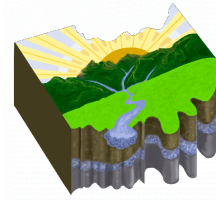


# DRINKING WATER SOURCE ASSESSMENT for Portage County-Brimfield (PWS ID #6706012)



Protecting  
Ohio's Drinking  
Water Sources

OhioEPA

July 2002

**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 Portage County-Brimfield can use to help protect its source of drinking water from contamination.

**SYSTEM DESCRIPTION & GEOLOGY.** Portage County-Brimfield is a community public water system serving 510 people in Brimfield, Ohio. This system operates 3 wells that pump approximately 632,000 gallons of water per day (GPD). Two wells (#1 and #3) pump from a sand and gravel aquifer (water-rich zone) within the Plum Creek Buried Valley aquifer system. The third well (#2) pumps from a bedrock sandstone aquifer that directly underlies the buried valley. Information on the depths and lengths of casing and screen of these wells is summarized in Table 1. The aquifer is covered by 8 or more feet of low-permeability material, which provides minimal protection from contamination. Depth to water in this aquifer is 7.8 to 19 feet below the ground surface (bgs). Available information on the Portage County-Brimfield wellfield indicates that the sandstone aquifer is interconnected with the overlying sand

and gravel aquifer.

Soils in the area are mucks to silty loams, which are moderately to poorly drained, meaning that much of the rainfall and snowmelt will run off or pond instead of infiltrating into the soil. The topography is generally moderately sloping to flat. Ground water in this area is replenished by the lateral flow of ground water from adjacent bedrock and by approximately 7 to 10 inches per year of precipitation, some of which infiltrates through the soil. At the Portage County-Brimfield wellfield, ground water flows from the buried valley walls to the east and west, and from the Mogadore Reservoir. Ground water within the buried valley system generally flows to the north. This information is based upon a water table elevation map completed by the Ohio Environmental Protection Agency (Ohio EPA).

**PROTECTION AREA.** The drinking water source protection area for Portage County-Brimfield's well 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 Portage County-Brimfield's well 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 computer model, called GFLOW, was used to determine the areal extent of the protection area. Protection areas based on computer modeling can be significantly more accurate 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 Portage County-Brimfield's source water assessment.

### **Model Set-up**

The GFLOW model for Portage County-Brimfield's wellfield was designed to simulate the sand and gravel buried valley aquifer that lies within a sandstone bedrock aquifer setting. 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. Potentiometric contour lines (lines along which the water table elevation is the same) were modeled as "line sinks" (lines along which ground water enters or leaves the aquifer).

### **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** for each hydrogeologic system. Table 2 summarizes the model input values used for this drinking water source protection area. For this model, the maximum daily pumping rate of 1,160,000 gallons per day was taken from Ohio EPA's files.

For the sand and gravel aquifer, an aquifer thickness of 96 feet was used, and was based on well logs for the Portage County-Brimfield wellfield. The hydraulic conductivity was varied between 181 and 307 feet per day, and was calculated from pump tests conducted at the wellfield in 1998. A recharge value of 2 inches per year from precipitation, was used within the buried valley.

For the sandstone bedrock aquifer, site specific information on the hydraulic conductivity was not available. The values used in the model (10 feet per day and 45 feet per day) were based upon published values and calculated average values for this type of aquifer in this county.

Measured porosity values were unavailable for any of the aquifers. However, based on published porosity values typically found in these kinds of rock and sediments, 20% porosity for the sand and gravel aquifer, and 10% porosity for the sandstone bedrock were used.

A sensitivity analysis for which the hydraulic

conductivity values were varied for both the sand and gravel and sandstone aquifers was run. The resulting four drinking water source protection areas, one for each of the hydraulic conductivity value combinations, were combined to determine the maximum extent of the drinking water source protection area.

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](http://www.epa.state.oh.us/ddagw/pdu/swap.html)).

**INVENTORY.** On June 4, 2002, an inventory of potential contaminant sources located within the drinking water source protection area was conducted by Ohio EPA with the assistance of Portage County-Brimfield personnel. Eight potential sources of contamination were identified within the protection area (see Figure 1). Table 3 provides 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, Portage County-Brimfield 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 Portage County-Brimfield 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:

- ▶ Ohio EPA water quality requirements are for water that is actually being provided to the public for consumption (tap water). If a treatment system is used, the water quality data evaluated is for treated water only, and not the water before treatment.
- ▶ 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 Portage County-Brimfield's public water system is available in the Consumer Confidence Report (CCR) for the system, which is distributed annually. The CCR identifies detected contaminants and any associated health risks from data collected during the past five years. Consumer Confidence Reports are available from Portage County-Brimfield.

**SUSCEPTIBILITY ANALYSIS.** The susceptibility of the aquifer (source of drinking water) to contamination was determined by evaluating (1) site specific information (i.e., aquifer material, topography, soils, rate of ground water recharge, etc.), (2) pollution potential rating of the drinking water source protection area, (3) available ground water quality data, and (4) potential contaminant sources that were identified within the drinking water source protection area. The results of this evaluation indicate that the aquifer within the protection area has a high susceptibility because of the following reasons:

- ▶ The buried valley aquifer has a shallow depth to water of 7.8 to 19 feet bgs;
- ▶ There is no significant low-permeability protective layer between the aquifer and the ground surface; and
- ▶ Potential significant contaminant sources exist within the protection area.

A high susceptibility rating of the aquifer does not imply that the wellfield will become contaminated. It only means that the existing/known aquifer conditions are such that **ground water within the aquifer** could become impacted if the potential contaminant sources are not appropriately

managed.

**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; and
5. Reduce regulatory monitoring costs.

Ohio EPA encourages Portage County-Brimfield 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 appropriate protective strategies 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 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 Portage County-Brimfield's valuable drinking water resources for current and future generations.

For further technical assistance on drinking water source protection, please contact the Ohio EPA Northeast District Office at {1-800-686-6330} or visit the Ohio EPA Source Water Assessment and Protection Web page at: <http://www.epa.state.oh.us/ddagw/pdu/swap.html>.

**BIBLIOGRAPHY**

Bennett & Williams, 2001, Brimfield Well Field Evaluation.

Ohio Department of Natural Resources, *Ground Water Pollution Potential of Portage County, Ohio*, (digital map).

Ohio Department of Natural Resources, 1979, *The Ground Water Resources of Portage County, Ohio*.

Ohio Department of Natural Resources, 2000, Glacial Aquifer Map (digital map).

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

Ohio EPA public drinking water files.

The Ohio Drilling Company, 1998, *Aquifer Test of the Brimfield Wellfield, Brimfield, Ohio*.

**Table 1. System Information on the Portage County-Brimfield Public Water System Wells**

Well #	Total Depth (feet)	Casing Length (feet)	Static Water Level (feet)	Well Status
1	215	140	10	Bedrock
2	129	90	19	Unconsolidated
3	117	83	7.8	Unconsolidated

**Table 2. Information Used in the Ground Water Flow Model**

Type of Information	Value Used	Source of information
Pumping rate	1,160,000 GPD	Ohio EPA public drinking water files
Aquifer porosity (sand-and gravel) Aquifer porosity (sandstone/shale)	20% 10%	Published Literature
Aquifer thickness	96 Feet	Well logs for the Portage County-Brimfield
Hydraulic conductivity (sand and gravel) Hydraulic conductivity (sandstone/shale)	181 & 307 Feet/Day 10 & 45 Feet/Day	Pumping test Ohio EPA's Delineations Guidance
Precipitation recharge	2 inches/Year	Brimfield Well Evaluation, Ohio EPA files

**Table 3. Potential Contaminant Sources Located in Portage County-Brimfield's  
Drinking Water Source Protection Area**

<b>Potential Contaminant Source</b>	<b>Number of Sources</b>	<b>Environmental Concerns</b>	<b>Protection Area</b>
<b>Aboveground storage tanks</b>	2	Potential for leaks and spills.	Outer Protection Zone
<b>Asphalt, cement, and concrete plants</b>	1	Among the potential contaminant sources related to these facilities are: aboveground storage tanks, underground storage tanks, other liquid storage, vehicle maintenance areas, electric substations, and vehicle washing areas. These types of facilities may be associated with surface water contaminants and the potential for leaks and spills of oil, gasoline, other petroleum products, and automotive fluids.	Outer Protection Zone
<b>Cropland</b>	1	Can be a source for elevated levels of nitrates, ammonia, and pesticides in drinking water sources.	Outer Protection Zone
<b>Golf courses</b>	1	Potential contaminants that may be associated with golf courses include nitrates, ammonia, and pesticides. Golf courses may also maintain storage areas for gasoline, diesel fuel, and other automotive fluids.	Outer Protection Zone
<b>Natural gas lines</b>	numerous	Condensate may contain PCBs and other chemicals.	Inner and Outer Protection Zones
<b>Oil and gas wells</b>	6	Potential sources of petroleum and brine, which may leak into an aquifer. Oil, brine, and other fluids may also leak from storage tanks.	Inner and Outer Protection Zones
<b>Surface water bodies</b>	1	May provide a direct pathway for spilled chemicals, nitrates, and pesticides from the ground surface to the aquifer.	Outer Protection Zone
<b>Transportation and transportation related spills</b>	numerous	Have been associated with leaks and spills of gasoline and chemicals.	Inner and Outer Protection Zones

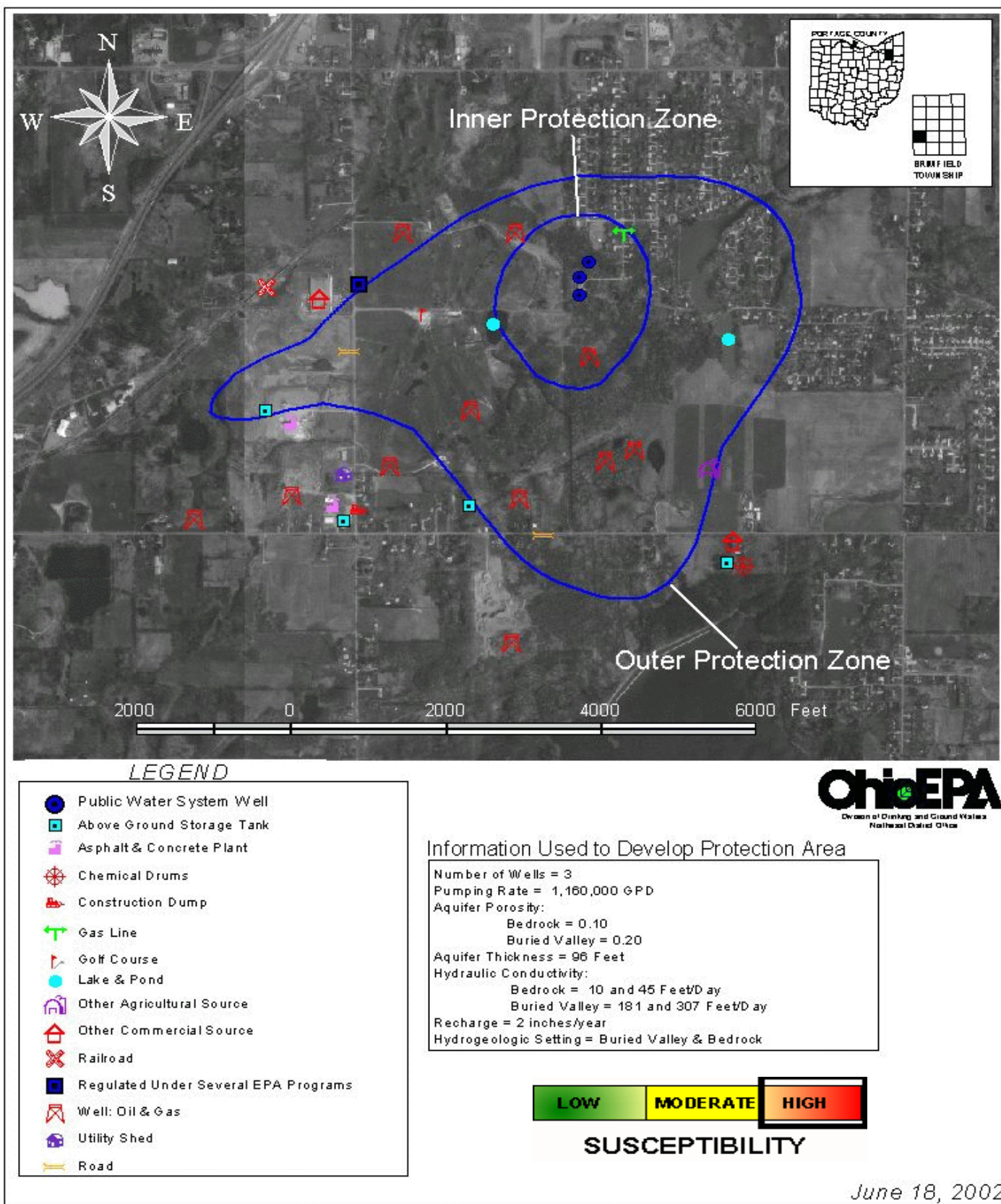
**Table 4. Protective Strategies for Consideration by Portage County-Brimfield.**

Potential Contaminant Source	Protective Strategies to Consider
<p><b>General</b></p>	<ul style="list-style-type: none"> <li>▶ Purchase additional property or development rights</li> <li>▶ Provide educational material to members of the community on topics regarding the drinking water source protection area.</li> <li>▶ Include drinking water source protection into the local school curriculum.</li> <li>▶ Provide education (material/meetings) to local businesses and industries on topics relating to drinking water source protection.</li> <li>▶ Encourage 'ground water friendly' development.</li> <li>▶ 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.</li> </ul>
<p><b>Aboveground storage tanks</b></p>	<ul style="list-style-type: none"> <li>▶ Provide education (material/meetings) local businesses on topics such as testing and maintenance requirements.</li> <li>▶ Monitor compliance with existing regulations through inspections and/or contact with regulatory agencies (such as the local fire department or the Ohio EPA).</li> <li>▶ Encourage/arrange hazardous materials training for local businesses and their employees.</li> <li>▶ Develop an early release notification system for spills.</li> <li>▶ Educate emergency responders to be aware of drinking water protection areas.</li> <li>▶ 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 U.S. EPA requirements.</li> </ul>
<p><b>Agricultural chemicals</b></p>	<ul style="list-style-type: none"> <li>▶ Assess the use of best management practices and recommend additional practices.</li> <li>▶ Encourage road safety with agricultural chemicals.</li> <li>▶ Provide education (material/meetings) to local farmers and agribusinesses on appropriate topics.</li> <li>▶ Plan/design/implement methods to control impacts to surface water.</li> <li>▶ 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.</li> </ul>

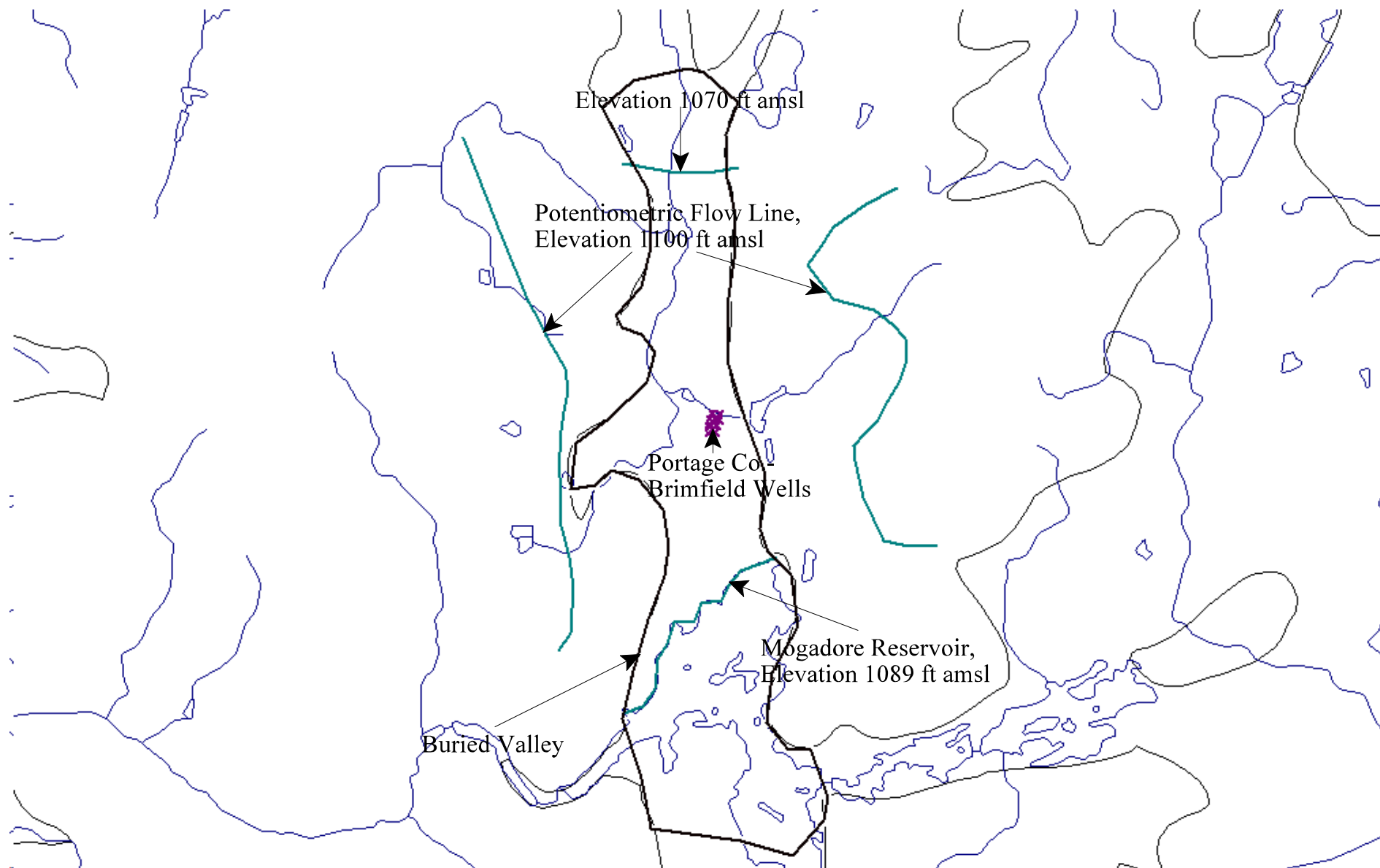
Potential Contaminant Source	Protective Strategies to Consider
<b>Hazardous substances</b>	<ul style="list-style-type: none"> <li>▶ Provide education (material/meetings) local industries on appropriate topics.</li> <li>▶ Use routine inspections as an educational opportunity.</li> <li>▶ Monitor compliance with existing regulations through inspections and/or contact with regulatory agencies.</li> <li>▶ Encourage compliance with materials handling procedures/requirements.</li> <li>▶ Encourage/arrange hazardous materials training for local industries and their employees.</li> <li>▶ Encourage/arrange waste and disposal assessments for local businesses.</li> <li>▶ Request installation of engineering controls for existing facilities.</li> <li>▶ Encourage facility spill/contingency planning ( also consider working with fire department).</li> <li>▶ Encourage local businesses to implement pollution prevention strategies.</li> <li>▶ Municipally led emergency planning.</li> <li>▶ 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.</li> </ul>
<b>Household and small business waste disposal</b>	<ul style="list-style-type: none"> <li>▶ Develop/enact/enforce a local ordinance on illegal waste disposal.</li> <li>▶ Identify areas used for illegal dumping.</li> <li>▶ Increase public awareness of illegal dumping and drinking water protection.</li> </ul>
<b>Oil and gas wells</b>	<ul style="list-style-type: none"> <li>▶ Provide education (material/meetings) to owners and land owners on maintenance.</li> <li>▶ Ensure/monitor proper operation and maintenance.</li> <li>▶ Develop an early release notification system for spills.</li> </ul>
<b>Road salt and yard chemicals</b>	<ul style="list-style-type: none"> <li>▶ Work with the street department and Ohio DOT to minimize use.</li> <li>▶ Provide education (material/meetings) on proper storage and handling to users.</li> <li>▶ Store in an enclosed building.</li> <li>▶ 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.</li> </ul>

Potential Contaminant Source	Protective Strategies to Consider
<b>Industry</b>	<ul style="list-style-type: none"> <li>▶ Provide education (material/meetings) local industries on appropriate topics.</li> <li>▶ Use routine inspections as an educational opportunity.</li> <li>▶ Monitor compliance with existing regulations through inspections and/or contact with regulatory agencies.</li> <li>▶ Encourage compliance with materials handling procedures/requirements.</li> <li>▶ Encourage/arrange hazardous materials training for local industries and their employees.</li> <li>▶ Encourage/arrange waste and disposal assessments for local businesses.</li> <li>▶ Encourage 'ground water friendly' development.</li> <li>▶ Request installation of engineering controls for existing facilities.</li> <li>▶ Encourage facility spill/contingency planning ( also consider working with fire department).</li> <li>▶ Encourage local businesses to implement pollution prevention strategies.</li> <li>▶ Municipally led emergency planning.</li> <li>▶ 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.</li> </ul>
<b>Small businesses</b>	<ul style="list-style-type: none"> <li>▶ Provide education (material/meetings) local businesses on appropriate topics.</li> <li>▶ Use routine inspections as an educational opportunity.</li> <li>▶ Monitor compliance with existing regulations through inspections and/or contact with regulatory agencies.</li> <li>▶ Encourage compliance with materials handling procedures/requirements.</li> <li>▶ Encourage/arrange hazardous materials training for local businesses and their employees.</li> <li>▶ Encourage/arrange waste and disposal assessments for local businesses.</li> <li>▶ Encourage 'ground water friendly' development.</li> <li>▶ Request installation of engineering controls for existing facilities.</li> <li>▶ Encourage facility spill/contingency planning ( also consider working with fire department).</li> <li>▶ Encourage local businesses to implement pollution prevention strategies.</li> <li>▶ Municipally led emergency planning.</li> <li>▶ 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.</li> </ul>

Potential Contaminant Source	Protective Strategies to Consider
<b>Spills</b>	<ul style="list-style-type: none"> <li>▶ Develop an early release notification system for spills.</li> <li>▶ Municipally led emergency planning.</li> <li>▶ Include drinking water protection in response planning and response personnel training.</li> <li>▶ Conduct routine sewer inspections, maintenance &amp; upgrades.</li> <li>▶ Work with local transporters on protection area awareness.</li> <li>▶ Post signs indicating the extent of the protection area.</li> </ul>
<b>Transportation</b>	<ul style="list-style-type: none"> <li>▶ Create hazardous materials routes around the protection area and require/encourage transporters to use them.</li> <li>▶ Include drinking water protection in response planning and response personnel training.</li> <li>▶ Work with local transporters on protection area awareness.</li> <li>▶ Encourage road safety with chemicals.</li> <li>▶ Coordinate activities with other public water systems</li> <li>▶ Post signs indicating the extent of the protection area.</li> </ul>
<b>Waterways</b>	<ul style="list-style-type: none"> <li>▶ Develop an early release notification system for spills impacting rivers.</li> <li>▶ Increased monitoring if spills are reported.</li> <li>▶ Coordinate activities with other public water systems.</li> </ul>



**Figure 1. Drinking Water Source Protection Area and Potential Contaminant Sources, Brimfield, Public Water System #6706012**



**Figure 2. Model Development Figure for the Portage Co-Brimfield Drinking Water Source Protection Area.**