Drinking Water Source Assessment for the Maysville Regional Water District

SUMMARY

Source Water Assessment and Protection. The following report for the Maysville Regional Water District was compiled as part of the Source Water Assessment and Protection Program for Ohio. This program is intended to identify drinking water protection areas and provide information on how to reduce the risk of contamination of the waters within those areas. The goal of the program is to ensure the long term availability of abundant and safe drinking water for the present and future citizens of Ohio.

The Safe Drinking Water Act Amendments of 1996 established the national Source Water Assessment and Protection Program, targeting drinking water sources for all public water systems in the United States. A public water system is a facility that provides drinking water to 15 or more service connections or that regularly serves at least 25 people a day for at least 60 days a year, whether from an underground well or spring, or from an above ground stream, lake, or reservoir. The requirement does not address residential wells or cisterns. In Ohio there are approximately 5,800 public water systems.

Background. The Maysville Regional Water District operates a community public water system that serves a population of approximately 6,252 people. The source is surface water stored in an on site reservoir. Frazier’s Quarry Reservoir holds 193 million gallons. Water is also withdrawn from the stream named Kent Run and from Lake Isabella and pumped to Frazier’s Quarry Reservoir when reservoir levels drop. Kent Run has an estimated usable capacity of 4.7 million gallons a day (MGD) and Lake Isabella holds approximately 190 million gallons. The treatment capacity of Maysville Regional Water District water plant is approximately 1.12 MGD, but currently the average production is about 477,000 gallons per day.

Protection Areas. The drinking water source protection area for the surface water source is shown in the following figure. The figure includes the results of an inventory of all potential contaminant sources within the protection area. The inventory was conducted by Ohio EPA with the assistance of the Maysville Regional Water District. Potential threats to the surface water source include: agricultural runoff, livestock activities, transportation spills, water fowl migration, oil and gas wells, previous mining activity, proposed mining activity, residential development, small business development, and intentional human contamination.

Protective Strategies. The ultimate goal of a source water assessment is the implementation of protective strategies that will better protect the drinking water source. Strategies for protecting Kent Run, Lake Isabella and Frazier’s Quarry should include monitoring runoff from urban, agricultural, and mining areas, increasing security around reservoirs, coordinating with local emergency response agencies, educating local businesses and residents, conducting streamflow and time of travel studies on Kent Run, developing an early release notification system for spills and creating a written contingency plan.

The Maysville Regional Water District and other jurisdictions comprising the protection area are encouraged to develop a local...
protection plan to protect the source of drinking water and to update current emergency management plans as applicable. Local watershed planning efforts may already be underway to guide stream restoration and protection activities. Recently the Muskingum Soil and Water Conservation District supported the development of a watershed action plan (WAP) for the Salt Fork watershed, and may be able to assist with similar efforts for Kent Run. Guidance on how to form a Drinking Water Source Protection Team and protection plan is available for Ohio EPA by calling (614) 644-2752.

For More Information. Additional information on protective strategies and how this assessment was completed is included in the detailed Drinking Water Source Assessment Report for the Maysville Regional Water District. For information on how to obtain a copy of this report, please visit Ohio EPA’s Source Water Assessment and Protection Program Web page at www.epa.state.oh.us/ddaqwswap.aspx contact the Maysville Regional Water District for a copy.

Current information on the quality of the treated water supplied by the Maysville Regional Water District is available in the Consumer Confidence Report (CCR) for the Maysville Regional Water District Public Water System. The CCR is distributed annually and reports the most current detected contaminants and any associated health risks from data collected during the past five years. Consumer Confidence Reports are available from the Maysville Regional Water District by contacting: Maysville Regional Water District Waterworks, Post Office Box 1700, Zanesville, Ohio 43701 or Maysville Regional Water District at 6255 Maysville Pike, Zanesville, Ohio 43701.
Summary Figure – Maysville Regional Water District Drinking Water Source Protection Area, Corridor Management Zone and Emergency Management Zone
How to Use this Assessment

Clean and safe drinking water is essential to every community. Protecting the source of drinking water is a wise and cost effective investment. The purpose of this source water assessment is to provide information your community can use to develop a local Drinking Water Protection Program. The Source Water Assessment benefits your community by providing the following:

- **A basis for focusing limited resources within the community to protect the drinking water source(s).**
  The assessment provides your community with information regarding activities within the Drinking Water Source Protection Area that directly affect your water supply source area. It is within this area that a release of contaminants, from a spill or improper use, may travel through the watershed and reach the surface water intake. By examining where the source waters are most sensitive to contaminants, and where potential contaminants are located, the assessment identifies the potential risks that should be addressed first.

- **A basis for informed decision-making regarding land use within the community.**
  The assessment provides your community with a significant amount of information regarding where your drinking water comes from (the source) and what the risks are to the quality of that source. This information allows your community planning authorities to make informed decisions regarding proposed land uses within the protection area that are compatible with both your drinking water resource and the vision of growth embraced by your community.

- **A start to a comprehensive plan for the watershed and source water area.**
  This assessment can be the beginning of a comprehensive plan for the water resource, one that addresses all of the uses the water resource provides. An ecologically healthy lake or stream will provide a stable, high quality resource for drinking water.

For information about developing a local Drinking Water Source Protection Program, please contact the Ohio EPA Division of Drinking and Ground Waters at (614)644-2752 or visit the Division’s web site at [http://www.epa.state.oh.us/ddagw/SWAP.aspx](http://www.epa.state.oh.us/ddagw/SWAP.aspx).
1.0 INTRODUCTION

The 1996 Amendments to the Safe Drinking Water Act established a program for states to assess the drinking water source for all public water systems. The Source Water Assessment and Protection (SWAP) Program is designed to help Ohio’s public water systems protect their sources of drinking water from becoming contaminated.

The purpose of this assessment is to identify where and how the Maysville Regional Water District’s source waters are at risk of contamination. The report

- identifies the drinking water source protection area,
- examines the characteristics of the watershed and water quality,
- inventories the potential contaminant sources within that area, and
- discusses the susceptibility of the system to contamination.

Finally, the report suggests actions that the public water supplier and local community may take to reduce the risk of contaminating their source of drinking water and ensure the long term availability of abundant and safe drinking water resources.

Results and recommendations presented in this report are based on the information available at the time of publication. Ohio EPA recognizes that additional information may become available in the future that could be used to more accurately determine the drinking water source protection area. Also, changes in land use may occur after Ohio EPA completes the potential contaminant source inventory. This report should be used as a starting point to develop a plan to protect drinking water resources. Ohio EPA is not responsible or liable for interpretations or decisions based on this report.

This report was written by Scott Schermerhorn, Ohio EPA, Division of Surface Water, Southeast District Office. For the 2011 update, text revisions were completed by Barb Lubberger and maps were revised by Rich McClay, Division of Drinking and Ground Waters, Central Office.

2.0 PUBLIC WATER SYSTEM DESCRIPTION

The Maysville Regional Water District operates a Class III community public water system that serves a population of approximately 6,300 people. A community public water system is a system that regularly supplies drinking water from its own sources to at least 15 service connections used by year-round residents of the area or regularly serves 25 or more people throughout the entire year. Maysville Regional Water District maintains approximately 1,967 metered service connections. The water treatment system obtains its water from Frazier’s Quarry and from supplemental water added to the quarry pumped from Kent Run and Lake Isabella. The pumping capacity of the sources is approximately 1.12 million gallons per day, but current average production is between 490,000 and 500,000 gallons per day. There are three surface water intakes.

The primary intake is located at the plant and draws from Frazier’s Quarry Reservoir. Frazier’s Quarry Reservoir holds approximately 190.7 million gallons. The second intake is located on Kent Run. Kent Run has an estimated average flow of 4.7 MGD. Water from Kent Run is pumped by a single 1,000 gallon per minute pump approximately 2,900 feet through a ten inch main into Frazier’s Quarry Reservoir. Similarly, water is pumped via a ‘temporary intake’ from Lake Isabella to Frazier’s Quarry as needed, i.e., when reservoir levels drop. Average daily treatment for the water plant is 490,000 gallons pumped at a normal rate of 780 gallons per
minute. The number of days of water storage for the Maysville Regional Water District is estimated at one to two days within the storage and distribution system and 380 days within Frazier's Quarry.

The Maysville water treatment plant was originally constructed in 1972 and upgraded in 1996. Water extension lines were run in 2001 to the Wesley Chapel Road area as well as to the Maysville School. The plant performs sedimentation, filtration, coagulation, and purification, in addition to fluoridation and disinfection as its treatment process. Raw water is drawn from Frazier’s Reservoir by two 780 gallon per minute pumps. The intake structure is floating and is tethered to the shoreline. The intake structure maintains two draw ports, one at a two foot depth and one at a four foot depth. The plant operates an average of 12-13 hours a day.

3.0 DRINKING WATER SOURCE PROTECTION AREA

The Drinking Water Source Protection Area (protection area) is the drainage area upstream from the point where water is withdrawn from a surface water source. Because Frazier’s Quarry Reservoir and Lake Isabella are both former quarries and are fed entirely by ground water, the ‘drainage area’ around these two water sources is a narrow buffer zone containing very few potential contaminant sources. The primary protection area for Maysville’s drinking water sources is the watershed for Kent Run upstream from the intake. The protection area is subdivided into corridor and emergency management zones. A map of the protection area and corridor management zone (CMZ) for the Maysville Regional Water District is shown in Figure 1. The emergency management zone (EMZ) is shown in Figure 2. The entire protection area is comprised of approximately 14,833 acres or 23.2 square miles.

The Corridor Management Zone, (CMZ), is defined in width as 1,000 feet on each bank of the Frazier’s Quarry Reservoir and Kent Run, starting from the intake and extending upstream, a distance of approximately twelve miles along the stream. The corridor management zone includes all unnamed tributaries that feed the two reservoirs. On tributaries the width of the corridor management zone is 500 feet from each bank. The corridor management zone encompasses approximately 5,943 acres or 9.3 square miles.

The Emergency Management Zone, (EMZ), for a drinking water supply is defined as an area in the immediate vicinity of the surface water intake in which the public water supply operator has little or no time to respond to a spill. The boundary of the emergency management zone is delineated in cooperation with the water supplier. The corridor and emergency management zones are the focus of field and windshield surveys to inventory potential contaminant sources. The Emergency Management Zone contains 80 acres (0.12 square miles) and includes the 49 acre (0.076 square mile) reservoir, Frazier’s Quarry.

4.0 HYDROLOGIC SETTING

The quarry is fed primarily by ground water.

The drinking water source protection area for Maysville Regional Water District is long, fan-shaped and encompasses approximately 14,833 acres or 23.2 square miles. The area is approximately 53,156 feet by 17,799 feet. The shape index is 4.4, defined as the basin length divided by the protection area. Annual average precipitation in the protection area is approximately 36-39 inches.
Kent Run, Lake Isabella and Frazier’s Quarry lie within the Western Allegheny Plateau (WAP) ecoregion. The WAP ecoregion is described as rolling glacial plateau underlain predominantly by sand and siltstone. Soils are derived from glacial till and lacustrine sediments. The underlying bedrock of the Allegheny Plateau is mainly sandstone, siltstone, shale and limestone all of which were derived from sediment laid down during the Late Mississippian, Pennsylvanian and early Permian periods. The limestone formation near the water plant is the Maxwell Formation, principally quarried for cement, but also for concrete aggregate, crushed stone, and agricultural lime.

Kent Run lies within the Muskingum River basin, which is the largest river basin in drainage area and length in Ohio. Kent Run is a tributary to Jonathan Creek and subsequently Moxahala Creek and the Muskingum River. Kent Run is fed by Salt Run and eleven other unnamed tributaries in the area. There are approximately 36 miles of stream in the Maysville drinking water source protection area. The mainstem of Kent Run is over 12.1 miles in length and drains approximately 22.8 miles. The average fall is 30.1 feet per mile with the upper mainstem elevation at 1,083 feet and the confluence with Jonathan Creek at 718 feet above sea level.

Kent Run has one named tributary, Salt Run. Salt Run is 2.7 miles long and drains 3.29 square miles. Its highest elevation is 982 feet and slopes to 750 feet at the confluence with Kent Run. The average fall of Salt Run is 85.9 feet per mile. Salt Run has two unnamed tributaries that feed the mainstem.

Lake Isabella is a former limestone/aggregate quarry that is now a 57-acre private recreational lake that supports swimming, fishing and boating. As noted above, there are no streams emptying into Lake Isabella, so the source water protection area consists simply of a buffer zone surrounding the lake. Like Kent Run, Lake Isabella provides water to Frazier’s Quarry only periodically, when water levels in the reservoir are low.

The protection area covers portions of three counties; Perry, Licking and Muskingum. It lies within four townships including Madison, Hopewell, Newton and Springfield. The majority of the drinking water source protection area lies principally within the Westmoreland-Berks-Guernsey soil association. These soils are generally described as deep and moderately deep, well drained and moderately well drained, strongly sloping to very steep soils that formed in colluvium and residuum derived from silt-stone and clay shale. Common in this soil type are coal mines. Other soil associations within the protection area include Glenford-Newark–Fitchville and Watertown-Chilli-Glenford.

The Glenford-Newark–Fitchville soils are described as deep, moderately drained, and somewhat poorly drained nearly level to strongly sloping soils that formed in lacustrine deposits and alluvium. A small section of the area actually contains some Watertown-Chilli-Glenford soils. These soils are described as deep, well drained and moderately well drained, nearly level to strongly sloping soils that formed in glacial out-wash and lacustrine sediments, principally glacial out-wash and are in the area of flint ridge. Specific soil types that surround Frazier’s Quarry include the Morristown Shaley, silt clay loam 25-75%. Kent Run lies within Lindside silt loam.

Morristown Shaley soils are described as deep, steep and very steep well drained soils on ungraded mine spoil ridges and trenches in areas that have been surface mined for coal or limestone. Permeability is moderate, and runoff may be rapid. Lindside silt loam soils are described as a deep moderately drained soil on flood plains of major streams. Permeability is
Land use within the protection area includes row-crop agriculture, pasture for dairy and beef production, poultry, woodland, and urban uses. Primary crops include corn, soybeans, wheat, straw and hay. Figure 3 shows a map of the land use within the protection area. The predominant land use, covering half of the protection area, is woodland. The second most dominant land use is agriculture. The protection area contains Deciduous Forest (49.2%), Pasture/Hay (31.2%), Row Crops (10.0%), and Low Intensity Residential (5.7%). The remaining land uses in the protection area consist of High Intensity Residential (1.2%), Open Water (0.8%), Evergreen Forest (0.8%), Bare Rock/Sand/Clay (0.5%), Grassland/Herbaceous (0.4%), and Commercial/Industrial/Transportation (0.1%).

Stream flow and time of travel
The quality of the water in a stream can change under different precipitation and flow conditions. Both high flow or low flow conditions can result in water quality problems and impacts to the source water. Typically heavy rains and high flows result in more materials dissolved and suspended in the runoff or re-suspended from the stream bottom and banks. The higher flows result in faster travel times for any contaminant plume, however the greater volume of water results in a lower concentration (given the same amount of material) relative to low flow conditions. Conversely, low flow conditions in a stream result in slow travel times and more concentrated contaminant plumes, and can exacerbate problems such as low dissolved oxygen and algal blooms. In addition, the inflow of ground water to the stream will bring with it any dissolved contaminants.

There are no estimates of stream travel times for Kent Run, Salt Run or the unnamed tributaries to Kent Run. The reservoir has been observed to drop as much as ten feet during times of drought. Several of the unnamed tributaries to Kent Run are “interstitial,” which means that they originate as surface water streams but seep into the subsurface further downstream and disappear from sight. Such streams are often associated with fractures in the bedrock. The Maysville Regional Water District’s intake on Kent Run is manually turned on and off. If a contaminant plume is suspected, the pump is not turned on.

Drinking Water Quality Monitoring Summary
Available water quality data submitted by the Maysville Regional Water System to Ohio EPA was evaluated to characterize water quality. A review of the Maysville Regional public water system compliance monitoring data from 1991-2002 revealed that the system had no water quality violations. Table 1 lists contaminants where at least one result was above the level of detection and does not include all contaminants tested for by the public water system.

It should be recognized that sampling results presented in this report can only provide information on the quality of the water at the time the sample was collected. Water quality may change over time due to a number of reasons. Therefore, it is recommended that the reader also consult the most recent Consumer Confidence Report (CCR) for the Maysville Regional public water system. All public water systems are required to annually prepare and distribute the CCR to their customers. The report is a good source of information on health effects associated with detected contaminants and contains information on the community's drinking water, including the source of the water, contaminants detected, the likely sources of detected contaminants, and the potential health effects of contaminants at levels above the drinking water standards.
**Biological and Chemical Monitoring in Kent Run**

Ohio EPA conducted a biological and chemical water quality study on Kent Run in 1986. Kent Run is listed as warm water habitat and a state resource water in the Ohio Water Quality Standards. In OAC 3745-1-24 Table 1, Kent Run is listed as a public, agricultural, and industrial drinking water supply as well as a primary contact water. The chemical assessment of Kent Run revealed good dissolved oxygen values (7.9 mg/l) and pH values (7.8). Despite the mining activities in the area, levels of aluminum, cadmium, zinc, and suspended/dissolved solids were below detection limits. Iron, manganese, lead, and hardness were 230 ug/l, 120 ug/l, 2 ug/l and 230 mg/l, respectively. Nutrient parameters of ammonia, nitrate/nitrite and Total Kjeldahl Nitrogen (TKN) were also low, ranging from non-detect to a TKN value of 0.5 mg/l. The biological assessment performed on Kent Run returned numbers indicative of a warm water habitat (WWH). The Index of Biological Integrity (IBI) was calculated to be 48 and the Index of Well Being (IWB) was calculated to be 9.4. Over twenty-one species of fish were recorded in the stream. Fish that have been collected include: Darters, Daces, Minnows, Suckers, and Sport fish. Specifically during the 1986 bioassessment the following fish were observed: golden redhorse, northern hog sucker, white sucker, creek chub, south redbelly dace, blacknose dace, striped shiner, common shiner, silverjaw minnow, blunt nose minnow, central stoneroller, rock bass, smallmouth bass, green sunfish, hybrid sunfish, blackside darter, logperch, greenside darter, banded darter, rainbow darter, and the fan tail darter. These fish are indicative of good water quality as most range from moderately tolerant to sensitive fish species, which thrive in lower impacted warm water habitats.

In 2008 Ohio EPA conducted additional chemical sampling monthly throughout the summer (viewable online at www.app.epa.ohio.gov/dsw/gis/wq/index.php). In June 2008, *E. coli* levels were 4,600/100 ml and fecal coliform levels were 11,000/100 ml. About a week later, in July, *E. coli* levels were 27,000/100 ml and fecal coliform levels were 18,000/100 ml. This indicates that Kent Run is occasionally contaminated at significant levels by microorganisms related to septic tanks and/or manure.

**Chemical Monitoring in Frazier’s Quarry**

In 1994 Ohio EPA conducted an abbreviated lake water quality survey on Frazier’s Quarry. During the investigation the water column and sediments were examined. The average depth of the quarry was reported as approximately 9 meters or 27 feet. Temperatures within the water column in April ranged from 18.3 degrees C at the surface to 7.5 degrees C at the bottom. Dissolved oxygen values ranged from 13.2 part per million (ppm) at the surface to 1.6 ppm at the bottom. The pH values ranged from 8.36 at the surface to 7.68 at the bottom sediment water interface. Conductivity in the same area ranged from 338 umhos/cm to 390 umhos/cm. The same parameters were evaluated two additional times in June and August. The ranges of the values decreased with respect to all parameters in the summer months. Temperature ranged from 25.3 degrees C at the surface to 14.4 degrees C at the bottom. Dissolved oxygen values ranged from 8.8 ppm at the surface to 1.3 ppm at the bottom. The pH and conductivity values ranged from 8.67 to 7.17 and 400 to 520 umhos/cm respectively. When the variables of depth and seasonal fluctuation are removed, mean field chemistry values for Frazier's Quarry are as follows: pH 7.9, dissolved oxygen 7.6 ppm, temperature 18 degrees C and conductivity 398 umhos/cm. These values are in range for the normal field measurements taken by the water treatment plant operators prior to treatment.

In addition to field parameters of physical water chemistry, laboratory analysis of metals and nutrients was performed. Metal values taken from the water column varied little over the sampling events. Bottom water chemistry results were very similar to surface water chemistry.
results with the exception of manganese. Mean manganese values for the bottom water column were 4,186 ug/l while mean manganese concentrations in the surface water column were 1,004 ug/l. Mean values for other metals within the water column were 25 mg/l magnesium, 55 mg/l calcium, 111 ug/l iron, and 307 mg/l strontium. Lead levels were all below detection limits. Mean hardness values were 221 mg/l CaCO3 and the mean alkalinity values for the water column were 143 mg/l CaCO3.

Demand parameters for the water column were consistent. Biological Oxygen Demand (BOD) was just detectable at 2.2 mg/l at the bottom water sediment interface. No BOD was detected in the upper water column. Ammonia, nitrogen and nitrite/nitrate parameters were all below the analytical detection limits. Total Kjeldahl Nitrogen (TKN) values returned a mean of 0.88 mg/l. Sulfate was detected in a mean concentration of 68 mg/l. Mean values for Total Suspended and Total Dissolved Solids were 10 mg/l and 280 mg/l respectively.

Sediment samples were taken from the bottom of Frazier’s Quarry in 1994. Metal values obtained in the sediments included 36.4 mg/kg Arsenic, 0.57 mg/kg Cadmium, 40.7 mg/kg total Chromium, 70.7 mg/kg Lead, 1800 mg/kg Manganese, 29.6 mg/kg Nickel, 125 mg/kg Zinc and 130 mg/kg Strontium. Organic parameters of Nitrogen were 10.9 mg/kg and Phosphorus was 74.2 mg/kg. These values were associated with sediments that were predominantly sand in nature with some silt and clay based on sediment settling time and particle size.

Organochlorine pesticides and PCBs were analyzed in the sediment as well. The only detectable compounds were Dieldrin, Endosulfan sulfate, 4-4-DDE, b-BHC and Endosulfan II. These compounds were detected just above the analytical detection limit in the low parts per billion (ppb) range or ug/kg sediment. The following organic compounds were detected in the sediment: Endrin at a concentration of 2.20 ug/kg, Dieldrin at 1.88 ug/kg, 4-4-DDE at 2.76 ug/kg, and D-BHC at 2.76 ug/kg. All other organochlorine pesticides and PCBs returned at levels below analytical detection.

Frazier’s quarry was sampled for fecal coliforms and fecal streptococcus bacteria in June of 1994. Fecal coliforms were present at a level of 15 colony forming units (cfu’s) per 100 mls and fecal streptococcus were present at the levels of 185 cfu’s per 100 mls.

The results of the water quality study suggest that the water chemistry appears to be indicative of a previously quarried reservoir. Manganese levels are high in the bottom of the quarry: however, the water plant has had no problem to date treating the water. Taste and odor problems are well controlled.

6.0 POTENTIAL CONTAMINANT SOURCES

A review of available regulated facility data-bases and a field survey of the corridor management zone indicate that there are several potential contaminant sources present in the drinking water source protection area. Table 2 provides a list of the identified potential contaminant sources in the drinking water source protection area. The location of potential sources in the protection area is shown in Figure 4.

It is important to note that this inventory represents potential contaminant sources and includes any source that has the potential to release a contaminant to surface or ground waters in the protection area. It is beyond the scope of this study to determine whether any specific potential source is actually releasing a contaminant, or to what extent any potential source(s) may be
contributing to the overall pollutant load. The information derived from these databases should be verified and updated before initiating efforts for a specific contaminant source.

One of the primary potential sources reported are oil/gas wells within the corridor management zone. There are over 518 oil/gas wells throughout the protection area. Within the CMZ there are 24 reported oil/gas wells and 3 oil/gas wells within the EMZ. It is not known if all such wells are active or if those that may have been abandoned were properly sealed.

There are also a number of surface impoundments located within the protection area, mostly small settling ponds from former mining activity. There are sixteen reported impoundments in the protection area, with eight in the CMZ area. Some of these ponds may be residential or publicly operated by fishing groups. Others may be abandoned and are undergoing natural sedimentation, deposition, and ecological succession to wetland areas.

Seven to eight additional potential contaminant sources exist within the protection area. Previously several leaking underground storage tanks were identified in the CMZ. The State Fire Marshals Bureau of Underground Storage Tanks Registration reveals that these tanks have been removed and require no further action. Other potential contaminant sources in the protection area include cemeteries, an airport, a body shop, an abandoned mine and one NPDES permitted discharge. In addition, an approved municipal sludge deposition site also lies within the protection area.

The transportation network is a potential source of contamination through vehicular accidents that release hazardous materials. Figure 4 shows the location of road and stream crossings within the protection area. Approximately 51 miles of named roads exist within the protection area. Some unnamed access roads to oil/gas wells etc. also exist. Approximately 17 miles of roads are within the CMZ, and one half mile is within the EMZ. There are a total of 39 road stream crossings within the CMZ and one road crossing within the EMZ. In the north end of the protection area Interstate 70 and National Road 40 cross sections of the headwaters of Kent Run. Lesser traveled Muskingum county roads CR33, CR126, CR71, CR123, CR28, also traverse the protection area. A variety of township roads also traverse the area including Rucker, Bagely, Kroft, Slack, Opera, Nutter, Dumolt, Wortman, Wesley-Chapel, Chapel, Wesley, Ford Coopermill, Wilkins, Asbury, Gorsky, Black Trapp, Moragn, Stine, and Foxfire. US 22 crosses the EMZ and maintains moderate to heavy traffic. US 22 passes by the water plant and is less than 1,000 feet from Frazier’s Quarry. US 22 is less than 2,000 feet from the water plant’s main intake, and as such, is a principal area of concern. Figures 1 and 2 show aerial photos of the protection area, Frazier’s Quarry and Lake Isabella.

Several wells were noted during a historical review of the area. They are not producing at this time, however, it is not known whether or not the wells were capped and closed pursuant to best available technology or recommendations.

7.0 SUSCEPTIBILITY ANALYSIS

For the purposes of source water assessments, all surface waters are considered to be susceptible to contamination. By their nature surface waters are accessible and can be readily contaminated by chemicals and pathogens with relatively short travel times from source to the intake. Based on the information compiled for this assessment, the Maysville Regional Water System drinking water source protection area is potentially susceptible to agricultural runoff, livestock activities, municipal sludge runoff, transportation spills, water fowl migration, oil and gas wells, previous mining activity, proposed mining activity, residential development, small business development, and intentional human contamination.
It is important to note that this assessment is based on available data, and therefore may not reflect current conditions in all cases. Water quality, land uses and other activities that are potential sources of contamination may change with time. While the source water for the Maysville Regional Public Water System is considered susceptible to contamination, historically, the Maysville Regional Water System has effectively treated this source water to meet drinking water quality standards.

8.0 PROTECTIVE STRATEGIES

Source water protection efforts for the Maysville Regional Water System should focus on controlling agricultural runoff and runoff from cattle grazing pastures; with particular attention to sources of pesticides, nitrates, phosphorus, and microorganisms such as fecal coliform bacteria. This can be accomplished via educational efforts. County Extension agents are an excellent resource for assisting the agricultural community with controlling agricultural runoff, and staff from local and County health offices can instruct homeowners in proper maintenance of their septic systems. Consideration should be given to the feasibility of installing sanitary sewer lines in areas that have discharging systems not performing to standards.

More specific suggestions include the following:

Education and Outreach: Informing people who live, work, or own property within your protection area about the benefits of drinking water protection is very important. Although some communities develop their own educational outreach resources, assistance is available at no cost from various agencies. An effort should be made to educate homeowners and businesses of the potential threat their activities can pose to the water supply. Education should also focus on increasing public awareness of illegal dumping and drinking water protection.

Transportation Routes: There is a potential for spills along roads within the protection area, including Interstate 70. The Maysville Regional Water System should contact the local fire department and local emergency planning agency about the location of the drinking water source protection area, so that strategies can be developed to prevent spilled materials from impacting Frazier's Quarry Reservoir, Lake Isabella and Kent Run.

Emergency Response Planning: The plan should also address early warning of spills and coordination of response and remediation activities for spills that may enter Frazier's Quarry, Lake Isabella and Kent Run. This plan should include emergency response actions for the water bodies, such as the placement of absorbent booms to control oil spills, or the ability to mechanically add oxygen to oxidize chemicals with a high oxygen demand. Different response plans could be developed for different types of contamination. The emergency response plan may also contain strategies for dealing with unexpected levels of runoff containing chemicals such as fertilizers and pesticides from adjacent land uses. Though it may be less catastrophic than a major spill, this kind of contamination is more prevalent and is harder to detect and contain.

Water Quality Monitoring: Monitoring does not directly prevent contamination, but a drinking water source protection plan will be more effective if the Maysville Regional Water System conducts periodic monitoring of raw water quality and quantity from Frazier's Quarry, Lake Isabella and Kent Run. For example, monitoring data can be used to (1) determine optimal conditions or seasons for pumping water to the treatment plant; (2) estimate time-of-travel for a chemical to reach the water treatment intake from various locations in the Frazier's Quarry reservoir, Lake Isabella and Kent Run; (3) track water quality trends; and (4) evaluate the
effectiveness of selected protective strategies. Sampling locations and schedules could be modified on an emergency basis to monitor spills or the runoff of contaminants that may enter the reservoir.

**Coordination with Existing Activities:** Many local groups are engaged in programs that complement a public water system’s drinking water source protection efforts. Working with groups such as the Natural Resources Conservation Service, the Soil and Water Conservation Service, the Farm Bureau, or a local watershed planning organization ensures coordination of their respective programs.

The Maysville Regional Water System and stakeholders within the protection area are encouraged to develop a local program to protect the source waters. A local program is capable of responding to changing conditions within the watershed and can bring together the local governments and stakeholders needed for an effective protection effort. Source water protection efforts could benefit the community by allowing the Maysville Regional Water System to more fully use its surface water resource. Protecting the source water can also benefit those in the protection area who are not using the Frazier’s Quarry Reservoir for drinking water. A high quality source water enhances other uses such as fishing, recreation, and water supply for agriculture or industry.

Table 3 provides a list of additional protective strategies for general potential source types. Ohio EPA encourages the Maysville Regional Water System to incorporate the types of protective strategies listed above and in Table 3 into a drinking water source protection plan. For more information on drinking water source protection please contact the Drinking Water Protection staff at (614) 644-2752.

**References**


Table 1. Water Quality Monitoring Summary of Treated Water, City of Maysville PWS

*Ohio EPA Pesticide Special Study (May 1995 - March 1999)*

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<td></td>
<td></td>
</tr>
<tr>
<td>Arsenic (µg/l)</td>
<td>8.9</td>
<td>50</td>
<td>No</td>
<td>Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes</td>
</tr>
<tr>
<td>Barium (mg/l)</td>
<td>0.00218 – 0.124</td>
<td>2</td>
<td>No</td>
<td>Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits</td>
</tr>
<tr>
<td>Copper (mg/l)</td>
<td>0.025 – 0.607</td>
<td>AL=1.3</td>
<td>No</td>
<td>Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives</td>
</tr>
<tr>
<td>Fluoride (mg/l)</td>
<td>0.78 – 1.2</td>
<td>4</td>
<td>No</td>
<td>Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories</td>
</tr>
<tr>
<td>Lead (µg/l)</td>
<td>251</td>
<td>AL=15</td>
<td>No</td>
<td>Corrosion of household plumbing systems; Erosion of natural deposits</td>
</tr>
<tr>
<td>Nitrate (mg/l)</td>
<td>0.1 – 3.92</td>
<td>10</td>
<td>No</td>
<td>Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits</td>
</tr>
<tr>
<td>Phosphorus (mg/l)</td>
<td>0.01 – 0.37</td>
<td>none</td>
<td>NA</td>
<td>Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits; Discharge of industrial waste</td>
</tr>
<tr>
<td>Selenium (µg/l)</td>
<td>4.3</td>
<td>50</td>
<td>No</td>
<td>Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines</td>
</tr>
<tr>
<td>Sulfate (mg/l)</td>
<td>54 - 65</td>
<td>none</td>
<td>NA²</td>
<td>Erosion of natural deposits; decomposition product of organic matter; discharge from mining and industrial waters; detergents in sewage; component of precipitation in metropolitan areas</td>
</tr>
<tr>
<td><strong>Radioactive Contaminants (pCi/L)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta/photon emitters</td>
<td>4.46 – 9.0</td>
<td>AL=50</td>
<td>No</td>
<td>Decay of natural and man-made deposits</td>
</tr>
<tr>
<td>Alpha emitters</td>
<td>3.0 – 5.0</td>
<td>15</td>
<td>No</td>
<td>Erosion of natural deposits</td>
</tr>
<tr>
<td><strong>Synthetic Organic Contaminants including Pesticides and Herbicides (µg/l)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alachlor³</td>
<td>0.06 – 0.16</td>
<td>2</td>
<td>No</td>
<td>Herbicide runoff</td>
</tr>
<tr>
<td>Atrazine³</td>
<td>0.06 – 0.15</td>
<td>3</td>
<td>No</td>
<td>Herbicide runoff</td>
</tr>
<tr>
<td>Metolachlor³</td>
<td>0.04 – 0.14</td>
<td>none</td>
<td>NA</td>
<td>Pesticide runoff</td>
</tr>
<tr>
<td>Metribuzin³</td>
<td>0.05</td>
<td>none</td>
<td>NA</td>
<td>Pesticide runoff</td>
</tr>
<tr>
<td><strong>Volatile Organic Contaminants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xylenes (mg/l)</td>
<td>0.6 – 2.39</td>
<td>10</td>
<td>No</td>
<td>Discharge from petroleum factories; Discharge from chemical factories</td>
</tr>
<tr>
<td>TTHMs [Total Trihalomethanes] (µg/l)</td>
<td>34.6 - 112</td>
<td>80</td>
<td>No⁴</td>
<td>By-product of drinking water chlorination</td>
</tr>
<tr>
<td>Bromodichloromethane (µg/l)</td>
<td>1.44 – 37.3</td>
<td>none</td>
<td>NA²</td>
<td>By-product of drinking water chlorination</td>
</tr>
<tr>
<td>Chloroform (µg/l)</td>
<td>1.03 – 48.8</td>
<td>none</td>
<td>NA²</td>
<td>By-product of drinking water chlorination</td>
</tr>
<tr>
<td>Bromoform (µg/l)</td>
<td>0.56 – 5.53</td>
<td>none</td>
<td>NA²</td>
<td>By-product of drinking water chlorination</td>
</tr>
<tr>
<td>Contaminant (units)</td>
<td>Levels Found</td>
<td>Primary MCL</td>
<td>Exceeds MCL</td>
<td>Typical Source</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------</td>
<td>-------------</td>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Dibromochloromethane (µg/l)</td>
<td>5.9 - 28.71</td>
<td>none</td>
<td>NA&lt;sup&gt;4&lt;/sup&gt;</td>
<td>By-product of drinking water chlorination</td>
</tr>
<tr>
<td>Dibromoacetic Acid (µg/l)</td>
<td>1.0 – 6.094</td>
<td>none</td>
<td>NA&lt;sup&gt;4&lt;/sup&gt;</td>
<td>By-product of drinking water chlorination</td>
</tr>
<tr>
<td>Dichloroacetic Acid (µg/l)</td>
<td>2.59 – 37.1</td>
<td>none</td>
<td>NA&lt;sup&gt;4&lt;/sup&gt;</td>
<td>By-product of drinking water chlorination</td>
</tr>
<tr>
<td>Trichloroacetic Acid (µg/l)</td>
<td>1.21 – 23.7</td>
<td>none</td>
<td>NA&lt;sup&gt;4&lt;/sup&gt;</td>
<td>By-product of drinking water chlorination</td>
</tr>
<tr>
<td>Monobromoacetic Acid (µg/l)</td>
<td>1.17 – 11.9</td>
<td>none</td>
<td>NA&lt;sup&gt;4&lt;/sup&gt;</td>
<td>By-product of drinking water chlorination</td>
</tr>
<tr>
<td>Monochloroacetic Acid (µg/l)</td>
<td>2.6 – 11.6</td>
<td>none</td>
<td>NA&lt;sup&gt;4&lt;/sup&gt;</td>
<td>By-product of drinking water chlorination</td>
</tr>
</tbody>
</table>

MCL = Maximum Contaminant Level (TT = Treatment Technique; AL = Action Level).
MFL = Millions of fibers per liter

<sup>1</sup> MCL set by federal or state drinking water standards. A sampling result that exceeds the MCL value does not necessarily indicate a violation by the public water system. MCL violations for many contaminants are based on a running annual average.

<sup>2</sup> Secondary Maximum Contaminant Level (SMCL) for this parameter. SMCLs are non-health-related limits.

<sup>3</sup> Data includes Ohio EPA Pesticide Special Study results (1995-1999). For the study, samples were analyzed using an immunoassay (IA) method and by USEPA Method 507, a gas chromatograph (GC) method. The immunoassay results are only estimations of the actual concentration values. The IA test kits tend to overestimate concentrations, due to cross reactivity of chemically similar pesticides (e.g. atrazine and simazine).

<sup>4</sup> Total Trihalomethanes (TTHMs): (MCL = 80 µg/l) calculated as the sum of the concentrations of Bromodichloromethane, Dibromochloromethane, Bromoform, and Chloroform. Five Haloacetic Acids (HAA5): (MCL = 60 µg/l) calculated as the sum of the concentrations of Monochloroacetic acid, Dichloroacetic acid, Trichloroacetic acid, Monobromoacetic acid, and Dibromoacetic acid.
<table>
<thead>
<tr>
<th>Map ID</th>
<th>Unique ID</th>
<th>City</th>
<th>County</th>
<th>Type</th>
<th>Inv. Code</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>------</td>
<td>None</td>
<td>Various</td>
<td>Muskingum</td>
<td>Oil/Gas Wells</td>
<td>0-21, 0-23</td>
<td>USEPA Geofacts</td>
</tr>
<tr>
<td>------</td>
<td>SIM (****)</td>
<td>Various</td>
<td>Muskingum</td>
<td>Surface Impoundments</td>
<td>0-19</td>
<td>USEPA Geofacts</td>
</tr>
<tr>
<td>------</td>
<td>None</td>
<td>Various</td>
<td>Muskingum</td>
<td>Agriculture</td>
<td>A1-17</td>
<td>Field Survey</td>
</tr>
<tr>
<td>Self</td>
<td>PWS6001411</td>
<td>Maysville RWA</td>
<td>Muskingum</td>
<td>Water Plant</td>
<td>M-4</td>
<td>Field Survey</td>
</tr>
<tr>
<td>0001</td>
<td>0PV000161</td>
<td>Hopewell</td>
<td>Muskingum</td>
<td>NPDES Outfall Mobile Home Park</td>
<td>M-10, 0-14, R-7</td>
<td>Field Survey/USEPAGeofact</td>
</tr>
<tr>
<td>0002</td>
<td>CEM4771</td>
<td>Wesley-Union</td>
<td>Muskingum</td>
<td>Cemetery</td>
<td>C-8</td>
<td>Field Survey/USEPAGeofact</td>
</tr>
<tr>
<td>0003</td>
<td>MIN0780</td>
<td>Hopewell</td>
<td>Muskingum</td>
<td>Abandoned Mine</td>
<td>I-11</td>
<td>ODNR AM GIS</td>
</tr>
<tr>
<td>0004</td>
<td>AIR0591</td>
<td>Springfield Twp</td>
<td>Muskingum</td>
<td>Airport</td>
<td>C-1</td>
<td>Field Survey/USEPAGeofact</td>
</tr>
<tr>
<td>0005</td>
<td>CEM</td>
<td>Newton Twp</td>
<td>Muskingum</td>
<td>Cemetery</td>
<td>C-8</td>
<td>Field Survey</td>
</tr>
<tr>
<td>0006</td>
<td>Newton Twp</td>
<td>Muskingum</td>
<td>Body Shop</td>
<td>C-2</td>
<td>Field Survey</td>
<td></td>
</tr>
<tr>
<td>0007</td>
<td>Newton Twp</td>
<td>Muskingum</td>
<td>Other/Commercial</td>
<td>C-33</td>
<td>Field Survey</td>
<td></td>
</tr>
<tr>
<td>0008</td>
<td>Springfield Twp</td>
<td>Muskingum</td>
<td>WWTP Sludge Application</td>
<td>M-12, W-10</td>
<td>Field Survey</td>
<td></td>
</tr>
</tbody>
</table>

NPDES = National Pollutant Discharge Elimination System  
WWTP = Wastewater Treatment Plant
<table>
<thead>
<tr>
<th>Potential Contaminant Source</th>
<th>Protective Strategy or Action</th>
</tr>
</thead>
</table>
| 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) to local businesses and industries on topics relating to drinking water source protection  
                              • Encourage ‘water resource friendly’ development  
                              • Develop/enact/enforce a local ordinance which may include any of the following: changing zoning; prohibiting or restricting waste disposal; requiring registration of existing facilities; banning certain types of new activities; prescribing 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 |
### Table 3. General Protective Strategies For Water Suppliers To Consider Implementing Within the Drinking Water Source Protection Area

<table>
<thead>
<tr>
<th>Potential Contaminant Source</th>
<th>Protective Strategy or Action</th>
</tr>
</thead>
</table>
| Residential Sources         | • Inventory/remove underground home heating oil tanks in the CMZ and 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 warning system for spills and emergency planning; educate emergency responders to be aware of drinking water protection areas; or coordinate facility spill/contingency planning.  
                                  • Encourage compliance with materials handling procedures/requirements  
                                  • Install engineering controls at municipal facilities  
                                  • Implement pollution prevention strategies  
                                  • Work with the street department and Ohio DOT to minimize use of road salt  
                                  • Conduct routine sewer inspections, maintenance and upgrades |
<table>
<thead>
<tr>
<th>Potential Contaminant Source</th>
<th>Protective Strategy or Action</th>
</tr>
</thead>
</table>
| **Commercial and 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.  
| **Oil and gas wells** | - Provide education (material/meetings) to owners on maintenance.  
- Ensure/monitor proper operation and maintenance.  
- Develop an early release notification system for spills.  
| **Spills** | - Develop an early release notification system for spills and an emergency response plan.  
- Include drinking water protection in response planning and training.  
| **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.  

Figure 1 - Maysville Regional Water District Drinking Water Source Protection Areas
Figure 2 - Fraziers Quarry, Lake Isabella, and Emergency Management Zones
Figure 3 - Land Use Within the Maysville Drinking Water Source Protection Area
Figure 4 - Potential Contaminant Sources in the Maysville Drinking Water Source Protection Areas