Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

December 5, 2018

Mr. Dale Church
P.O. Box 148
Jamestown, Ohio 45335

Re: Village of Jamestown
Report
Source Water Assessment and Protection (SWAP)
Greene County
OH2901712

Subject: Revised Drinking Water Source Assessment

Dear Mr. Church:

The Ohio Environmental Protection Agency (Ohio EPA) revised the Village of Jamestown's Drinking Water Source Protection Area to include well #4 and to remove former well #1. The Village's original protection area, which was completed by Ohio EPA in December 2001, included well #'s 1, 2, and 3. Well #1 has since been abandoned, and well #4 was installed in 2017. A description of how the protection area was delineated and a map showing the revised protection area are included in the revised Drinking Water Source Assessment Report (see attached).

The report includes a table that lists some protective strategies appropriate for the types of potential contaminant sources identified within your protection area. A comprehensive guidance document titled "*Developing Local Drinking Water Source Protection Plans in Ohio*" can be downloaded at http://epa.ohio.gov/portals/28/documents/swap/swap_psdoc.pdf, which provides guidance on how to develop an effective drinking water source protection plan. When Congress amended the Safe Drinking Water Act in 1986 and 1996 to include the wellhead protection and source water protection programs, it was their intent that ultimately all public water systems would develop a plan for protecting their source waters.

Please take a moment to review the Assessment Report. Any suggested revisions must be received in writing by Ohio EPA, postmarked no later than 30 days after date of this letter. The report will be posted on Ohio EPA's Source Water Protection website and available for viewing at http://epa.ohio.gov/ddagw/swap.

If you have any questions concerning this report, please feel free to contact me at Ohio EPA's Southwest District Office at (937) 204-1008.

Sincerely,

Megan Marhelski
Geologist
Division of Drinking and Ground Waters

Enclosure: Revised Drinking Water Source Assessment Report

ec: John McGinnis, Manager, DDAGW-SWDO
Jeff Davidson, Manager, DDAGW-SWDO
Craig Smith, DDAGW-CO
Jeff Patzke, Manager, DDAGW-CO (cover letter only)

MM/bp

DRINKING WATER SOURCE ASSESSMENT for the Village of Jamestown PWS ID #OH2901712

Protecting Ohio's Drinking Water Sources

December 2001
Revised December 2018

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

SYSTEM DESCRIPTION & GEOLOGY. The Village of Jamestown is a community public water system serving 1,997 people in Jamestown, Ohio. This system operates 3 wells that pump approximately 170,000 gallons of water per day from a sand and gravel aquifer (water-rich zone) and a Silurian carbonate bedrock aquifer. Well 2 and Well 4 are completed in the sand and gravel aquifer, and Well 3 is completed in the carbonate bedrock aquifer. Well 4 is pumped from 9 PM to 8 AM, and Well 2 and Well 3 are pumped from 8 AM to 9 PM. The sand and gravel aquifer is predominantly located within the Shawnee Hills Ground Moraine Aquifer.

Review of well log information surrounding the Jamestown area, ODNR bedrock maps, and consultant reports indicate the thickness of the glacial deposits range from 70 to 90 feet in the Jamestown area. Sand and gravel deposits of varying thicknesses overlie fractured limestone and dolomite bedrock. Based on the log for Well 4, the sand and gravel aquifer thickness in the well field is approximately 15 feet.

Well log information for Jamestown's production wells indicate that the wells are under confining conditions. Aquifer testing in the Jamestown well field demonstrated that there is an interconnection between the bedrock and overlying sand and gravel deposits. According to the log for Well 4, there is a low permeability layer in the well field that is approximately 40 feet thick and may act as a barrier between the ground surface and the aquifers. The low permeability layer is most likely creating the confining conditions in the well field. The sand and gravel aquifer that is located beneath the confining layer is approximately 69 feet below the ground surface. The top of the bedrock aquifer is approximately 88 feet below ground surface.

Soils in the area are silt loam with a moderate to low permeability. Runoff is generally moderate to slow. The topography is generally flat to gently sloping with an average relief of 2 feet over a distance of 100 feet. Ground water in this area is replenished by the gradual flow of water underground from higher to lower elevations and by approximately 4 to 7 inches per year of precipitation that infiltrates through the soil. However, due to the presence of the low permeability layer between the ground surface and the sand and gravel aquifer, less than 4 inches of precipitation are expected to reach the aquifers in one year.

At the Village of Jamestown wellfield, ground water flows generally toward the southwest in both aquifers based on ground water elevation

maps prepared by Ohio EPA using surrounding ODNR water well logs.

PROTECTION AREA. The drinking water source protection area for Village of Jamestown'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 Village of Jamestown'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 "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 (Ground Water FLOW) 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 Village of Jamestown's source water assessment.

Model Set-up

Two GFLOW models were prepared and then combined to complete the delineation. One model was designed to simulate the characteristics of a confined sand and gravel aquifer. The second model was designed to simulate confined flow within the carbonate bedrock. The information used in both models (input parameters) were based on characteristics of the sand and gravel deposits and bedrock.

In this area, there are no known natural flow boundaries near the wellfield. Therefore, as shown in Figure 2, the northeastern and southwestern boundaries of the modeled areas follow the ground water contours at elevations of 1060 and 1010 above sea level in the sand and gravel aquifer and 1075 and 970 feet above sea level in the carbonate bedrock aquifer. These boundaries are modeled as lines along which water enters and leaves the model (called "line-sinks strings" in Figure 2). The northern and southern 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 wells, **hydraulic conductivity** of each aquifer (that is, the ease with which water moves through it), **aquifer thickness**, and **aquifer porosity**. For this model, the pumping rate of 197,000 gallons per day represents the average daily pumping rate provided by Jamestown (170,000 gallons per day), plus an additional 16 percent, to provide a more protective area. The hydraulic conductivity for each aquifer was based on a pump test conducted at the wellfield in 2016, typical hydraulic conductivities for each aquifer, and best professional judgement using numerous model simulations. The sand and gravel aquifer thickness was based on the well log for Well 4, and the bedrock aquifer thickness was based on recorded information obtained from drinking water files, and nearby well logs. The measured porosity values were unavailable for any of the units. Therefore, the values used in the model were based on values typically found in these kinds of rock and sediments. The screen and aquifer information for each production well is summarized in Table 1. The GFLOW input parameters are provided in Table 2.

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 at: www.epa.ohio.gov/ddagw/swap

INVENTORY. On June 30, 2017, an inventory of potential contaminant sources located within and outside the drinking water source protection area

was conducted by Ohio EPA with the assistance of Village of Jamestown personnel (Figure 3). 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, Village of Jamestown 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 Village of Jamestown'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 the Village of Jamestown'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 Village of Jamestown.

SUSCEPTIBILITY ANALYSIS. This assessment indicates that Village of Jamestown's source of drinking water has a **low** susceptibility to contamination because of:

< the presence of a thick protective layer of clay overlying the aquifer,

< the significant depth (over 60 feet below ground surface) of the aquifer,

< no evidence to suggest that ground water has been impacted by any significant levels of chemical contaminants from human activities, and

< no apparent significant potential contaminant sources in the protection area.

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 Village of Jamestown 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 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 Village of Jamestown's valuable drinking water resources for current and future generations.

For further technical assistance on drinking water source protection, please contact the Ohio EPA Southwest District Office at (937) 285-6357 or visit the Ohio EPA Source Water Assessment and Protection Web page at: www.epa.ohio.gov/ddagw/swap

This report was written by Megan Marhelski, Ohio EPA, Division of Drinking and Ground Waters, Southwest District Office.

BIBLIOGRAPHY.

Ohio EPA public drinking water files.

Ohio Department of Natural Resources, 1995, Ground Water Pollution Potential of Greene County, Ohio, Report No. 30.

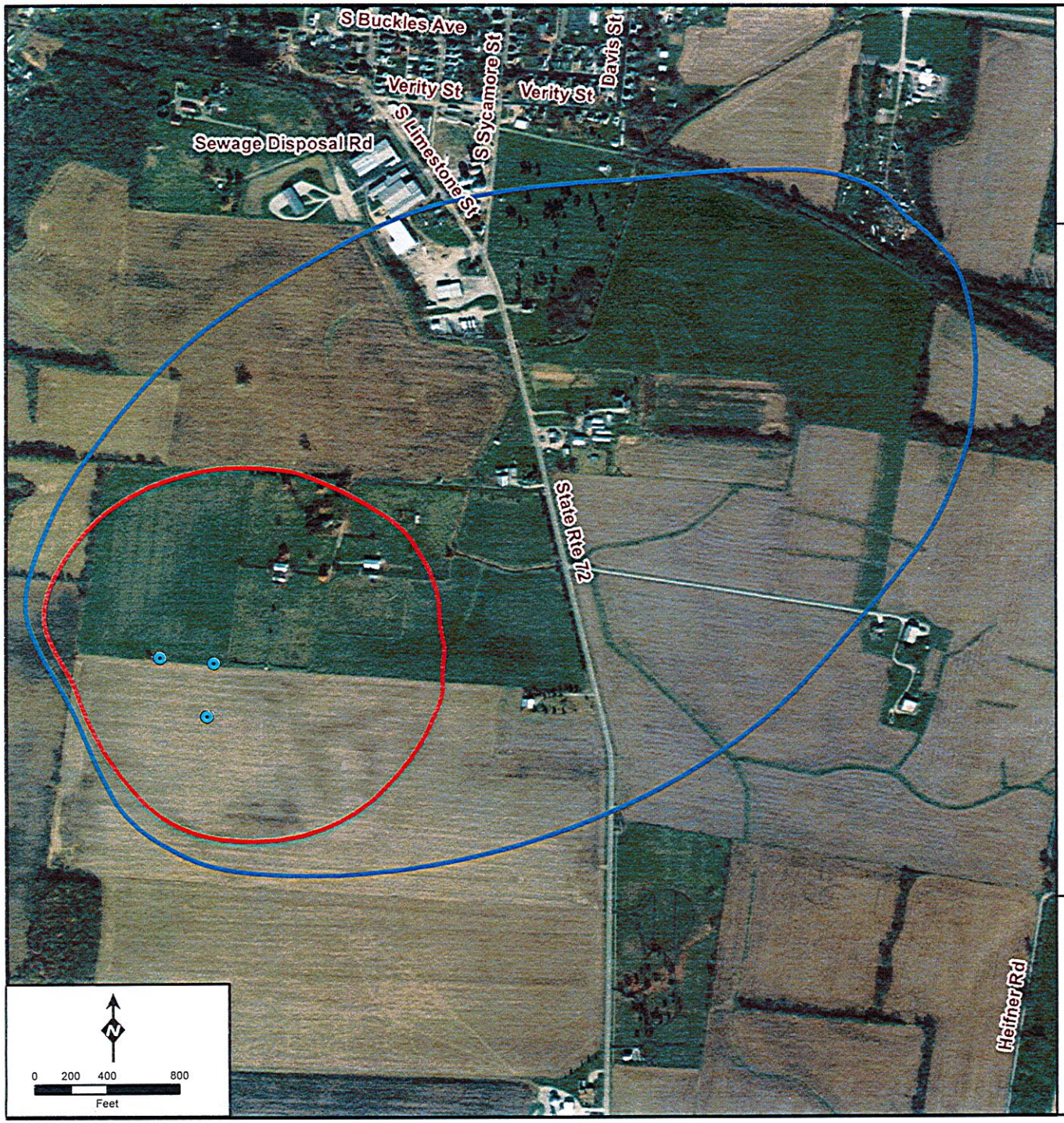
Ohio Department of Natural Resources, 1991, The Water Resources of Greene County, Ohio, Map.

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

Ohio EPA, 2010, Drinking Water Source Protection Area Delineation Guidelines & Process Manual.

United States Department of Agriculture, 2018, Online Web Soil Survey (digital).

Figures



Village of Jamestown
PWS ID# OH2901712
Greene County
Silvercreek Township

LOW MODERATE HIGH

AQUIFER SUSCEPTIBILITY

Protection Area Data

Number of Wells = 3
Pumping Rate = 197,000 gallons per day (average)
Porosity = varies
Aquifer Thickness = varies
Hydrogeologic Setting = Glacial and Carbonate Bedrock
Land Use = Agricultural

Legend

- PWS Active Wells
- Inner Management Zones
- Source Water Protection Areas

Figure 1.

Drinking Water Source Protection Area

Ohio Environmental Protection Agency

November 29, 2018

Figure 2. GFLOW Model Setup

Figure 2A: Sand & Gravel Aquifer

Figure 2B: Bedrock Aquifer

Legend

- Recharge Boundary
- No Flow Boundary
- Line-sinks (ground water contour boundary)
- Capture Zones

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Ohio Environmental Protection Agency

November 28, 2018

Tables

Table 1.
Drinking Water Well Data

Well #	Surface Elevation (feet)	Well Log #	Depth to Top of Screen (feet)	Depth to Bottom of Screen (feet)	Aquifer Thickness (feet)	Aquifer Top Elevation (feet)	Aquifer Bottom Elevation (feet)	Aquifer Type
1	1060	101812?	82	92	10	978	968	sealed, glacial
2	1060	281090?	84	99	15	976	961	glacial
3	1060	?	88	115	27	972	945	bedrock
4	1060	2060976	69	84	15	991	976	glacial

Table 2.
GFLOW Model Input Parameters

Aquifer Type	Hydraulic Conductivity (feet/day)	Aquifer Bottom Elevation (feet)	Aquifer Thickness (feet)	Porosity	Recharge (feet/day)	Discharge* (cubic feet/day)		
						Well 2	Well 3	Well 4
Confined sand and gravel	100	976	18	0.2	0.0002	19,600	NA	26,300
Confined carbonate bedrock	15	945	30	0.03	0.00005	NA	6,700	NA

***Discharge Notes**

Sand and Gravel Aquifer Model. Wells 2 and 4 were run separately in the sand and gravel model to help simulate pumping rotation schedule. Well 3 was not included in the sand and gravel model.

Bedrock Aquifer Model. Well 3 was the only well included in the bedrock model. Decreased discharge based on pump capacity information provided by Jamestown representatives.

Table 3.
Potential Contaminant Sources
Village of Jamestown PWS

Map ID	Potential Contaminant Source Type	Facility Name
9289	Metalworking/Machine Shop/Plating/Welding Facility	TWIST
9290	Lagoon: Industrial Waste/Sewage	Jamestown Water Treatment Plant
9291	Lagoon: Industrial Waste/Sewage	Jamestown Wastewater Treatment Plant
9292	Junk Yard	Former Automotive Repair/Junkyard
9293	Auto Repair/Auto Body	Former Automobile Repair/Junkyard
9294	Crops: Corn/Soybean/Wheat	Farm
9295	Crops: Corn/Soybean/Wheat	Farm
9296	Aboveground Storage Tank	Farm, Wilbur Long
9297	Sanitary Sewer Line	Sewered Area
9298	Storm Drain	Storm Sewer
9299	Underground Storage Tank: Status Unknown	Jamestown Transportation
9300	Drinking Water Treatment Plant	Jamestown Water Treatment Plant
35039	Cemetery	Old Silver Creek Cemetery
35184	Cemetery	Silver Creek Cemetery
36828	Underground Storage Tank: Leaking	FLAGWAY INC. #8
36855	Underground Storage Tank: Non-Leaking	Jamestown Transportation
36901	Underground Storage Tank: Leaking	Former gas station
43160	Airborn Emissions	FLAGWAY #8
43170	Airborn Emissions	TWIST INC PLT 2
50495	Cemetery	Quaker Cemetery
51693	Toxic Release Inventory	American Buildings Company
52259	Wastewater Treatment Plant	Jamestown Wastewater Treatment Plant
52261	Wastewater Treatment Plant	Jamestown Wastewater Treatment Plant
63697	Underground Storage Tank: Leaking	BP OIL CO. #26676
86683	Underground Storage Tank: Leaking	Swifty
86685	Underground Storage Tank: Leaking	Ryan Homes Inc
86692	Sanitary Sewer	Greene City Sanitary
86712	Cemetery	Old Silver Creek Cemetery
86714	Cemetery	Silver Creek Cemetery
117396	Pasture	Horses
117397	Crops: Corn/Soybean/Wheat	Farm
117398	Crops: Corn/Soybean/Wheat	Farm
117399	Crops: Corn/Soybean/Wheat	Farm
117400	Pasture	Horses
177490	Gas Station: Abandoned/Historic	Swifty
177493	Auto Repair/Auto Body	Hometown Tire Sales & Service
177494	Fleet/Truck/Bus Terminal	Fanning Trucking
177496	Metalworking/Machine Shop/Plating/Welding Facility	Mike's Welding
177497	Junk Yard	Junkyard
177498	Crops: Corn/Soybean/Wheat	Farm
177499	Crops: Corn/Soybean/Wheat	Farm
177500	Crops: Corn/Soybean/Wheat	Farm
177501	Crops: Corn/Soybean/Wheat	Farm
177502	Crops: Corn/Soybean/Wheat	Farm

Table 3.
Potential Contaminant Sources
Village of Jamestown PWS

Map ID	Potential Contaminant Source Type	Facility Name
177503	Other Commercial Source	Sharpies Warehouse & Pine Ridge Products
177504	Other Agricultural Source	Premier Grain
177505	Greenhouse/Nursery	Friendly Knoll Farm
177507	Crops: Corn/Soybean/Wheat	Farm
177508	Crops: Corn/Soybean/Wheat	Farm
177509	Crops: Corn/Soybean/Wheat	Farm
177510	Crops: Corn/Soybean/Wheat	Farm
177512	Crops: Corn/Soybean/Wheat	Farm
177514	Other Commercial Source	Shawnee Storage
177515	Crops: Corn/Soybean/Wheat	Farm
177517	Crops: Corn/Soybean/Wheat	Farm
177518	Crops: Corn/Soybean/Wheat	Farm
177519	Crops: Corn/Soybean/Wheat	Farm
177524	Auto Repair/Auto Body	L&N Automotive
180347	Gas Station: Abandoned/Historic	Suspected Gas Station
197922	Sanitary Sewer Line	Sewered Area
197923	Sanitary Sewer Line	Sewered Area
197924	Septic System: Tank/Leachfield/Mound System	Unsewered Area
197925	Septic System: Tank/Leachfield/Mound System	Unsewered Area
197926	Septic System: Tank/Leachfield/Mound System	Unsewered Area

Table 4. Protective Strategies for Consideration

Potential Contaminant Source	Protective Strategies to Consider
General	➢ Purchase additional property. ➢ 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) local businesses and industries on topics relating to drinking water source protection. ➢ Encourage 'ground water friendly' development. ➢ Form partnerships with neighboring jurisdictions and potential contaminant source owners ➢ Develop/enact/enforce a local ordinance which may include any of the following: changing zoning; illegal waste disposal; 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	➢ 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.
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.

Potential Contaminant Source	Protective Strategies to Consider
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.
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.