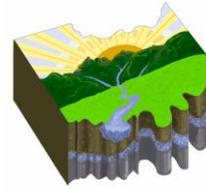


DRINKING WATER SOURCE ASSESSMENT for Scioto County Regional Water District #1 PWS ID #OH7300212



Protecting
Ohio's Drinking
Water Sources

Revised July 2017

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 Scioto County Regional Water District #1 can use to help protect its source of drinking water from contamination.

SYSTEM DESCRIPTION & GEOLOGY. Scioto County Regional Water District #1 is a community public water system serving approximately 14,000 people in Scioto County, Ohio. This system has 11 wells that are operated on a regular basis. The system pumps approximately 2,477,000 gallons of water per day from a sand and gravel aquifer (water-rich zone) within the Scioto River Buried Valley aquifer system. The aquifer is covered by approximately 10 feet of highly permeable material, which provides minimal protection from contamination. Depth to water in this aquifer is 10 to 15 feet below the ground surface.

Soils in the area are silty loams which are 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 flat with little relief. Ground water in this

area is replenished by the gradual flow of water underground from higher to lower elevations and by approximately 9 inches per year of precipitation that infiltrates through the soil. At the Scioto County Regional Water District wellfield, ground water flows generally toward the south, in the direction of flow in the Scioto River.

PROTECTION AREA. The drinking water source protection area for Scioto County Regional Water District's wells is illustrated in Figure 1. This figure shows two areas, one inside the other. The "inner management zone" is the area that provides ground water to the 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 "source water protection area" 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 model computer program called GFLOW was used to determine the areal extent of the protection area. Protection areas based on computer modeling can be significantly 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 Scioto County Regional Water District's source water assessment.

Model Set-up

The GFLOW model for Scioto County Regional Water District's wellfield was designed to simulate the characteristics of a sand and gravel buried valley aquifer that lies within a sandstone and shale bedrock aquifer. Figure 2 shows that the sand and gravel aquifer was modeled as an area of different flow properties (called

“inhomogeneities”) within the bedrock aquifer. The Scioto River was modeled as lines along which ground water enters or leaves the aquifer (called “line sink strings”).

Model Values

Information needed to run the model includes, at a minimum, **pumping rate** of the wells, **hydraulic conductivity** of the aquifer (that is, the ease with which water moves through it), **aquifer thickness**, and **aquifer porosity**. For this model, a pumping rate of 2,848,550 gallons per day was used for modeling purposes. This figure represents the average daily pumping rate as recorded in Ohio EPA’s files, plus an additional 15 percent, to provide a more protective area. The hydraulic conductivity range of 150 to 1,000 feet per day for the sand and gravel aquifer was based on pump tests conducted at the cities of Waverly and Piketon by Parker Hannefin in 1990 and the United States Department of Energy in 1969. The model used an aquifer thickness of 40 feet which was based on well logs. Site specific information on the hydraulic conductivity of the interbedded sandstone and 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, 15% porosity for the interbedded sandstone and shale bedrock, and 1 foot per day hydraulic conductivity for the interbedded sandstone and shale bedrock. Table 1 provides a summary of the model values.

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, 2010) on Ohio EPAs Source Water Assessment and Protection Web page (www.epa.ohio.gov/ddaqw/swap.aspx).

INVENTORY. In 2002, an inventory of potential contaminant sources located within the drinking water source protection area was conducted by

Ohio EPA staff. This inventory was updated and revised by Ohio EPA staff in December 2016. Twenty-four potential sources of contamination were identified within the protection area and three potential sources of contamination were identified just outside the protection area (See Figure 1). Table 2 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, Scioto County Regional Water District’s 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 Scioto County Regional Water District’s water quality record currently available in Ohio EPAs 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:

- < the data evaluated are mostly for treated water samples only, as Ohio EPAs quality requirements are for the water being provided to the public, not the water before treatment.
- < sampling results for coliform bacteria and naturally-occurring inorganics (other than arsenic) 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 Scioto County Regional Water District’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 Scioto County Regional Water District.

SUSCEPTIBILITY ANALYSIS. This assessment indicates that Scioto County Regional Water District's source of drinking water has a **high** susceptibility to contamination due to:

- the presence of a relatively permeable layer of soil overlying the aquifer,
- the relatively shallow depth (less than 15 feet below ground surface) of the aquifer,
- the presence of numerous significant potential contaminant sources in the protection area.

The risk of future contamination can be minimized by implementing appropriate protective measures.

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.
- < reduce regulatory monitoring costs.

Ohio EPA encourages Scioto County Regional Water District #1 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 3 lists protective strategies that are appropriate for the kinds of facilities/activities listed in the inventory. Finally, a document titled *Developing Local Drinking Water*

Source Protection Plans in Ohio 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 Scioto County Regional Water District #1's valuable drinking water resources for current and future generations.

For further technical assistance on drinking water source protection, please contact the Ohio EPA Southeast District Office at (740) 385-8501 or toll free at (800) 686-7330, or visit the Ohio EPA Source Water Assessment and Protection Web page at: www.epa.ohio.gov/ddagw/swap.aspx.

This report was written by Kevin O'Hara, Ohio EPA, Division of Drinking and Ground Waters, Southeast District Office.

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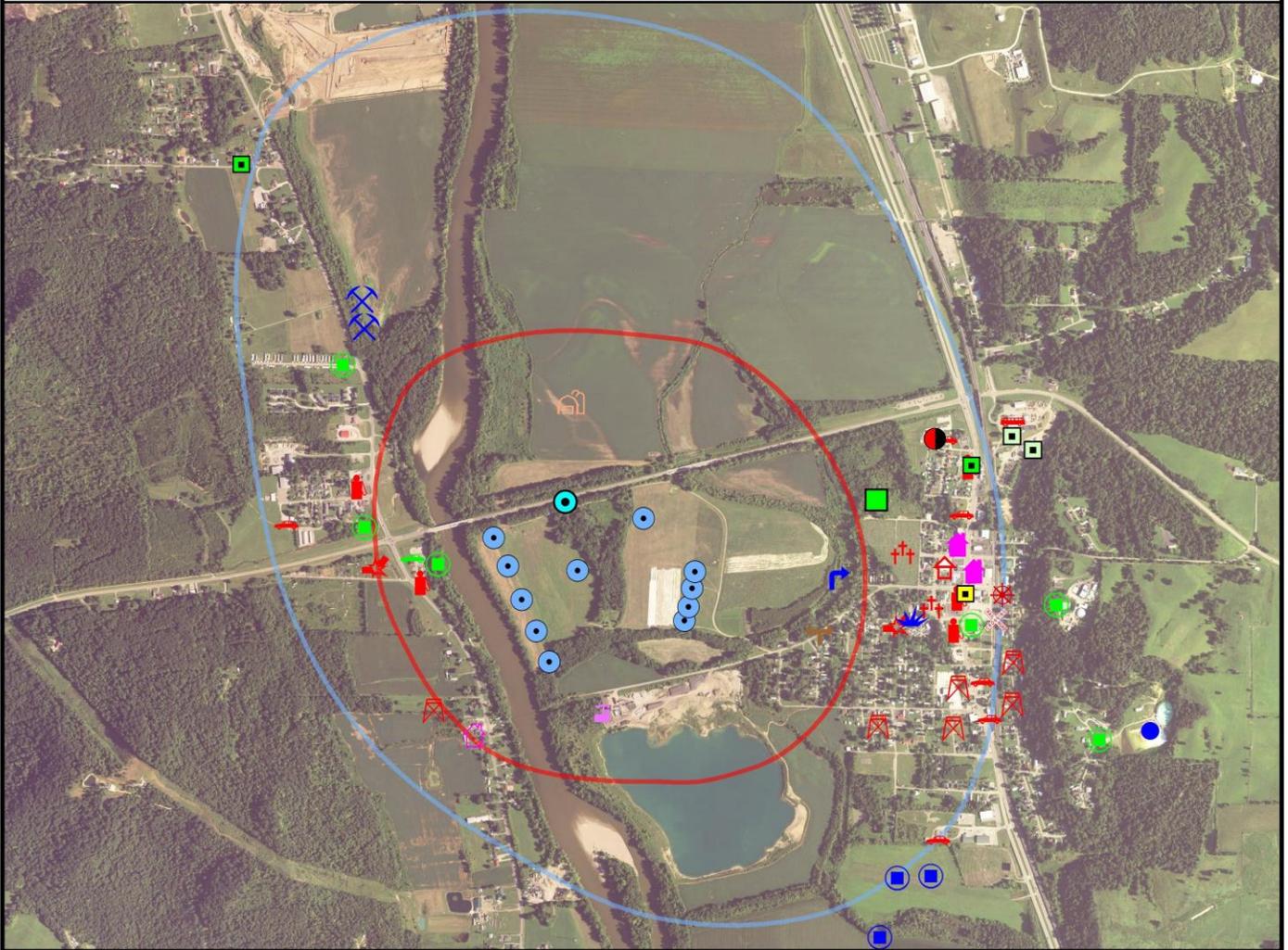
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Table 1. Data Used in Construction of Ground Water Flow Model

Type of Information	Value Used	Source of Information
Pumping rate	2,858,550 gallons per day	Average daily pumping rate, plus 15 percent, Ohio EPA public drinking water files
Aquifer porosity (sand-and gravel)	20%	Conservative estimate, based on typical porosity of similar aquifer settings
Aquifer thickness	40 feet	Well logs for area, filed at Ohio Department of Natural Resources, Division of Water
Hydraulic conductivity of aquifer (sand and gravel)	150 to 1,000 feet per day	From ODNR aquifer map, and previous pumping test performed at wellfield by Parker Hannefin and USGS.
Hydraulic conductivity of bedrock (sandstone and shale)	1 foot per day	Best professional judgment, more than 2 orders of magnitude difference from alluvium.
Precipitation recharge	9 inches per year	Based on GFLOW modeling at Parker Hannefin and DRASTIC database for buried valley aquifer in southern Ohio.

Scioto County Regional Water District #1, PWS ID#OH7300212 Scioto County, Valley Township



Legend

- | | |
|---|---|
| ● PWS Active Wells | ⊗ Gravel Pit/Quarry |
| ⬜ Inner Management Zones (groundwater) | ⊗ Junk Yard (Auto Salvage/Scrap) |
| ⬜ Source Water Protection Areas (groundwater) | ⊗ Landfill: Closed/Inactive |
| ⬜ Above Ground Storage Tank | ⊗ Other Commercial Source |
| ⬜ Asphalt/Cement/Concrete Plant | ⊗ Railroad Yard/Maintenance Facility |
| ⬜ Auto Repair/Body Shop | ⊗ Salt/De-icer Storage |
| ⬜ Auto/Truck Wash | ⊗ Sanitary Sewer Line |
| ⬜ Carpet/Tile/Paint Store | ● Surface Water |
| ⬜ Cemetery | ⬜ Underground Storage Tank: Leaking |
| ⬜ Chemical Storage | ⬜ Underground Storage Tank: Non-Leaking |
| ⬜ Crops: corn, soybean, wheat | ⬜ Utility Shed/Maintenance Building |
| ⬜ Drainage Canal/Tile | ⬜ Wastewater Treatment Facility |
| ⬜ Equipment Rental/Repair Shop | ⬜ Wastewater/Biosolids Application |
| ⬜ Garage: Municipal | ⬜ Well: Oil & Gas |
| ⬜ Gas Station: Active | |

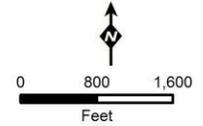


Protection Area Data

Number of Wells = 11
 Pumping Rate = 2,477,000 gallons per day
 Porosity = 20%
 Aquifer Thickness = 40 feet
 Hydrogeologic Setting = Buried Valley
 Land Use = Residential/Commercial/Agricultural



Figure 1. Drinking Water Source Protection Area



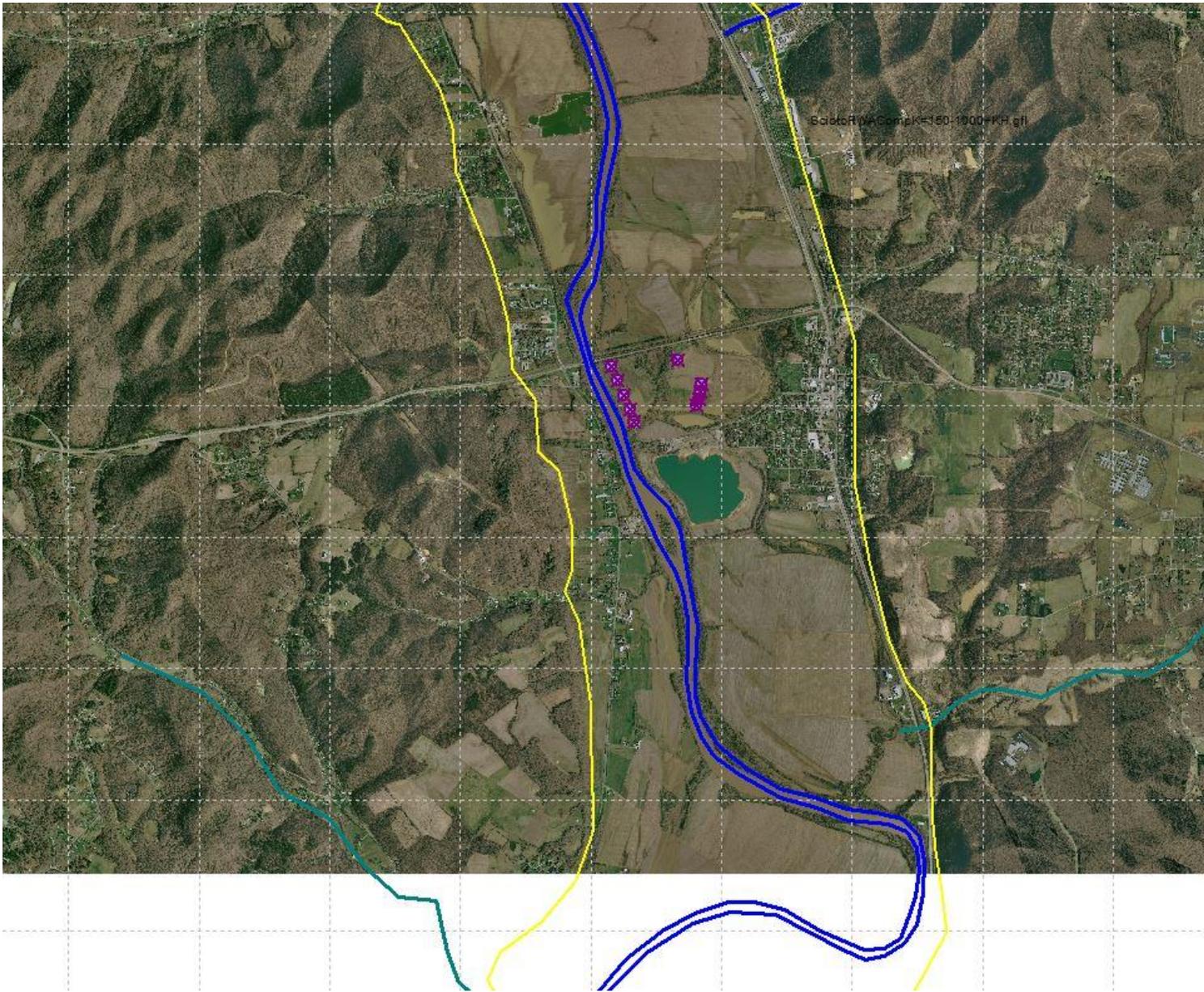


Figure 2. Purple symbols are production wells. Yellow boundaries represent inhomogeneities for zones of varying hydraulic conductivity. Blue lines are river line sinks, green lines are far field line sinks.

Table 2. Potential Contaminant Sources Located in Scioto County Regional Water District's Drinking Water Source Protection Area

Potential Contaminant Source	Number of Sources	Environmental Concerns	Protection Area
AGRICULTURAL SOURCES			
Crops: Corn, Soybean, Wheat	1	Potential contaminant sources that may be associated with pastures include sludge application, fertilizer, and pesticide use. Cropland may be associated with nitrates, ammonia, pesticides, and pathogens in drinking water sources.	Within inner protection area
Drainage Canals/Tiles (agricultural)	>1	Potential contaminant sources that may be associated with pastures include sludge application, fertilizer, and pesticide use. Cropland may be associated with nitrates, ammonia, pesticides, and pathogens in drinking water sources.	Within inner protection area
MUNICIPAL SOURCES			
Maintenance Garages (Scioto Co. Highway Dept.)	1	Among the potential contaminant sources related to these facilities are: underground storage tanks; automotive fluid storage; equipment storage areas; parking lots; vehicle storage areas; 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.	Just outside outer protection area
INDUSTRIAL SOURCES			
Asphalt Plant (Shelley Materials)	1	Among the potential contaminant sources related to these facilities are: underground storage tanks; automotive fluid storage; equipment storage areas; parking lots; vehicle storage areas; 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.	Within inner protection area.
Sand & Gravel Mining/Processing (Jurgenson Aggregates)	1	Among the potential contaminant sources related to these facilities are: aboveground storage tanks, underground storage tanks, other liquid storage, vehicle maintenance areas and vehicle washing areas. These types of facilities may be associated with surface water contaminants and the potential for oil, gasoline, and automotive fluid leaks and spills.	Within outer protection area
WASTE DISPOSAL SOURCES			
Closed Landfills	1	Runoff or leachate from historic disposal sites may be a source of contaminants.	Outer protection area

Potential Contaminant Source	Number of Sources	Environmental Concerns	Protection Area
COMMERCIAL SOURCES			
Auto Repair Shops/Body Shops	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. Waste oil and machining wastes may contain metals that could contaminate drinking water sources.	Within outer protection area
Car Washes	1	Runoff from these facilities may be a source of metals, petroleum products such as motor oil, and organic compounds in source water.	Within inner protection area
Cemeteries	2	Cemeteries have been associated with arsenic and formaldehyde contamination in ground water.	Within outer protection area
Chemical Supplier/Storage (Pool World)	1	The chemicals of concern at these facilities are dependent on the materials sold and/or handled.	Within outer protection area
Automotive Parts Stores	2	Among the potential contaminant sources related to these facilities are: parts cleaning solvents, and other chemical storage. These types of facilities may be associated with the potential for leaks and spills of chemicals used or stored at these locations.	Within outer protection area
Gas Stations	4	Among the Potential sources of petroleum and brine, which may leak into an aquifer. Oil, brine, and other fluids may also leak from storage tanks.	Within inner and outer protection areas
Junk yards	2	These types of facilities may be locations for leaks and spills of oil and other petroleum products. Waste oil and auto parts may contain metals that could contaminate drinking water sources.	Within inner and outer protection areas
Equipment Sales/Repair (Valley Tractors)	1	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.	Within inner protection area
WIDESPREAD SOURCES			
Oil & Gas Wells	Numerous (Illustrated)	Potential sources of petroleum and brine, which may leak into an aquifer. Oil, brine, and other fluids may also leak from storage tanks.	Within inner and outer protection areas

Potential Contaminant Source	Number of Sources	Environmental Concerns	Protection Area
Surface Water Bodies	1	May provide a direct pathway for spilled chemicals, nitrates, and pesticides from the ground surface to the aquifer.	Within inner protection area
Transportation Route	3	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.	Within inner and outer protection areas

Table 3. Protective Strategies for Consideration by Scioto County Regional Water District

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 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.
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. ➤ Provide education (material/meetings) to local farmers and agribusinesses on appropriate topics. ➤ Plan/design/implement methods to control impacts to surface water.
Septic systems	<ul style="list-style-type: none"> ➤ Provide education (material/meetings) to home owners on use/maintenance of septic systems. ➤ Develop a centralized wastewater collection/treatment system ➤ 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.
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). ➤ Encourage facility spill/contingency planning in conjunction with the fire department. ➤ Request installation of engineering controls for existing facilities. ➤ Encourage local industries to implement pollution prevention strategies. ➤ Encourage compliance with materials handling procedures/requirements. ➤ Encourage/arrange waste and disposal assessments for local businesses.
Oil & gas wells	<ul style="list-style-type: none"> ➤ Provide education (material/meetings) to owners on maintenance. ➤ Ensure/monitor proper operation and maintenance. ➤ Develop an early release notification system for spills.
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.

	<ul style="list-style-type: none"> ➤ Encourage road safety with chemicals. ➤ Post signs indicating the extent of the protection area.
Commercial 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 businesses (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 to implement pollution prevention strategies.
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. ➤ Post signs indicating the extent of the protection area.