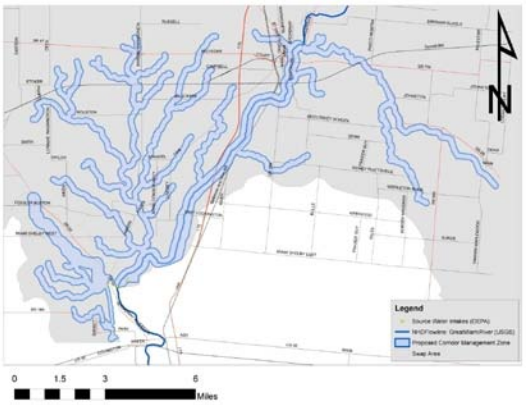


FINAL

REPORT

Source Water Assessment & Protection Plan

City of Piqua

March, 2011

CDM

Executive Summary

An endorsed source water protection plan provides multiple benefits to both the drinking water utility and the community in general. Though changes in water quality in a watershed are typically slow, it may be possible to improve water quality through execution of management and educational strategies. Source water quality directly impacts treatment process requirements, regulatory compliance and treatment costs. Therefore, improvements in source water quality are beneficial to the drinking water system and can also provide aesthetic improvements for communities along the lakes.

This revision to the 2003 City of Piqua Source Water Protection Plan was developed by a team of consultants, City staff and public representative. The City of Piqua was represented by

- Mr. Don Freisthler, Superintendent, Water Treatment Plant
- Mr. Dave Burtner, Director of Utilities
- Ms. Amy Havenar, City Engineer

The City of Piqua has an active and established Community Advisory Committee with representation from community members-at-large, local media and the Miami County Soil and Water Conservation District (see Appendix for complete list). Additional participants are actively solicited and encouraged to participate including surrounding communities in the watershed. A subcommittee of this group is actively involved in actions to improve water quality, particularly for the reservoir. There is also an education subcommittee which is being encouraged to become involved in the execution of this plan.

This updated Source Water Assessment and Protection Plan (SWAP) addresses the following elements

- Benefits of SWAP
- Updates to source water protection areas
- Current land use and potential contaminant inventory
- Current water quality
- Prioritization of contaminant sources and risks
- Strategies for protection from known contaminant sources
- Educational strategies
- Contingency Planning for Water Supply
- Source Water Monitoring Recommendations
- Implementation strategy and responsibility

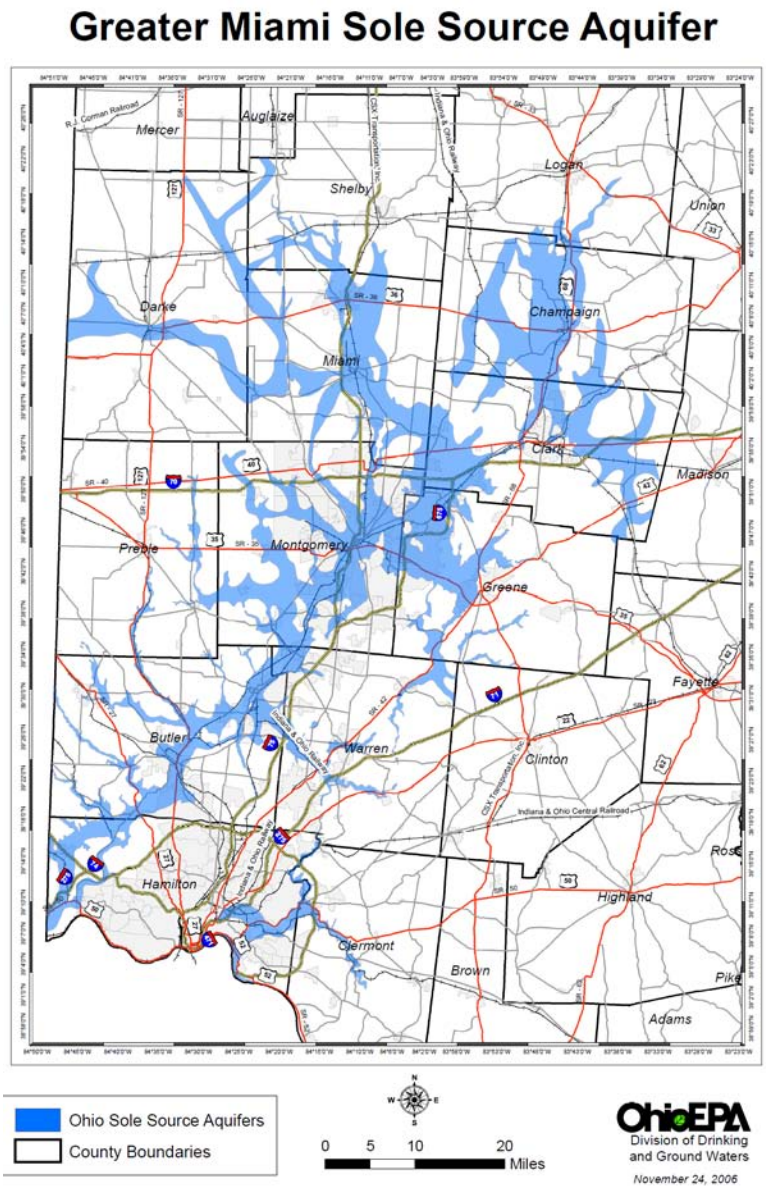
1.0 Introduction

The City of Piqua and its water supply are located in central Ohio. The City serves approximately 20,500 people with 8,550 service connections, primarily within the City boundaries. The water treatment plant has a capacity rated at 7 MGD. The average production was 2.9 MGD from 2006-2010. Part of the watershed is designated as "sole source" by the Ohio EPA (Figure 1). The watershed is not in a karst area, but rather a sand and gravel aquifer. Therefore, availability of groundwater is limited and the City relies upon surface water for its supply.

Source water is obtained from three water sources: the hydraulic system, a gravel pit and the Great Miami River. The preferred source of Piqua's water comes from the Ernst gravel pit for the best quality and the Great Miami River for quantity. The other source is the hydraulic system. This is a series of lakes and canals, which were left from Ohio's canal era. These lakes and canals collect water from a 10.5 square mile recharge zone (SWAP Report, 2003). The system is composed of Swift Run Lake, Echo Lake, Frantz Pond and the connecting canals. Known as the "hydraulic system", or "Swift Run Lake", it will hereafter be referred to the "reservoir" in this report. Water quality from this source is typically the most challenging to treat. Supplemental water can be pumped to the reservoir from the Great Miami River. Water is then gravity fed from the reservoir to the treatment plant. The Ernst gravel pit, or Rocky Ridge Lake, is actually a set of two interconnected water bodies, only one of which is owned by Piqua. The naming has recently been changed; for the purposes of this report the historical "Ernst gravel Pit" designation will be used. This is a preferred source of water since it is of higher quality (lower TOC). The Ernst gravel pit now consists of a 4.5-acre lake (Piqua's) and a 32-acre lake with residential ownership. It is located in sand and gravel deposits of the Miami River aquifer system and is limited in supply (<30% of needed volume). Additional water is withdrawn from the Great Miami River at River Mile 118.5. This source is primarily used in summer months when water demands increase. Pumps of 3, 6 and 11.5 MGD can move water to either the reservoir or the water treatment plant.

The City of Piqua must rely on surface water supplies since groundwater availability is insufficient to meet the total needs of the City. Piqua is in a "sole source aquifer" area (Figure 1). This designation is applied when the resource is limited and it was developed to protect groundwater resources by requiring U.S. EPA to review and potentially restrict water usage in the area.

Figure 1: Map of Sole Source Aquifers near Piqua



Water for treatment is drawn directly from the reservoir, Ernst gravel pit and from the Great Miami River. For taste or odor control, activated carbon or potassium permanganate solutions can be added to the water after it enters the plant. Lime, soda ash and/or caustic soda, and ferric sulfate are added to the raw water and from there, water moves to the flocculators or mixing tanks. The flow then splits 75-25 into two clarifier tanks. Fluoride is also added to the treated water from a bulk chemical Hydrofluorosilicic acid tank. Chemicals can be fed for coagulation (ferric sulfate), pH adjustment (soda ash, lime, caustic soda and carbon dioxide), disinfection (chlorine), corrosion control (phosphate) and fluoridation. Settled clear (recarbonated) effluent then flows to the filters for complete removal of suspended materials. After passing through the filters, water flows to two underground clear wells with a combined capacity of 1,060,000 gallons. Chemically treated water is disinfected by gaseous chlorine.

From the clear well storage, the softened, filtered, chlorinated and fluoridated water is pumped by the high service pumps and delivered via a distribution system to the City at an average pressure of 70 pounds per square inch.

The distribution system is comprised of the four storage tanks previously mentioned as well as two booster stations coupled via 107 miles of piping utilizing over 2,000 valves and over 2,000 hydrants.

2.0 Identification of Critical Areas

The Drinking Water Source Protection Area for surface water streams are defined as the drainage area upstream of the withdrawal point. The protection area includes the corridor management zone (CMZ); this is defined as the area 10 miles upstream from the intake, including all tributaries that drain into the body of water at the intake. All tributary areas should likewise extend for 10 miles upstream from the intake. The CMZ is further defined as extending 1,000 feet from each bank of the stream and 500 feet from the bank of each tributary. CMZs may also be determined by topographic lines and runoff direction.

The protection area and CMZ include the emergency management zone (EMZ). This is the area in the immediate vicinity of an intake where there would be no or minimal time to respond to a spill. The original SWAP for Piqua identified three CMZs: the Miami River intake, the Ernst gravel pit and Swift Run Lake. EMZs were defined by Ohio EPA as a semi-circular centered at the intake and extending 500 feet upstream and 100 feet downstream. The Ernst gravel pit was treated as a "well" supply and a 500 foot radius were applied for a full circle. EMZ's were not developed for Frantz Pond and Echo Lake because water from these sources is conveyed to other sources i.e. water withdrawal does not occur directly from either of these locations.

For this update, modifications were made both to the Great Miami River EMZ and to all CMZs. The EMZ developed for the Great Miami River resulted in a small area with very minimal response time. Given an average river flow of 0.6 mile per hour, the travel time for a spill at the edge of the EMZ to reach the water plant intake is only 9.5 minutes. This does not provide for sufficient response time to detect an incident, report it to the water plant and allow the water plant to close the intake. Based on discussion with the water plant staff, a response time of 5 to 10 minutes following a report of an incident was desired. In addition, allowing 20 minutes for the public to report a spill and have this communicated to the WTP, a total response time of 30 minutes is recommended. This was translated into a new EMZ that extends 1,500 feet upstream of the intake. The downstream EMZ was retained at 100 feet. This travel time approach is allowed per EPA guidance and was acceptable to Ohio EPA. This provides for more realistic response time and protection. The revised EMZ is shown in Figure 2.

Modifications were also prepared for the CMZs because the CMZs developed by Ohio EPA sometimes did not include the entire EMZ. While EMZs might extend beyond the CMZ, intuitively, all of the EMZ should be included in the CMZ layer. Therefore, the Ernst gravel pit and Great Miami River CMZs were modified to encompass the EMZs (Figures 2 & 3). In addition, the CMZ for the Ernst gravel pit ran through the middle of one of the lakes. The CMZ was extended to encompass the entire lake as it was assumed that water could easily mix throughout the lake and that any impacts on portion of that body of water should be addressed (Figure 4). For the reservoir, the CMZ for Echo Lake was extended to include a tributary that was not captured in the original assessment (Figure 4). Based on physical review of the watershed, it was noted that Tawawa Creek was a significant tributary to the Great Miami River and that was not included in the CMZ. While it technically falls outside of the EPA protocol for establishing a CMZ, utilities have the option to expand this area if desired. Therefore, the CMZ was extended along this creek to include the entire Creek (Figure 5). A complete picture of all of the CMZs is presented in Figure 6.

Figure 2: Updated EMZ for Great Miami River (indicated by pink line)

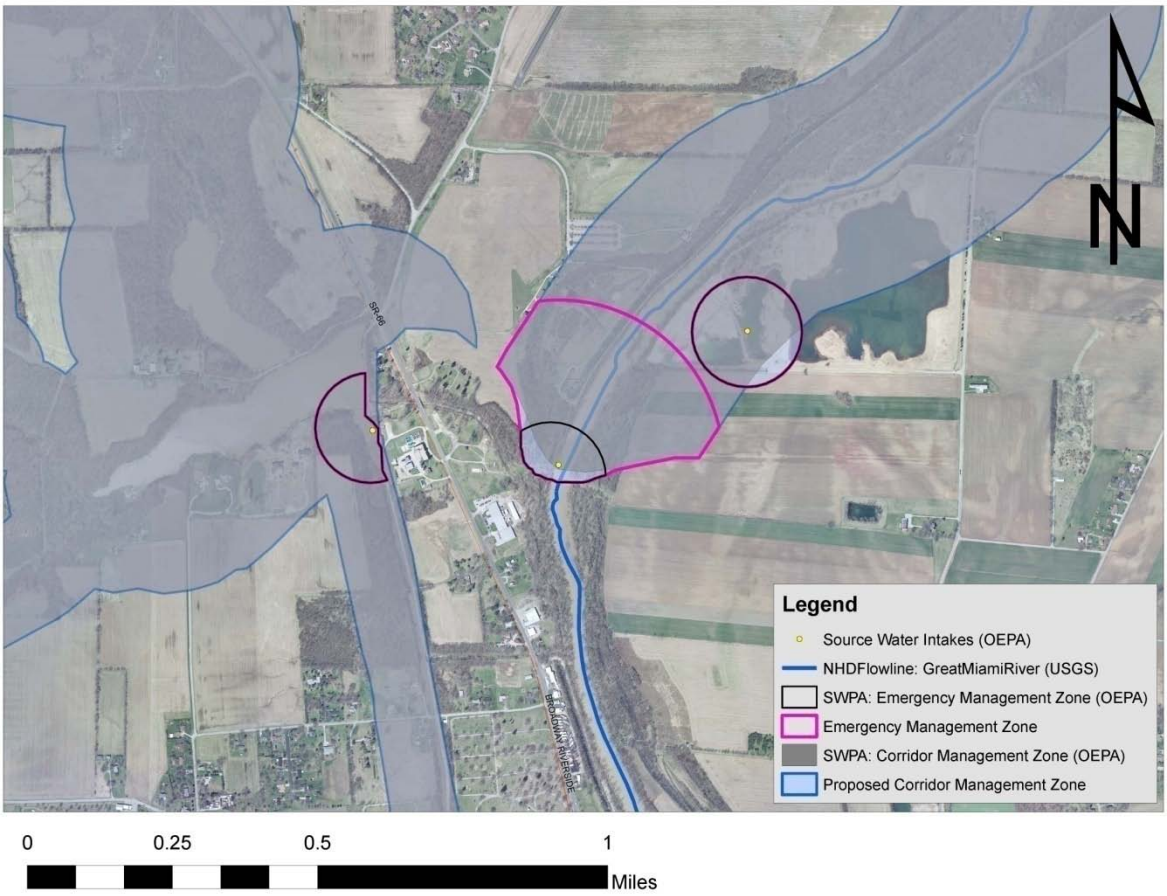


Figure 3: Updated CMZ for Ernst gravel pit (indicated by white area edged in blue)

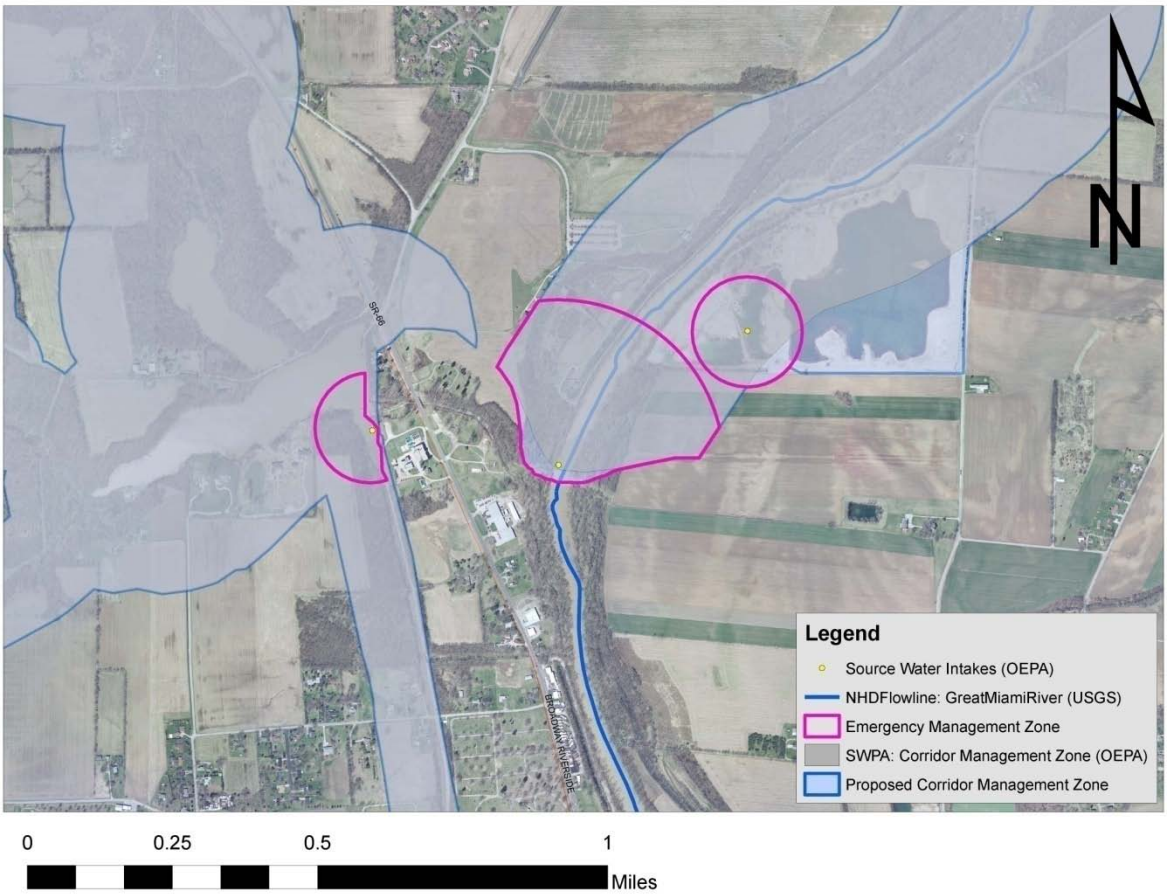


Figure 4: Updated CMZ at Echo Lake (indicated by light blue highlight)

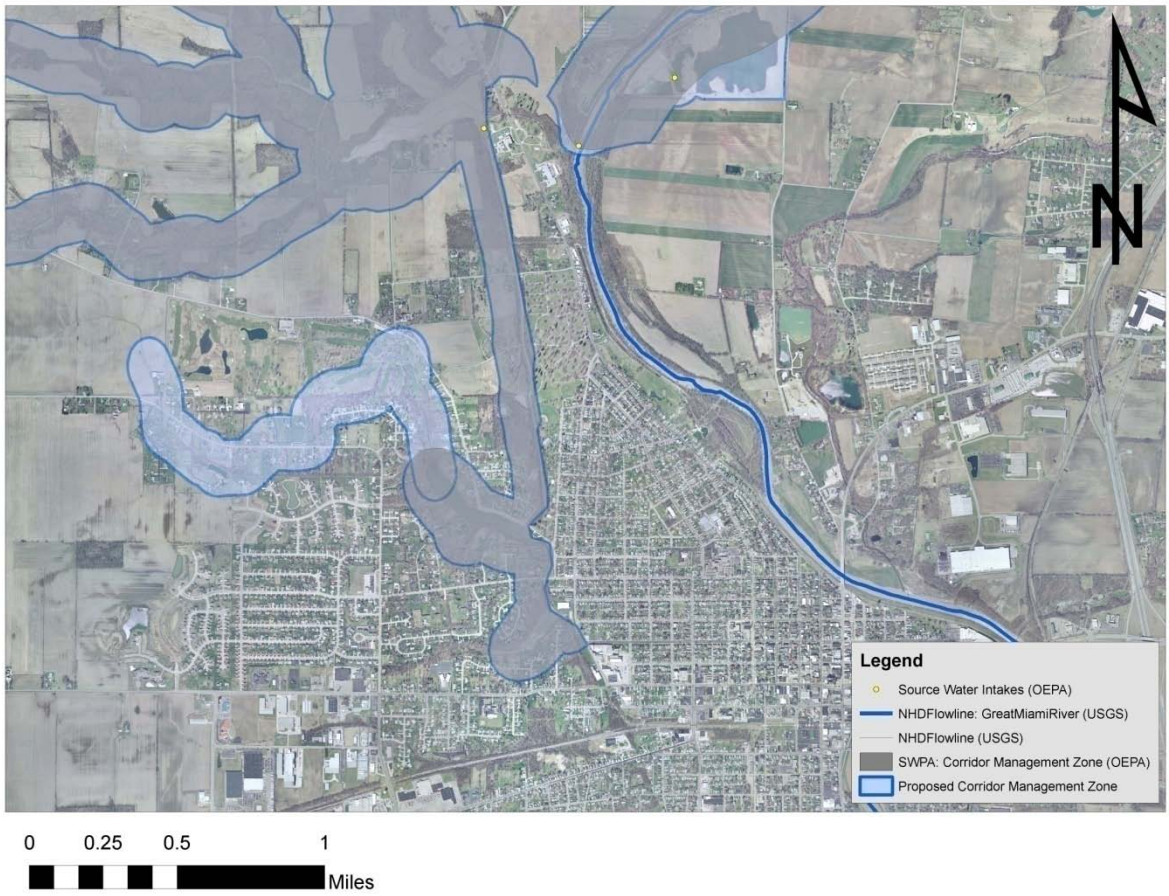


Figure 5: Modification to CMZ to include for Tawawa Creek (indicated by light blue highlight).

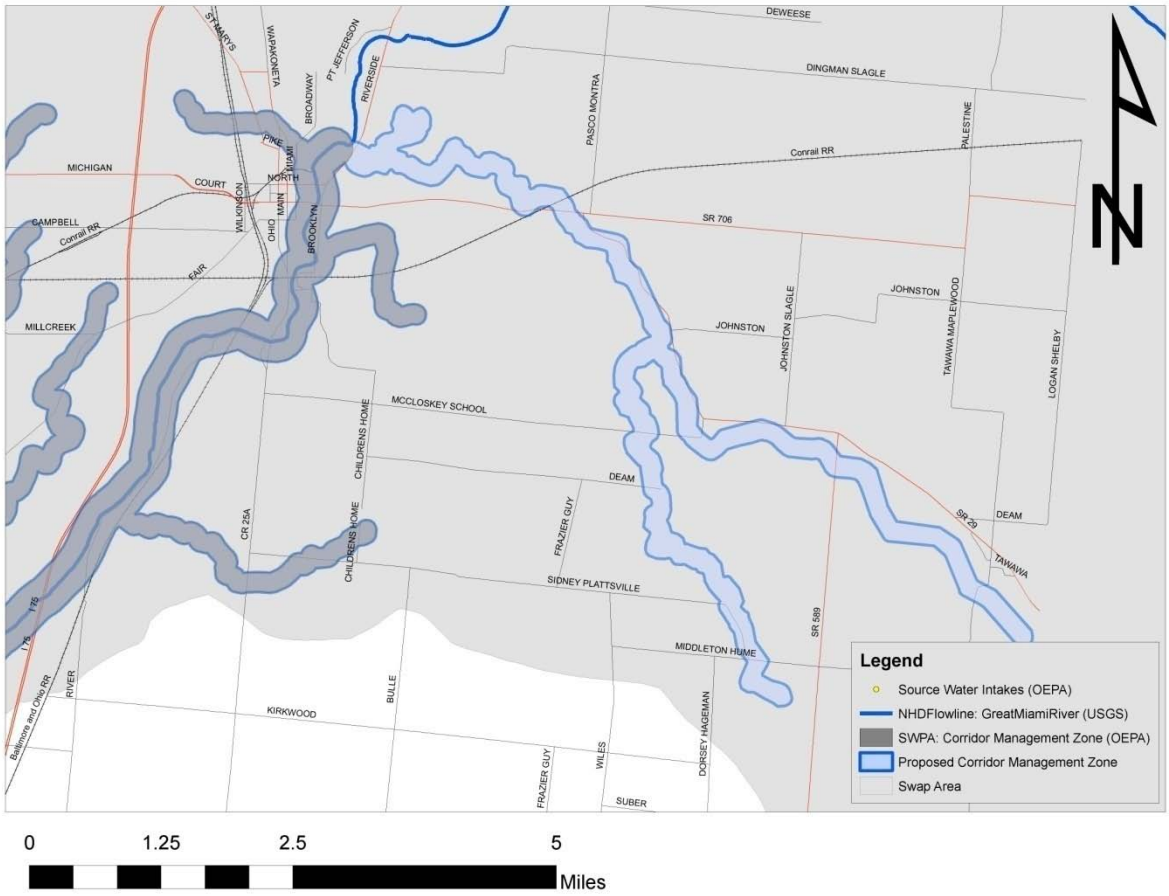
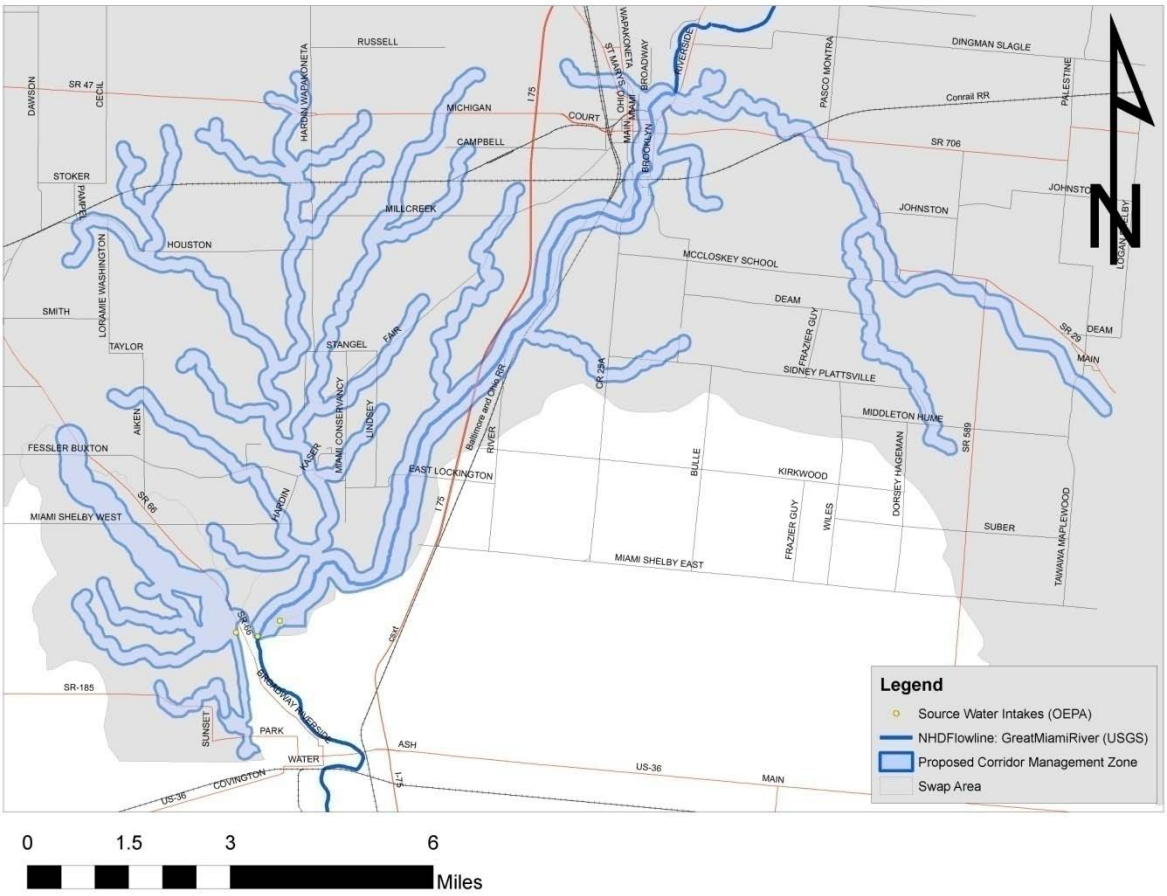
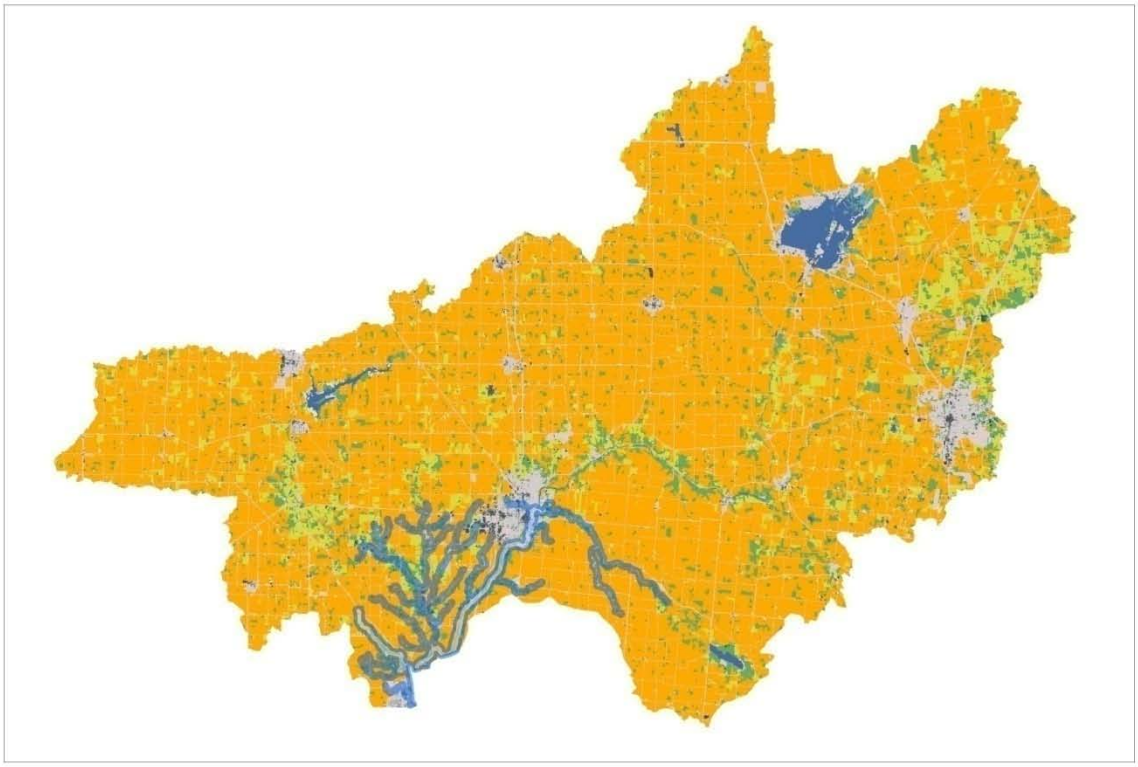


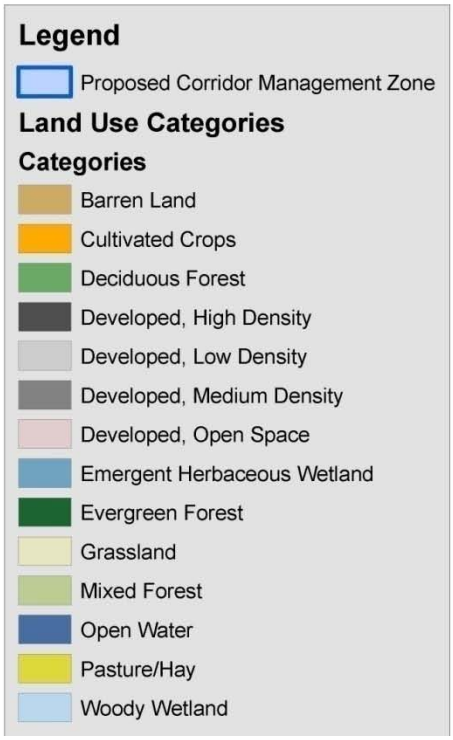
Figure 6: New CMZs for City of Piqua Water Supplies



Land use is predominantly agricultural (corn, soybeans, wheat). Livestock are also present including swine, cattle, and poultry. Some forest and pasture remain. (Figure 7). The City of Piqua incorporates approximately 7,180 acres of which 3,903 acres are developed. As development proceeds in the watershed, impact on the source water protection areas will need to be addressed. While this potential exists, growth in the area has been limited and the population is expected to increase by only 2.4% over the next 20 years (from 20,522 to 21,019). The source water protection area, which encompasses a much broader area than the City, is expected to remain primarily rural and agricultural.

Figure 7 Land Use in Source Water Protection and Surrounding Areas.





Categories	Percent
Open Water	1.54%
Developed, Open Space	7.09%
Developed, Low Density	1.97%
Developed, Medium Density	0.54%
Developed, High Density	0.24%
Barren Land	0.06%
Deciduous Forest	8.98%
Evergreen Forest	0.06%
Mixed Forest	0.00%
Grassland	1.41%
Pasture/Hay	7.45%
Cultivated Crops	70.36%
Woody Wetland	0.01%
Emergent Herbaceous Wetland	0.31%

Water quality data on the water sources is not available individually except for TOC and atrazine. The potential contaminants of concern are atrazine, algae, nitrate and TOC. Emerging contaminants, such as PPCPs (Pharmaceuticals and Personal Care Products) have not been monitored. The highest levels of Atrazine are found seasonally (Spring) in Swift Run lake and in the Great Miami River (Figure 8). Atrazine in the Ernst gravel pit has not exceeded 1.54 ug/L. TOC is of concern as a

precursor for DBP formation (Figure 9). The current water treatment process effectively reduces TOC by about 50% on average with an average finished water concentration of 2.7 mg/L for 2005-2010. This level of TOC is higher than the plant goal of <2.0 mg/l. Algal blooms have been noted on the lakes with reports. A single sample of algae taken on July 27, 2010 demonstrated the occurrence of cyanobacteria (also known as blue-green algae). Nitrate is present at up to 80% of the MCL. The summary of source water data is shown in Table 1.

Table 1: Summary of Source Water Quality 2005-2010

Parameter	Minimum	Maximum	Average
Total Hardness (mg/L as $CaCo_3$)	176	336	252
Total Alkalinity (mg/L as CaCo3)	146	288	208
pH	7.9	8.7	8.3
Turbidity (NTU)	4	56	19
Magnesium (mg/L)	30	114	82
Nitrates (mg/L)	0.32	8.06	1.7
Fluoride (mg/L)	0.22	0.53	0.35
TOC-Plant Composite *(mg/L)	1.9	7.3	4.4
TOC-Ernst gravel pit (mg/L)	1.9	5.1	3.6
TOC-Reservoir (Swift Run Lake) (mg/L)	2.5	9.2	6.1
TOC-Great Miami River (mg/L)	2.9	7.8	4.5
Atrazine-Ernst gravel pit (µg/L)	0.03	1.5	0.1
Atrazine-Reservoir (µg/L)	0.03	85	3.3
Atrazine-Great Miami River (µg/L)	0.03	33	1.2

Figure 8: Atrazine in Source Waters (Reservoir and Miami River only) for January 2005 to January 2011.
Note: The Ernst gravel pit source is not shown as concentrations were very low.

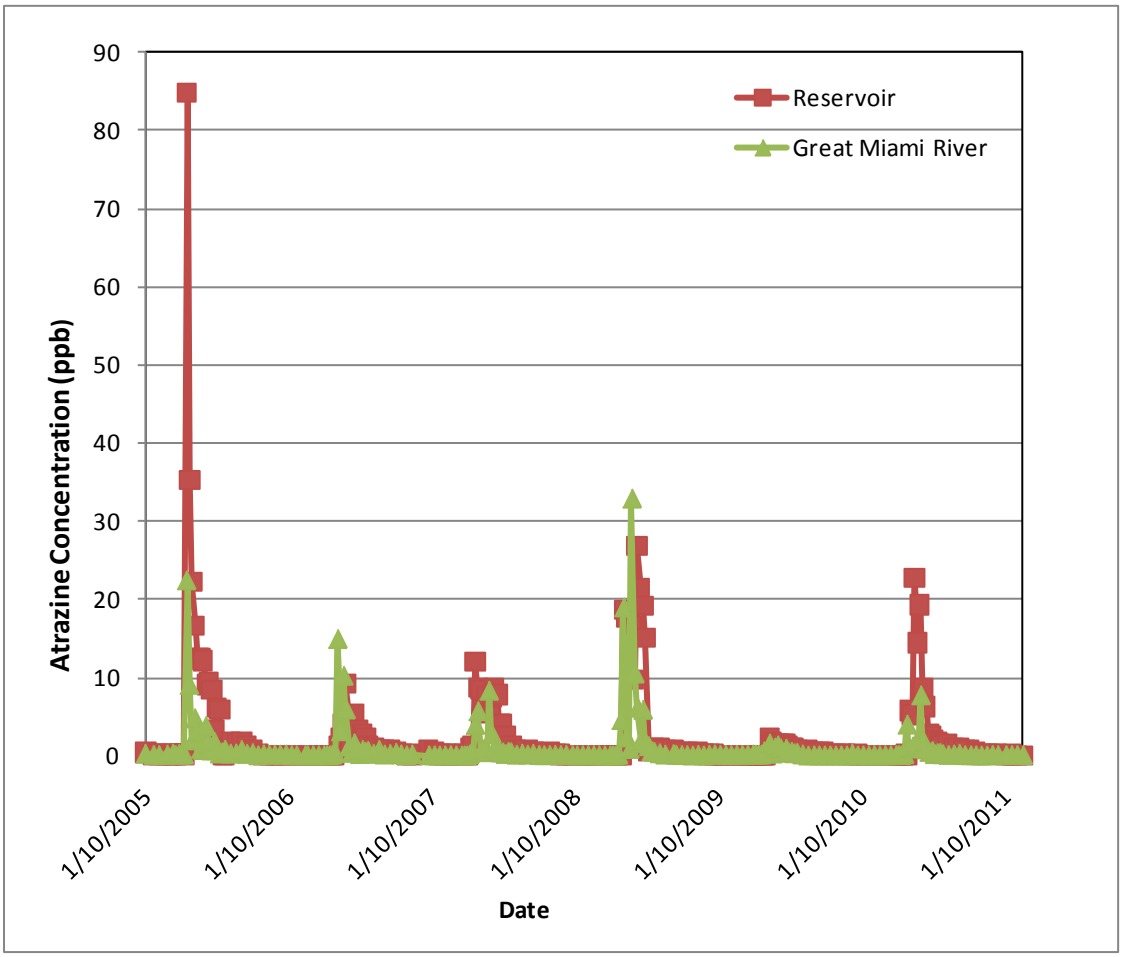
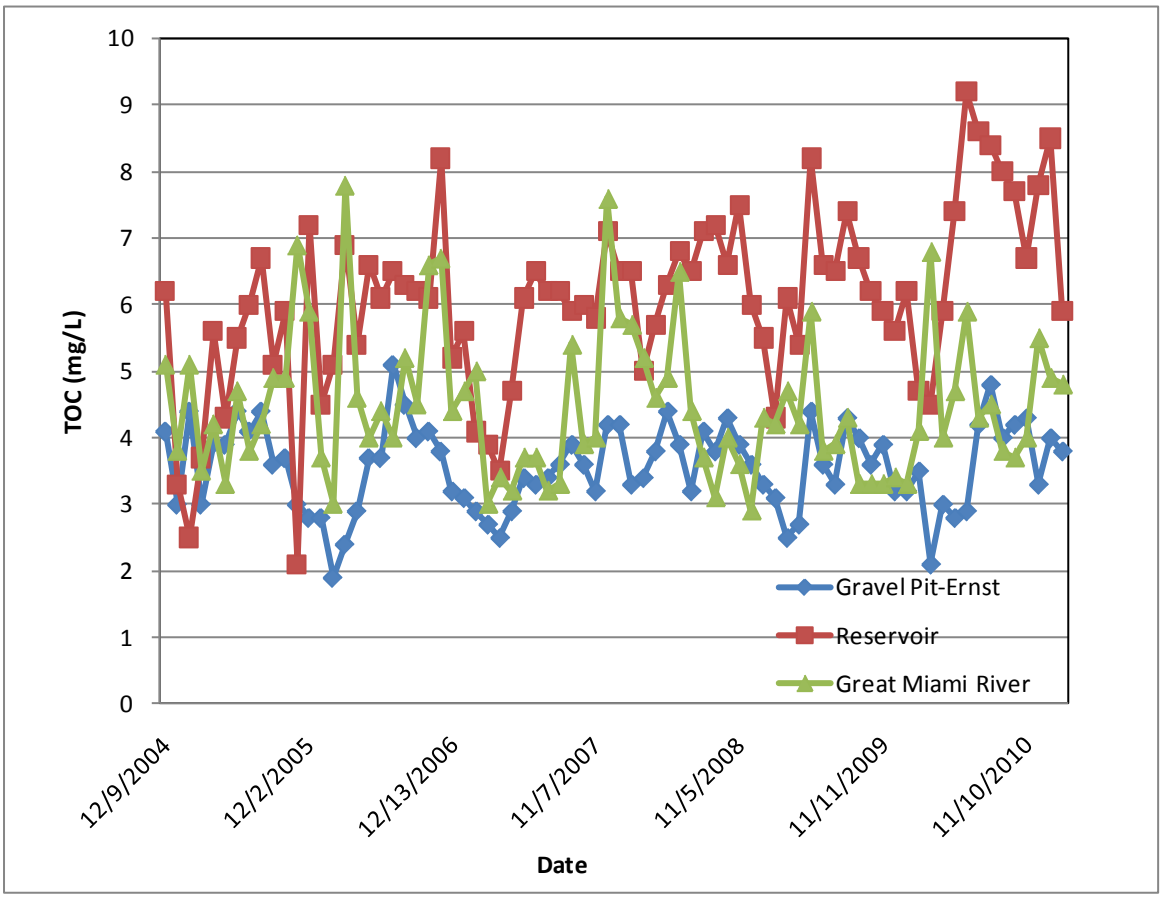


Figure 9: TOC in Source Waters for November 2004 to December 2010



Past studies of the source water were reported in the 2003 SWAP report. Key conclusions from this report based on sampling in 2000 are:

- Stormwater runoff impacts raw water quality which in turn impacts selection of treatment processes and drinking water quality. Compounds detected at low levels were BHC (benzene hexachloride), DDT dichlorodiphenyltrichloroethane), dieldrin, endosulfan, hexachlorobenzene, bis (2-ethylhexyl)phthalate, 2,6-bis (1,1-dimethyl)-4-ethyl phenol, and 17 metals.

- A tributary at Sunset Drive feeding Frantz Pond was sampled to examine the input from the highway, residential and farmland runoff. Atrazine, alachlor, cyanazine, metolachlor, simazine, and nitrate were detected.

- The Piqua golf course tributary to Echo Lake was sampled to examine the input of lawn care chemicals. Atrazine, simazine, metolachlor, and nitrate were detected.

- Patterson Run at Demming Road, feeding Swift Run Lake, was sampled to see the impact of farm runoff. It was observed that this runoff contributes herbicides (atrazine, alachlor, cyanazine, simazine and metolachlor) and nutrients (ammonia-N, nitrate-N, phosphorus).

Review of the finished water for the City of Piqua indicated that the system is compliant with all existing USEPA and Ohio EPA regulations. However, compliance with the D/DBP Stage 2 rule for TTHMs will present an upcoming challenge based on current DBP data.

Ohio EPA has conducted water quality sampling and is in the process of developing TMDLs for the greater watershed. The area along the Great Miami River at the water supply intake is considered to have full attainment status.

3.0 Identification of Potential Contaminant Sources

Available GIS and other data sources were obtained from a variety of websites (accessed July 17, 2011 and August 24, 2011). Contaminants of potential interest were mapped based on their occurrence in the CMZ. Databases and the CSI were updated per the following:

- NPDES permits (http://epa.ohio.gov/dsw/gis/index.aspx)
- CAFOs (http://epa.ohio.gov/dsw/cafo/permit_lists.aspx)
- Biosolids applications (http://wwwapp.epa.ohio.gov/dsw/gis/sludge/index.php)
- Land use designations (see Figure 7) (http://gisdata.usgs.gov/website/mrlc/viewer.htm)
- Registered landfills (http://www.epa.ohio.gov/portals/34/document/facility_lists/lic_msw.pdf)
- Composting facilities listed by Ohio EPA (http://ohioepa.custhelp.com/app/answers/detail/a_id/164)
- Industrial facilities listed by Ohio EPA (http://epa.ohio.gov/Default.aspx?tabid=2582)
- Brownfields listed by Ohio EPA (http://epa.ohio.gov/Default.aspx?tabid=2582)
- Aerial maps (maps.google.com)
- 2003 CSI (http://www.epa.ohio.gov/ddagw/swap.aspx)
- Existing water quality data (provided by City of Piqua)

Utility and public input from the local watershed group was solicited based on their local knowledge of current and past land use activities, such as suspected waste sites.

A windshield survey of the watershed was conducted by the City of Piqua on July 25 and 26, 2011. The purpose of this survey was two-fold: verify the CSI revised based on the above tasks and to identify additional sources of potential contaminants. To assist with the identification of potential contaminant sources, USEPA and Ohio EPA guidance were reviewed. The lists of potential contaminants available in the guidance documents were reduced to those items relevant to Piqua and reasonable to document. The list for use in the windshield survey is shown in Table 2. Basic information and location were collected for all sites identified.

Table 2: List of Potential Contamination Sites Surveyed in Windshield Survey.

Source	Code	Source	Code
Above Ground Storage Tanks	E-1	Junk yards	C-20
Chemical Drums/Storage	E-2	Lawn/farm stores	C-23
Chemical/petroleum pipelines	E-3	Marina/boat docks	C-24
Underground storage tanks	E-4	Paint stores	C-26
Gas lines	E-5	Pest control companies	C-27
Material stockpiles	E-6	Railroad yards/maintenance	C-29
Salt/deicing Storage	E-7	Veterinary offices	C-31
Oil or gas wells	E-8	Welding shops	C-32
Abandoned wells	E-9	Ernst gravel pits & quarries	I-5
Auto repair shops/body shops	C-2	Historic hazardous material sites	I-6
Boat services/repair/refinishing	C-4	Power plants	I-16
Car washes	C-6	Electric substations	I-20
Dry cleaners	C-9	Composting/yard waste facility	M-2
Fleet/truck/bus terminals	C-11	Municipal garages	M-5
Funeral services/crematories	C-13	Recycling facilities	M-7
Gas stations, existing & abandoned	C-15	Animal burial areas	A-1
Animal waste storage/disposal	A-3	Farm chemical distributor	A-10
Greenhouses/nurseries	A-12	Farm machinery repair areas	A-11
Abandoned dumps	W-1	Inactive/closed landfills	W-3
Industrial landfills	W-4	Municipal landfills	W-5
Residual waste landfills	W-6	Hazardous waste landfills	W-7
Radioactive waste landfills	W-8	Other waste disposal sources	W-10

The windshield survey identified:

- a new WWTP package plant, at 5880 State Route 29
- Kinninger goose farm at 5523 SR 29 E in Sidney
- a horse stable at 4301 River Rd in Sidney
- the recycling house at 62 Broadway in Sidney
- the old Shelby County landfill at Shelby Township Transfer Station on SR 47 in Sidney.

The windshield survey also determined that one cemetery (Steward) was abandoned (note this was retained on the CSI as it is still a potential contaminant source) and that one wastewater treatment plant (WWTP) was no longer in operation. A new pressure main was identified that was constructed to provide wastewater service to an area previously on septic systems. The windshield survey also identified Tawawa Creek as a significant tributary to the Great Miami River that had not been previously included in the CMZ. As part of the update, the delineation was revised to encompass Tawawa Creek.

The CAC also reviewed the draft CSI and provided input. The CAC identified a City waste disposal site at Hardin Road and Fester Buxton Road which was added to the CSI. They also identified an industrial quarry on the north side of I-75 and Peterson Road, a quarry on the north end of Johnson Farm where there is an old industrial dump site, and an old dump site with unidentified barrels two miles north of the Ernst Gravel Pit. These were determined to be outside the CMZ and were therefore not included in the SCI update.

The 2003 SWAP report discussed the importance of both railroads and highways as potential contaminant sources. This information was not updated as it is no longer available due to security constraints. The information from the 2003 SWAP report is presented here and is assumed to be similar to current conditions (Table 3). The railway transports petroleum gases, molten sulfur, ammonium nitrate, sulfuric acid, hydrochloric acid, flammable liquids, sodium hydroxide, anhydrous ammonia and inhibited acrylonitrile. The CSX rail lines travel both north-south and east-west through the CMZ. These rail lines present a potential contamination scenario for the Great Miami River. Truck traffic on I-75 also presents a potential contamination source if spills occur. This freeway is a major artery for hazardous material transport.

Table 3: Railroad Hazardous Materials Transported (2003 SWAP Report)

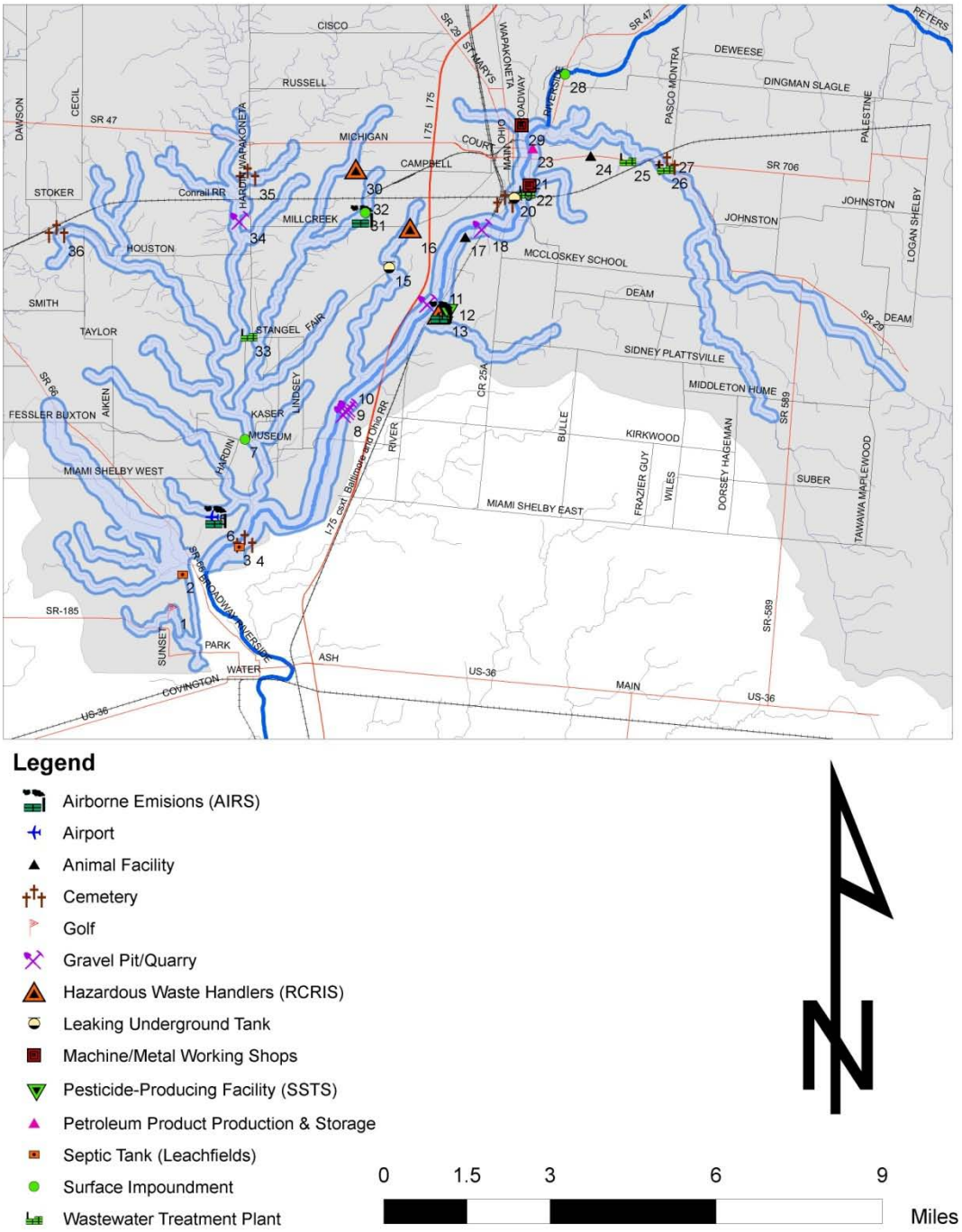
Substance	**Railcar loads (September 1994 to August 1995)**	**Percent of Total Hazardous Material**
Liquefied Petroleum Gases	5,724	26.7%
Molten Sulfur (Flammable Solid)	2,196	10.3%
Molten Sulfur (ORM-B)	1,119	5.2%
Ammonium Nitrate	981	4.6%
Sulfuric Acid	914	4.3%
Hydrochloric Acid	700	3.3%
Flammable Liquid, Elevated Temperature Material	695	3.3%
Sodium Hydroxide	657	3.1%
Anhydrous Ammonia	611	2.9%
Inhibited Acrylonitrile	317	1.5%

Using all of the above resources, the Contaminant Source Inventory was updated and is shown in Table 4 and Figure 10.

Table 4: List of Potential Contaminant Sources in CMZs (ID numbers correspond to Figure 10)

ID #	County	Type
1	Miami	Golf
2	Miami	Septic Tank (Leachfields)
3	Miami	Septic Tank (Leachfields)
4	Miami	Cemetery
5	Miami	Airport
6	Miami	Airborne Emissions (AIRS)
7	Miami	Surface Impoundment
8	Miami	Gravel Pit/Quarry
9	Miami	Gravel Pit/Quarry
10	Miami	Gravel Pit/Quarry
11	Shelby	Hazardous Waste Handlers (RCRIS)
12	Shelby	Pesticide-Producing Facility (SSTS)
13	Shelby	Airborne Emissions (AIRS)
14	Shelby	Gravel Pit/Quarry
15	Shelby	Leaking Underground Tank
16	Shelby	Hazardous Waste Handlers (RCRIS)
17	Shelby	Animal Facility
18	Shelby	Gravel Pit/Quarry
19	Shelby	Cemetery
20	Shelby	Leaking Underground Tank
21	Shelby	Wastewater Treatment Plant
22	Shelby	Machine/Metal Working Shops
23	Shelby	Petroleum Product Production & Storage
24	Shelby	Animal Facility
26	Shelby	Wastewater Treatment Plant
25	Shelby	Wastewater Treatment Plant
27	Shelby	Cemetery
28	Shelby	Surface Impoundment
29	Shelby	Machine/Metal Working Shops
30	Shelby	Hazardous Waste Handlers (RCRIS)
31	Shelby	Surface Impoundment
32	Shelby	Airborne Emissions (AIRS)
33	Shelby	Wastewater Treatment Plant
34	Shelby	Gravel Pit/Quarry
35	Shelby	Cemetery
36	Shelby	Cemetery

Figure 10: Map of Contaminant Source Inventory for City of Piqua Corridor Management Zone



4.0 Prioritization of Contaminant Sources

Contaminant sources were prioritized based on prevalence in the watershed, potential contribution to water quality parameters of concern, and risk to the drinking water supply should a contamination event occur. The top three risks were determined to be:

1. Agriculture – nutrient and pesticide/herbicide runoff

2. Livestock – microbial runoff

3. Roads and Railroads – spills and runoff (deicing chemicals, fuels)

Other risks identified in the watershed include: airports, cemeteries, golf courses, gravel pits/quarries, and other facilities. Stormwater and septic fields are common throughout the area and were not mapped unless the location was captured in the 2003 Source Water Protection Plan.

The Ohio EPA considers all surface water sources to be "susceptible" to contamination. Ohio EPA does not provide degrees of susceptibility nor assigns a sensitivity rating.

5.0 Strategies for Protecting Source Water from Prioritized Sources/Known Contaminants

A list of management, water quality and public education strategies were developed after consulting with the Community Advisory Group (CAC), the watershed subcommittee and Utility representatives. The USEPA and Ohio EPA's guidance and the experiences at other utilities also helped in shape the potential strategies to improve the source water protection plan. The CAC has a well established presence and already has activities that relate to the Piqua watershed. Their focus is on City properties.

Potential and existing action items include:

Management Strategies

- Develop ordinance or zoning restrictions for Swift Run Lake, other locales
- Implement a source water monitoring program
- Participate in Farm Bureau meetings and obtain involvement in SWAP/CAC
- Provide spill response coordination
- Develop list of BMPs for use throughout watershed
- Be the responsible party or track to perform septic system inspections and incentives for repair or track the party's progress

Education Strategies

- Promote use of buffer strips in watershed
- Develop SWAP unit for schools
- Develop signage on watershed protection
- Provide presentations to groups interested in watershed and obtain input/participation
- Develop materials for use in agricultural community
- Provide education to waterfront homeowners
- Produce local TV show specifically on SWAP
- Produce and use printed materials such as coloring books, posters, brochures

- Provide Enviroscape demos to schools, volunteer groups, other events
- Include SWAP information in CCR's (Consumer Confidence Report)
- Publish informational materials on City website
- Participate in existing groups addressing watershed issues

The list was prioritized with input from all groups and a first year action plan was developed (Table 3). The action plan was developed to assure that the initial items addressed the top three contaminant pathways and all of the source waters.

Table 4: Action items for 2011-2012 for City of Piqua Source Water Assessment and Protection Plan

Action	Measurable	Responsibility	Target audience	Key Contaminant Pathway Addressed			Source Water Addressed		
				Farmland	Roads & Railroads	Livestock	Great Miami	Ernst gravel pit	Swift Run Lake
1. Participate in at least two Farm Bureau Meetings	Number of meetings attended and presentations given	City of Piqua	Agriculture and livestock community	X		X	X		X
2. Perform one table top exercise using emergency action plan for WTP	One exercise completed	City of Piqua	Utility department		X		X	X	X
3. Public Education: post endorsed SWAP on web and work with TV show to highlight	Number of hits on website, completion of TV show	CAC & City of Piqua	All customers and inhabitants in watershed	X	X	X	X	X	X

The activities listed in Table 4 will be completed within one year of approval of this source water protection plan.

The list of potential future activities was prioritized by the City of Piqua. Coordination with both CAC activities and stormwater education activities will be required. Both of these groups will be essential to overall program implementation. The list of activities including anticipated timeline and primary responsibility is presented in Table 5.

Table 5: Recommended SWAP Activities for 2012-2017

Action	Measurable	Responsibility	Target Audience	Year
Develop ordinance or zoning restrictions for Swift Run Lake, other locales	Completion and adoption of ordinance	City	Swift Run Lake residents and developers	2015
Implement a source water monitoring program	Recommended plan is implemented routinely	WTP	WTP, all residents in CMZs	2012
Provide spill response coordination	Completion of spill response plan document	WTP, Stormwater division, City Police and Fire	All emergency responders	2012
Promote use of the list of BMPs for use throughout watershed	Review and adopt relevant BMPs from CAC list	City	All residents in CMZs	2013
Promote use of buffer strips in watershed	Number of presentations or informational packets delivered	CAC, City	Residents in CMZs	2017
Develop SWAP unit for schools & train teachers	Completion of unit, number of teachers trained, number of units presented	City	School age children	2014
Develop signage on watershed protection	Number of signs posted	City	Residents in CMZs	2012
Provide presentations to groups interested in watershed and obtain input/participation	Number of presentations provided	City, CAC	Groups and individuals with related interests	2013
Develop materials for use in agricultural community	Completion of materials (electronic and hard copy)	City	Farming community	2012
Provide education to waterfront homeowners	Number of information packets or presentations provided	City, CAC	Waterfront homeowners	2013
Produce local TV show	One show on SWAP developed and provided	CAC	Residents in CMZs and City	2011

Action	Measurable	Responsibility	Target Audience	Year
Produce and use printed materials such as coloring books, posters, brochures	Complete posting materials on City website	City , CAC	School age children, Residents in CMZs	2016
Provide Enviroscape demos to schools, volunteer groups, other events	Obtain one Enviroscape, number of events where Enviroscape used	City, CAC	Residents in CMZs, related organizations	2016
Include SWAP info in CCR's	Annual info on SWAP in CCR provided	City	City residents	2013
Provide information in City's Spirit Newsletter	Annual info on SWAP in newsletter provided	City	City residents	2013
Publish informational materials on City website	Annual information posted or updated	City	City residents, others as interested	2011
Participate in existing groups addressing watershed issues	Attendance of at least one meeting per year	City, CAC	Groups and individuals with related interests	2011

7.0 Contingency Planning

The City of Piqua completed a Vulnerability Assessment in 2003 per the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. This plan addresses a range of security related recommendations. The specific vulnerabilities and recommendations were reviewed, but are not discussed in this report due to confidentiality requirements. The VA appropriately addresses source water concerns and mitigation.

The City of Piqua certified to the Administrator of the U.S. Environmental Protection Agency that this community water system has completed an Emergency Response Plan that complies with Section 1433(b) of the Safe Drinking Water Act, as amended by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Public Law 107-188, Title IV-Drinking water Security and Safety.

Emergency action plans specific to source water concerns were reviewed and updates recommended.

The City of Piqua currently uses three different water sources, the Great Miami River, the hydraulic system and the Ernst gravel pit. Groundwater is not used and its availability and quantity are both limited. Therefore it is not deemed a viable alternative source. At this time, the City does not have any interconnects with other water systems. Due to the distance to the nearest available provider, this option is not practical. Therefore, in the event that one of the existing water sources becomes contaminated or otherwise compromised, the City would utilize the remaining two sources. It is unlikely that all sources would be simultaneously contaminated and therefore the City has the existing option to avoid the use of any one source. The water supply capacity from any of the two sources should meet the City's water demands in the short term and potentially in the long term. Additional actions, such as water use restrictions, could be implemented if the outage was long-term during periods of high demand. Therefore, the existing multiple source system should be sufficient to protect the consumers from source water issues such as contamination events.

8.0 Source Water Monitoring

Current practice is to monitor the combined source water quality at the plant influent. Only TOC and atrazine are monitored at the individual sources. Most parameters are monitored daily and analysis is performed by the water treatment plant staff. Some parameters are monitored monthly and are typically sent to a private certified lab. Atrazine and copper are monitored both routinely and based on events such as copper sulfate application events. The current source water sampling plan is presented in Table 6. This table does not include infrequent regulatory required analyses which are performed per EPA requirements.

Table 6: Current Source Water Sampling (2011)

Parameter Monitored	Sample location	Sample Frequency	Analysis Performed by
Total Hardness	Plant composite	Daily	WTP
Total Alkalinity	Plant composite	Daily	WTP
pH	Plant composite	Daily	WTP
Turbidity	Plant composite	Daily	WTP
Magnesium	Plant composite	Daily	WTP
Nitrate	Plant composite	Monthly	Certified lab
Fluoride	Plant composite	Daily	WTP
TOC	Plant composite All Individual sources	Monthly	Certified lab
Atrazine/SOCs	All individual sources	Quarterly in 1st, 3rd and 4th quarters, monthly in 2nd quarter	Certified Lab
Atrazine	All individual sources	Weekly or biweekly depending on season and vulnerability	Certified Lab
Odor	Plant composite	Daily	WTP
Temperature	Plant composite	Daily	WTP
Copper	Plant composite	Monthly, if applying copper sulfate then testing increased to before and after application	Certified lab
Phosphate	Plant composite	Monthly	Certified lab

In order to understand the water quality of the different sources and to assess changes over time, particularly following implementation of this plan, it will be important to monitor Swift Run Lake, the Great Miami River and the Ernst gravel pit individually. These locations will be sampled at the water treatment intakes. Intake locations are shown on Figure 2. Monitoring of the intakes is important to understand the source water quality that must be addressed by the treatment processes.

The selection of analytes and the frequency of monitoring may vary between sources based on vulnerability to different parameters. It is recommended that the change from plant composite sampling to individual source sampling be phased in over time. Initially, plant composite samples should be collected daily and individual source samples weekly. When the new treatment plant is designed, addition of sample taps for each source should be included thus facilitating ease of sample collection. Currently sampling at each source is time intensive due to the need for site visits. Grab samples will be collected for analysis and sampling protocols will comply with method requirements.

Additional parameters are recommended at varying frequencies of routine monitoring (Table 6). Assessment of nutrients will provide information on the effectiveness of this plan and on vulnerability of the water sources to macrophyte and algae growth. Monitoring directly for algae and odor will assist in understanding and controlling the ecology of the water sources. Monitoring for microbiological contaminants is recommended to assess fecal inputs to the watershed, health risks and treatment needs. Chloride and sulfate are recommended to assess corrosion chemistry and inputs from salt use on roadways. Recommended sampling is presented in Table 7 with new analyses highlighted.

Table 7: Recommended Source Water Sampling

Parameter to be Monitored	**Sample Locations**			**Sample Frequency**	**Analysis Performed by**
	Swift Run Lake	**Ernst gravel pit**	**Great Miami River**		
Total Hardness	x	x	x	Weekly/Daily	WTP
Total Alkalinity	x	x	x	Weekly/Daily	WTP
pH	x	x	x	Weekly/Daily	WTP
Turbidity	x	x	x	Weekly/Daily	WTP
Magnesium	x	x	x	Weekly/Daily	WTP
Fluoride	x	x	x	Monthly	WTP
TOC	x	x	x	Weekly	Certified lab
Atrazine	x	x	x	Monthly during spring/summer	Certified lab
Odor	x	x	x	Weekly/Daily	WTP
Algae (including Cyanobacteria)	x	x		Weekly during spring-fall	WTP
Phosphorus	x	x	x	Weekly	Certified lab
Chloride	x	x	x	Monthly	Certified lab
Sulfate	x	x	x	Monthly	Certified lab
Copper	x			When copper sulfate used	Certified lab
Temperature	x	x	x	Weekly/Daily	WTP
Color	x	x	x	Weekly/Daily	WTP
Total coliform/*E. coli*	x	x	x	Weekly/Daily	WTP
Giardia & *Cryptosporidium*	x	x	x	Annual during runoff	Certified lab

Cyanobacteria, also known as blue-green algae, are an emerging issue. It is proposed to monitor for these organisms using weekly grab samples of the WTP influent during the vulnerable months of May – September. Samples will be initially sent to a private lab for analysis. The water plant intends to develop in-house algal analysis capabilities in the future. Lab methods will follow *Standard Methods for the Examination of Water and Wastewater*, 19th edition, 2005 or *AWWA M57 Algae Source to Treatment*, 2010 or US EPA Guidelines for Design and Sampling for Cyanobacterial Toxin and Taste-and-Odor Studies in Lakes and Reservoirs, 2008. The samples will be processed to determine a biomass or concentration of algal cells plus an identification of all common species.

The water quality data will be used by the water treatment plant staff. Understanding the source water quality will allow the operators to make informed decisions about selection of the source water(s) and chemical dosage adjustments. For example, the detection of taste and odor algae may lead to an increase in the chemical dosages used to control that taste and odor. Some data will be made available in the annual Water Quality report delivered to all customers. Through data sharing, the public and interested groups will be better informed about the water quality challenges facing the water treatment plant as well as general environmental concerns.

The analytical methods provide QAQC procedures that will ensure acceptable data quality. All Analytical methods will be either EPA approved methods or from *Standard Methods for the Examination of Water and Wastewater*. Data of high quality are essential to providing useful information. QAQC reports will be requested from the laboratories performing the analyses. In-house analyses shall likewise report all QAQC results. QAQC data will be reviewed by plant staff and data acceptability will be determined based on criteria set forth in the methods. Any data not meeting QAQC standards shall be qualified as "suspect" and the rationale for this designation shall be noted. If QAQC data are not provided, this shall be noted along with the results and any associated reports. Use of drinking water certified labs will be important for data integrity. Data from other groups shall be subject to the same QAQC constraints and reporting protocol.

Data retention is the responsibility of the WTP staff. Data will be retained in both hard copy and electronically. Data will be reported to the Ohio EPA monthly using the Monthly Operating Report.

9.0 Implementation

9.1 Responsibility: The water treatment plant superintendent will be the person with primary responsibility for overseeing the implementation and future updates to the SWAP. The watershed subcommittee of the CAC (Community Advisory Committee) will be an integral part of program implementation.

9.2 Funding Sources: There are a variety of potential funding sources identified by Ohio EPA. These sources include:

- 319 Grant Program: This program provides grants to watershed groups, non-profit organization, local governments and others. Grant funds need to be matched by at least 20% local funds and in-kind services. These grants target non-point source pollution. The Great Miami River is not yet a targeted watershed for grant application

- Drinking Water Assistance Fund: This program includes the Water Supply Revolving Loan Account. This fund addresses water-related infrastructure projects. These funds can be difficult to compete for if being used for source water protection. Modifications to intakes and raw water pumping structures would be allowed for nomination.

- Ohio Water Pollution Control Loan Fund: This fund is similar to the Drinking Water assistance fund, except that it is directed at wastewater utilities. The current funding

program includes control of nonpoint source pollution. Activities such as agriculture improvements and best management practices are eligible. Stream corridor restoration and protection is also a fundable practice. This program offers below-market interest rate loans.

- SWIR (Surface Water Improvement Fund) Grant: This grant has been provided by Ohio EPA. Grants are awarded for two years of funding to local municipalities, park districts, County soil and water conservation districts, City/County health departments. non-profit groups and others. The projects target stream, riparian, wetland, and lake restoration and management activities. Innovative stormwater management demonstration projects and repair/replacement of on-site home-sewage systems are also eligible.

- Nonprofit organizations may be able to obtain funding to support their activities which also benefit Piqua's source water protection. http://water.epa.gov/grants_funding/shedfund/nonprofit.cfm

- The EPA provides watershed funding programs. Some of the relevant programs are

    - Community Action for a Renewed Environment: This is a competitive grant program for a community. http://www.epa.gov/care/

    - Environmental Education Grants: These competitive grants are provided to local education agencies. Partnering with a school or other agency would be recommended if Piqua were to pursue this opportunity. http://www.epa.gov/enviroed/grants.html

    - Environmental Justice Grants: These competitive grants are offered to address local environmental and public health issues through collaborative partnerships. http://www.epa.gov/compliance/environmentaljustice/grants/index.html

The City of Piqua will continue to actively seek new funding sources if they become available in the future.

9.3 Evaluation of effectiveness measures

All action items identified as part of this program will contain assessment measures (see Tables 3 and 4). Progress on action items will be updated annually and shared with the CAC.

Effectiveness of the plan will be based on the percent completion of the action items. In addition, water quality improvements in the watershed based on data collected per Table 7 will be tracked and assessed. Parameters to be examined for either reduction or at least no increase include:

- Atrazine
- TOC
- Phosphorus
- Nitrate
- Total algae & Cyanobacteria
- *E. coli*
- *Giardia* & *Cryptosporidium*

9.4 Updating responsibility

The City of Piqua Water Department will be responsible for updating this source water protection program. The update shall occur every five years or when there are any major land uses in the CMZ.

Appendix A

Table A-1: Membership of CAC (Community Advisory Committee Membership and Representation

Representation	Number of members
City of Piqua	2
Community at Large	20 (2 non-voting)
Local Media	2
Miami Soil & Water Conservation District	2 (non-voting)

Table A-2: City of Piqua Staff Involved in SWAP Development and Implementation of Action Items

Person	Title	Representation
Dave Burtner	Utilities Director	City at large
Don Freisthler	WTP Superintendent	Water treatment plant
Amy Havenar	City Engineer	Public education
Devon Alexander	Storm Water Coordinator	Storm Water Program

Table A-3: CAC Membership Information as of August, 2011

Last	First	No	St	State	Voting CAC Member	Phone	Alt. Phone	Email
Allison	Kara	6397	Emerald Pkwy., Ste. 200	Dublin, Ohio 43016	N (Moderator)	614-793-8777	614-296-4169	kallison@hullinc.com
Brandewie	Richard	310	Ron Aire Dr.	Piqua, Ohio 45356	Y	773-2460		rbrandewie@woh.rr.com
Buecker	Thomas	1	Hopewood Dr.	Piqua, Ohio 45356	Y	778-3544	778-8000	thomasbuecker@woh.rr.com
Dougherty	Bob	312	Ron Aire Dr.	Piqua, Ohio 45356	Y	773-4851		dougherty8735@sbcglobal.net
Fierce	Mark & Mary Lou	19	Marymont Dr.	Piqua, Ohio 45356	Y	773-0166		mfierce@woh.rr.com
Freisthler	Don		City of Piqua		Y (City Manager's alt. designee)	778-2090		dfreisthler@piquaoh.org
French	Dan	1127	N. Sunset Dr	Piqua, Ohio 45356	Y	778-1626		dpfrench@frenchoil.com
Hartley	Susan				N (Editor, Piqua Daily Call)			shartley@dailycall.com
Havenar	Amy		City of Piqua		Y (City Manager's designee)	778-2044		ahavenar@piquaoh.org
Heilers	Aaron	Miami Soil and Water Conservation District	1330 N. County Road 25A, Suite C	Troy, Ohio 45373	N	335-7666		Aheilers@miamiswcd.org
Jackson	Robert	Jackson Tube	8210 Industry Park Dr.	Piqua, Ohio 45356	Y			

Last	First	No	St	State	Voting CAC Member	Phone	Alt. Phone	Email
Kirchner	Randy	1105	Anderson	Piqua, Ohio 45356	Y	773-6829		randolphkirchner@yahoo.com
Lange	Jeff	9586	N. S.R. 66	Piqua, Ohio 45356	N	615-9398		tjlange@ashland.com
Lloyd	Rachel				N (Reporter, Piqua Daily Call)			goddessecouture@gmail.com
Marshall	Elizabeth A.	1208	Marwood Dr.	Piqua, Ohio 45356	Y	778-1108		
McMaken	Jim D.	1306	Echo Lake Dr.	Piqua, Ohio 45356	Y			jmcmaken@miamicountyymca.net
McNeil	William	323	Short Dr.	Piqua, Ohio 45356	Y	773-4568		wmcneil@woh.rr.com
Phillips	Scott	9640	Piqua - Lockington	Piqua, Ohio 45356	N	773-1002		aws.sphillips@yahoo.com
Raterman	Linda	Miami Soil and Water Conservation District	1330 N. County Road 25A, Suite C	Troy, Ohio 45373	N	335-7666 x 230		LRaterman@miamiswcd.org
Sever	Heather	10	Hopewood Dr.	Piqua, Ohio 45356	Y			vsever@kbcom.net
Sever	James	118	Lakewood Dr.	Piqua, Ohio 45356	Y			
Shear	Stu	1854	W. Parkway Dr.	Piqua, Ohio 45356	Y	418-7657	773-0730	sshear01@sbcglobal.net or sshear02@gmail.com
Staley	Paul	7	Alpha	Piqua, Ohio 45356	Y	773-6448		
Starrett	Lonnie	1222	Park Ave.	Piqua, Ohio 45356	Y	214-6272		

Last	First	No	St	State	Voting CAC Member	Phone	Alt. Phone	Email
Tyson	James M.	1400	Echo Lake Dr.	Piqua, Ohio 45356	Y	773-3247		gooseygander2222@yahoo.com
Wallace	C. Timothy	1216	Marwood Dr.	Piqua, Ohio 45356	Y	773-7647		ctwallace@hotmail.com
Zimmerman	Maxine R.	322	Short Dr.	Piqua, Ohio 45356	Y	773-2857		
Zimmerman	David A.				N	682-0106		david_Zimmerman@teamphoto.com