to be more susceptible to ground water contamination than deep ground water supplies. Thus, the Planning Unit narrowed the overall goal of protecting ground water from contamination to a specific emphasis on unprotected ground water supplies located outside the service areas of large water systems. This emphasis enables limited resources to be allocated to those ground water users facing the greatest risk of contamination. The goal of the ground water quality strategy can therefore be stated as:

- ❑ *Protect ground water quality for public water supply purposes, with an emphasis on unprotected ground water supplies located outside the service areas of large water systems.*

Under this overall goal, three specific management goals were developed:

- ❑ Prevent future impacts to clean ground water supplies;
- ❑ Prevent further degradation of currently impacted ground water supplies; and,
- ❑ Clean up impacted ground water supplies.

In the context of this chapter of the Watershed Plan, an "unprotected" ground water supply means an unconfined aquifer, an aquifer located less than 100 feet below ground surface, or an aquifer penetrated by improperly sealed wells. "Outside the

service areas of large water systems” includes both populated areas where most residences are served by private household wells and areas that are served by a public water system with less than 500 service connections. “Ground water supplies” refers to both existing drinking water sources and aquifers that could be used for a drinking water supply in the future. The term “clean” water is used to mean potable water that has contaminant concentrations consistent with background levels. The term “impacted” water is used to mean water with contaminant concentrations elevated above background levels. These definitions are not absolute, but are intended to provide general guidance.

The Planning Unit recognizes that shallow, unprotected supplies in areas served by larger water systems may also be impacted by land use, industrial activities, storage of petroleum products and chemicals, and other factors. While these areas are not covered in detail here, this does not indicate a lack of concern that these supplies also be protected and cleaned up where necessary. The Planning Unit anticipates that these types of conditions will continue to be addressed by existing federal, State and local ground water quality protection and cleanup programs.

The Planning Unit also recognizes that in some areas, impacted ground water may discharge to surface water, causing impairment of the natural environment. Although the Watershed Assessment did not identify this as a significant concern for the Yakima Basin, it is noted that protection of ground water for public water supply purposes also will generally result in improved protection of the natural environment as well.

## **6.2 Ground Water Quality Strategy**

Management objectives and actions were developed for ground water quality protection in the Yakima Basin based on needs identified in Section 5.3 of the Watershed Assessment, the review and evaluation of existing programs documented in the Technical Memorandum (EES 2002d), and input from the Planning Unit’s Water Quality Work Group.

Six management objectives were developed to accomplish the three management goals listed above. These objectives are:

1. Improve public understanding and awareness of issues related to drinking water quality;
2. Assess susceptibility of ground water supplies to contamination on a regional basis;
3. Improve ability to detect and monitor impacts to ground water supplies;
4. Improve local Wellhead Protection Programs;
5. Minimize impacts of land use activities on ground water supplies by implementing technical management strategies; and,
6. Clean up sources of ground water contamination.

Together, these objectives provide a comprehensive approach to achieving the management goals.

It is recognized that funding may not be available to implement all actions recommended in this Chapter. However, many of the six objectives could be pursued independently, in a scaled-back program. The objectives can be prioritized based on relative importance, cost, staffing availability, and the sequential relationship of some objectives. It is recommended that Objectives 1 and 2 be given the highest priority. Accomplishing the public education objective (Objective 1) will provide broad support for the remaining actions. The risk assessment objective (Objective 2) is a foundation for all subsequent strategies since it will reveal which locations are most susceptible to ground water contamination.

It is recommended that Objectives 3 and 4 have a slightly lower priority than Objectives 1 and 2. The local implementing agency has the ability to make improvements to ground water monitoring (Objective 3) and wellhead protection (Objective 4) activities; however, existing state and federal programs are already addressing these objectives to a certain extent.

If a more limited program is undertaken, it should be recognized that Objectives 5 and 6 will likely prove the most complex and expensive to carry out. While preventing ground water contamination from land use activities (Objective 5) is critical, it may be expensive and difficult to implement this objective effectively. Likewise, taking actions to clean up contaminant sources (Objective 6) is anticipated to be expensive and difficult to implement. In addition, existing state and federal programs already exist for cleaning up most contaminant sources.

A discussion of each recommended objective is presented below. Specific actions developed for each objective and implementation considerations for each objective are also discussed. Tables showing proposed agency involvement for completing each objective are included. These tables also contain planning-level assessments of staff resources, implementation cost, and a characterization of benefits as either short-term, long-term, or both.

### **6.2.1 Objective 1: Improve Public Understanding and Awareness of Issues Related to Drinking Water Quality**

**Purpose:** Enable the public to make educated decisions about actions that can protect ground water quality.

**Rationale:** Educating the public about the importance of ground water quality will over time raise awareness and improve practices. An aware public will likely be able to facilitate more change in terms of ground water protection than local government agencies. In addition, broad public support will be necessary to successfully implement technical management strategies.

**Relationship to Other Objectives:** In general, this objective is tied to all other objectives since broad public support will be necessary.

### **Proposed Actions**

**Action 1A.** Provide outlets for ground water protection information. The public should have easy access to relevant information about ground water supplies and water quality. Region-specific information about the ground water resource, risk assessment activities, monitoring programs, wellhead protection activities, technical management strategies, and clean up efforts should be provided to the public. Information about existing national programs for private homeowners such as “Home-A-Syst/Farm-A-Syst” (WSU Cooperative Extension 2001) and United States Department of Agriculture’s Environmental Quality Incentives Program (National Resources Conservation Service 2001) should also be provided to the public. Information should be available to the public in a variety of mediums such as compact disk, web site, flyers, workshops, community fairs, etc.

Although this action is focused on areas outside the service areas of larger water purveyors, there may be opportunities to link with outreach and education programs of the larger water purveyors in each community.

**Action 1B.** Develop a mass media campaign for ground water protection. Advertisements and public service announcements in print, radio, and television can reach a broad audience. A mass media campaign is often the most effective way of raising awareness about a particular issue such as drinking water.

**Action 1C.** Develop a ground water protection program for schools. Classroom education will influence a large portion of the community and will establish a long-term legacy. The program could include class presentations, class exercises, and field trips and should be integrated into existing science or environmental education programs.

**Action 1D.** Conduct periodic public opinion surveys related to ground water protection efforts. Surveys would provide an indicator of the apparent effectiveness of ground water protection strategies. Surveys would also provide valuable feedback about which strategies the public supports.

### **Considerations for Objective 1**

- Public education programs require expertise often unavailable in the existing staff resources of the anticipated implementing agencies.
- A long-term commitment of resources will be required to develop a successful public education program.

- ❑ While a mass media campaign can quickly improve the public’s name-recognition of a particular issue, it is not an effective means of educating the public about complex or technical ideas.

**Table 6-1  
 Agency Involvement and Resource Needs for Objective 1**

<b>Action</b>	<b>Proposed Agency Involvement <sup>(1)</sup></b>	<b>Staff Resources Required <sup>(2)</sup></b>	<b>Initial Implementation Cost <sup>(3)</sup></b>	<b>Short-term Benefit</b>	<b>Long-term Benefit</b>
1A. Provide outlets for ground water protection information	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• WSU Cooperative Extension</li> <li>• Conservation districts</li> </ul>	Medium	Medium	✓	✓
1B. Develop a mass media campaign for ground water protection	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• WSU Cooperative Extension</li> <li>• Conservation districts</li> </ul>	High	Medium	✓	
1C. Develop a ground water protection program for schools	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• WSU Cooperative Extension</li> <li>• Conservation districts</li> </ul>	High	Medium	✓	✓
1D. Conduct periodic public opinion surveys related to ground water protection efforts	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• WSU Cooperative Extension</li> <li>• Conservation districts</li> </ul>	Medium	Medium	✓	

- (1) The agency proposed for a lead role is shown in italics. Other listed agencies may provide additional support with data and/or resources. Interagency agreements may be a vehicle for promoting cooperation.
- (2) Staffing estimated only for agency proposed for lead role. Low = Need ¼ to ¾ fulltime equivalent (FTE) to implement. Medium = Need 1-2 FTE to implement. High = Need > 2 FTE and/or contracted services to implement. Staffing estimates are relative, and would likely be reduced if multiple actions are implemented simultaneously.
- (3) In general, Low = Less than \$50,000 per county. Medium = Between \$50,000 and \$250,000. High = Greater than \$250,000.

### **6.2.2 Objective 2: Assess Susceptibility of Ground Water Supplies to Contamination on a Regional Basis**

**Purpose:** Identify unprotected ground water supplies located outside the service areas of large water purveyors “at risk” of becoming impacted in order to guide subsequent management strategies.

**Rationale:** It is not feasible or cost effective to implement management strategies that protect all unprotected ground water supplies outside the service areas of large water purveyors. Rather, management strategies should focus resources primarily on a subset of this population – supplies that are already impacted and supplies “at risk” of becoming impacted in the future. The risk assessment procedures described in this section will be used to rank ground water supplies in terms of relative susceptibility to contamination.

**Relationship to Other Objectives:** The risk assessment described in Objective 2 is intended to guide the selection and implementation of subsequent management strategies under Objectives 3, 4, and 5.

## **Proposed Actions**

**Action 2A.** Conduct Level I Risk Assessment. This preliminary assessment is intended as a relatively quick and cost-effective way to determine general areas that are susceptible to ground water contamination. Land use and hydrogeologic screening criteria could be applied to a ground water quality database to rank the susceptibility of all ground water supplies. Land use and hydrogeologic screening criteria that could be used to delineate “at risk” supplies include:

- Presence of Washington Department of Ecology (Ecology) or United States Environmental Protection Agency (EPA) regulated facilities and sites
- Presence of domestic on-site septic systems (i.e., unsewered areas)
- Presence of land application of untreated, non-domestic wastewater
- Presence of concentrated animal feeding operations
- Presence of agricultural operations requiring frequent fertilizer and pesticide application
- Presence of stormwater dry wells above some specified threshold density
- Presence of mining activities
- Presence of wells above some specified threshold density
- Presence of shallow wells (e.g., less than 100 feet below ground surface)
- Presence of unconfined, shallow aquifers (such as alluvial aquifers or perhaps aquifers in the Upper Ellensburg Formation) in which a shallow well could be completed
- Presence of regional aquifer recharge area
- Presence of water quality monitoring exceedances
- Presence of source designated as “ground water under the influence of surface water”

A ground water quality database could be built with data obtained from the Washington Department of Health (DOH), Ecology, county governments, and other agencies. The Geographic Information System (GIS) database developed for the Kittitas County Groundwater Survey (Bain, April 1999) is a relevant local example of the type of database that needs to be built. The ground water quality database should be maintained at the local level with a single data management system as described in Action 2C. The technical memorandum (EES 2002d, Table 2) describes potential sources of data for a ground water quality database and how the data might be incorporated into a single data management system.

**Action 2B.** Conduct Level II Risk Assessment (if necessary). This follow-up assessment is intended as a comprehensive approach to more accurately rank susceptibility to contamination in the event that the Level I Risk Assessment is not sufficient. Additional data would be acquired and added to the ground water quality database developed for the Level I Risk Assessment in Action 2A. The technical memorandum (EES, 2002d, Table 3)

describes additional sources of data that could be added to the ground water quality database. Essentially the same land use screening criteria that were used to screen the database in the Level I Risk Assessment would be applied to the expanded database for the Level II Risk Assessment. Additional hydrogeologic screening criteria that could be added for the Level II Risk Assessment include:

- Well screen or perforations located in more than one aquifer
- Absence of significant confining layers above aquifer
- Age of well (e.g., wells completed prior to early 1970s when requirements to submit Water Well Reports were implemented)
- Absence of adequate surface seal on well
- Relative distance of well downgradient from contaminant source

The improved accuracy of the Level II Risk Assessment would be based on significant improvements in the quality of data in the database and improvements in hydrogeologic screening criteria.

**Action 2C.** Evaluate existing data management system and improve system if necessary. A considerable amount of potentially useful ground water quality data can be easily acquired from a variety of sources to build the database described in Actions 2A and 2B. Unfortunately, this data is often provided in incompatible formats. For instance, DOH and Ecology currently maintain GIS databases with locations of wells and regulated facilities and sites, respectively. However, other water quality data is currently only available in tab-delimited text files, Microsoft Access databases, or paper files. Thus, a local data management system is needed in order to store, link, manipulate, and present data acquired from a variety of sources. GIS software such as ArcInfo is capable of providing the database and mapping tools needed to complete the risk assessment described in this objective. Other data management systems such as AutoCAD may have sufficient database and mapping capabilities as well.

**Action 2D.** Produce regional maps showing results of risk assessment. Areas with “at risk” ground water supplies and potential sources of contamination should be highlighted at a minimum. These maps can be used as graphical tools to select management strategies and locations for strategy implementation. The mapping products can also be used by local agencies, water purveyors, and facility/site operators for planning activities and as a public education tool.

### **Considerations for Objective 2**

- In some areas, selected elements of Objective 2 may already be addressed by existing critical areas ordinances.

- ❑ The accuracy of some data will be compromised due to inherent inaccuracies and inconsistencies in the data source. For instance, the accuracy of a well location on a Water Well Report (e.g., well log) is to be limited by the restraints of the Public Land Survey System (e.g., locations typically delineated according to  $\frac{1}{4}$  Section or  $\frac{1}{4}$   $\frac{1}{4}$  Section of a given Township and Range). Field mapping using Global Positioning Systems (GPS) may be necessary if precise locations are needed.
- ❑ It will be difficult to establish uniform hydrogeologic and land use ranking criteria that apply to all ground water supplies. For instance, it will be difficult to qualitatively or quantitatively assess the relative potential for contamination from different land use activities.
- ❑ The tendency when working with a large database is to summarize the data record (as done in the 1999 Kittitas County Groundwater Survey by Bain). Actually ranking the susceptibility of ground water supplies and then prioritizing management strategies based on that ranking will be a much more difficult process.
- ❑ A considerable amount of work would be required to compile all the data suggested for a Level II Risk Assessment. If the Level II Risk Assessment is not completed due to budget constraints, some of the data for the Level II Risk Assessment could still be gathered for use in the Level I Risk Assessment (e.g., gather well completion data from Water Well Reports as done by Bain, April 1999).
- ❑ Technical map products may be misunderstood by some public audiences.

**Table 6-2  
 Agency Involvement and Resource Needs for Objective 2**

<b>Action</b>	<b>Proposed Agency Involvement <sup>(1)</sup></b>	<b>Staff Resources Required <sup>(2)</sup></b>	<b>Initial Implementation Cost <sup>(3)</sup></b>	<b>Short-term Benefit</b>	<b>Long-term Benefit</b>
2A. Conduct Level I Risk Assessment	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• County planning department</li> <li>• Ecology</li> <li>• DOH</li> <li>• Local water purveyors</li> </ul>	Medium	Low	✓	
2B. Conduct Level II Risk Assessment (if necessary)	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• County planning department</li> <li>• Ecology</li> <li>• DOH</li> <li>• Local water purveyors</li> </ul>	High	Medium to High	✓	✓
2C. Evaluate existing data management system and improve if necessary	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> </ul>	Low to Medium	Low	✓	✓
2D. Produce regional maps showing results of risk assessment	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• County planning department</li> <li>• Local water purveyors</li> </ul>	Low	Low	✓	

- (1) The agency proposed for a lead role is shown in italics. Other listed agencies may provide additional support with data and/or resources. Interagency agreements may be a vehicle for promoting cooperation.
- (2) Staffing estimated only for agency proposed for lead role. Low = Need ¼ to ¾ fulltime equivalent (FTE) to implement. Medium = Need 1-2 FTE to implement. High = Need > 2 FTE and/or contracted services to implement. Staffing estimates are relative, and would likely be reduced if multiple actions are implemented simultaneously.
- (3) In general, Low = Less than \$50,000 per county. Medium = Between \$50,000 and \$250,000. High = Greater than \$250,000.

### **6.2.3 Objective 3: Improve Ability to Detect and Monitor Impacts to Ground Water Supplies**

**Purpose:** Identify impacted ground water supplies located outside the service areas of large water purveyors.

**Rationale:** Locations with impacted ground water supplies should be identified in order to select and guide subsequent management strategies in conjunction with the risk assessment (Objective 2). Three separate monitoring approaches (initial baseline assessment, long-term monitoring to detect impacted supplies, and long-term performance monitoring) have been recommended to provide the technical data needed to accomplish this objective.

**Relationship to Other Objectives:** Selection of sampling locations to identify impacted ground water supplies should be based in part on the results of the risk assessment (Objective 2). Water quality monitoring data obtained during this objective should be added to the ground water quality database described in Objective 2. Improvements to local wellhead protection activities

(Objective 4) should be highly encouraged in locations where impacted supplies are detected. Application of Objectives 5 and 6 should be based in part on the results of the baseline water quality assessment.

### ***Proposed Actions***

***Action 3A.*** Evaluate the availability and usefulness of existing ground water quality monitoring data. This evaluation should review the data sources discussed below to determine whether new monitoring programs need to be established or if this objective can be accomplished with existing monitoring programs. Group A and Group B Public Water Systems (PWSs) are required to conduct water quality monitoring of all production sources. Some Ecology regulated facilities and sites are required to collect site-specific data from monitoring wells. Ground water quality data can also be obtained from regional monitoring events that have been conducted in the Yakima Basin. For instance, ground water monitoring surveys conducted by Bain (April 1999) and Ecology (April 1997) could be used as initial baseline assessments of nitrate and pesticide impacts in the Kittitas Valley. In addition, the United States Geological Survey (USGS) is in the process of collecting water quality monitoring data from a number of wells throughout the Yakima Basin. Finally, efforts by Ecology's Environmental Assessment Program to implement a statewide ground water monitoring program should be reviewed. The Environmental Assessment Program is scheduled to propose strategies for program implementation in 2002.

***Action 3B.*** Establish or facilitate short-term monitoring approach to determine baseline conditions of ground water supplies. If an existing baseline ground water quality assessment (e.g., USGS Yakima Basin study) is not available for the areas and parameters of interest, then the implementing agency should consider implementing a short-term monitoring program. This monitoring program would consist of a one-time monitoring event with a large number of monitoring locations across the basin. Selected sampling locations should include wells in areas designated "at risk" by the risk assessment as well as "clean" wells. Private household wells could be included in the baseline assessment by implementing a program for providing financial assistance to owners of private wells. Monitoring locations could be tested for bacteria, nitrate, pesticides (e.g., synthetic organic compounds regulated by the Safe Drinking Water Act), and/or any other identified contaminants of concern (e.g., iron and manganese in the Kittitas Valley). Well completion details (e.g., presence of surface seal, casing diameter, exact well location) should be verified and field parameters (e.g., temperature, pH, specific conductivity) should be monitored to the greatest extent practicable during sampling. The local implementing agency may want to rely upon technical expertise provided by DOH, Ecology, and USGS in completing this monitoring approach.

**Action 3C.** Establish or facilitate long-term monitoring approach to detect impacted ground water supplies. The implementing agency will most likely need to establish a new long-term monitoring program and/or compile monitoring data from a variety of existing programs (e.g., data collected from Group A PWSs, Group B PWSs, Ecology regulated facilities/sites, USGS Yakima Basin study, etc.) in order to satisfy this objective. A long-term monitoring program would consist of periodic monitoring events at a reduced number of monitoring locations used in the baseline ground water quality assessment. Selected long-term monitoring locations should specifically target areas identified as “at-risk” in the risk assessment. All monitoring locations could be tested for an expanded list of contaminants beyond bacteria, nitrate, and pesticides, if necessary. If possible, water levels should be measured and recorded during the long-term monitoring program for use in determining regional ground water gradients. The local implementing agency may want to rely upon technical expertise provided by DOH, Ecology, and USGS in completing this monitoring approach.

**Action 3D.** Establish or facilitate long-term monitoring approach to evaluate the performance of implemented management strategies. Before implementing this action, the local implementing agency should understand that it is often extremely difficult to draw accurate performance conclusions from long-term monitoring data. This action will be technically similar to Action 3C, but the monitoring results will be used for a different application. While some of the same long-term monitoring locations may be used to satisfy both actions, additional long-term monitoring locations will likely be necessary to conduct the performance evaluations. All implemented technical management strategies should be represented with long-term monitoring locations in the proximity of the implementation area. Ideally, each implementation area could be evaluated with monitoring results from upgradient and downgradient monitoring locations. For instance, historical water quality data collected from an upgradient well and a downgradient well could be used to evaluate the effectiveness of extending a sewer line to a previously unsewered residential area. Each monitoring location would only need to be tested for the specific contaminant targeted by the management strategy (e.g., testing for nitrate in areas where sewer lines are being extended to replace on-site septic systems). Again, water levels should be measured and recorded for use in determining local ground water gradients. The local implementing agency may want to rely upon technical expertise provided by DOH, Ecology, and USGS in completing this monitoring approach.

**Action 3E.** Analyze data collected during monitoring programs. Potential analysis techniques could include statistical descriptions of data record, comparisons with maximum contaminant levels, trend analysis, hypothesis testing, determination of three-dimensional distribution of contaminants, and

correlation of land use activities with impacted ground water supplies. Linking ground water monitoring data with other attributes in the data management system described in Objective 2 will facilitate analysis and presentation of ground water monitoring data.

### ***Considerations for Objective 3***

- ❑ The overall effectiveness of the ground water monitoring programs will be directly proportional to the quality of data analysis. Collecting a large amount of data is useless if the data is not properly analyzed. For instance, a thorough hypothesis testing and trend analysis should be periodically conducted to draw conclusions from the data record.
- ❑ Will need continued availability of staff resources and funding to keep the long-term monitoring program going (i.e., Actions 3C and 3D).
- ❑ Inconsistent protocols can greatly impact the usefulness of the monitoring program. For instance, a change in laboratory analytical method can make it difficult to compare sample results within the same data record. Therefore, uniform procedures should be established for field sampling procedures, laboratory analysis, quality assurance/quality control methods, monitoring frequency, and recordkeeping.
- ❑ Long-term monitoring locations should be selected with great care. Monitoring locations in which access may be an issue over the course of the monitoring program (e.g., homeowner selling property) should be avoided. Well completion information should be available for each well selected as a long-term monitoring location. In other words, hydrogeologic information about the well such as the location of the well screen, characteristics of the surface seal, and the type of aquifer tapped should be known.

**Table 6-3  
 Agency Involvement and Resource Needs for Objective 3**

Action	Proposed Agency Involvement <sup>(1)</sup>	Staff Resources Required <sup>(2)</sup>	Initial Implementation Cost <sup>(3)</sup>	Short-term Benefit	Long-term Benefit
3A. Evaluate the availability and usefulness of existing ground water quality monitoring data	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• DOH</li> <li>• Ecology</li> <li>• USGS</li> </ul>	Low to Medium	Low	✓	✓
3B. Establish or facilitate short-term monitoring approach to determine baseline conditions of ground water supplies	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• Local water purveyors DOH</li> <li>• Ecology</li> <li>• USGS</li> </ul>	Medium to High	High	✓	✓
3C. Establish or facilitate long-term monitoring approach to detect impacted ground water supplies	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• Local water purveyors DOH</li> <li>• Ecology</li> <li>• USGS</li> </ul>	Medium to High	Medium		✓
3D. Establish or facilitate long-term monitoring approach to evaluate the performance of implemented management strategies	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• Local water purveyors DOH</li> <li>• Ecology</li> <li>• USGS</li> </ul>	Medium to High	Medium		✓
3E. Analyze data collected during monitoring programs	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• DOH</li> <li>• Ecology</li> <li>• USGS</li> </ul>	High	Low	✓	✓

- (1) The agency proposed for a lead role is shown in italics. Other listed agencies may provide additional support with data and/or resources. Interagency agreements may be a vehicle for promoting cooperation.
- (2) Staffing estimated only for agency proposed for lead role. Low = Need ¼ to ¾ fulltime equivalent (FTE) to implement. Medium = Need 1-2 FTE to implement. High = Need > 2 FTE and/or contracted services to implement. Staffing estimates are relative, and would likely be reduced if multiple actions are implemented simultaneously.
- (3) In general, Low = Less than \$50,000 per county. Medium = Between \$50,000 and \$250,000. High = Greater than \$250,000.

### 6.2.4 Objective 4: Improve Local Wellhead Protection Programs

**Purpose:** Improve management of unprotected ground water sources located outside the service areas of large water purveyors.

**Rationale:** Local water purveyors have the greatest ability to assess, protect and manage their own ground water sources. Unfortunately, many small water systems lack the resources to complete a formal wellhead protection program or initiate wellhead protection activities. Technical and/or financial assistance could be provided to these small systems to complete formal or informal wellhead protection activities. Assistance should be concentrated in areas with ground water supplies that are already impacted or “at risk” of becoming impacted in the future.

***Relationship to Other Objectives:*** Wellhead protection area delineations and contaminant inventories completed by local water purveyors could be added to the ground water quality database used for the risk assessment (Objective 2). Assistance to local water purveyors should be targeted in areas identified as “at risk” in Objective 2 and impacted supplies identified in Objective 3.

### ***Proposed Actions***

***Action 4A.*** Enforce Wellhead Protection Program requirements for all Group A PWSs. The majority of Group A PWSs in the Yakima Basin have established acceptable Wellhead Protection Programs. However, a number of Group A PWSs have not established a Wellhead Protection Program at all. Other Group A PWSs have submitted Wellhead Protection Program documentation to DOH, but have not established or maintained adequate wellhead protection area delineations, contaminant inventories, or management programs. DOH should require compliance for all Group A PWSs and provide additional technical and/or financial assistance, if necessary. Enforcement actions and assistance should be focused in areas with supplies that are impacted or “at risk” of becoming impacted in the future.

***Action 4B.*** Facilitate use of a computer model for delineating select Group A PWS wellhead protection areas. The USGS is in the process of developing a numerical ground water transport model for the Yakima Basin in accordance with the Memorandum of Agreement between the Bureau of Reclamation, Ecology, and the Yakama Nation. This regional model could be used to delineate accurate wellhead protection areas (e.g., capture zones) around Group A PWS ground water supplies that are impacted or “at risk” of becoming impacted in the future. Determining accurate capture zones around an “at risk” or impacted ground water supply would enable a water purveyor to more precisely pinpoint where management strategies should be implemented. Thus, the implementing agency should work with the USGS to evaluate applicability of the USGS computer model for this purpose. This activity should also be coordinated with DOH activities to map wellhead protection areas using Geographic Information Systems (GIS) including web access.

***Action 4C.*** County health districts can encourage Group B PWSs to voluntarily establish a Wellhead Protection Program. Group B PWSs are not required to do any wellhead protection planning under current regulations. However, most Group B PWSs would benefit from going through the process of establishing a simplified Wellhead Protection Program. Existing wellhead protection regulations and guidance documents for Group A PWSs could be distilled into an easy-to-use guide for Group B PWSs. The guide would essentially be an informational packet with suggestions for establishing wellhead protection area delineations, contaminant inventories, and simple

management programs. This guide could be mass-mailed to all Group B PWSs. Additional technical and/or financial assistance could be offered to Group B PWSs in areas with “at risk” or impacted ground water supplies.

**Considerations for Objective 4**

- 100 percent compliance of Group A PWSs with wellhead protection regulations may not be attainable.
- Group A PWSs and local government agencies may not have the technical staff to use computer models to generate more accurate wellhead protection area delineations. This may require reliance on USGS staff or contracted services.
- Ability of DOH to carry out actions such as 4A is contingent on availability of staff and other resources.
- Many local water purveyors lack the technical background to accurately identify potential sources of contamination.
- Many Group B PWSs will not perform wellhead protection activities even if technical and financial assistance is provided.
- Wellhead protection literature and informational packets may be misunderstood by some public audiences.

**Table 6-4  
 Agency Involvement and Resource Needs for Objective 4**

Action	Proposed Agency Involvement <sup>(1)</sup>	Staff Resources Required <sup>(2)</sup>	Initial Implementation Cost <sup>(3)</sup>	Short-term Benefit	Long-term Benefit
4A. Enforce Wellhead Protection Program requirements for all Group A PWSs	<ul style="list-style-type: none"> <li>• <i>DOH</i></li> <li>• Local water purveyors</li> </ul>	Low	Low to Medium	✓	
4B. Facilitate use of a computer model for delineating select Group A PWS wellhead protection areas	<ul style="list-style-type: none"> <li>• <i>DOH</i></li> <li>• Local water purveyors</li> <li>• USGS</li> </ul>	High	High	✓	✓
4C. Encourage Group B PWSs to voluntarily establish a Wellhead Protection Program	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• Local water purveyors</li> <li>• WSU Cooperative Extension</li> <li>• DOH</li> </ul>	Low to Medium	Medium	✓	✓

(1) The agency proposed for a lead role is shown in italics. Other listed agencies may provide additional support with data and/or resources. Interagency agreements may be a vehicle for promoting cooperation.  
 (2) Staffing estimated only for agency proposed for lead role. Low = Need ¼ to ¾ fulltime equivalent (FTE) to implement. Medium = Need 1-2 FTE to implement. High = Need > 2 FTE and/or contracted services to implement. Staffing estimates are relative, and would likely be reduced if multiple actions are implemented simultaneously.  
 (3) In general, Low = Less than \$50,000 per county. Medium = Between \$50,000 and \$250,000. High = Greater than \$250,000.

### **6.2.5 Objective 5: Minimize Impacts of Land Use Activities on Ground Water Supplies by Implementing Technical Management Strategies**

**Purpose:** Prevent degradation of unprotected ground water supplies outside the service areas of large water purveyors by various land use activities.

**Rationale:** A variety of land use activities can act together as non-point sources to impact ground water supplies. It is more efficient and cost-effective method to prevent land use activities from impacting ground water supplies than attempt to clean up ground water supplies after they have been impacted.

**Relationship to Other Objectives:** The type of management strategies that need to be implemented and the locations where the strategies need to be implemented should be based on the risk assessment (Objective 2) and monitoring programs (Objective 3).

#### **Proposed Actions**

**Action 5A.** Identify land use activities and contaminants to be addressed with technical management strategies. Land use activities and contaminants of concern in the Yakima Basin will depend on region-specific ground water quality results obtained during the risk assessment (Objective 2) and monitoring program (Objective 3). For example, it might be determined that the following land use activities are associated with “at risk” and impacted ground water supplies: on-site wastewater disposal, animal feeding operations, agricultural operations, and chemical storage and handling operations. Likewise, data might suggest that pesticide impacts are more prevalent than nitrate impacts, or vice versa. Please note that this action is similar to a portion of Action 3E.

**Action 5B.** Select and implement technical management strategies. The local implementing agency will be responsible for final selection and implementation of management strategies based upon input from local and state agencies, stakeholders, interest groups, and the general public. Examples of specific management strategies that might be selected and implemented in the Yakima Basin include:

- Establish guidelines to limit septic system densities in new developments.
- Extend sewer lines from urban centers to nearby areas with septic systems.
- Provide technical and financial assistance to expanding wastewater collection and treatment facilities.
- Develop operations and maintenance program for on-site septic systems.

- Review existing guidelines for land application of wastewater effluent and consider whether more stringent requirements are needed including rules and regulations if applicable.
- Review existing guidelines prohibiting on-site disposal of non-domestic wastewater from commercial and industrial facilities, and consider whether more stringent requirements are needed, including rules and regulations, if applicable.
- Review existing design and operation standards for chemical storage and handling operations, and consider whether more stringent requirements are needed, including rules and regulations, if applicable.
- Promote implementation of BMPs for fertilizer application, pesticide application, irrigation management practices, and manure handling (e.g., Field Operations Technical Guide; and Ecology and WSU, April 1995).
- Review existing guidelines for siting of concentrated animal feeding operations, and consider whether more stringent requirements are needed, including rules and regulations, if applicable.
- Provide technical and financial assistance to agricultural and animal feeding operations for ground water quality improvement projects.
- Maintain local household hazardous waste collection and disposal programs; and, State producer pesticide collection (WSDA).
- Support research on contaminant fate and transport issues in the Yakima Basin.

#### ***Considerations for Objective 5***

- In some areas, some aspects of this objective may be addressed already, under existing critical areas ordinances.
- It may be difficult to discern from the results of the risk assessment and monitoring program which land use activities and contaminants need to be addressed.
- Selection and implementation of technical management strategies do not guarantee adequate protection of ground water supplies from contamination.
- Management strategies should not be applied uniformly to all locations. Some locations and land uses may require site-specific strategies.

**Table 6-5  
 Agency Involvement and Resource Needs for Objective 5**

<b>Action</b>	<b>Proposed Agency Involvement <sup>(1)</sup></b>	<b>Staff Resources Required <sup>(2)</sup></b>	<b>Initial Implementation Cost <sup>(3)</sup></b>	<b>Short-term Benefit</b>	<b>Long-term Benefit</b>
5A. Identify land use activities and contaminants to be addressed with technical management strategies	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• Conservation districts</li> <li>• Ecology</li> <li>• WSDA</li> <li>• NRCS</li> </ul>	Medium	Low	✓	
5B. Select and implement technical management strategies	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• Conservation districts</li> <li>• Ecology</li> <li>• WSDA</li> <li>• NRCS</li> </ul>	High	High	✓	✓

- (1) The agency proposed for a lead role is shown in italics. Other listed agencies may provide additional support with data and/or resources. Interagency agreements may be a vehicle for promoting cooperation.
- (2) Staffing estimated only for agency proposed for lead role. Low = Need ¼ to ¾ fulltime equivalent (FTE) to implement. Medium = Need 1-2 FTE to implement. High = Need > 2 FTE and/or contracted services to implement. Staffing estimates are relative, and would likely be reduced if multiple actions are implemented simultaneously.
- (3) In general, Low = Less than \$50,000 per county. Medium = Between \$50,000 and \$250,000. High = Greater than \$250,000.

### **6.2.6 Objective 6: Clean Up Sources of Ground Water Contamination**

**Purpose:** Restore impacted, unprotected ground water supplies outside the service areas of large water purveyors for potential use as a drinking water source.

**Rationale:** While prevention is the most effective way of protecting clean ground water supplies, a significant number of unprotected ground water supplies may already be impacted. These impacted ground water supplies cannot be safely used as an existing or future source of supply. Impacted ground water supplies should be cleaned up where feasible such that the ground water can be used as a drinking water source.

**Relationship to Other Objectives:** Some impacted ground water supplies may be identified by the long-term monitoring program (Objective 3).

#### **Proposed Actions**

**Action 6A.** Evaluate the need for greater involvement as a stakeholder in clean up actions at Ecology regulated facilities and sites. Remediation activities at Ecology regulated facilities and sites are already reviewed and approved by Ecology. While most remediation activities are required to restore impacted ground water to acceptable drinking water levels, Ecology occasionally allows ground water contaminants to be left in place at concentrations significantly above maximum contaminant levels (MCLs). Ecology should notify the local implementing agency about sites in the Yakima Basin in which proposed remediation actions will not restore impacted ground water to concentrations below MCLs. Then the local implementing agency could get more involved as an active participant in the public notification process to ensure that remediation actions are sufficient to

protect existing and future ground water supplies. The local implementing agency can identify geographic locations of many currently regulated sites and facilities at the Ecology facility/site database web site (<http://www.ecy.wa.gov/services/as/iss/fsweb/fshome.html>). A number of geographic searches can be conducted with this database including latitude/longitude, city, zip code, and county searches.

**Action 6B.** Evaluate the need for independent clean up actions. Some land use activities that have contributed to ground water contamination cannot be easily assigned to responsible parties. Examples of contaminant sources that may not be fully addressed by Ecology clean up programs include septic systems, animal feeding operations, agricultural operations, chemical storage facilities under a certain size threshold, etc. The local implementing agency should investigate the potential for providing technical and/or financial assistance to remove or remediate sources of contamination and downgradient impacts associated with these land use activities.

**Considerations for Objective 6**

- ❑ It may be difficult to stay up-to-date with the status of all remediation activities in the county or basin unless significant resources are earmarked for this task.
- ❑ It may be extremely difficult in most cases to identify specific land use activities that have contributed to ground water contamination and need to be cleaned up. A strong link between an impacted ground water supply and a land use activity would need to be firmly established (see Objective 3).

**Table 6-6  
 Agency Involvement and Resource Needs for Objective 6**

Action	Proposed Agency Involvement <sup>(1)</sup>	Staff Resources Required <sup>(2)</sup>	Initial Implementation Cost <sup>(3)</sup>	Short-term Benefit	Long-term Benefit
6A. Evaluate the need for greater involvement as a stakeholder in clean up actions at Ecology regulated facilities and sites	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• Ecology</li> <li>• Local water purveyors</li> </ul>	Medium	Low		✓
6B. Evaluate the need for independent clean up actions	<ul style="list-style-type: none"> <li>• <i>County health department</i></li> <li>• Ecology</li> <li>• WSDA</li> <li>• USGS</li> </ul>	High	High	✓	✓

(1) The agency proposed for a lead role is shown in italics. Other listed agencies may provide additional support with data and/or resources. Interagency agreements may be a vehicle for promoting cooperation.  
 (2) Staffing estimated only for agency proposed for lead role. Low = Need ¼ to ½ fulltime equivalent (FTE) to implement. Medium = Need 1-2 FTE to implement. High = Need > 2 FTE and/or contracted services to implement. Staffing estimates are relative, and would likely be reduced if multiple actions are implemented simultaneously.  
 (3) In general, Low = Less than \$50,000 per county. Medium = Between \$50,000 and \$250,000. High = Greater than \$250,000.

## 6.3 Implementation Considerations

Although management goals, objectives, and actions have been developed for the Yakima Basin as part of this watershed planning effort, local organizations will be responsible for establishing actual programs to protect ground water from contamination. A brief overview of some preliminary issues that will need consideration by local organizations when implementing the Watershed Plan are presented below.

### 6.3.1 Roles and Responsibilities

The role and responsibilities of each participant in a given ground water quality protection program needs to be defined from the beginning. A lead agency with broad local authority, such as the board of county commissioners, should be designated. Local government agencies able to provide resources and support staff, such as the county health department and county planning department, should be delineated. The amount of resources and support available from state agencies, such as DOH and Ecology, should be gauged. Likewise, the degree to which cities and local water purveyors are able to participate in the protection program should be established.

The local agency that implements the Watershed Plan will need to accept the management goals and objectives, as presented herein or modify the goals and objectives to satisfy new criteria. Development of specific management strategies and actions can be accomplished later by local committees. However, it should be decided in the beginning if independent ground water protection programs are going to be developed or if the framework for an existing program such as the GWMA Program will be used.

### 6.3.2 Potential Sources of Funding

The degree to which the Watershed Plan can be implemented will depend largely on the amount of funding available. The implementing agency should initiate attempts to obtain long-term sources of funding immediately. Potential sources of funding for ground water protection activities include:

- Federal grants from EPA and United States Department of Agriculture
- Cooperative agreements with federal agencies (e.g., USGS) in which the federal government funds a portion of the project
- Clean Water Act Section 319 Non-point Source Fund
- Centennial Clean Water Fund
- Washington State Revolving Fund
- Washington State Water Pollution Control Fund
- Grants from the Washington Conservation Commission
- Tax septic system and/or water use
- User fees on drinking water systems

- Property tax or other local taxes
- Plan review fees and permit fees
- Water rate surcharges adopted by public water systems benefiting from program
- Other state or local appropriations

Where funding is derived from targeted fees or taxes, care must be taken to ensure that principles of fairness and equity are addressed.

### **6.3.3 General Management Considerations**

A number of common-sense suggestions should be considered for successful implementation of a Yakima Basin ground water protection program. The following suggestions were modified from lessons learned from implemented ground water protection programs for the Spokane Valley/Rathdrum Prairie Aquifer (Idaho DEQ 1999):

- Effective leadership and a clear understanding of roles and responsibilities will benefit implemented objectives and actions.
- Successful programs will require cooperation, communication, and information exchange between local water purveyors, cities, counties, and state government agencies.
- Key leadership and staff positions should be stable over a long-term period (e.g., need staff with institutional memory to sustain programs since local planners and elected officials are continually changing).
- Successful implementation of most strategies requires sustained commitment of dedicated technical staff.
- Long-term success will depend on the ability to integrate management programs into core local government responsibilities (such as wellhead protection, land use planning, permitting septic systems).
- An effective methodology is needed for monitoring the performance of implemented objectives and actions.
- The public should be involved throughout the adoption and implementation process.
- Short-term successes should be promoted to boost the success of the entire program.