DRINKING WATER SOURCE ASSESSMENT for the Village of South Point

(PWS ID # 4401212)

June 2003

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 South Point can use to help protect its source of drinking water from contamination.

SYSTEM DESCRIPTION & GEOLOGY. The Village of South Point is a community public water system serving 3,892 people in Lawrence County, Ohio. This system operates 5 potable wells in four well fields that pump approximately 800,000 gallons of water per day from a sand and gravel aquifer (water-rich zone) within the Ohio River Valley alluvial aquifer system. Up to 35 feet of moderate to low-permeability material rests on top of the aquifer; depth to water below the ground surface is approximately 40 feet. At the end of this report, Table 1 contains information about the physical characteristics of the water supply wells operated by South Point.

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 area topography is gently sloping with an average relief of 70 feet within the river valley setting. 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 South Point wellfield, ground water flows generally toward the northwest, based on the direction of surface water flow in the Ohio River.

PROTECTION AREA. The drinking water source protection area for South Point's wells are 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 South Point'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 well is 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 South Point's source water assessment.

Model Set-up
The GFLOW model for South Point's wellfield was designed to simulate the characteristics of a sand and gravel alluvial valley aquifer that is bounded by a less permeable bedrock aquifer. Figure 2 shows that the sand and gravel aquifer was modeled as an area of different flow properties (called an "inhomogeneity") within the bedrock aquifer. The Ohio River and contributing streams were modeled as lines along which ground water enters or leaves the aquifer (called "line sinks").

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, the pumping rate of 920,000 gallons per day represents the average daily pumping rate of South Point's potable wells and interceptor well as recorded in Ohio EPA's files, plus an additional 15 percent, to provide a more protective area. A hydraulic conductivity range of 100 - 900 feet per day was used for the sand-and-gravel aquifer, based on data collected during environmental and wellfield investigations at sites similar to South Point along the Ohio River. An aquifer thickness of 45 feet was used, based on local well logs. Site specific information on the hydraulic conductivity of the 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 bedrock, and 1 foot per day hydraulic conductivity for the bedrock. The hydraulic parameters used in the Gflow model are summarized in Table 2 at the end of this report.

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 the 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).

INVENTORY. On June 9,2003 an inventory of potential contaminant sources located within the drinking water source protection area was conducted by Ohio EPA with the assistance of South Point personnel. Thirty-two 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 staff were able to observe on the day of the site visit. Therefore, South Point staff should be alert to the possible presence of potential sources of contamination that are not on this list.

GROUND WATER QUALITY
At this time, there is evidence indicating the quality of water provided by South Point has been impacted. Samples collected since 1990 contained nitrate above the concentration of concern of 2 mg/L on 84 occasions, with concentrations ranging from 2.0 to 6.5 mg/L. Since 1990, cis-1,2 dichloroethylene has been detected on two occasions, with concentrations ranging from 0.5 to 14.6 ug/L. These chemical detections indicate a manmade influence. The above reported concentrations are all below the federal and state drinking water standards for Nitrate (MCL = 10mg/L) and cis-1,2 dichloroethylene (MCL = 70 ug/L).

Please note that this water quality evaluation has some limitations:

1) The data evaluated is mostly 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 (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 South Point'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 South Point.

This assessment indicates that South Point's source of drinking water has a HIGH susceptibility to contamination due to the:

- relatively thin layer of clay overlying the aquifer;
- presence of significant potential contaminant sources in the protection area; and
- presence of manmade contaminants in treated water

The risk of additional 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:

1. Protect the community's investment in its water supply.

2. Protect the health of the community residents by preventing contamination of its drinking water source.

3. Support the continued economic growth of a community by meeting its water supply needs.

4. Preserve the ground water resource for future generations.

5. Reduce regulatory monitoring costs.

Ohio EPA encourages South Point 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 "*Developing Local Drinking Water Source Protection Plans in Ohio*" is enclosed. This document offers comprehensive guidance for developing and implementing a municipal Drinking Water Source Protection Plan. Ongoing implementation of the plan will help protect South Point'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 (1-800-686-7330) or visit the Ohio EPA Source Water Assessment and Protection Web page at: http://www.epa.state.oh.us/ddagw/pdu/swap.html.

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BIBLIOGRAPHY

Ohio EPA public drinking water files.

Ohio Department of Natural Resources, 2000, Alluvial Aquifer Map (digital) and local well logs.

Ohio EPA, 2002, *Drinking Water Source Protection Area Delineation Guidelines & Process Manual*, Draft (February, 2002).

Table 1. Data for South Point's Public Water System Wells

Well #	Total Depth (ft)	Casing Length (ft)	Screen Length (ft)	Well Status
2	72	46	26	In Use
8	--	--	--	Not in use
10	72	--	--	In Use
11	73	55	18	In Use
9	73	--	--	In Use
6	--	--	--	Not in Use
3	73	--	15	In Use
7	--	--	13	Not in Use

Table 2. Data Used in Construction of Ground Water GFLOW Model

Type of Information	**Value Used**	**Source of information**
Pumping rate	920,000 gallons per day	Ohio EPA public drinking water files + 15%
Aquifer porosity (sand-and gravel)	20%	Estimated, based on typical porosity of sand and gravel aquifers.
Aquifer thickness	45 feet	Based on local well logs
Hydraulic conductivity of aquifer (sand and gravel)	100 - 900 feet per day	Based on environmental & wellfield investigations at sites along the Ohio River.
Hydraulic conductivity of bedrock	1 foot per day	Estimated, best professional judgement .
Precipitation (recharge)	9 inches per year	Drastic value for many river valley systems in southeastern Ohio.

Table 3. Potential Contaminant Sources Located in South Point's Drinking Water Source Protection Area

Potential Contaminant Source	Number of Sources	Environmental Concerns	Protection Area
AGRICULTURAL SOURCES			
Greenhouses / Nurseries	1	Potential contaminants that may be associated with nurseries include nitrates, ammonia, and pesticides. Nurseries may also maintain storage areas for gasoline, diesel fuel, and other automotive fluids.	Outer Protection Zone
MUNICIPAL SOURCES			
Drinking Water Treatment Plants	1	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
Garages	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.	Inner Protection Zone
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.	Outer Protection Zone
Wastewater Treatment Plant	1	Among the potential contaminant sources related to these facilities are waste treatment lagoons, aboveground storage tanks, and underground storage tanks. Wastewater treatment plants may be associated with nitrates, ammonia, pathogens, and chemical spills and leaks.	Inner Protection Zone
COMMERCIAL SOURCES			

Potential Contaminant Source	Number of Sources	Environmental Concerns	Protection Area
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.	Inner and Outer Protection Zone and Beyond 5-Year Time-of-Travel
Barber and Beauty Shops	2	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.	Inner Protection Zone and Beyond 5-Year Time-of-Travel
Car Dealerships	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.	Outer Protection Zone
Cemeteries	1	Cemeteries have been associated with arsenic and formaldehyde contamination in ground water.	Beyond 5-Year Time-of-Travel
Gas Stations	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. 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 and Beyond 5-Year Time-of-Travel

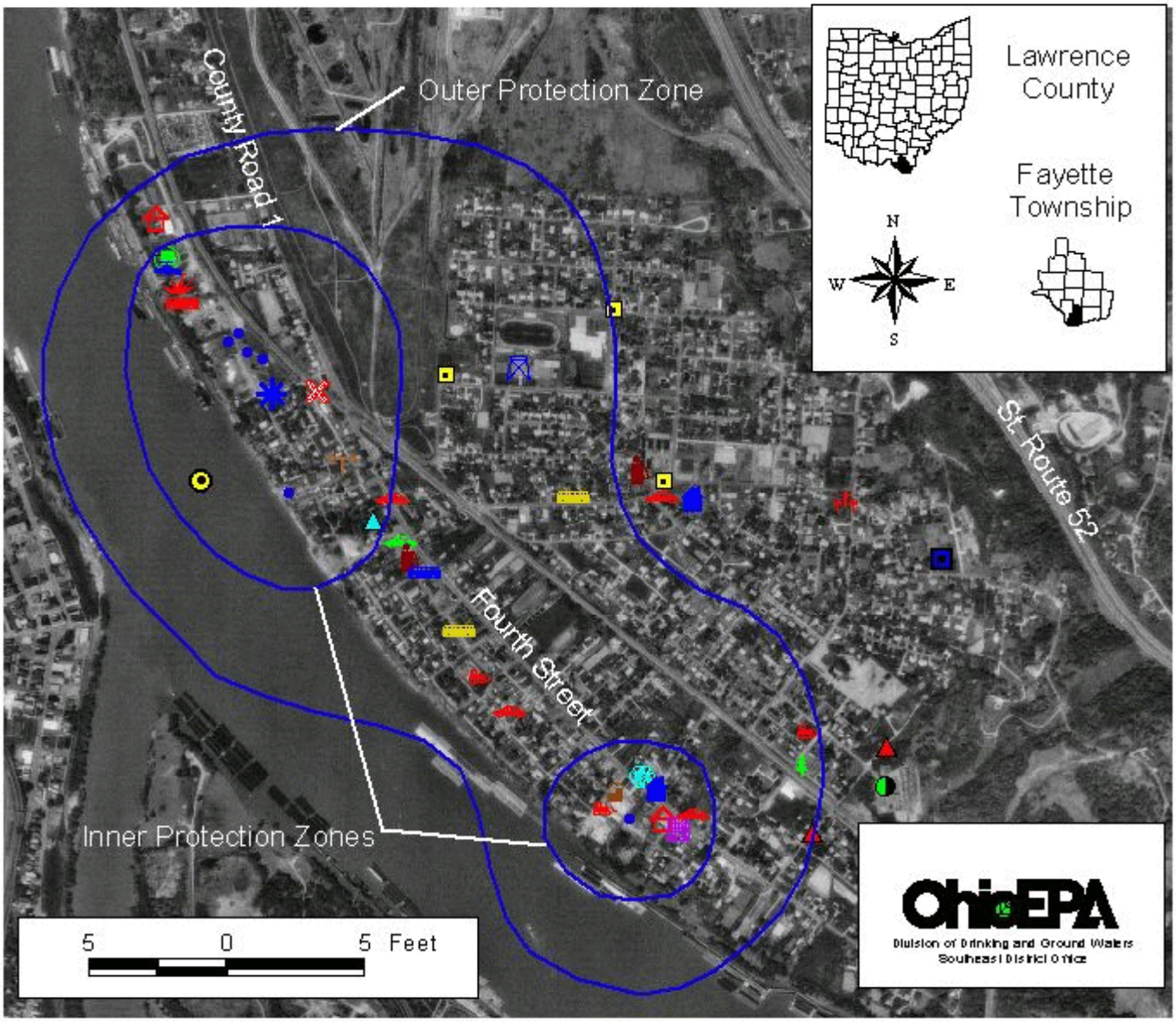
Potential Contaminant Source	Number of Sources	Environmental Concerns	Protection Area
Fleet / Truck / Bus Terminals	1	Among the potential contaminant sources related to these facilities are: underground storage tanks; automotive fluid storage; equipment storage areas; parking lots; vehicle storage areas; 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.	Outer Protection Zone
Railroad	Numerous in surrounding area	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.	Outer Protection Zone and Outside 5-year Time-0f-Travel
Medical / Dental Offices / Clinics	1	Among the potential contaminant sources related to these facilities are pathogen containing medical waste.	Inner Protection Zone
Other Commercial Sources	1	Environmental concerns are dependant on the materials used and other site specific conditions.	Inner Protection Zone
INDUSTRIAL SOURCES			
Hazardous Waste Handlers	2	Runoff or leachate from historic hazardous materials sites may be a source of metals, fuels, or organic compounds in source water, dependant on the materials disposed and other site specific conditions.	
Machine Shops	1	Among the potential contaminant sources related to these facilities are: waste handling and disposal practices; aboveground storage tanks; underground storage tanks; other liquid storage; bulk material storage; and equipment storage and maintenance areas. These types of facilities may be associated with the potential for leaks and spills of oil and other chemical. Waste streams may contain metals that could contaminate drinking water sources.	Inner Protection Zone

Potential Contaminant Source	Number of Sources	Environmental Concerns	Protection Area
Other Industrial Sources	1	Environmental concerns are dependant on the materials used and other site specific conditions.	Inner Protection Zone
WIDESPREAD SOURCES			
Salt Storage	1	If improperly stored, have the potential to be dissolved or washed into surface waters.	Inner Protection Zone
Construction Equipment and Material	3	Runoff or leachate from construction and demolition may be a source of organic compounds in source water. Potential for oil, gasoline, and automotive fluid leaks and spills.	Inner and Outer Protection Zone
Surface Water Bodies	Numerous in surrounding area	May provide a direct pathway for spilled chemicals, nitrates, and pesticides from the ground surface to the aquifer.	Inner and Outer Protection Zone and Outside 5-Year Time-of-Travel
Highway / Transportation Route	Numerous in surrounding area	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 and Outer Protection Zone and Outside 5-Year Time-Of-Travel
Leaking underground storage tanks	3	If not properly addressed, may allow gasoline and chemicals to reach the aquifer.	Outer Protection Zone and Beyond 5-Year Time-of-Travel
Sanitary sewer lines	Numerous in surrounding area	If poorly maintained, may be a source of household and business chemicals, viruses and bacteria.	Inner and Outer Protection Zone and Beyond 5-Year Time-of-Travel
Electric substations	1	May contain equipment containing hundreds of gallons of oil, some of which may contain PCBs. Poorly maintained equipment may result in leaks and spills.	Beyond 5-Year Time-of-Travel

Table 4. Protective Strategies for Consideration by South Point

Potential Contaminant Source	Protective Strategies To Consider
General	▸ 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.
Transportation	▸ 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. ▸ Post signs indicating the extent of the protection area.
Residential Sources	▸ 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	▸ 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 of 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 Sources	▸ 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.
Industrial Sources	▸ 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.
Spills	▸ 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.



LEGEND

- Well Locations

Potential Contaminant Sources

- Car Wash
- Cemetery
- Scioto River
- Railroad
- Machine Shop
- UIC Class V
- Fleet/Truck/Bus Terminal
- Leaking Underground Tank
- Medical/Dental Office/Clinic
- NPDES Permitted Facility (PCS)
- Other Commercial Source
- Sewer Line
- Gas Station
- Greenhouse/Nursery
- Garage (Municipal)
- School (Bus Area/Garage)
- Wastewater Treatment Plant
- Drinking Water Treatment Plant
- Electrical Substation (Transformer)
- Construction Equipment and Material
- Hazardous Waste Handlers (RCRIS)
- Regulated Under Several EPA Programs
- OEPA DERR Sites
- Auto Repair Shop
- Barber/Beauty Shop
- Other Industrial Source
- Salt Storage Area

This area is served by a sanitary sewer system.
Land use is primarily residential and commercial.

Information used to develop Protection Area:

Number of Wells = 5
Total Well Pumping Rate = 920,000 GPD
Porosity = 20 %
Aquifer Thickness = 45 feet
Hydrogeologic Setting = Alluvial

LOW | MODERATE | HIGH

SUSCEPTIBILITY

July, 2003

Figure 1. Drinking Water Source Protection Area for the Village of South Point #4401212.