

DRINKING WATER SOURCE ASSESSMENT for the Village of Johnstown PWS ID #4501512



Protecting
Ohio's Drinking
Water Sources

OhioEPA

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INTRODUCTION. The 1996 Amendments to the Safe Drinking Water Act establish a program for states to assess the drinking water source for all public water systems. Ohio's Source Water Assessment and Protection Program is designed to help public water systems protect their sources of drinking water from becoming contaminated. This assessment:

- ▶ identifies the drinking water source protection area, based on the area that supplies water to the well(s),
- ▶ inventories the potential contaminant sources in the area,
- ▶ evaluates the susceptibility of the drinking water source to contamination, and
- ▶ recommends protective strategies.

The purpose of the assessment is to provide information that Village of Johnstown can use to help protect its source of drinking water from contamination.

SYSTEM DESCRIPTION & GEOLOGY. The Village of Johnstown's public water system serves approximately 3,700 people. This system currently operates three wells that pump approximately 302,000 gallons of water per day from three sand and gravel zones within the buried valley aquifer (water-rich zone) system underlying the present day Raccoon Creek valley. Pumping well information for the Village's wells is presented in Table 1. The aquifer is covered by an average of 130 feet of low-permeability material (clays), which provide significant protection from contamination.

Soils in the area are silty loams which are moderately well-drained, meaning that much of the rainfall and snowmelt will infiltrate into the soil, instead of running off or ponding. The

topography is generally moderately sloping with an average relief of 75 feet. Ground water in this area is replenished by the gradual flow of water underground from higher to lower elevations and by approximately four inches per year of precipitation that infiltrates through the soil. At the Village of Johnstown wellfield, ground water flows generally toward the south, based on a water table elevation map completed by the Ohio Department of Natural Resources (ODNR).

Table 1. Village of Johnstown Production Well Data

Well	Total Depth (feet)	Casing Length (feet)	Screen Length (feet)	Pump Capacity (gallons per minute)	Well Status
1	165	150	20	252	In Use
2	377	262	45 total	1034	In Use
3	377	344	45 total	826	In Use

PROTECTION AREA. The drinking water source protection area for the Village of Johnstown's wellfield is illustrated in Figure 1. This figure shows two areas, one inside the other. The "inner protection zone" is the area that provides ground water to the Village of Johnstown's wells within one year of pumping. A chemical spill in this zone poses a greater threat to the drinking water, so this area warrants more stringent protection. The "outer protection zone" is the additional area that contributes water when the wells are pumped for five years. Together, they comprise the drinking water source protection area.

Method Selection

An analytic element computer modeling program called GFLOW was used to determine the areal extent of the protection area. Protection areas based on computer modeling can be significantly

LEGEND

- Public Water System Well Location
- Above Ground Storage Tank
- Auto Repair/Body Shop
- Barber/Beauty Shop
- Car Wash
- Cemetery
- Dry Cleaner
- Electrical Substation (Transformer)
- Floor Drain (to septic tank/well)
- Funeral Service/Crematory
- Gas Station (Existing/Abandoned/Historical)
- Hardware/Lumber/Parts Store
- Gas Line
- Hazardous Waste Handlers (RCR(S))
- Inactive/Closed Landfill
- Leaking Underground Tank
- Medical/Dental Office/Clinic
- NPDES Permitted Facility (PFS)
- OEPA DERR Sites
- Ground Water Monitoring Wells
- Other Agricultural Source
- Other Commercial Source
- Paint Store
- Petroleum Product Production
- Plastics/Synthetics Producer
- Print/Photo Shop
- Regulated Under Several EPA Programs
- Sewer Line
- Storm Drain
- Veterinary Office

Protection Area Data



SUSCEPTIBILITY

Number of Wells: 3
 Total Pumping Rate: 1,000,000 GPD
 Porosity: 0.20
 Aquifer Thickness: 20 feet
 Hydrogeologic Setting: Buried Valley
 Land Use: Agricultural/Commercial/Residential
 Sewage Treatment: Centralized Sewer System

February 13, 2003



Figure 1. Drinking Water Source Protection Area for The Village of Johnstown Public Water System Identification # 4501512



more credible than those produced by simpler methods, especially in areas with complex geology. The time and effort required to develop a computer model are warranted when the wellfield is located in a complex hydrogeologic setting, and the hydrogeologic data needed to run the program are available for the area. Both criteria were met for the Village of Johnstown's source water assessment.

Model Set-up

The GFLOW model for the Village of Johnstown wellfield simulates the characteristics of the buried valley aquifer. It is based on a ground water map created by the ODNR that shows the water levels and ground water flow direction in many Licking County sand and gravel aquifers. As shown in Figure 2, the northern and southern boundaries of the modeled area follow the ground water contours at elevations of 1070 feet and 1030 feet above sea level. These boundaries are modeled as lines along which water enters and leaves the model (called "line-sink strings" in Figure 2). The eastern and western boundaries are drawn perpendicular to the north-south boundaries, and are modeled as no-flow boundaries because ground water generally flows parallel to these boundaries, not across them.

Model Values

Information needed to run the model includes, at a minimum, **pumping rate** of the well(s), **hydraulic conductivity** of the aquifer (that is, the ease with which water moves through it), **aquifer thickness**, and **aquifer porosity**. Model input data are presented in Table 2. For this model, a pumping rate of 1.0 million gallons per day was used. The modeled pumping rate is an extremely conservative value that is based on the water plant's treatment capacity as noted in Ohio EPA's Division of Drinking and Ground Water files. The hydraulic conductivity of 230 feet per day for the sand and gravel aquifer was based on pump tests conducted at the wellfield in 1993. An aquifer thickness of 50 feet was used, based on well logs and glacial aquifer maps. Site specific information on the hydraulic conductivity of the sandy shale bedrock was not available, and measured porosity values were unavailable for any of the units. In these cases, the values used in the model were based on values typically found in these kinds of rock and sediments. They were: 20% porosity for the sand and gravel aquifer, 3% porosity for the sandy shale bedrock, and 0 feet

per day hydraulic conductivity for the bedrock (no flow).

Table 2. Summary of Flow Model Input Parameters

Type of Information	Value Used	Source of Information
Pumping Rate (gallons/day)	1.0 million	Plant Treatment Capacity, Ohio EPA public drinking water files
Aquifer Porosity (%)	20	Estimated, based on typical porosity of sand and gravel aquifer
Aquifer Thickness (feet)	50	Well logs for area, filed at Ohio Department of Natural Resources, Division of Water
Hydraulic Conductivity of Aquifer (feet/day)	230	From pumping test conducted at wellfield by the City in 1993
Hydraulic Conductivity of Bedrock (feet/day)	0	Bedrock was treated as a no-flow boundary
Precipitation Recharge (inches/year)	6.5	From Ohio Department of Natural Resources, 1995, <i>Ground Water Pollution Potential of Licking County, Ohio</i> , Report No. 31

The protection area was determined based on the best information available at the time of the assessment. If you would like to have more information about how this protection area was derived, or if you would like to collect additional information and revise your protection area, please call Ohio EPA staff listed at the end of this report. Also, a more detailed discussion of the technical aspects of modeling drinking water source protection areas, can be found in the *Delineation Guidelines and Process Manual* (Ohio EPA, 2000) on Ohio EPA's Source Water Assessment and Protection Web page (www.epa.state.oh.us/ddagw/pdu/swap.html).

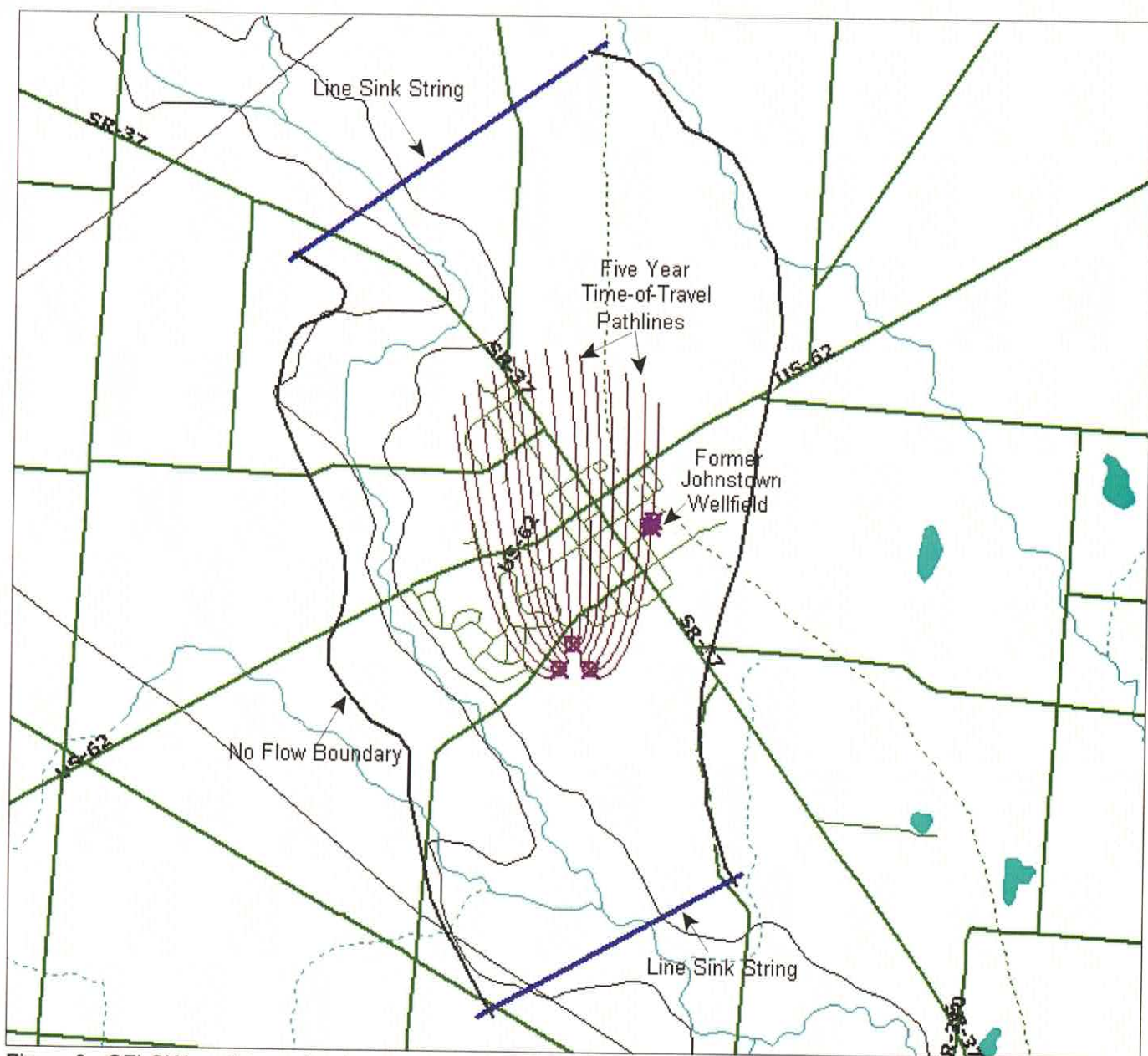


Figure 2. GFLOW model results showing the five year time-of-travel pathlines, the line sink strings, and the no-flow boundaries of the buried valley aquifer.

INVENTORY. On July 24, 2002, an inventory of potential contaminant sources located within the drinking water source protection area was conducted by Ohio EPA with the assistance of the Village of Johnstown personnel. Fifty-one potential sources of contamination were identified within the protection area (see Figure 1). Table 3 provides additional information about these types of potential contaminant sources.

A facility or activity is listed as a potential contaminant source if it has the **potential** to release a contaminant, based on the kinds and amounts of chemicals typically associated with that type of facility or activity. It is beyond the scope of this assessment to determine whether any specific potential source is **actually** releasing (or has released) a contaminant to ground water. Also, the inventory is limited to what Ohio EPA staff were able to observe on the day of the site

visit. Therefore, the Village of Johnstown staff should be alert to the possible presence of potential sources of contamination that are not on this list.

GROUND WATER QUALITY. A review of The Village of Johnstown's water quality record currently available in Ohio EPA's drinking water compliance database did not reveal any evidence of chemical contamination at levels of concern in the aquifer. Please note that this water quality evaluation has some limitations:

1. The data evaluated are for treated water samples only, as Ohio EPA's quality requirements are for the water being provided to the public, not the water before treatment.
2. Sampling results for coliform bacteria and naturally-occurring inorganics were not evaluated for this assessment, because they are not a reliable indicator of aquifer contamination.

Current information on the quality of the treated water supplied by the Village of Johnstown's Public Water System is available in the Consumer Confidence Report for the system, which is distributed annually. It reports on detected contaminants and any associated health risks from data collected during the past five years. Consumer Confidence Reports are available from the Village of Johnstown.

SUSCEPTIBILITY ANALYSIS. This assessment indicates that the Village of Johnstown's source of drinking water has a low susceptibility to contamination due to:

- ▶ the presence of thick protective layers of clay (total thickness approximately 130 feet) overlying the aquifer providing significant protection from contaminant movement between the ground surface and the aquifer,
- ▶ the significant depth (over 130 feet below the ground surface) of the aquifer,
- ▶ lack of evidence to suggest that ground water has been impacted by any significant levels of chemical contaminants from human activities, and

- ▶ the presence of significant potential contaminant sources in the protection area which may further impact the Village of Johnstown's drinking water supply.

This susceptibility analysis is subject to revision if new potential contaminant sources are sited within the protection area, or if water sampling indicates contamination by a manmade contaminant source.

PROTECTIVE STRATEGIES. Protective strategies are activities that help protect a drinking water source from becoming contaminated. Implementing these activities benefits the community by helping to:

- ▶ protect the community's investment in its water supply,
- ▶ protect the health of the community residents by preventing contamination of its drinking water source,
- ▶ support the continued economic growth of a community by meeting its water supply needs,
- ▶ preserve the ground water resource for future generations, and
- ▶ reduce regulatory monitoring costs.

Ohio EPA encourages the Village of Johnstown to develop and implement an effective Drinking Water Source Protection Plan. The plan can be developed from the information provided in this Drinking Water Source Assessment Report. The potential contaminant source inventory provides a list of facilities or activities to focus on. Table 4 lists protective strategies that are appropriate for the kinds of facilities/activities listed in the inventory. Finally, a document titled *Implementing Drinking Water Source Protection: Guidance for Public Water Systems Serving Municipalities and other Large Populations* is available from Ohio EPA.

This document offers comprehensive guidance for developing and implementing a municipal Drinking Water Source Protection Plan. Ongoing implementation of the plan will help protect the Village of Johnstown's valuable drinking water resources for current and future generations.

For further technical assistance on drinking water source protection, please contact the Ohio EPA Central District Office at 728-3778 or toll free at 728-3797 or visit the Ohio EPA Source Water Assessment and Protection Web page at: www.epa.state.oh.us/ddagw/pdu/swap.html.

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Table 3. Potential Contaminant Sources Located in the Village of Johnstown's Drinking Water Source Protection Area

Potential Contaminant Source	Number of Sources	Environmental Concerns	Protection Area
AGRICULTURAL SOURCES			
Silage Storage (Bulk)	1	Runoff or infiltration of liquids from bulk silage storage areas may be a source of excess nutrients in source water.	Outer Protection Zone
Other Agricultural Sources	N/A	Environmental concerns are dependent on the materials used and other site specific conditions.	Inner Protection Zone Outer Protection Zone Outside Protection Area
MUNICIPAL SOURCES			
Schools	2	Among the potential contaminant sources schools include aboveground storage tanks, underground storage tanks, lawn chemical storage, and vehicle storage, maintenance, and washing areas.	Inner Protection Zone Outer Protection Zone
Drinking Water Treatment Plants	2	Among the potential contaminant sources related to these facilities are: underground storage tanks; aboveground storage tanks; and storage of chemicals used in water treatment and testing.	Inner Protection Zone Outer Protection Zone
Other Municipal Sources	N/A	Environmental concerns are dependent on the materials used and other site specific conditions.	Inner Protection Zone Outer Protection Zone Outside Protection Area
COMMERCIAL SOURCES			
Auto Repair Shops / Body Shops	2	Among the potential contaminant sources related to these facilities are: underground storage tanks, automotive fluid storage, vehicle maintenance areas, and vehicle washing areas. These types of facilities may be associated with the potential for leaks and spills of oil, gasoline, other petroleum products, and automotive fluids. Waste oil and machining wastes may contain metals that could contaminate drinking water sources.	Outer Protection Zone
Barber and Beauty Shops	6	Although the majority of chemicals found at these facilities are safe for human use, they may also store cleaning solutions. Potential contaminants that may be associated with beauty shops include cleaning fluids and solutions used for some hair treatments, such as permanents.	Outer Protection Zone
Cemeteries	1	Cemeteries have been associated with arsenic and formaldehyde contamination in ground water.	Outer Protection Zone
Dry Cleaners	1	Potential contaminant sources at these facilities include storage and use of dry cleaning chemicals.	Outer Protection Zone
Funeral Services and Crematories	1	Potential contaminant sources at these facilities include the storage and use of chemicals and the disposal of biological wastes.	Outer Protection Zone
Gas Stations	4	Among the potential contaminant sources related to these facilities are: underground storage tanks, automotive fluid storage, vehicle maintenance areas, and vehicle washing areas. These types of facilities may be associated with the potential for leaks and spills of oil, gasoline, other petroleum products, and automotive fluids. Historic gas station location have been associated soil and water contamination related to leaks and spills of gasoline and other petroleum products. Unused underground storage tanks may be used for the improper disposal of wastes.	Outer Protection Zone
Hardware / Lumber / Parts Stores	2	Among the potential contaminant sources related to these facilities are: wood treatment chemicals, pesticides, fertilizers, parts cleaning solvents, and other chemical storage. These types of facilities may be associated with the potential for leaks and spills chemicals stored or used at that location.	Outer Protection Zone
Laundromats	1	Waste water from laundromats may contain elevated levels of nutrients.	Outer Protection Zone

Potential Contaminant Source	Number of Sources	Environmental Concerns	Protection Area
Medical / Dental Offices / Clinics	4	Among the potential contaminant sources related to these facilities are pathogen containing medical waste.	Outer Protection Zone
Paint Stores	1	Paint stores may store significant quantities solvents and other organic compounds.	Outer Protection Zone
Photo Processing / Printing Shops	2	Chemicals of concern at photo processing facilities is dependant on the processes used at the facility, but may be a potential source of metals, solvents, and organic chemicals.	Outer Protection Zone
Veterinary Offices	1	Among the potential contaminant sources related to these facilities are diseased and deceased animals. These types of facilities may be associated with animal pathogens.	Outer Protection Zone
Other Commercial Sources	N/A	Environmental concerns are dependent on the materials used and other site specific conditions.	Inner Protection Zone Outer Protection Zone Outside Protection Area
INDUSTRIAL SOURCES			
Plastics / Synthetics Producers	1	Among the potential contaminant sources related to these facilities are chemical storage in underground storage tanks, above ground storage tanks, and other storage areas. The chemicals of concern at these facilities are dependant on the materials processed and the processes used at the facility, but may include solvents and organic chemicals.	Outer Protection Zone
Other Industrial Sources	N/A	Environmental concerns are dependent on the materials used and other site specific conditions.	Inner Protection Zone Outer Protection Zone Outside Protection Area
WASTE DISPOSAL SOURCES			
Inactive / Closed Landfills	1	Runoff or leachate from historic waste disposal sites may be a source of metals, pesticides, or organic compounds in source water, dependant on the materials disposed and other site specific conditions.	Outer Protection Zone
Other Waste Disposal Sources		Environmental concerns are dependent on the materials used and other site specific conditions.	Inner Protection Zone Outer Protection Zone Outside Protection Area
WIDESPREAD SOURCES			
Aboveground Storage Tanks	1	Above ground storage tanks present a potential for leaks and spills that could impact surface or ground water.	Inner Protection Zone
Wells: Abandoned		Improperly sealed unused water wells create a direct pathway for potential contaminants to reach the aquifer.	
Highway / Transportation Routes	N/A	Accidents on transportation routes pose the threat of leaks and spills of fuels and chemicals. Weed killers used to control vegetation can elevate levels of pesticides in drinking water sources. Runoff may contain oil, metals, and deicers.	Inner Protection Zone Outer Protection Zone Outside Protection Area

Table 4. Protective Strategies for Consideration by the Village of Johnstown

Potential Contaminant Source	Protective Strategies To Consider
General	<ul style="list-style-type: none"> ▶ Purchase additional property or development rights ▶ Provide educational material to members of the community on topics regarding the drinking water source protection area. ▶ Include drinking water source protection into the local school curriculum. ▶ Provide education (material/meetings) to local farmers, businesses, and industries on topics relating to drinking water source protection. ▶ Encourage 'ground water friendly' development. ▶ Develop/enact/enforce a local ordinance which may include any of the following: changing zoning; requiring registration of existing facilities; banning certain new types of activities; dictating chemical handling procedures; maintaining/filing a chemical inventory; facility spill/contingency planning; engineering controls for existing/new facilities; paralleling existing federal or state requirements. ▶ Post road signs indicating the extent of the protection area.
Agricultural Sources	<ul style="list-style-type: none"> ▶ Assess the use of best management practices and recommend additional practices. ▶ Encourage road safety with agricultural chemicals. ▶ Plan/design/implement methods to control impacts to surface water.
Residential Sources	<ul style="list-style-type: none"> ▶ Inventory/remove underground home heating oil tanks in the protection area. ▶ Identify areas used for illegal dumping. ▶ Provide education (material/meetings) to home owners on: drinking water protection; use/maintenance of septic systems; illegal dumping; proper well abandonment (both the reason and the process). ▶ Develop a centralized wastewater collection/treatment system. ▶ Encourage/require (and provide incentives) for sealing unused wells. ▶ Ensure enforcement of existing requirements for closing unused wells. ▶ Ensure the proper construction of new wells.
Municipal Sources	<ul style="list-style-type: none"> ▶ Monitor compliance with existing regulations through inspections and/or contact with regulatory agencies (such as the local fire department, State Fire Marshal, or the Ohio EPA). ▶ Encourage/arrange hazardous materials training or waste and disposal assessments for employees. ▶ Develop an early release notification system for spills and emergency planning; educate emergency responders to be aware of drinking water protection areas; or coordinate facility spill/contingency planning. ▶ Encourage compliance with materials handling procedures/requirements. ▶ Install engineering controls at municipal facilities ▶ Implement pollution prevention strategies. ▶ Work with the street department and Ohio DOT to minimize use of road salt. ▶ Evaluate and close fire cisterns or other city owned wells. ▶ Conduct routine sewer inspections, maintenance & upgrades.
Commercial and Industrial Sources	<ul style="list-style-type: none"> ▶ Monitor compliance with existing regulations through inspections and/or contact with regulatory agencies. ▶ Use routine inspections as an educational opportunity. ▶ Encourage compliance with materials handling procedures/requirements. ▶ Encourage/arrange hazardous materials training or waste and disposal assessments for local industries (and their employees). ▶ Request installation of engineering controls for existing facilities. ▶ Encourage facility spill/contingency planning in conjunction with the fire department. ▶ Encourage local businesses and industries to implement pollution prevention strategies. ▶ Encourage/arrange waste and disposal assessments for local businesses.
Spills	<ul style="list-style-type: none"> ▶ Develop an early release notification system for spills and an emergency response plan. ▶ Include drinking water protection in response planning and training.
Transportation	<ul style="list-style-type: none"> ▶ Create hazardous materials routes around the protection area and require/encourage transporters to use them. ▶ Work with local transporters on protection area awareness. ▶ Encourage road safety with chemicals.