

# Fulton County Water Supply and Demand Analysis

## Final Report

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**Fulton County Commissioners**  
152 South Fulton Street  
Wauseon, Ohio 43567

**July 2012**



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# 1 Background

Fulton County residents receive drinking water from a variety of sources, including local municipal water systems, a wholesale pipeline supplied by the City of Toledo (Toledo)/Lucas County, and private wells. In 2011, water purchased from Toledo/Lucas County cost \$53.79 per 1,000 cubic feet per month for Fulton County and \$26.02 per 1,000 cubic feet per month for Fulton County service to North Star BlueScope Steel (North Star Steel). Currently, Toledo and surrounding communities buying water from Toledo/Lucas County are evaluating the possibility of forming a 6119 regional water system. ARCADIS has studied the 6119 regional water system option, including predicting future water rates and assessing the value of the various water systems. The water rates for Fulton County areas in a 6119 regional water system, depending on a revenue stream ranging from \$2 million to \$10 million, were projected as follows:

- \$53.79 up to \$58.29 per 1,000 cubic feet per month for Fulton County
- \$26.02 up to \$30.52 per 1,000 cubic feet per month for Fulton County service to North Star Steel

In response to the 6119 regional water system, the Fulton County Commissioners contracted with American Structurepoint to evaluate the possibility of supplying water with only Fulton County resources and modifying its connection with Toledo/Lucas County to an emergency supply source. The first phase of this evaluation seeks to determine the following:

- Current and Year 2035 water demands for Fulton County plus the City of Napoleon, located south of Wauseon in Henry County. It is noted the Villages of Delta and Swanton will be emergency customers only.
- Amount of available water from either groundwater or surface water sources.
- Does available water meet the current and 2035 demands?

If it is established that water is available, future considerations include:

- Determination of the components needed for a Fulton County regional water system to include: treatment, storage, and distribution/transmission facilities of the potential participants, including cities, villages, and wholesale water customers provided by the Owner.
- Identification of infrastructure improvements plus opinions of probable costs to facilitate a regional system to distribute treated water to potential participants.
- Financial analysis to develop preliminary estimates of annual revenue requirements, estimated project funding scenarios for proposed construction projects, and an estimate of a wholesale water rate.
- Review and outline the requirements for establishing a regional water district, including development of a list of action items and schedule for implementation.
- Fulton County Commissioner authorization of a second phase of the feasibility study, based on information contained in this report.

## 2 Water Demand

In general, water demand is a function of the type and number of customers. Therefore, this analysis focuses on understanding the users to develop current and future population data. This data is used to determine typical residential water usage for communities in Fulton County and the City of Napoleon, supplemented by known large users, resulting in a total water demand.

### 2.1 Summary of Communities

The predominant land use in Fulton County is primarily agricultural, along with incorporated villages and cities, and unincorporated rural communities. The eastern part of Fulton County includes residential “bedroom” communities and some industrial land use due to the close proximity to the City of Toledo. North Star Steel is the largest industrial entity located in the central part of the County west of the Village of Delta. The Village of Archbold is a community with a sizeable percentage of industrial land use, thereby making it a large commercial water user. The City of Wauseon has the largest population and serves as the Fulton County seat.

Located to the south, in Henry County, the City of Napoleon is included as a potential water user in light of the fact that they are considering options to become a wholesale water purchaser in the future.

Currently, Fulton County and the City of Napoleon’s primary drinking water sources are from surface water withdrawals from streams or stream impoundments. The exception to this is the Village of Fayette, which utilizes a groundwater aquifer. Table 2.1-1 is a list of the incorporated areas within Fulton County, as well as the City of Napoleon, and their sources of water. Several of these communities distribute water to other areas (incorporated and unincorporated) within Fulton County (Table 2.1-2).

<b>Village or City</b>	<b>Water Source</b>
Archbold	Tiffin River, Brush Creek and off-stream holding reservoirs
Delta	Bad Creek and off-stream holding reservoirs
Fayette	Groundwater Wells
Lyons	Purchases from Wauseon
Metamora	Purchases from Toledo/Lucas County
Swanton	Swan Creek and off-stream holding reservoirs
Wauseon	Big Ditch, Stuckey Ditch, Maumee River, and off-stream holding reservoirs
Napoleon (Henry County)	Maumee River and off-stream holding reservoir

<b>Table 2.1-2 Fulton County Unincorporated Areas Summary</b>	
<b>Rural Water System</b>	<b>Water Source</b>
Swan Creek Rural Water District	Purchases from Toledo/Lucas County
Ai	Purchases from Toledo/Lucas County
Assumption	Purchases from Toledo/Lucas County
Elmira/Burlington	Purchases from Archbold
Pettisville	Purchases from Archbold
Tedrow/Ottokee	Purchases from Wauseon

Tables 2.1-1 and 2.1-2 explain interconnections between the cities, villages, and rural water utilities in the county.

## **2.2 Current and Projected Water Demands**

Understanding the communities in Fulton County and their water sources is necessary to evaluate current and future water demands. With this understanding, the analysis focuses on current and projected population, which will be used to determine the amount of water required by Fulton County and the City of Napoleon. Also discussed below is the effect economic development of a given region may also have on water demand forecasting.

### **2.2.1 Population**

Population data from the US Census Bureau was obtained for Fulton County and the communities comprising the water service area for the years 1980 through 2010. Population projections are based on the average annual increase calculated from this historical data. Table 2.2.1-1 provides a summary of actual population data for Fulton County from 1980 through 2010 and projected population through 2035. It should be noted, the projections are less than what was shown in the *2000 Fulton County Comprehensive Plan Chapter 2, Table 2-2 Population Projections Slow Growth*. Said table projected the population to be 50,000 and 52,500 people in 2010 and 2020, respectively. The actual 2010 Fulton County population was 42,669, based on US Census data, thereby challenging the likelihood the County population would reach 52,500 in 2020. In order to confirm these changes, Steve Brown, Fulton County Planning Director, was contacted as part of the study effort. He stated that the Comprehensive Plan has not been updated and the projected population should be reduced as, at the time this study was published, seven percent (7%) of homes in the County are vacant, and new home construction has been limited to five homes per year over the past two years.



<b>Year</b>	<b>Population (US Census)</b>	<b>Population Change</b>	<b>Percent Change</b>
1980	37,751	N/A	N/A
1985	37,833	82	0.22%
1990	38,601	768	2.03%
1995	40,527	1,926	4.99%
2000	42,136	1,609	3.97%
2005	42,638	502	1.19%
2010	42,669	31	0.07%
Average Annual Increase =		164	
2015	43,489	820	1.92%
2020	44,309	820	1.89%
2025	45,129	820	1.85%
2030	45,949	820	1.82%
2035	46,769	820	1.78%
Average 5 Year Increase: 164 X 5 = 820 people			

Unless otherwise noted, Table 2.2.1-2 provides a summary of actual 2010 population data for Fulton County communities from the US Census Bureau and includes projected population for these areas through 2035. 2010 population for smaller, unincorporated communities was estimated from the population data in the *2000 Fulton County Comprehensive Water Plan* prepared by Finkbeiner, Pettis & Strout, Inc. Community population projections are based upon the percentage of the total Fulton County population.

**Table 2.2.1-2**

<b>Fulton County Community Population Data</b>				
<b>Community</b>	<b>2010 Population</b>	<b>Percent of County Population</b>	<b>2020 Estimated Population</b>	<b>2035 Estimated Population</b>
Archbold	4,346	10.19%	4,513	4,764
Delta	3,103	7.27%	3,222	3,401
Fayette	1,283	3.01%	1,332	1,406
Lyons	562	1.32%	584	616
Metamora	627	1.47%	651	687
Swanton	3,690	8.65%	3,832	4,045
Wauseon	7,332	17.18%	7,614	8,037
Swan Creek	8,556	20.05%	8,885	9,378
Al <sup>1</sup>	227	0.53%	236	249
Assumption <sup>1</sup>	185	0.43%	192	203
Elmira <sup>1</sup>	120	0.28%	125	132
Burlington <sup>1</sup>	120	0.28%	125	132
Ridgeville <sup>2</sup>	-	-	-	-
Evansport <sup>2</sup>	-	-	-	-
Pettisville	590	1.38%	613	647
Tedrow/Ottokee <sup>3</sup>	485	1.14%	504	532
Served by Utilities	31,226		32,426	34,226
Unserved	11,443		11,883	12,543
	26.82%		26.82%	26.82%
<sup>1</sup> Population estimated 2000 Fulton County Water Comprehensive Plan by Finkbeiner, Pettis & Strout, Inc. dated October 24, 2000 <sup>2</sup> Population included in Archbold. <sup>3</sup> Population estimated from number of water users (194 X 2.5 people = 485).				

Table 2.2.1-3 provides a summary of actual population growth data for year 2000 through 2010 and projected population growth rate for Henry County and the City of Napoleon based on information obtained from the US Census Bureau.

Henry County Population Growth Rate (2000 to 2010)	-3.40%
Projected County Growth Rate	-3.40%
Napoleon Population Growth (2000 to 2010)	-6.10%
Anticipated Napoleon Growth	-6.10%
2010 Napoleon Population	9,300

The preceding tables indicate growth has occurred in Fulton County over the last 30 years, with the County's most pronounced growth occurring between 1995 and 2000. For planning purposes, a growth model was used to determine the future water demands. Also, while Napoleon's population has declined over the past 10 years, data provided by the City of Napoleon Water Utility suggests an overall increase in demand and growth in population is anticipated over the next 25 years. Therefore, the data provided by the City of Napoleon was used in this report instead of the population data for determining future water demands.

While the Villages of Delta and Swanton are included in the tables above, the Village of Delta is not included in the water demand calculations, since the community installed a membrane water treatment system in 2006. It is anticipated they would not be interested in joining a Fulton County regional water system due to differences in water quality from their membrane plant and the other treatment plants in the County. Like the Village of Delta, Swanton plans to maintain a separate water system. It is anticipated Delta and Swanton will have a connection to a Fulton County system for emergency purposes only.

## 2.2.2 Economic Development

In addition to population growth, economic development can have a large impact on future water demands. The majority of the County is small unincorporated rural communities with scattered development. Historically, the area has relied on agriculture for its economic base and is expected to continue to do so in the future. Based on communications with the Fulton County Planning Department, economic development may be limited over the next 25 years, with growth potential stemming from possible expansions of the North Star Steel facility located in the central portion of the county, west of the Village of Delta. Therefore, water demands for this analysis are focused on population growth.

## 2.3 Summary of Water Needs

Table 2.3-1 provides estimated 2020 and 2035 water demands based on uniform population growth projections for Fulton County and its communities, including the population currently unserved by a public water utility. The table also includes historical water use data as provided by the municipalities comprising the study area. Fulton County is projected to grow in population by 8.82 percent from 2010 to 2035. Napoleon's Water Utility provided future average water demands, which were used to calculate corresponding population growth and future peak water demands for 2020 and 2035.

**Table 2.3-1  
Present and Future Water Consumption and Pumpage**

	Wauseon <sup>2</sup>			Archbold <sup>3</sup>			Delta			Fayette			Swanton		
	2010	2020	2035	2010	2020	2035	2010	2020	2035	2010	2020	2035	2010	2020	2035
Percent of County Population	19.64%	19.64%	19.64%	12.13%	12.13%	12.13%	7.27%	7.27%	7.27%	3.01%	3.01%	3.01%	8.65%	8.65%	8.65%
Population <sup>1</sup>	8,379	8,702	9,191	5,176	5,375	5,676	3,103	3,221	3,402	1,283	1,334	1,409	3,690	3,833	4,048
Average Day Total Pumping (GPD)	898,000	932,648	984,996	1,519,000	1,577,307	1,665,839	800,000	830,490.31	877,104.53	140,000	145,532	153,701	400,000	415,472	438,792
Gallons Per Capita Per Day	107	107	107	293	293	293	258	258	258	109	109	109	108	108	108
Max Day Pumping (GPD)	1,431,000	1,486,212	1,569,631	3,485,000	3,618,772	3,821,889	1,100,000	1,141,924	1,206,019	210,000	218,299	230,551	680,000	706,302	745,946
Pumping Peaking Factor	1.59	1.59	1.59	2.29	2.29	2.29	1.38	1.38	1.38	1.50	1.50	1.50	1.70	1.70	1.70
Max Day Pumping Rate (GPM)	994	1,032	1,090	2,420	2,513	2,654	764	793	838	146	152	160	472	490	518
High Service Pump Rate, 20 Hours (GPM)	1,193	1,239	1,308	2,904	3,016	3,185	917	952	1005	175	182	192	567	589	622

	Fulton County (Served) <sup>4</sup>			Fulton County (Unserved) <sup>5</sup>			Fulton County (Total) <sup>6</sup>			Napoleon <sup>7</sup>			Combined Total <sup>8</sup>		
	2010	2020	2035	2010	2020	2035	2010	2020	2035	2010	2020	2035	2010	2020	2035
Percent of County Population	22.48%	22.48%	22.48%	26.82%	26.82%	26.82%	100.00%	100.00%	100.00%	N/A	N/A	N/A	N/A	N/A	N/A
Population <sup>1</sup>	9,595	9,961	10,520	11,444	11,884	12,551	39,567	41,088	43,394	9,300	13,881	18,739	48,867	54,968	62,133
Average Day Total Pumping (GPD)	1,666,667	1,730,183	1,827,296	1,258,821	1,307,204	1,380,576	5,482,488	5,692,874	6,012,407	1,340,000	2,000,000	2,700,000	6,822,488	7,692,874	8,712,407
Gallons Per Capita Per Day	174	174	174	110	110	110	149	149	149	144	144	144	148	148	148
Max Day Pumping (GPD)	2,500,000	2,595,274	2,740,943	1,888,231	1,960,806	2,070,863	10,194,231	10,585,666	11,179,824	2,100,000	3,134,328	4,231,343	12,294,231	13,719,995	15,411,168
Pumping Peaking Factor	1.50	1.50	1.50	1.50	1.50	1.50	1.73	1.73	1.73	1.57	1.57	1.57	1.70	1.69	1.68
Max Day Pumping Rate (GPM)	1,736	1,802	1,903	1,311.27	1,362	1,438	7,079	7,351	7,764	1,458	2,177	2,938	8,537.66	9,527.77	10,702.20
High Service Pump Rate, 20 Hours (GPM)	2,083	2,163	2,284	1,573.53	1,634	1,726	8,495	8,821	9,317	1,750	2,612	3,526	10,245	11,433	12,843

**Notes:**

<sup>1</sup>Population based on US Census Bureau Data. Growth rate for all Fulton County communities based upon same growth rate for the entire county.

<sup>2</sup>Includes Lyons, Tedrow and Ottokee.

<sup>3</sup>Includes Elmira, Burlington and Pettisville in Fulton County plus Ridgeville and Evansport in Henry County. 75 percent of demand is from industry and is included in the gallons per day per capita.

<sup>4</sup>Includes Metamora, Swan Creek Township, Ai, Assumption and North Star Steel.

<sup>5</sup>Gallons per capita and peaking factor based upon similar usage in non-industrial communities in Fulton County.

<sup>6</sup>Includes Fulton County served and unserved areas. Delta and Swanton are not included.

<sup>7</sup>Population growth based on US Census data is -6.1 percent. Population growth shown is based upon estimated future demands provided by City of Napoleon and their gallons per day per capita.

<sup>8</sup>Includes Fulton County served, unserved and Napoleon. Delta and Swanton are not included.

Fulton County Population, 2010	42,669
Fulton County Population, 2020	44,309
Fulton County Population, 2035	46,796
Fulton County Population Growth (2010-2035) =	8.82%

Based on these demands, Napoleon’s population is projected to nearly double by 2035, which is a concern since the US Census data shows a population decline for the area. This additional water would be available for potential economic development if population does not increase as suggested.

In Table 2.3-1, the data for 2010 Average Day Total Pumping (GPD) is actual pumpage from the respective municipalities from their water treatment plant data. This volume includes backwash water at the water treatment plants and water lost throughout the distribution system. The 2010 Average Day Total Pumping for the Fulton County communities served by Toledo/Lucas County was calculated using the maximum allowable daily water volume to be purchased divided by a standard peaking factor of 1.5.

Table 2.3-1 also provides an estimate of daily water consumption determined by dividing the Average Day Total Pumping (GPD) by the population served. For purposes of this report, all water usage, including commercial business and industry, is included in the daily per capita consumption. Table 2.3-1 shows per capita water consumption ranges from 107 gallons per day per capita (gpdpc) in the Wauseon system, to 293 gpdpc in the Archbold system. It should be noted that Archbold’s water pumpage includes industries and commercial businesses at approximately 75 percent of the total. For planning purposes, a daily per capita water consumption of 148 gallons per day was calculated and used through the 2035 planning horizon.

Using projected populations shown in Table 2.2.1-2, projected Average Day Total Pumping (GPD) was calculated with each water system’s per capita water demand. With the projected Average Day Total Pumping, peaking factors were used to calculate the Max Day Pumping Rate (GPD) as shown in Table 2.3-1. These peaking factors were determined from historical pumping data provided by the municipalities and ranged from 1.4 for Delta to 2.3 for Archbold. An overall combined peaking factor of 1.7 was used for Fulton County and Napoleon. Table 2.3-1 also includes the Max Day Pumping Rate (GPM) given the Max Day Pumping (GPD) occurred for 24 hours. However, determining the high-service pumping requirements was calculated from the Max Day Pumping Rate operating for a 20-hour period.

The sections above detail the methods used to determine the current and future water demands based on the available data. From this analysis, a Fulton County regional water system would need to provide water for the projected population and corresponding water demands shown in Table 2.3-2.

**Table 2.3-2**

<b>Fulton County and Napoleon Population and Water Demand Summary</b>			
	<b>2010</b>	<b>2020</b>	<b>2035</b>
Population <sup>1</sup>	45,177	51,136	58,085
Per Capita Water Use, gallons per day	151	150	150
Average Water Demand, MGD	6.8	7.7	8.7
Maximum Daily Water Demand, MGD <sup>2</sup>	11.6	13.0	14.7

<sup>1</sup>Population does not include Delta or Swanton

<sup>2</sup>Based on a peaking factor of 1.7

## 3 Water Supply

A critical component to water supply planning is an understanding of the water resources, particularly the reliability of these resources to provide a safe and dependable source to meet anticipated demand. The following sections provide an overview of the ground and surface water resources in Fulton County, including an assessment of the dependable yield.

### 3.1 Ground Water Supplies

Based on information obtained from the Ohio Department of Natural Resources (ODNR), ground water withdrawals accounted for four to six percent (4% to 6%) of the total high-capacity water withdrawals by public water systems for the period of 2006 to 2010. Although ground water has not been utilized significantly, it may provide a significant source to meet future supply needs.

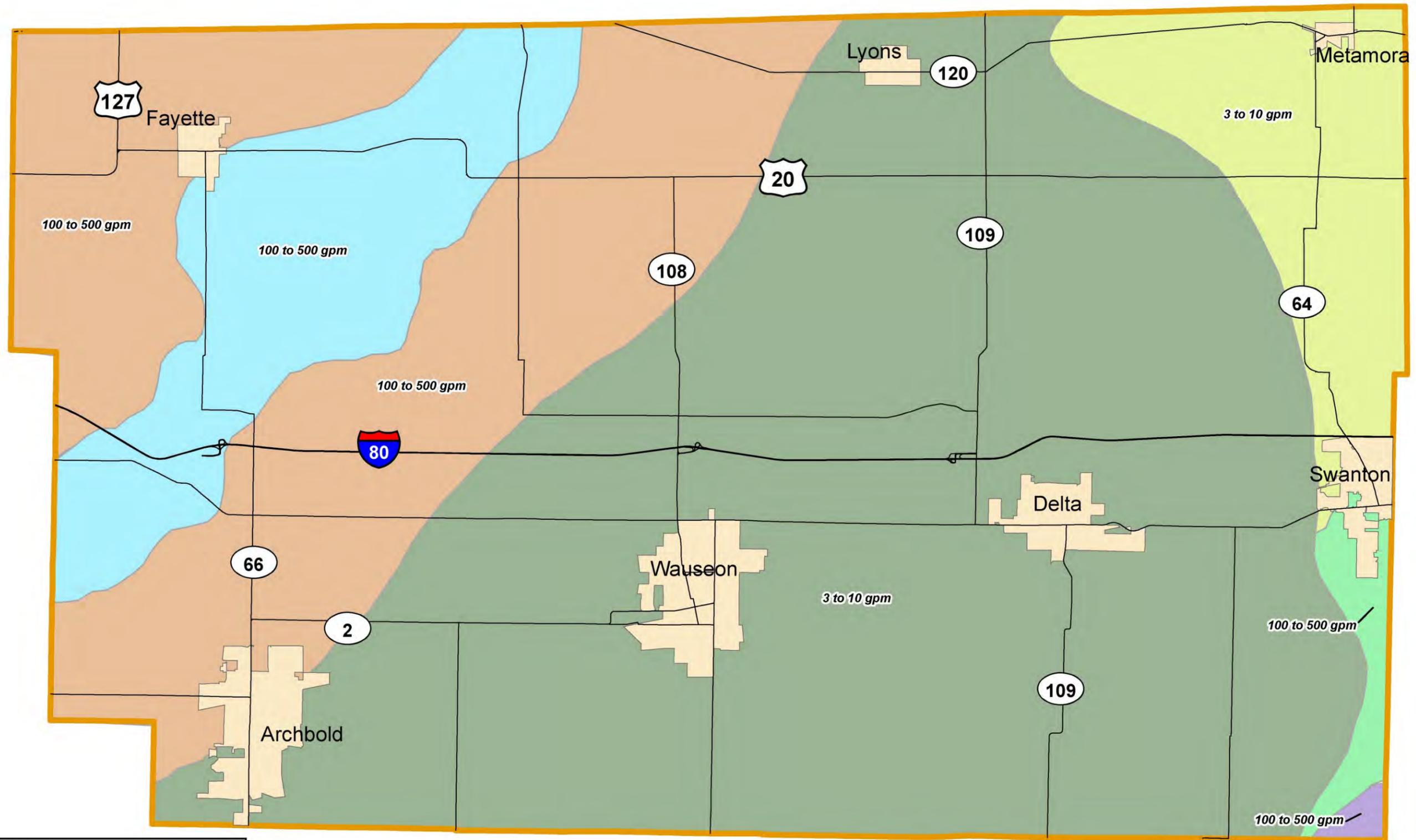
### 3.2 Physiographic and Hydrogeologic Setting

Fulton County is located in the northwest corner of Ohio and primarily within the Maumee Lake Plains Physiographic Region, including the Maumee Sand Plains section (Ohio Division of Geological Survey, 1998). These areas are characterized by very low-relief plains formed by expansive ice-age lakes. The very northwest corner of the county is within the Central Ohio Clayey Till Plain Physiographic Region, characterized by a moderate-relief till plain sourced from the Erie glacial lobe. The unconsolidated thickness (glacial drift) in Fulton County ranges from approximately 50 to 80 feet in the southeast portion of the County, to over 200 feet in the northwest portion of the county (Ohio Division of Geological Survey, 2004). These glacial deposits overlie sedimentary rock formations of Silurian and Devonian age.

Productive aquifers within the county include unconsolidated formations comprising of buried sand and gravel, and discontinuous sand and gravel lenses, deposited as glacial drift complex, including outwash and beach ridges. Bedrock aquifers, including shale and carbonate bedrock, underlie the glacial drift deposits and also serve as a source of supply for several wells in the county.

Walker (1991) divides the county into those areas where well yields of 100 to 500 gallons per minute (gpm) can be expected and the areas where yields of three to ten gpm can be expected (Figure 3-1). The northwest half of the county includes the areas of high yielding wells, as sourced from thick sand and gravel deposits interbedded within the glacial drift. This area includes all of Gorham and Franklin Townships, most of Chesterfield Township, and portions of Dover, Royalton, and German Townships. A northeast to southwest trending swath, generally consistent with the Tiffin River and tributaries valley, is described as having desirable yields (100 to 500 gpm) with possible artesian conditions.

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**Groundwater Resources**

- Thick sand and gravel, 100-500 gpm
- Thick sand and gravel, possible artesian conditions, 100-500 gpm
- Glacial fine sand, silty clay, sand and gravel, 3-10 gpm
- Carbonate bedrock, 100-500 gpm
- Carbonate bedrock underlying shale, 100-500 gpm
- Shale, localized sand and gravel lenses, 3-10 gpm



**Groundwater Resources of Fulton County**

Fulton County Commissioners  
 152 South Fulton Street  
 Wauseon, OH 43567

**Fulton County  
 Water Supply and Demand Analysis**

County: Fulton  
 State: Ohio

Date: 5/22/2012

Groundwater resources data modified from Walker (1991).

Figure 3-1

Although high yielding wells are also identified in the southeastern corner of the county from the bedrock aquifer, Walker (1991) cautions that hydrogen sulfide and dissolved solids are to be expected from this source. The remaining portions of the County are not identified as areas of significant groundwater yield. Although sand and gravel aquifers and bedrock aquifer systems may be available in these areas, yields of significant quantity are unlikely for commercial development (Figure 3-1).

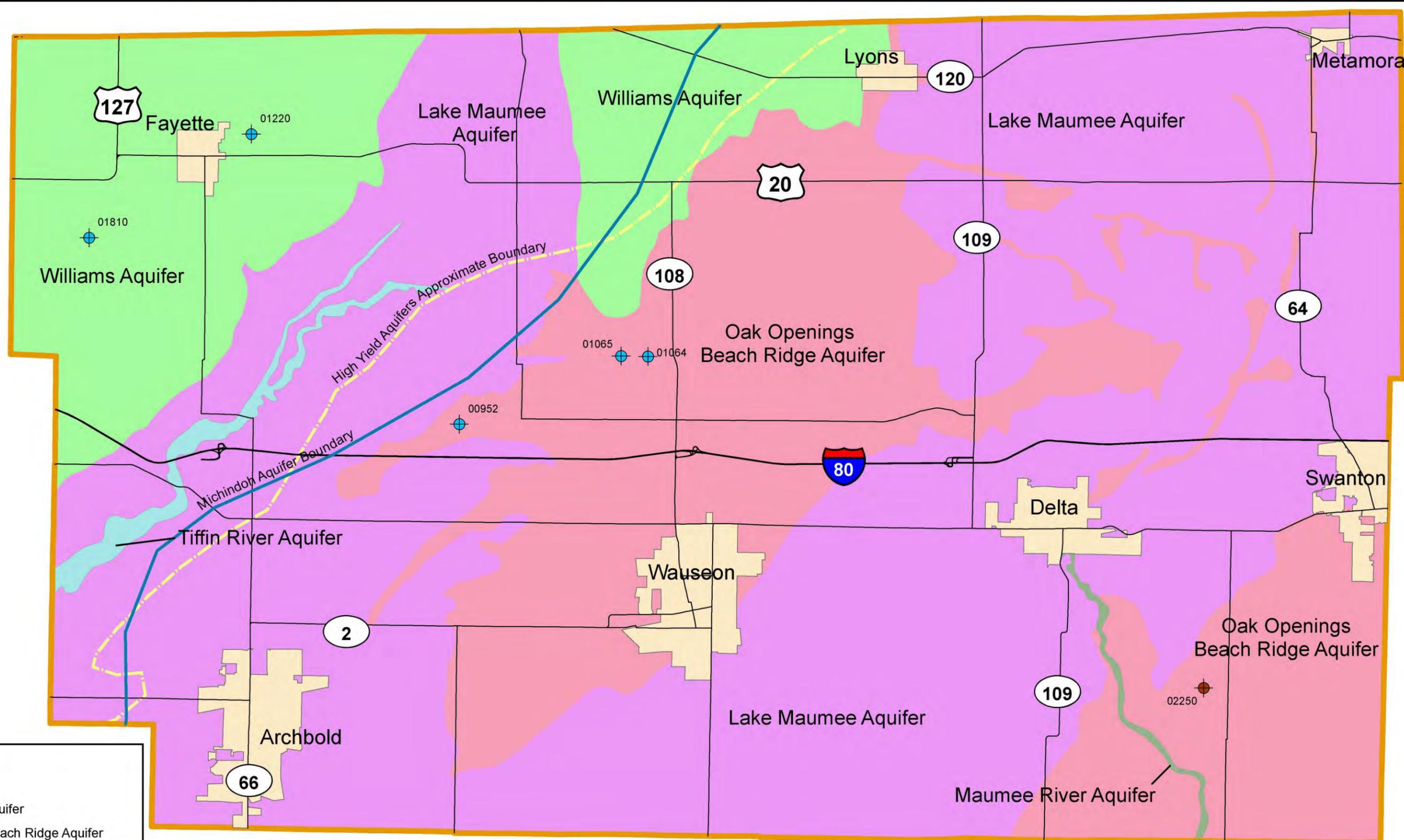
Spahr (2000) provides mapping of the local aquifer systems for Ohio, including the unconsolidated aquifers of Fulton County. The northwest portion of the county (areas of high-yielding wells) includes portions of the Williams Aquifer, the Lake Maumee Aquifer, and the Tiffin River Aquifer (Spahr, 2000) as seen on Figure 3-2. The Williams Aquifer consists of both thick glacial drift complex deposits and end moraine deposits. Yields are derived from thick sand and gravel sequences at depth and are reported at 100 to 500 gpm. Most areas of this aquifer have multiple sand and gravel zones or layers. The Lake Maumee Aquifer includes interbedded sand and gravel lenses with lacustrine deposits. In Fulton County, adjacent to the Williams Aquifer, coarse sand and gravel outwash can be found at depth below the surficial lacustrine and beach ridge deposits. This deep sand and gravel formation is reported to yield 100 to 500 gpm. The Tiffin River Aquifer is an alluvial formation within the Tiffin River valley. In this area the alluvial deposits grade into the underlying sand and gravel formations of the Lake Maumee aquifer, and provide a thick sequence of sand and gravel with reported yields of 100 to 500 gpm. Figure 3-2 displays the aquifers as mapped by Spahr (2000) and the potential yields to be expected. The anticipated yields are consistent with those provided by Walker (1991) as shown in Figure 3-1.

Bryan Municipal Utilities (City of Bryan, Ohio) has filed a petition with the US EPA for a Sole Source Aquifer designation for a portion of what is known as the Michindoh Glacial Aquifer, a regional aquifer system that comprises variably confined and hydraulically connected discontinuous sand and gravel intervals distributed within the unconsolidated glacial sediments (Tritium, 2007). The portion of the Michindoh Glacial Aquifer under petition for designation as a Sole Source Aquifer includes a 9-county area that spans northwest Ohio, northeast Indiana, and southeast Michigan. The Michindoh Glacial Aquifer comprises multiple local aquifers, as mapped by Spahr (2000), and includes portions of the Williams Aquifer, the Lake Maumee Aquifer, and the Tiffin River Aquifer as discussed above.

### **3.3 Existing High Capacity Wells**

The ODNR, Division of Water provided data on the high-capacity water wells registered in Fulton County. There are nine high-capacity wells within the County among five registered high-capacity water well active facilities (one registered facility is inactive). Figure 3-2 provides the locations and facility registration numbers of these high-capacity water well facilities. Two facilities are in the northwest portion of the county within the Williams Aquifer. The remaining facilities are within varying portions of the Oak Openings Beach Ridge Aquifer. Table 3.3-1 summarizes the well capacities provided by ODNR.

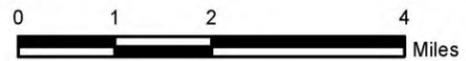
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**Glacial Aquifers**

- Williams Aquifer
- Lake Maumee Aquifer
- Oak Openings Beach Ridge Aquifer
- Tiffin River Alluvial Aquifer
- Maumee River Alluvial Aquifer
- Michindoh Aquifer Boundary
- High Yield Aquifer Approximate Boundary
- Active High Capacity Well Facility
- Inactive High Capacity Well Facility

Aquifer data modified from Spahr (2000).



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**Aquifers of Fulton County**

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Fulton County Commissioners  
152 South Fulton Street  
Wauseon, OH 43567

**Fulton County  
Water Supply and Demand Analysis**

County: Fulton  
State: Ohio

Date: 5/22/2012 Figure 3-2

**Table 3.3-1**

Fulton County High Capacity Wells Summary						
Facility Registration Number	Status	Aquifer	Aquifer Media	Well ID	Depth (feet)	Well Capacity (gpm)
00952	Active	Oak Openings Beach Ridge Aquifer	SG	Well 1	147	555
			SG	Well 2	130	500
			SG	Well 3	128	555
01064	Active	Oak Openings Beach Ridge Aquifer	SG	Well 1	220	20
			SA	Well 2	15	13
01065	Active	Oak Openings Beach Ridge Aquifer	NA	Well 1	190	5
01220	Active	Williams Aquifer	SG	Well 1	42	650
			SG	Well 2	40	650
01810	Active	Williams Aquifer	SG	Well 1	190	83
02250	Inactive	Oak Openings Beach Ridge Aquifer	SG	Quarry	NA	70

SG = Sand and Gravel

SA = Sand

NA = Not Available

In addition to the data provided by ODNr, the Village of Fayette provided pumping test completion reports for the two high-capacity wells completed for the Village in 2003 and 2004. Data provided in these reports indicated the Village explored a deep sand and gravel formation for potential supply to replace the shallower production wells that were compromised. Ajaka (2004a) defined the aquifer as the Brawley Aquifer, named for the property upon which the investigations had taken place (Brawley Property). This location is just north of the Village of Fayette within the local Williams Aquifer, or the regional Michindoh Aquifer, as described above.

Two extraction or production wells (EW-1 and EW-2) were completed on the Brawley Property within the deep sand and gravel formation. Pumping test data indicated EW-1 produced 917 gpm at a specific capacity of 52 gpm/ft of drawdown (Ajaka, 2004a), while EW-2 produced 906 gpm at a specific capacity of 36 gpm/ft of drawdown (Ajaka, 2004b). The average aquifer thickness at the Brawley property was reported to be 50 feet, and the average transmissivity of the aquifer is approximately 96,000 gpd/ft, which is within the expected range for a confined sand and gravel aquifer.

### 3.4 Surface Water Supplies

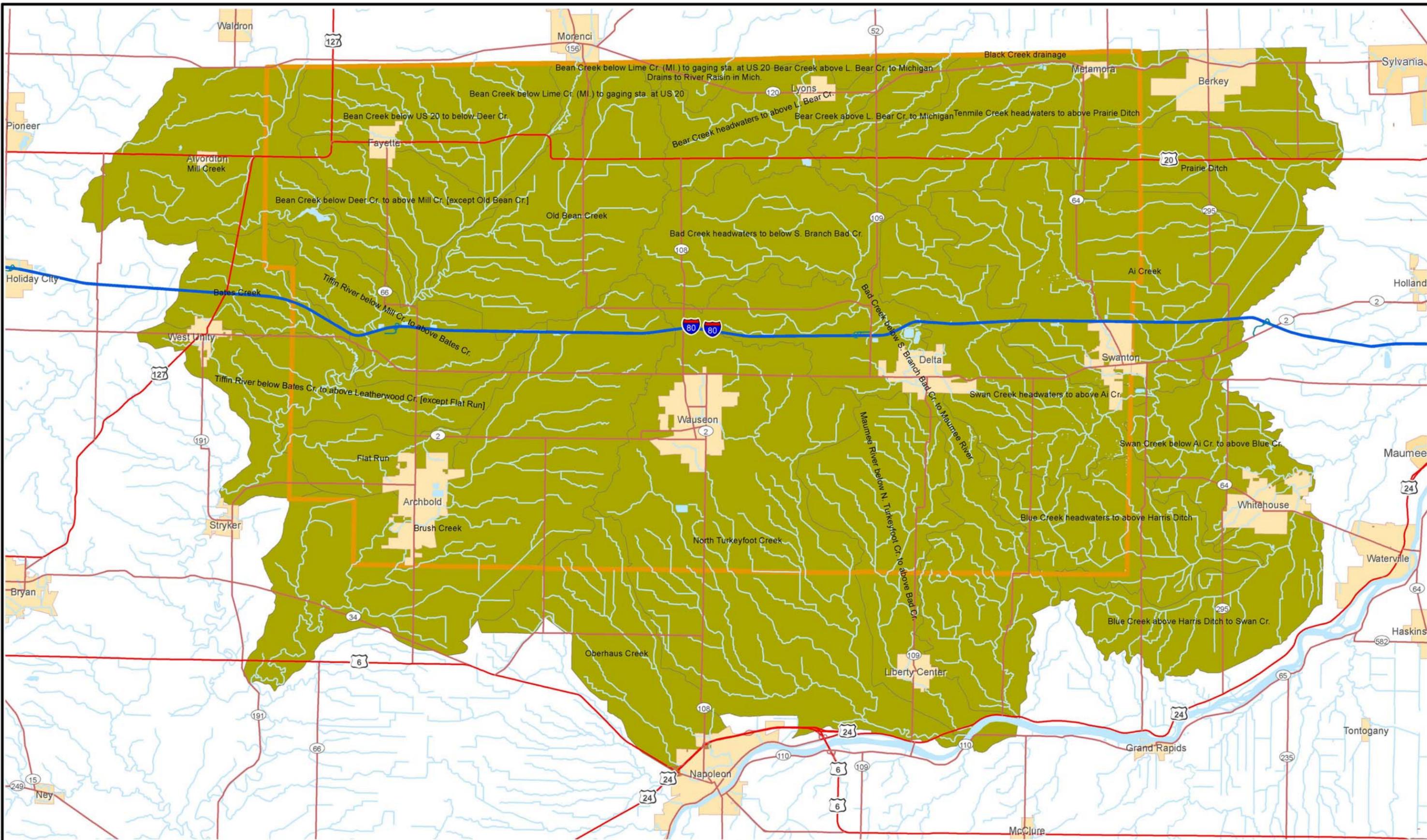
Surface water resources within Fulton County are components of the larger Lake Erie drainage basin. Most of the major surface streams within the county are tributaries to the Maumee River (Tiffin River, Brush Creek, North Turkeyfoot Creek, etc.), while streams along the north portion of the county drain to the River Raisin (Bear Creek) in Michigan or the Ottawa River (Tenmile Creek). The following sections discuss surface water resources within Fulton County, including low flow characteristics calculated for streams within the County.

### 3.5 Streams and Rivers

Average daily streamflow measurements were collected from US Geological Survey (USGS) gauging stations within and near Fulton County. The only USGS gauging station within Fulton County is on Bean Creek at Powers, Ohio (Gage No. 4184500). Additional streamflow data was obtained for the Tiffin River near Stryker, Ohio (Gage No. 4185000), and the Maumee River near Defiance, Ohio (Gage No. 4192500). Daily data were ranked from highest flow to lowest, and flow duration curves were developed for each gauged stream. Summaries for each gauging station utilized in this study are provided in Appendix C.

Based on available 14-digit Hydrologic Unit Code (HUC) mapping (Figure 3-3), 14 principal streams were identified in Fulton County - summarized below in Table 3.5-1. As mentioned previously, USGS gauging station data is available for only two streams (Tiffin River and Bean Creek) within Fulton County. Average daily streamflow for the other streams was calculated based on a drainage area ratio method (Ehlke and Reed, 1999). This method utilizes the ratio of the drainage area for an un-gauged stream and a gauged site (Bean Creek at Powers) to calculate the estimated low flow characteristics of the stream. The drainage area of Bean Creek at Powers was used as the reference site, as the relative watershed characteristics (soils, topography, etc.) should be similar to other streams/watersheds in Fulton County. Additional streamflow data was obtained for the Maumee River near Defiance (USGS Gage No. 04192500). Calculated average daily streamflow is shown in Table 3.5-1, with actual average daily streamflow shown in italics for gauged streams.

Path: O:\2011\01066\Drawings\Environmental\AveView\Exhibit\201101066\_EV\2012-05-21\_11x17\_MAP\_Watersheds.dwg.mxd Date: 5/23/2012 User: dgraves



	Fulton County
	HUC 14 Digit Watersheds




AMERICAN  
**STRUCTUREPOINT**  
INC.  
[www.structurepoint.com](http://www.structurepoint.com)

**14 Digit Watersheds**

Fulton County Commissioners  
152 South Fulton Street  
Wauseon, OH 43567

**Fulton County  
Water Supply and Demand Analysis**

County: Fulton  
State: Ohio

Date: 5/22/2012

Figure 3-3

**Table 3.5-1**

<b>Drainage Areas and Average Daily Streamflow for Principal Streams Fulton County, Ohio</b>			
<b>Stream</b>	<b>Drainage Area (mi<sup>2</sup>)</b>	<b>Average Daily Streamflow (ft<sup>3</sup>/s)</b>	<b>Notes</b>
<i>Tiffin River</i>	410	348.8	Above Stryker, OH
<i>Bean Creek-North</i> <sup>1</sup>	206	167.2	Portion north of US 20
<i>Bean Creek-Combined</i> <sup>1</sup>	246.1	199.8	Above Mill Creek
<i>Old Bean Creek</i> <sup>1</sup>	33.3	27.1	Above Bean Creek
<i>Mill Creek</i> <sup>1</sup>	31.8	25.8	Above Tiffin River
<i>Bates Creek</i> <sup>1</sup>	12.3	10.0	Above Tiffin River
<i>Brush Creek</i>	65.7	53.3	Above Tiffin River
<i>North Turkeyfoot Creek</i>	75.3	61.1	Above Maumee River
<i>Dry Creek</i>	27.7	22.5	Above Maumee River
<i>Bad Creek</i>	64.7	52.5	Above Maumee River
<i>Blue Creek</i>	44.8	36.4	Above Swan Creek
<i>Swan Creek</i>	45.1	36.6	Above Blue Creek
<i>Ai Creek</i>	50.6	41.1	Above Swan Creek
<i>Ten Mile Creek</i>	39.9	32.4	Above Prairie Ditch
<i>Bear Creek</i>	26.5	21.5	Above Fulton County Line
<i>Maumee River</i>	5,545	4,581.6	<i>USGS Gage near Defiance, Ohio</i>

<sup>1</sup>Streams that are tributaries to Tiffin River, upstream of the USGS Gage at Stryker.

The calculated streamflow is for the entire watershed, including areas outside the County. Therefore, the estimated values shown in Table 3.5-1 may be greater than average daily flow at the most likely withdrawal location near a municipality.

### **3.6 Existing Surface Water Withdrawals**

As required by Section 1521.16 of the Ohio Revised code, any owner of a facility or combination of facilities with the capacity to withdraw water at a quantity greater than 100,000 gallons per day (GPD), must register with the Ohio Department of Natural Resources (ODNR), Division of Water. The ODNR Water Withdrawal Facilities Registration program collects and assembles withdrawal data provided by the required facilities.

According to the ODNR 2005 water withdrawal summary (ODNR, 2006), over 95 percent of the water withdrawals in the county are for public water supplies. Moreover, approximately 94 percent of the withdrawals in 2005 were from surface waters. The 2005 summary indicates approximately 2.65 million

gallons per day (MGD) of surface water was withdrawn, down from approximately 3.9 MGD in 2000. A copy of the 2005 summary for Fulton County is provided in Appendix D.

Recent water withdrawal data obtained from ODNR for the years 2006 to 2010, as well as withdrawal data for the City of Wauseon<sup>1</sup>, indicates a declining trend in surface water withdrawals for public water systems. Over the period of 2006 to 2010, surface withdrawals peaked in 2008 at 5.61 MGD and declined to approximately 4.23 MGD in 2010 (Figure 3-4). No data was available for 2011. Four public water systems reported as surface water withdrawal facilities, including the villages of Archbold, Delta, and Metamora and the City of Wauseon. According to the ODNR data, the Village of Archbold had the highest average daily surface withdrawals within Fulton County over the period of 2006 to 2010, averaging approximately 1.9 MGD. Water withdrawals for the Village of Delta averaged 0.9 MGD, and Metamora reported average withdrawals of 0.1 MGD.

The City of Wauseon, combining both their Fulton County and Maumee River withdrawals, averaged 1.92 MGD for the period of 2006-2010. This withdrawal rate accounts for occasions where raw water is conveyed (back) to the City of Napoleon from Wauseon's reservoirs during times of poor water quality in the Maumee River (per inter-municipal agreement).

Figure 3-5 shows the reported surface water withdrawals for each public water system over the period of 2006 to 2010.

### 3.7 Surface Water Supply Potential

Dependable yield of surface water supplies is typically based on the low-flow characteristics of the stream, namely the minimum available yield during the worst dry period on record. The desired dependability for public water systems is generally in the 95 percent to 99 percent range. **This analysis does not include available storage in off-line reservoirs, which are presently maintained in Archbold, Delta, Metamora/Assumption, Swanton, and Wauseon.**

For this analysis, it was assumed the streamflow, after withdrawal, would be maintained at levels no less than the 99 percent flow duration – the average daily discharge equaled or exceeded 99 percent of the time. The 99 percent flow is likely much less than the flow required to maintain aquatic habitat or dilution for wastewater discharges. The minimum flow for wastewater discharges (Q7-10) is roughly equivalent to the 90 percent flow duration.

Assuming only the lowest flows will be maintained in the stream, the 95 percent flow duration (average daily discharge equaled or exceeded 95 percent of the time) was utilized as a minimum streamflow for withdrawals. Subtracting the 99 percent flow duration (D99) from the 95 percent flow duration (D95) provides the estimated dependable yield for each stream (Table 3.7-1).

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<sup>1</sup> The City of Wauseon obtains a majority of their water supply from the Maumee River, via the City of Napoleon.

**Figure 3-4: Average Daily Surface Water Withdrawals by User Type, Fulton County, Ohio (2006-2010)**

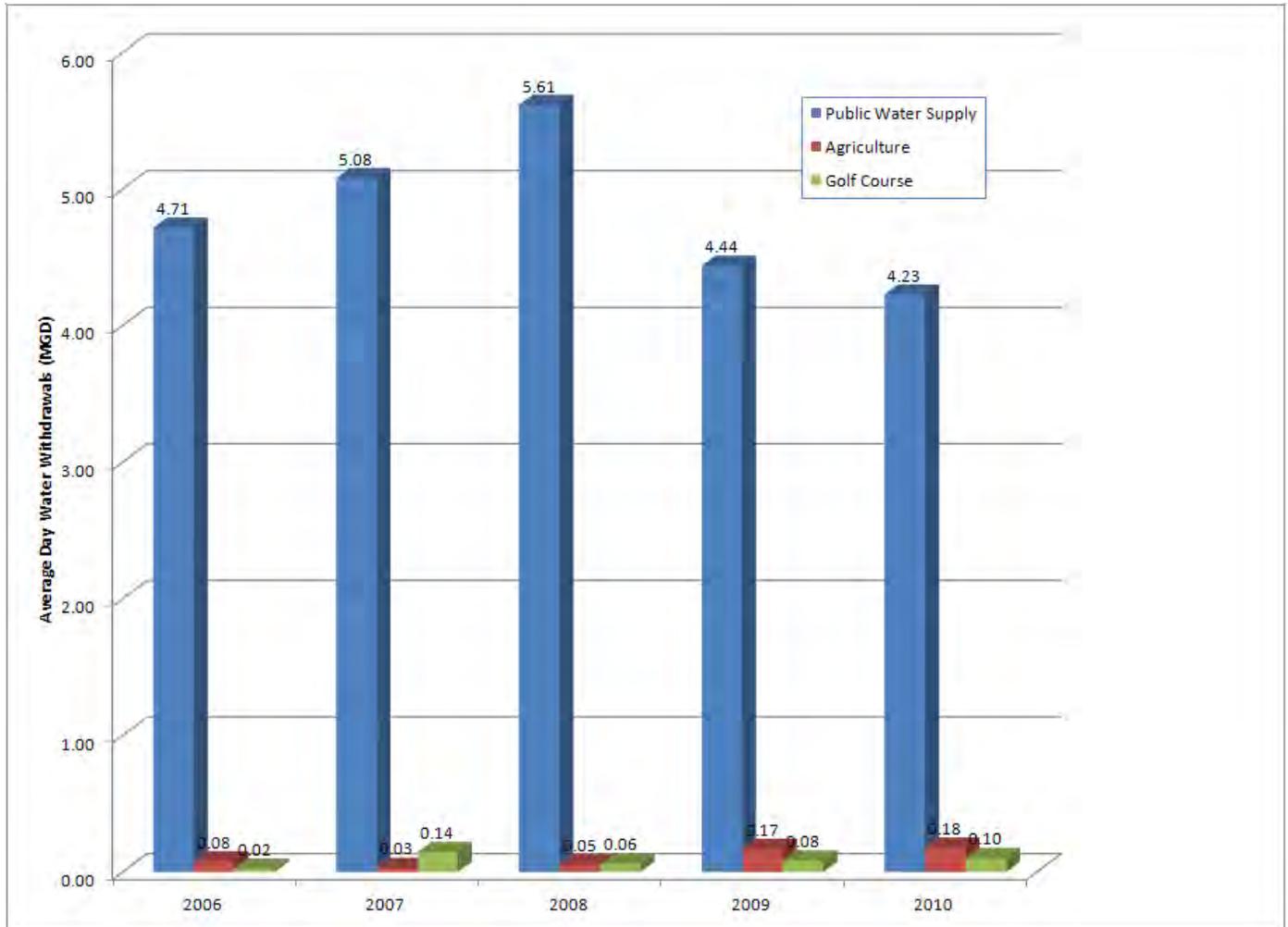
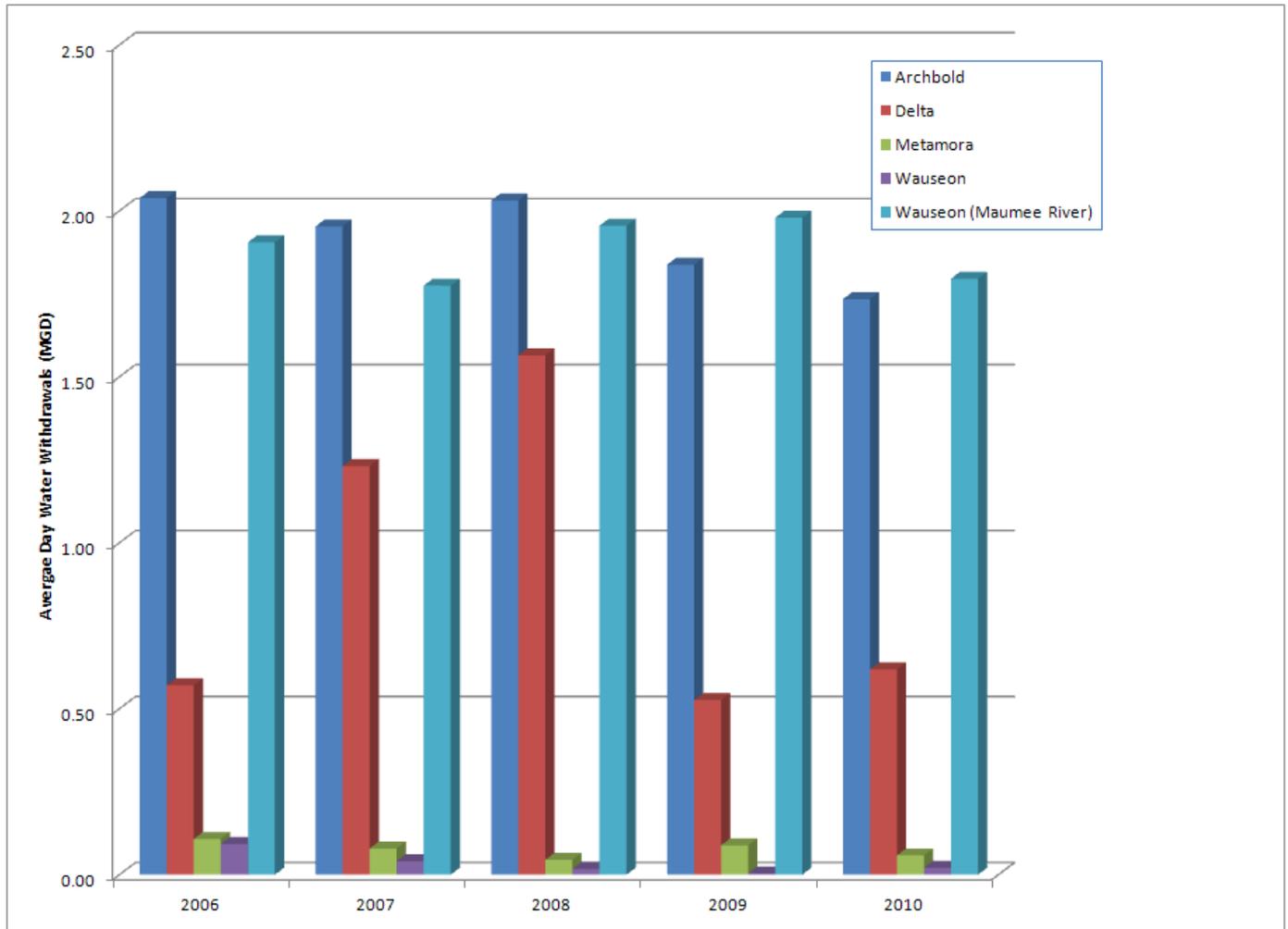


Figure 3-5: Average Daily Surface Water Withdrawals for Public Water Systems, Fulton County, Ohio (2006-2010)



**Table 3.7-1**

<b>Estimated Average Daily Streamflow, Low Flow Statistics and Dependable Yield for the Principal Streams, Fulton County, Ohio</b>				
<b>Stream</b>	<b>Average Daily Streamflow (ft<sup>3</sup>/s)</b>	<b>D95 (ft<sup>3</sup>/s)</b>	<b>D99 (ft<sup>3</sup>/s)</b>	<b>Dependable Yield (MGD)</b>
<i>Tiffin River</i>	348.8	17	9.6	4.78
<i>Bean Creek-North</i>	167.2	13	8.2	3.10
Bean Creek-Combined	199.8	19.1	15.53	3.71
Old Bean Creek	27.1	2.10	1.33	0.50
Mill Creek	25.8	2.01	1.27	0.48
Bates Creek	10.0	0.78	0.49	0.19
Brush Creek	53.33	4.15	2.62	0.99
North Turkeyfoot Creek	61.08	4.75	3.00	1.13
Dry Creek	22.46	1.75	1.10	0.42
Bad Creek	52.50	4.08	2.57	0.97
Blue Creek	36.38	2.83	1.78	0.68
Swan Creek	36.56	2.84	1.79	0.68
Ai Creek	41.08	3.19	2.01	0.76
Ten Mile Creek	32.4	2.52	1.59	0.60
Bear Creek	21.5	1.67	1.06	0.40
<i>Maumee River</i>	4,581.6	172	84	56.87

Based on the dependable yields calculated above, Fulton County streams with the greatest potential for development as a reliable source of supply appear to be limited to Bean Creek and the Tiffin River at 3.71 MGD and 4.78 MGD, respectively. These calculated dependable yields are near, or exceed, historical withdrawal rates within Fulton County. In addition, the calculated dependable yield of the Maumee River, located approximately five miles south of the Fulton County line, is approximately 57 MGD, which far exceeds anticipated demand in the County.

## 4 Comparison

### 4.1 Water Demand and Supply Comparison

As stated in Section 1, the purpose of this analysis is to evaluate the possibility of supplying water with only Fulton County resources to meet the current and 2035 water needs as an alternative to the proposed Toledo/Lucas County 6119 regional water system. From the water demand and source water information presented in Sections 2 and 3, it appears that Fulton County has limited capabilities for a ground water only source at current and future demands for the County and Napoleon, as shown in Table 4.1-1. However, the Tiffin River, Bean Creek, and Maumee River have the yields needed to supply water to Fulton County and Napoleon. The Maumee River has the capacity as a single supply to meet the current and future water demands.

Year	Estimated Average Water Demand, MGD <sup>1</sup>	Estimated Max Day Water Demand, MGD <sup>1</sup>	Estimated Ground Water Yield, MGD <sup>2</sup>	Tiffin River Bean Creek and Maumee River Yield, MGD
2010	6.8	11.6	5.0	65.5
2020	7.7	13.0	5.0	65.5
2035	8.7	14.7	5.0	65.5

<sup>1</sup> For Napoleon and Fulton County communities except Delta and Swanton.

<sup>2</sup> Actual yield may be higher depending on location, well spacing, and test drilling. Additional investigations would be required.

Without Napoleon, the three surface water sources still meet the estimated average water demand for Fulton County as shown in Table 4.1-2.

Year	Estimated Average Water Demand, MGD <sup>1</sup>	Estimated Max Day Water Demand, MGD <sup>1</sup>	Ground Water, MGD <sup>2</sup>	Tiffin River, Bean Creek and Maumee River Yield, MGD
2010	5.5	9.5	5.0	65.5
2020	5.7	9.9	5.0	65.5
2035	6.0	10.4	5.0	65.5

<sup>1</sup> For Fulton County communities except Delta and Swanton.

<sup>2</sup> Actual yield may be higher depending on location, well spacing, and test drilling. Additional investigations would be required.

The comparisons presented in Tables 4.1-1 and 4.1-2 do not include the impacts of water storage or increasing ground water withdrawals and stream levels. These items require additional effort that is

beyond the current scope of service. However, it is anticipated the existing reservoirs will provide additional capacity for a surface water only source for Fulton County. The required storage capacity will be evaluated in the next phase.

## **4.2 Additional Considerations**

For this analysis, the initial question was: “Is there a ground water or surface water source in Fulton County that is capable of meeting water demands?” While it appears that a ground water only source is not likely, it could be combined with surface water supplies to meet Fulton County and Napoleon’s water demands. Combining sources would require addressing water chemistry issues including chlorine versus chloramines. Another option for Fulton County would be to create pressure districts with designated source waters within a regional water system, should the County wish to make use of the ground water. As noted, the actual ground water yield may be greater than the 5.0 MGD listed in Tables 4.1-1 and 4.1-2. The yield will depend on location, spacing, and the number of wells. A ground water supply will require property acquisition, which could be significant depending on the layout and test drilling results. Additional investigation and planning are recommended if the County would like to proceed with a ground water supply.

As previously noted, the Maumee River is a surface water source with a dependable yield of 57 MGD that would meet the current and projected water demands. Through the existing intake, water from the Maumee River could be conveyed for treatment at Wauseon or to Archbold with additional infrastructure. While the location is south of the county line and there are issues with surface water intakes, the Maumee River presents the most dependable yield for Fulton County to have a county regional water system.

## **4.3 Next Steps**

With this information, Fulton County will need to decide the next steps regarding a Fulton County regional water system. Items to consider are:

- Using a combination of ground and surface waters.
- Serving the City of Napoleon.
- With the knowledge that the Maumee River can be a source of supply, initiate the second phase of this feasibility study to determine the necessary infrastructure to establish a Fulton County Regional Water System.

American Structurepoint will assist as needed as the County continues to explore the options for providing water to residents in Fulton County.

## Appendix A – References

## References

Ajaka, C., 2004a, Brawley Aquifer Pumping Test Report for Extraction Well EW-1, Fayette, Ohio. LTI Environmental Engineering, A Division of Limno-Tech, Inc.

Ajaka, C., 2004b, Brawley Aquifer Pumping Test Report Addendum Extraction Well EW-2, Fayette, Ohio. LTI Environmental Engineering, A Division of Limno-Tech, Inc.

Ehlke, M.H. and Reed, L.A., 1999, Comparison of methods for computing streamflow statistics for Pennsylvania streams, US Geological Survey, Water Resources Investigations 99-4068, 80p.

Ohio Division of Geological Survey, 1998, Physiographic Regions of Ohio: Ohio Department of Natural Resources, Division of Geological Survey, page-size map with text, 2 p., scale 1:2,100,000.

Ohio Division of Geological Survey, 2004, Shaded Drift-Thickness Map of Ohio: Ohio Department of Natural Resources, Division of Geological Survey Map SG-3, generalized page size version with text, 3 p., scale 1:2,000,000.

Ohio Division of Natural Resources, 2006, Water Withdrawal in Fulton County for 2005, Fact Sheet, [http://www.dnr.state.oh.us/WWFR\\_FULTON\\_Page/tabid/18889/Default.aspx](http://www.dnr.state.oh.us/WWFR_FULTON_Page/tabid/18889/Default.aspx)

Spahr, P., 2000, Unconsolidated Aquifers of Ohio: Ohio Department of Natural Resources, Division of Water.

Walker, A., 1991, Ground-Water Resources of Fulton County: Ohio Department of Natural Resources, Division of Water, Ground-Water Resources Section, scale 1:63,360.

## Appendix B – Source Information

# FULTON COUNTY SANITARY ENGINEER

152 South Fulton Street, Suite 240  
Wauseon, Ohio 43567

Phone: (419) 337-9263  
Fax: (419) 337-9269

Paul Barnaby, Dean Genter, Perry Rupp  
Board of County Commissioners

Ziad Musallam, P.E.  
Sanitary Engineer

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July 7, 2011

Jon Gochenour, Village Administrator  
Village of Swanton  
219 Chestnut St.  
Swanton OH 43558

Re: Fulton County Water Comprehensive Plan

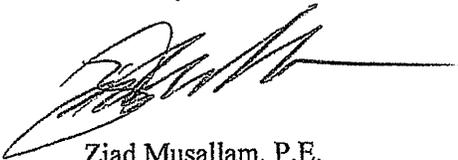
Dear Mr. Gochenour:

We are in the process of updating the Fulton County Water Comprehensive Plan to incorporate all new developments and changes in the county since 2005 and to maintain continuity with the Fulton County Comprehensive Plan. In order to complete this task, certain information regarding your water system is needed. This information would then be compiled in the plan to assist the county in providing water service from you system, if available, to the public. The focus of the plan is to provide said service within the urban growth area of your municipality and any critical need areas outside the municipalities.

Please provide us with information about your water system as outlined in the attached list. Please contact me to arrange for a meeting with you or your staff to discuss or clarify any item in the attached list or assist you in collecting such information.

We would like to thank you in advance for your assistance in this matter. If you have any questions concerning the plan or the requested information, please contact me.

Sincerely,



Ziad Musallam, P.E.  
Fulton County Sanitary Engineer

ZM/kjb

Enclosures

Cc: File  
Board of Fulton County Commissioners

**From:** [Ziad Musallam](#)  
**To:** [Fruehling, Andy](#)  
**Cc:** [Bailey, Jennifer](#); [Munroe, Darcy](#); [Vond Hall](#)  
**Subject:** RE: Fulton County Regional Water System Feasibility Meeting - Follow-up  
**Date:** Friday, January 06, 2012 1:08:04 PM  
**Attachments:** [image001.jpg](#)  
[image002.jpg](#)  
[image003.jpg](#)  
[Archbold Water System Info.pdf](#)  
[Fayette Water System Info.pdf](#)  
[Wauseon Water System Info.pdf](#)  
[solesourceaquifer\\_petition.pdf](#)

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Andy,

Attached is the following information:

1. Water system information for Archbold, Fayette & Wauseon
2. Fulton County Current Demand = 2.5 MGD, Near Future Demand = 5.0 MGD, Far Future Demand = 12.0 MGD. Link to TMACOG Study

[www.tmacog.org/Regional\\_Water\\_Discussion/RWD\\_web/RWD\\_index.htm](http://www.tmacog.org/Regional_Water_Discussion/RWD_web/RWD_index.htm)

3. Link to Land Use Plan

[www.fultoncountyoh.com/county\\_agencies/regional\\_planning/county\\_development\\_plan\\_1998.htm](http://www.fultoncountyoh.com/county_agencies/regional_planning/county_development_plan_1998.htm)

4. MICHINDOH Aquifer

If you have any questions or need more information, please contact me.

Ziad Musallam, PE  
Director  
Fulton County - Department of Public Utilities  
152 South Fulton Street, Suite 240  
Wauseon, OH 43567  
Phone 419-337-9263  
Fax 419-337-9269  
[zmusallam@fultoncountyoh.com](mailto:zmusallam@fultoncountyoh.com)

---

**From:** Fruehling, Andy [mailto:AFruehling@structurepoint.com]  
**Sent:** Thursday, December 15, 2011 6:13 PM  
**To:** Ziad Musallam  
**Cc:** Bailey, Jennifer; Munroe, Darcy; Vond Hall  
**Subject:** Fulton County Regional Water System Feasibility Meeting - Follow-up

Ziad-

Thanks to you, Vond and Commissioner Genter for taking time Tuesday morning to meet with Jennifer, Darcy and myself. At your earliest opportunity, we would like to receive the following information:

1. **Updated information about the communities supply, treatment and distribution systems – in particular for Wauseon, Archbold and Fayette.**
2. **Current and future demand information for all potential customers of a Fulton County Regional Water system. Also, information used for the TMACOG study so that the comparison is consistent.**
3. **Land use information for the subject communities**
4. **Information on the Great Lakes aquifer serving the tri-state area of Michigan, Indiana and Ohio.**

We anticipate providing a revised scope and fee for Phase 1 work within 10 business days of receiving this information. Feel free to call with any questions or advise of any delays in gaining access to any of the data.

**Water Information**

- ✗ Treated water source(s). *Local WTP*
- ✗ Maximum treatment capacity. *3.0*
- ✗ Average and maximum day water usage for the last 5 years, broken down into customer type (i.e., residential, commercial, institutional, industrial, and bulk sales) if possible.
- Number of connections per customer type (in and outside town).
- Treated water storage capacity (ground and elevated). *Same*
- Raw water supply source(s), capacity and storage capacity. *updated FPS. Chart.*
- Water tanks elevations, high service and booster pumps maximum capacity, current flows and TDH. *SAT*
- Location and size of main transmission water line throughout the distribution system. Use attached map. *Same*
- Location of water treatment plant and storage tanks. Use attached map. *Same*
- Description of water treatment plant and distribution system future improvements.

	<i>AVE.</i>	<i>Max</i>	
2005 -	• 925 MGD	1.847 MG	
2006 -	• 871 MGD	1.319 MG	
2007 -	• 835 MGD	2.244 MG	(Downtown Fire)
2008 -	• 790 MGD	1.561 MG	
2009 -	• 840 MGD	1.459 MG	
2010 -	• 898 MGD	1.431 MG	

- Improvements Completed.*
- 2 pretreatment Basins Added to WTP. (Carbon & KMnO<sub>4</sub>) Both provide 30 min CT ea.
  - Napoleon Road water updated on FPS. Sheet.
  - Many 4" lines have been replaced w/ 6" or 8" C-900 since last study (2000)

*Service Connections:*

	<u>In</u>	<u>Out</u>
Residential	2,459	194
Commercial		23
Industrial	308	

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DEC 08 2011

FULTON COUNTY  
SANITARY ENGINEER

TABLE 4  
INVENTORY OF FULTON COUNTY'S MUNICIPAL WATER SYSTEMS

Urban Growth/Water Service Area	Treated Water Source	Present Water Usage (MGD)	Max. Treatment Capacity/Peak Supply Capacity (MGD)	Treated Water Storage Capacity (MGD)	Raw Water Supply	Raw Water Supply Capacity	Raw Water Storage	Water System Deficiencies
Archbold (Incl. Elmira, Burlington, & Pettisville)	Local WTP	Ave 1.800 Max 3.915	7.00	0.772 MG clearwell 2 - 0.15 MG elevated tank 1 - 0.1 MG elevated tank 1 - 1.0 MG ground Total 2.17 MG	Tiffin River	13 MGD (Est Capacity) 12 MGD (Pumping Capacity)	1 - 100 MG Reservoir 1 - 200 MG Reservoir	- Add clearwell storage - Storage tank for backwash water - Replace older water mains
Delta	Local WTP	Ave 0.359 Max 0.673	1.00	1 - 0.2 MG elevated tank 1 - 0.6 MG elevated tank 1 - 0.2 MG clearwell Total 1.0 MG	Bad Creek	11.3 MGD (Mean Annual Discharge) 4.0 MGD (Pumping Capacity)	1 - 400 MG Reservoir 1 - 108 MG Reservoir	- Inadequate sludge handling system - Plant needs upgrading - Some water mains in system are old and need replaced, some main sizing inadequate
Fayette	Local WTP	Ave 0.155 Max 0.293	0.72	1 - 0.1 MG elevated tank	Wells (2)	0.86 MGD (Well Capacity) 0.72 MGD (Pumping Capacity)	1 - 0.2 MG Ground Storage Tank	6-inch mains make up 75% of system
Lyons	Purchases finished Water from Wauseon's WTP via 6-inch main	Ave 0.058 Max 0.126	0.144 (Pumping capacity)	1 - 0.1 MG elevated tank	N/A	N/A	N/A	- 6-inch water transmission main from Wauseon inadequate in terms of strength and fire flow capacity. - dead end lines need looped
Metamora (Incl. Assumption)	Local WTP	Ave 0.100 Max 0.159	0.20	1 - 0.200 MG clearwell 1 - 0.075 MG elevated tanks Total 0.275 MG	Branch of Ten Mile Creek	1.7 MGD (Mean Annual Discharge) 1.4 MGD (Pumping Capacity)	1 - 25 MG Reservoir 1 - 35.5 MG Reservoir	- Service area expansion limited by WTP capacity - need distribution system looping between Maple St. and Fulton St.
Swanton	Local WTP	Ave 0.400 Max 0.853	1.25	0.3 MG clearwells 1 - 0.5 MG elevated tank 1 - 0.2 MG elevated tank Total 1.0 MG	Swan Creek Well	Undefined 0.50 MGD (0.36 MGD Pumping Capacity)	100 MG Reservoir	- Need to replace raw water intake and elevated tank - Need clarifier covers and emergency generator
Wauseon	Local WTP	Ave 0.950 Max 1.1	3.00	0.900 MG clearwells 1 - 0.75 MG elevated tank 1 - 0.30 MG elevated tank Total 1.95 MGD	Big Ditch Stuckey Ditch Emergency Wells	1.5 MGD 1.5 MGD <del>0.40 MGD</del> 5 MGD	350 MG in Reservoirs (2)	- 4-inch water mains need replaced/upgraded - raw water supply needs to be increased
Fulton/Lucas Trunk Main	Purchases finished Water from Lucas Co./ City of Toledo	Ave 1.1 Max 1.5	3.6 (Pumping capacity)	1.0 MG elevated tank	N/A	N/A	N/A	- Minor pump station electrical/control improvements needed

*Maumee River*  
*SAB*





## Village of Archbold

P.O. Box 406, 300 N. Defiance  
Archbold, OH 43502-0406  
Phone 419 445 4726 - FAX 419 445 0908  
email [dhowell@archbold.com](mailto:dhowell@archbold.com)

### Letter of Transmittal

Date: July 26, 2011

TO: Mr. Ziad Musallum, Fulton County Sanitary Engineer

Transmitted: Packet containing requested water system information per your correspondence of July 7, 2011.

Copy to: file

*Dennis Howell*

Dennis Howell  
Village Administrator

RECEIVED

JUL 26 2011

FULTON COUNTY  
SANITARY ENGINEER

## Water Information

- ✓• Treated water source(s).
- ✓• Maximum treatment capacity.
- ✓• Average and maximum day water usage for the last 5 years, broken down into customer type (i.e., residential, commercial, institutional, industrial, and bulk sales) if possible.
- ✓• Number of connections per customer type (in and outside town).
- ✓• Treated water storage capacity (ground and elevated).
- ✓• Raw water supply source(s), capacity and storage capacity.
- ✓• Water tanks elevations, high service and booster pumps maximum capacity, current flows and TDH.
- ✓• Location and size of main transmission water line throughout the distribution system. Use attached map.
- ✓• Location of water treatment plant and storage tanks. Use attached map.
- ✓• Description of water treatment plant and distribution system future improvements.

<b>Water Information</b>	
Treated Water Source	Archbold Water Treatment Plant
Max Treatment Capacity	5.0 MGD current, 7.5 MGD w high rated filters
Avg daily residential use, last 5 years	Avg of 0.353 MGD, includes all accounts less than 30,000/month
Avg daily commercial use, last 5 years	Avg 0.142 MGD, commercial includes schools, hospitals, bulk sales, etc.
Avg daily industrial use, last 5 years	1.062 MGD average industrial use
Total active accounts	2,423
Accounts inside Archbold	1,857
Accounts outside Archbold	566
Treated Water Storage Capacity	0.4 MG elevated, 1.0 MG Ground level, 1.2752 MG clearwell
	Oak Street El. Tank 0.15 MG, elevation at overflow 860.6 ft.
	NWSCC El. Tank 0.15 MG, elevation at overflow 849.0 ft.
	CCNO El. Tank 0.10 MG, elevation at overflow 873.0.0 ft.
High Service Pumps	(2) 60 hp, 1,000 gpm, 180' TDH
	(1) 20 hp, 300 gpm, 170 TDH
	(1) 40 hp, 700 gpm, 180' TDH
	(1) 40 hp, 600 gpm, 170' TDH
	(1) 100 hp, 1667 gpm, 176' TDH
	(1) 150 hp, 2569 gpm, 176' TDH
Pumps at 1.0 MG Ground level tank	(1) 20 hp, 350 gpm, 150' TDH, will be replaced w larger pump @ 180' TDH
	(1) 40 hp, 750 gpm, 150' TDH, will be re-built @ 180' TDH
	(1) 60 hp, natural gas emergency pump, 1,000 gpm, 150' TDH
Booster Station, Henry Co Line @ SR 66	(2) 15 hp, 400 gpm, 70 TDH
Description of WTP	Built 1981, designed by Jones & Henry, lime-soda softening, 5.0 MGD current, 7.5 MGD w high rated filters, hydraulic flow max capacity 10.0 MGD, 160,000 gallon backwash water holding tank added in 1999, backwash waste goes to sanitary sewer.
Raw Water Supply Sources	Tiffin River 12.0 MGD Firm Capacity, Brush Creek emergency supply, 300 MG raw water reservoir storage
Future Improvements, WTP	Anion exchange system to remove DBP precursors prior to chlorination. Estimated \$1.1 M, planned construction 2012 - 2013.
Future Improvements, Distribution	Minimum 300,000 elevated tank @ Lutz & Clyde's Way, plan to add 10 psi to normal system pressure.
Future Improvements, Raw Water	800 MG Reservoir @ Lutz & Clyde's on Tiffin River supply line

Treated Water Source	Present Average Daily Usage MGD	Max Treatment Capacity/Peak Supply Capacity MGD	Treated Water Storage Capacity MG	Raw Water Supply	Raw Water Supply Capacity	Raw Water Storage	Water System Deficiencies
Archbold WTP	1.519	7.5	1.272 MG Total Clearwell (2) - 0.15 MG EI tank (1) - 0.1 MG EI Tank (1) - 1.0 MG Ground level Tank Total - 2.67 MG	Tiffin River Brush Creek backup	12.0 MGD	(1) 100 MG Res. (1) 200 MG Res 300 MG Total	Ability to meet future THM limit Pilot Demo completed & OEPA approved Now in design phase Plan to construct in 2013
Present Avg. Daily Treatment/ Water Usage (MGD), Year 2010							
	Outside	Inside	Total	Outside	Inside	Total	
Archbold	0.158	1.261	1.946			3.29	
Ridgeville/Springfield, Elmira/Burlington			0.109			0.141	
Pettisville			0.009			0.009	
Unaccounted for water			0.040			0.045	
			0.105				
Ridgeville/Springfield, Elmira/Burlington, and Pettisville numbers are water metered & sold.							
Archbold total is water treated, Archbold inside/ outside numbers are sales							

## Ziad Musallam

---

**From:** Harmsen, Tim <Tim.Harmsen@arcadis-us.com>  
**Sent:** Monday, December 19, 2011 2:36 PM  
**To:** Ziad Musallam  
**Cc:** thclemensen@villageoffayette.com  
**Subject:** RE: Fayette

The Village's water treatment plant has a maximum capacity of 720,000 gallons per day. Each of the two well pumps at the new well field has a capacity of 720,000 gallons per day (500 gpm). Each well itself is thought to have an even larger capacity.

Timothy A. Harmsen, P.E. | Project Manager | [tim.harmsen@arcadis-us.com](mailto:tim.harmsen@arcadis-us.com)  
ARCADIS U.S., Inc. | One SeaGate, Suite 700 | Toledo, OH 43604  
T. 419.213.1621 | F. 419.473.2108 | C. 419-450-1553  
[www.arcadis-us.com](http://www.arcadis-us.com)  
ARCADIS, Imagine the result  
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**From:** Ziad Musallam [<mailto:zmusallam@fultoncountyoh.com>]  
**Sent:** Friday, December 16, 2011 2:44 PM  
**To:** Harmsen, Tim  
**Subject:** Fayette

Tim,

I am trying to update our records as pertain to Fayette's water supply specifically; raw and treated capacities. Please provide any data, if available. Thanks

Ziad Musallam, PE  
Fulton County Sanitary Engineer  
152 South Fulton Street, Suite 240  
Wauseon, OH 43567  
Phone 419-337-9263  
Fax 419-337-9269  
[zmusallam@fultoncountyoh.com](mailto:zmusallam@fultoncountyoh.com)

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**SUMMARY OF  
FAYETTE MOR PLANT PRODUCTION 2011**

<b>MONTH</b>	<b>AVERAGE DAILY PRODUCTION (MGD)<sup>1</sup></b>	<b>MAX DAILY PRODUCTION (MGD)<sup>1</sup></b>
JAN	0.1418	0.1870
FEB	0.1597	0.2530
MAR	0.1463	0.1750
APRIL	0.1346	0.1950
MAY	0.1314	0.1710
JUNE	0.1369	0.2210
JULY	0.1476	0.2050
AUG	0.1382	0.2230
SEPT	0.1311	0.1650
OCT	0.1341	0.1790
NOV	0.1419	0.2440
DEC	0.1315	0.1750
<b>AVERAGE</b>	<b>0.1396</b>	<b>0.1994</b>

<sup>1</sup>DAILY FLOW DATA TAKEN FROM OHIO EPA WATER PLANT/DISTRIBUTION SYSTEM MONTHLY OPERATING REPORT (MOR) FOR 2011.

**From:** [Fruehling, Andy](#)  
**To:** [Elliott, Kent](#); [Bailey, Jennifer](#)  
**Subject:** Fw: Fulton County Water Supply Availability and Demand Analysis - Water Use/Demand RFI  
**Date:** Thursday, May 24, 2012 10:09:15 AM

---

Sent from my Blackberry Wireless

----- Original Message -----

From: Ziad Musallam [<mailto:zmusallam@fultoncountyoh.com>]  
Sent: Tuesday, May 22, 2012 01:32 PM  
To: Fruehling, Andy  
Subject: RE: Fulton County Water Supply Availability and Demand Analysis - Water Use/Demand RFI

Andy,

1. The 2.5 MGD is our current contractual obligation to all current users.
  2. Near future would be within 5 years.
  3. The 2.5 MGD represent the current usage of Swan Creek Water District, Assumption, Ai, Metamora and North Star Steel. The 5 MGD is the anticipated (near future) additional usage by North Star Steel. The 12.0 MGD is based on the current water service contract with Toledo.
- Ziad

-----Original Message-----

From: Fruehling, Andy [<mailto:AFruehling@structurepoint.com>]  
Sent: Thursday, May 17, 2012 9:38 AM  
To: Ziad Musallam  
Cc: Bailey, Jennifer; Elliott, Kent  
Subject: Fulton County Water Supply Availability and Demand Analysis - Water Use/Demand RFI

Good morning, Ziad-

As we solidify our draft Water Supply Availability and Demand Analysis, we respectfully request your input on the demand data we are currently referencing. Upon reviewing data received early-on, compared to information we found in other published sources in the interim, we would like to receive affirmation of the following:

1. Confirm the water demands used for the TMACOG study. Past email correspondence (below) states 2.5 MGD as a maximum day demand; but the attached pdf file from the TMACOG model shows an average day of 1.5 mgd and a maximum day of 1.8 mgd.
2. In the emails below, what planning years do the "Near Future Demand" and "Far Future Demand" represent? Again, attached TMACOG model shows the 5.0 mgd demand for 2035. Previous email correspondence (see below) categorize as the "Near Future Demand".
3. Confirmation that the 2.5 mgd, 5.0 mgd and 12.0 mgd demands mentioned in the emails below represents the water used to serve Swan Creek Water District, Swanton, Assumption, Ai, Metamora and Lyons plus North Star Steel

Thanks in advance for your insight on these topics. Will look forward to receiving your reply.

Andrew E. Fruehling, PE  
Project Manager  
Municipal and Environmental Engineering

2550 Corporate Exchange Drive, Suite 300 Columbus, Ohio 43231  
T 614.901.2235 E [afruehling@structurepoint.com](mailto:afruehling@structurepoint.com)

F 614.901.2236 W www.structurepoint.com  
C 614.633.5451

From: Ziad Musallam [<mailto:zmusallam@fultoncountyoh.com>]  
Sent: Thursday, January 19, 2012 8:52 AM  
To: Bailey, Jennifer  
Cc: Vond Hall; Fruehling, Andy; Munroe, Darcy  
Subject: RE: Fulton County Regional Water System Feasibility Meeting - Follow-up

Jennifer,

The demands were determined based on the following:

1. 2.5 MGD is based on the current max water usage.
2. 5.0 MGD is based on the estimated demand of certain industries growth (within 5 yrs.)
3. 12.0 MGD is based on the current water service contract with Toledo (projected demand).

Ziad

From: Bailey, Jennifer [<mailto:jbailey@structurepoint.com>]  
Sent: Wednesday, January 18, 2012 8:56 AM  
To: Ziad Musallam  
Cc: Vond Hall; Fruehling, Andy; Munroe, Darcy  
Subject: RE: Fulton County Regional Water System Feasibility Meeting - Follow-up

Good morning Ziad,

Thank you for the additional information. One question, how were the Fulton County demands listed in item 2 below developed? Were they based on input from the individual communities? If so, is this data available?

Jennifer

---

Jennifer M. Bailey, PE  
Project Manager, Environmental Engineering Group

7260 Shadeland Station, Indianapolis, IN 46256  
T 317.547.5580 E [jbailey@structurepoint.com](mailto:jbailey@structurepoint.com) <<mailto:jbailey@structurepoint.com>>  
F 317.543.0270 W [www.structurepoint.com](http://www.structurepoint.com) <<http://www.structurepoint.com/>>  
C 317.508.8155

[cid:image001.jpg@01CD337F.F8791380] <<http://www.structurepoint.com/>>

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<<http://twitter.com/#!/AmericanStrpnt>>

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From: Ziad Musallam  
[<mailto:zmusallam@fultoncountyoh.com>] <[mailto:\[mailto:zmusallam@fultoncountyoh.com\]](mailto:[mailto:zmusallam@fultoncountyoh.com])>  
Sent: Friday, January 06, 2012 1:07 PM  
To: Fruehling, Andy  
Cc: Bailey, Jennifer; Munroe, Darcy; Vond Hall

Subject: RE: Fulton County Regional Water System Feasibility Meeting - Follow-up

Andy,

Attached is the following information:

1. Water system information for Archbold, Fayette & Wauseon
2. Fulton County Current Demand = 2.5 MGD, Near Future Demand = 5.0 MGD, Far Future Demand = 12.0 MGD. Link to TMACOG Study  
[www.tmacog.org/Regional\\_Water\\_Discussion/RWD\\_web/RWD\\_index.htm](http://www.tmacog.org/Regional_Water_Discussion/RWD_web/RWD_index.htm)
3. Link to Land Use Plan  
[www.fultoncountyoh.com/county\\_agencies/regional\\_planning/county\\_development\\_plan\\_1998.htm](http://www.fultoncountyoh.com/county_agencies/regional_planning/county_development_plan_1998.htm)
4. MICHINDOH Aquifer

If you have any questions or need more information, please contact me.

Ziad Musallam, PE  
Director  
Fulton County - Department of Public Utilities  
152 South Fulton Street, Suite 240  
Wauseon, OH 43567  
Phone 419-337-9263  
Fax 419-337-9269  
[zmusallam@fultoncountyoh.com](mailto:zmusallam@fultoncountyoh.com)

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**From:** [Dennis Howell](#)  
**To:** [Bailey, Jennifer](#)  
**Cc:** "[Vond Hall](#)"; [Jim Wyse](#); [Perry Rupp](#)  
**Subject:** FW: demand  
**Date:** Tuesday, March 06, 2012 12:45:50 PM  
**Attachments:** [image001.jpg](#)

---

Good afternoon, Jennifer. Below is an email from the Napoleon City Engineer with some numbers.

The City of Wauseon should be included as a source. As we discussed they have the raw line coming from the Maumee in Napoleon to their plant. I also believe OEPA would be open to co-mingling of two surface water supplies as close in characteristics as Archbold & Wauseon.

Please let me know if you need any additional information.

Dennis Howell  
Village Administrator  
P.O. Box 406  
Archbold, OH 43502  
Phone 419-445-4726  
FAX 419-445-0908  
e-mail: [dhowell@archbold.com](mailto:dhowell@archbold.com)



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**From:** Chad Lulfs [<mailto:clulfs@napoleonohio.com>]  
**Sent:** Tuesday, March 06, 2012 10:51 AM  
**To:** Dennis Howell  
**Subject:** Fw: demand

Dennis,

Below is the information I was able to obtain regarding potential demand requirements. As for the ownership of the right-of-way, Bisher believed that everything from the City Corp Limits to Wauseon was owned by Wauseon, but he was not positive on that. Let me know if you need me to get you more information.

Chad  
Chad E. Lulfs, P.E., P.S.  
Director of Public Works

255 W. Riverview Avenue  
P.O. Box 151  
Napoleon, OH 43545  
Phone: 419-592-4010  
Fax: 419-599-8393

---

-----Original Message-----

From: "Scott Hoover" <[shoover@napoleonohio.com](mailto:shoover@napoleonohio.com)>  
To: "Chad Lulfs" <[clulfs@napoleonohio.com](mailto:clulfs@napoleonohio.com)>  
Date: 03/05/12 15:11  
Subject: demand

Here are some numbers on demand. These are based on 2010 numbers.

487.6 MGY, 1.34MGD ave., 2.1 MGD High day, 1.1 MGD low

Not included, Possible Golf Course 10.8 MGY, 150,000 gal. for 72 days

Not included, Possible McClure connection. 70,000 gal. a day Ave. 100,000-110,000 gal. summer months

10 year? Its a guess, 2MGD

20 year? Bisher said to double 2.7MGD

Scott Hoover  
Napoleon Water Plant Supt.

*"Lack of planning on your part does not constitute an emergency on our part."*

**From:** [Dennis Richardson](#)  
**To:** [Fruehling, Andy](#)  
**Cc:** [mayor@cityofwauseon.com](mailto:mayor@cityofwauseon.com); [Wauseon Water Treatment Plant](#)  
**Subject:** RE: Futon County Water Supply Feasibility Study  
**Date:** Thursday, June 28, 2012 12:38:01 PM  
**Attachments:** [Napoleon water usage autosave.xls](#)

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Mr. Fruehling,

Attached is a spreadsheet tabulation of our use of the raw water line to the City of Napoleon/Maumee River. It is important for you to understand that the raw water main is a "two way street".

We are in a long-term agreement with Napoleon regarding the line. Wauseon gained access to the Maumee and therefore insurance that our reservoirs would never run dry. Napoleon needed access to our reservoirs so that they had a safe and reliable source during times when the water in the Maumee was bad (nitrates etc.) Therefore, the spreadsheet tracks raw water running in both directions. Through the years you will see that Napoleon has increased its use of water from our reservoirs. They found that it was much cheaper for them to blend some of our water with the river during times when our reservoir was full or the river was bad. The water they use is credited back to us and pumped back to us free. The maximum capacity of the Napoleon raw water pump station is 5MGD delivered to our reservoirs.

Sincerely,

Dennis Richardson,  
Public Service Director  
City of Wauseon  
230 Clinton Street  
Wauseon, OH 43567

Phone: (419) 335-9871  
Fax: (419) 335-3866  
e-mail: [dennis.richardson@cityofwauseon.com](mailto:dennis.richardson@cityofwauseon.com)

---

**From:** Fruehling, Andy [<mailto:AFruehling@structurepoint.com>]  
**Sent:** Tuesday, June 26, 2012 10:01 AM  
**To:** Dennis Richardson  
**Subject:** Futon County Water Supply Feasibility Study

Good morning, Dennis-

To follow-up my voicemail from Monday, June 25<sup>th</sup>, I thought it more efficient to pose the question for which we seek clarification; then follow-up with phone call if necessary.

As we wrap up our Water Supply Feasibility Study for the Fulton County Commissioners, we would like to include **the average daily withdrawal(s) from the Maumee River (via Napoleon) from 2006 through 2010**. The information will allow us to more accurately determine the water available County-wide, provided Wauseon's participation in such a county water company scenario.

If you would like to talk with us over the phone about any of this data, we're more than happy to take a few minutes and discuss.

Thanks in advance for your assistance – we look forward to hearing from your office soon.

Take care,

Andy

**Andrew E. Fruehling, PE**

Project Manager

Municipal Engineering

2550 Corporate Exchange Drive, Suite 300

Columbus, Ohio 43231

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<http://www.emaildisclaimers.com/>

### Napoleon Water Usage (2006-2010)

#### Recieved from Wauseon Public Service

	Days To	To Napoleon		Days To	To Wauseon		M.G.'s toward debt	annual off 365M.G.	totald off annual
		Days Ran	MG's		Days Ran	MG's			
<b>2001</b>	November				14	35.621			
	December		10		11	23.418			
	<b>Total</b>		<b>10</b>		<b>25</b>	<b>59.039</b>			
<b>2002</b>	January		1		20	53.582			
	February		13		0	0.000			
	March		1		3	8.810			
	April		14		1	0.115			
	May		4		6	13.740			
	June		6		19	48.242			
	July		0		29	61.049			
	August		0		29	66.022			
	September		2		22	53.869			
	October		0		18	43.533			
	November		0		8	17.908			
	December		22		7	16.697			
	<b>Total</b>		<b>63</b>		<b>162</b>	<b>383.567</b>	<b>306.530</b>	<b>-58.470</b>	<b>-58.470</b>
<b>2003</b>	January		31		0	0.000	started blending		
	February		6		22	59.013			
	March		19		8	20.256			
	April	40.511	20		9	19.922			
	May		14		11	27.252			
	June		8		16	33.767			
	July		8		20	41.414			
	August		5		21	43.875			
	September		9		9	19.996			
	October		3		17	38.234			
	November		2		25	56.039			
*	December		2		6	14.118	* days estimated		
	<b>Total</b>		<b>127</b>		<b>164</b>	<b>373.886</b>	<b>260.224</b>	<b>-104.776</b>	<b>-163.246</b>
<b>2004</b>	January		8		18	41.113			
	February		0		5	9.561			
	March		5		8	18.190			
	April		2		18	42.685			
	May		7		3	4.404			
	June		12		12	26.417			

**Napoleon Water Usage (2006-2010)**

**Recieved from Wauseon Public Service**

	July		0	0.000		26	58.526			
	August		0	0.000		16	34.833			
	September		0	0.000		21	45.661			
	October		4	5.314		20	44.317			
	November		0	0.000		11	24.775			
	December		7	6.808		0	0.000			
	<b>Total</b>		<b>45</b>	<b>44.223</b>		<b>158</b>	<b>350.482</b>	<b>306.259</b>	<b>-58.741</b>	<b>-221.987</b>
<b>2005</b>	January	24	14	5.543	7	7	17.050			
	February	20	12	4.989	8	7	17.041			
	March	0	0	0.000	31	28	68.772			
	April	20	5	4.267	10	8	17.291			
	May	10	2	1.519	21	15	33.507			
	June	0	0	0.000	30	27	53.463			
	July	0	0	0.000	31	25	48.445			
	August	1	1	0.003	30	19	36.851			
	September	0	0	0.000	30	7	14.618			
	October	13	7	5.461	18	18	39.526			
	November	3	1	1.160	27	15	36.755			
	December	23	13	14.392	7	7	17.480			
	<b>Total</b>	<b>114</b>	<b>55</b>	<b>37.334</b>	<b>250</b>	<b>183</b>	<b>400.799</b>	<b>363.465</b>	<b>-1.535</b>	<b>-223.522</b>
<b>2006</b>	January	23	10	10.385	8	4	9.932			
	February	17	12	5.531	11	4	9.701			
	March	12	11	7.179	19	17	41.870			
	April	8	1	0.675	22	9	20.782			
	May	21	14	9.949	10	7	16.209			
	June	0	0	0.000	31	19	38.874			
	July	4	0	0.000	27	18	39.338			
	August	0	0	0.000	31	26	58.775			
	September	8	0	0.000	22	18	39.601			
	October	14	10	7.387	17	12	27.992			
	November	8	6	4.407	22	15	37.009			
	December	30	16	10.725	0	0	0.000			
	<b>Total</b>	<b>145</b>	<b>80</b>	<b>56.238</b>	<b>220</b>	<b>149</b>	<b>340.083</b>	<b>283.845</b>	<b>-81.155</b>	<b>-304.677</b>
<b>2007</b>	January	23	22	12.449	8	8	19.204			
	February	0	0	0.000	28	21	49.112			
	March	30	25	14.275	1	0	0.000			
	April	12	7	3.310	18	15	36.122			

**Napoleon Water Usage (2006-2010)**

**Recieved from Wauseon Public Service**

	May	17	5	2.846	14	13	28.740			
	June	6	2	0.590	24	23	50.420			
	July	0	0	0.000	31	30	59.109			
	August	9	9	6.436	22	12	24.449			
	September	12	0	0.000	18	16	34.748			
	October	5	3	4.667	26	17	32.129			
	November	18	11	7.897	13	9	20.155			
	December	31	16	10.703	0	0	0.000			
	<b>Total</b>	<b>163</b>	<b>100</b>	<b>63.173</b>	<b>203</b>	<b>164</b>	<b>354.188</b>	<b>291.015</b>	<b>-73.985</b>	<b>-378.662</b>
<b>2008</b>	January	16	10	6.170	15	12	27.723			
	February	25	21	13.435	4	3	6.642			
	March	23	16	6.765	8	1	2.395			
	April	15	7	2.993	15	14	30.458			
	May	0	0	0.000	31	21	44.363			
	June	18	3	1.026	12	6	10.493			
	July	13	7	2.476	18	11	17.095			
	August	0	0	0.000	30	0	0.000			
	September	0	1	0.218	31	16	37.980			
	October	3	3	3.991	28	26	60.810			
	November	0	0	0.000	31	29	70.193			
	December	13	5	3.575	18	10	23.814			
	<b>Total</b>	<b>126</b>	<b>73</b>	<b>40.649</b>	<b>241</b>	<b>149</b>	<b>331.966</b>	<b>291.317</b>	<b>-73.683</b>	<b>-452.345</b>
<b>2009</b>	January	5	5	3.535	26	22	48.119			
	February	22	13	8.198	6	2	4.399			
	March	22	15	9.461	9	7	14.584			
	April	21	7	3.323	7	5	11.827			
	May	16	0	0.000	14	14	31.766			
	June	21	4	1.983	10	9	19.848			
	July	0	0	0.000	31	29	61.370			
	August	0	0	0.000	31	25	55.198			
	September	0	0	0.000	31	22	47.374			
	October	11	4	3.755	20	6	12.533			
	November	0	0	0.000	31	12	26.049			
	December									
	<b>Total</b>	<b>118</b>	<b>48</b>	<b>30.255</b>	<b>216</b>	<b>153</b>	<b>333.067</b>	<b>302.812</b>	<b>-62.188</b>	<b>-514.533</b>
<b>2010</b>	January	0	0	0.000	26	6	10.241			

Pump at Napoleon had broken casing and took six weeks to get parts

Roger Noblit retired; Nap pumped with valves wrong way

asked to pump just 3 days a week

I asked Nap to pump two days a week

**Napoleon Water Usage (2006-2010)**

**Recieved from Wauseon Public Service**

	February	4	0	0.000	24	22	44.939			
	March	20	7	2.915	11	5	9.494			
	April		16	6.242		8	17.064			
	May		19	10.366		3	4.275			
	June			0.000		15	27.389			
	July			0.000		30	55.500			
	August			0.000		31	60.445			
	September			0.000		30	61.547			
	October			0.000		12	25.047			
	November		4	4.833		6	12.750			
	December		8	4.697		15	28.950			
	<b>Total</b>	<b>24</b>	<b>54</b>	<b>29.053</b>	<b>61</b>	<b>183</b>	<b>357.641</b>	<b>328.588</b>	<b>-36.412</b>	<b>-550.945</b>
<b>2011</b>	January		5	2.748		21	40.482			
	February		11	7.615		16	28.796			
	March		12	8.512		10	19.797			
	April		9	4.270		4	8.451			
	May		19	9.396		4	6.280			
	June		3	1.588		21	36.630			
	July		1	0.029		26	48.581			
	August			0.000		25	48.876			
	September		4	2.058		8	15.391			
	October		11	4.837		4	6.727			
	November		13	8.505		2	3.469			
	December		23	9.986		0	0.000			
	<b>Total</b>	<b>0</b>	<b>111</b>	<b>59.544</b>	<b>0</b>	<b>141</b>	<b>263.480</b>	<b>203.936</b>	<b>-161.064</b>	<b>-712.009</b>
<b>2012</b>	January		3	0.696		0	0.000			
	February			0.000		20	37.957			
	March		0	0.000		0	0.000			
	April		0	0.000		0	0.000			
	May									
	June									
	July									
	August									
	September									
	October									
	November									
	December									
	<b>Total</b>	<b>0</b>	<b>3</b>	<b>0.696</b>	<b>0</b>	<b>20</b>	<b>37.957</b>	<b>37.261</b>	<b>-327.739</b>	<b>-1039.748</b>



### PHONE CALL RECORD

**Date:** 05/17/12

**Time:** \_\_\_\_\_

**Person Called:** Steve Brown, Planning Director of Fulton Co. Planning (419.337.9214)

**Person Calling:** Kent Elliott of Structurepoint

**cc:** \_\_\_\_\_

**Project Name:** Fulton County Water Study

**Project Number:** 2011.01066

**Subject:** County Growth and Economic Development

#### Summary of Conversation

Steve Brown stated that they are no potential large water users coming into the county. He said that they only possible increase in water usage or any new business/industry would be if North Star Steel expanded their existing facilities. Kent asked him about the 1998 County Plan that has the population increasing to 50,000 in 2010 and 52,500 in 2020, but the actual population for 2010 was 42,669. Mr. Brown said the Plan has not been updated, but the projected growth in population needs to be adjusted down. Mr. Brown said that he does not see any future development, but contrary, 7% of the homes in the county are vacant. Additionally, Mr. Brown said that there has been just 5 new homes built total per year for the past couple years.

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## Appendix C – Gauging Station Data

**USGS Gauge 04185000**  
**Tiffin River at Stryker, Williams County, Ohio**  
**Summary Statistics -- October 1940 - September 2011 (71 years)**

**Latitude:** 41°30'16" NAD 27  
**Longitude:** 84°25'47" NAD 27  
**Drainage Area:** 410 Mi<sup>2</sup>  
**Gauge Datum:** 685.1 NGVD 1929

	<b>Discharge (ft<sup>3</sup>/s)</b>	<b>Date</b>
Peak Daily	7800	3/12/2009
Minimum Daily	2.5	7/18/1988
Average Daily	348.8	

<b>% of time Daily Discharge was Equaled or Exceeded</b>			
<b>Percent of time</b>	<b>Discharge (ft<sup>3</sup>/s)</b>	<b>Percent of time</b>	<b>Discharge (ft<sup>3</sup>/s)</b>
1	2780	75	46
2	2200	80	37
5	1500	90	23
10	990	95	17
25	360	98	12
50	131	99	9.6

	<b><u>CFS</u></b>	<b><u>MGD</u></b>
Depend. Yield	7.4	4.78

**USGS Gauge 04185000**

**Bean Creek at Powers, Fulton County, Ohio**

**Summary Statistics -- Oct 1940 - Sept 1981 (41 yrs) and Nov 2000 - May 2012 (12 yrs)**

**Latitude:** 41°39'34" NAD 27  
**Longitude:** 84°14'57" NAD 27  
**Drainage Area:** 206 Mi<sup>2</sup>  
**Gauge Datum:** 710 NGVD 1929

	1940-1981		2000-2012	
	Discharge (ft <sup>3</sup> /s)	Date	Discharge (ft <sup>3</sup> /s)	Date
<b>Peak Daily</b>	3740	4/5/1950	3600	2/10/2001
<b>Minimum Daily</b>	5.2	8/9/1964	2.3	9/11/2002
<b>Average Daily</b>	167.24	--	228.77	--

<b>% of time Daily Discharge was Equaled or Exceeded</b>			
1940-1981		2000-2012	
Percent of time	Discharge (ft <sup>3</sup> /s)	Percent of time	Discharge (ft <sup>3</sup> /s)
1	1410	1	1960
2	1100	2	1460
5	680	5	917
10	415	10	531
25	178	25	242
50	65	50	106
75	27	75	41
80	23	80	32
90	16	90	22
95	13	95	17
98	9.5	98	13
99	8.2	99	11

	<b><u>CFS</u></b>	<b><u>MGD</u></b>
Dependable Yield (1940-1981)	4.8	3.10

**USGS Gauge 04192500**  
**Maumee River Near Defiance, Defiance County, Ohio**  
**Summary Statistics -- October 1924 - May 2012 (87 years)**

**Period of Record Missing:** 10/1/1935 - 3/1/1939  
 10/24/1974 - 9/28/1978

**Latitude:** 41°17'31" NAD 27  
**Longitude:** 84°16'52" NAD 27  
**Drainage Area:** 5545 Mi<sup>2</sup>  
**Gauge Datum:** 658.56 NGVD 1929

	<b>Discharge (ft<sup>3</sup>/s)</b>	<b>Date</b>
Peak Daily	98800	3/15/1982
Minimum Daily	3	9/4/1925
Average Daily	4581.6	

<b>% of time Daily Discharge was Equaled or Exceeded</b>			
<b>Percent of time</b>	<b>Discharge (ft<sup>3</sup>/s)</b>	<b>Percent of time</b>	<b>Discharge (ft<sup>3</sup>/s)</b>
1	38400	75	493
2	30300	80	395
5	20500	90	239
10	13000	95	172
25	4900	98	112
50	1490	99	84

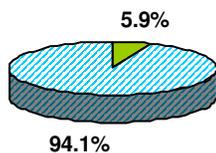
	<b><u>CFS</u></b>	<b><u>MGD</u></b>
Depend. Yield	88	56.87

## Appendix D – ODNR 2005 Water Withdrawal Summary

# Water Withdrawal in FULTON COUNTY

## Total fresh-water withdrawal and source of water in 2005

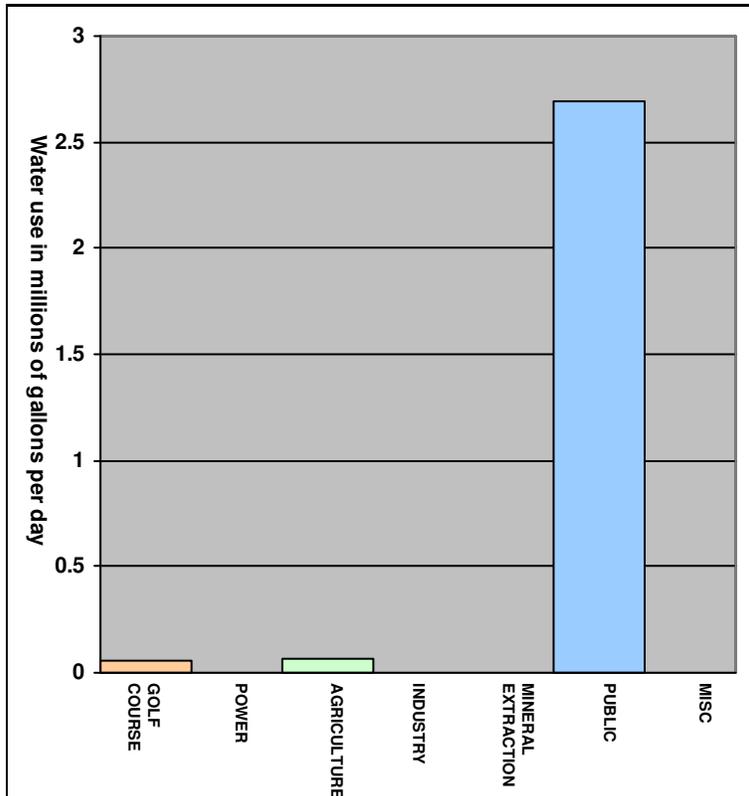
Source	Water use, in million gallons per day	Percent of total use
Surface Water	2.65	94.1%
Ground Water	0.17	5.9%
<b>Total</b>	<b>2.81</b>	<b>100.0%</b>



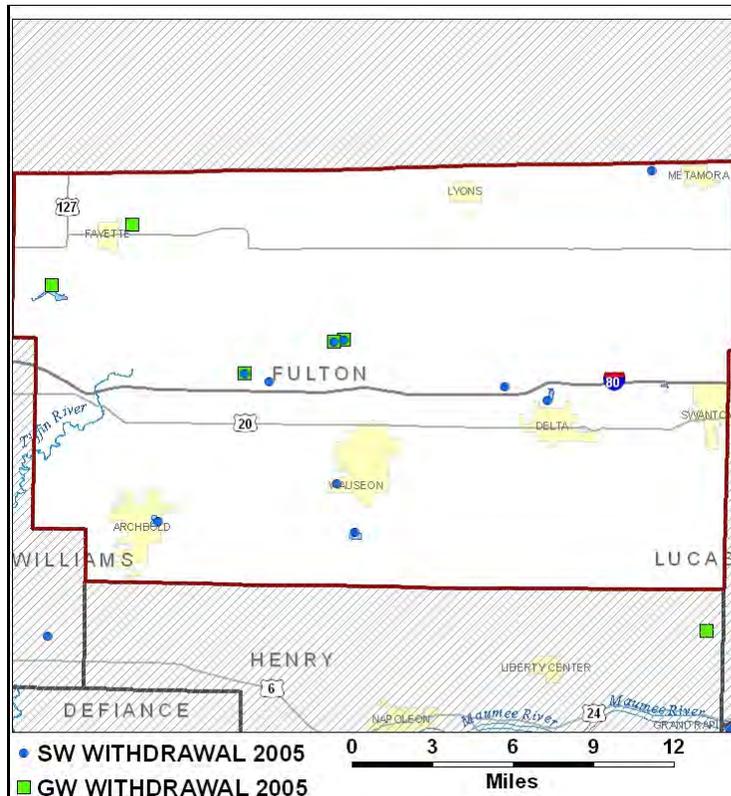
■ GROUND WATER ■ SURFACE WATER



## Total fresh-water withdrawal by category in 2005



## Location of facilities withdrawing water in 2005



## Total fresh-water withdrawal by category in 2005 in millions of gallons per day

	Golf Course	Power	Agriculture	Industry	Mineral Extraction	Public	Misc	Total
Surface Water	0.05	0.00	0.06	0.00	0.00	2.54	0.00	2.65
Ground Water	0.00	0.00	0.01	0.00	0.00	0.16	0.00	0.17
<b>Total</b>	<b>0.05</b>	<b>0.00</b>	<b>0.07</b>	<b>0.00</b>	<b>0.00</b>	<b>2.69</b>	<b>0.00</b>	<b>2.81</b>
Percent Total	1.9%	0.0%	2.3%	0.0%	0.0%	95.6%	0.1%	100.0%

## Water withdrawal trends

