TMACOG AREAWIDE WATER QUALITY MANAGEMENT PLAN

Toledo Metropolitan Area Council of Governments

Documents Certified
pursuant to Section 208 of the Clean Water Act

STATE OF OHIO

Division of Surface Water
Ohio Environmental Protection Agency

2006

Division of Surface Water, 122 South Front St., PO Box 1049, Columbus, Ohio 43215 (614) 644-2001

Table of Contents

The regional or areawide planning agency listed below has prepared and adopted, pursuant to their bylaws, the Section 208 plan updates described below. Ohio EPA is charged with reviewing these materials to ensure the following:

- the documents are consistent with basin plans;
- the documents (original plan and updates) cover the required planning elements; and
- the documents (plans) are consistent with one another.

Ohio EPA staff concluded the above criteria are satisfied. The following documents have been certified by the State of Ohio as an update to the Areawide Waste Treatment Management Plans prepared pursuant to Section 208 of the Clean Water Act and the State's Water Quality Management Plan maintained pursuant to Section 303 of the Clean Water Act.

Item or Document	Description	Supplemental Materials on File
Toledo Metropolitan Area Council of Governments (TMACOG)		
TMACOG Areawide Water Quality Management Plan, October 2005	Chapters 1, Areawide Overview and Chapter 2, Environmental Policies are new; Revisions made in the other chapters except Chapter 6, Agricultural Runoff (see Executive Summary)	1. Letter requesting certification of updates (10/19/05) 2. TMACOG Resolution No. 2005-17 updating and adopting the *Areawide Water Quality Management Plan* 3. 2005 Update Executive Summary 4. Summary of changes being made from the 2003 to 2005 versions, in MS Powerpoint format.

TMACOG "208" Areawide Water Quality Management Plan
2005 UPDATE

Executive Summary

TMACOG is updating its principal environmental document, the "208" Areawide Water Quality Management Plan. The 208 Plan identifies areawide policies to protect clean water in Lucas, Ottawa, Sandusky, and Wood counties in Ohio and Bedford, Erie, and Whiteford townships of Monroe County Michigan. The TMACOG 208 Plan is ultimately approved by the TMACOG Board of Trustees, representing the political jurisdictions of the region. After approval by the Board of Trustees, it is submitted to the states for inclusion as part of the statewide plans.

208 Plan Update Process

The TMACOG 208 Plan is updated on a regular basis to keep it current with the needs of the region. The 2005 update is undergoing public review. The full plan is available at:

http://www.tmacog.org/208WaterManPlan.htm

The webpage includes the following sections:

- The complete current 208 Plan: chapters 3-7 as adopted by the TMACOG Board of Trustees in 2003 and certified by Governor Taft in 2004: http://www.tmacog.org/Environment/208WaterManPlan_A.htm
- The complete 208 Plan (chapters 1-7) as recommended by the TMACOG Environmental Council on September 22 2005. This version incorporates all changes since the 2003 version, including chapters 1 and 2, which are new. Individual updated chapters are also available for downloading: http://www.tmacog.org/Environment/208WaterManPlan_B.htm
- All 49 individual sewerage Facility Planning Areas with proposed revisions; see discussion of chapter 4. http://www.tmacog.org/Environment/208WaterManPlan_C.htm

Please direct comments to:

Kurt Erichsen, P.E.
Vice President of Environmental Planning
TMACOG
300 Dr Martin Luther King Jr Dr
Toledo, OH 43602
Kurt@tmacog.org

This 208 Plan update was approved by the TMACOG Environmental Council on September 22, 2005. The Environmental Council makes its recommendations to the TMACOG Board of Trustees through the Executive Committee. After the final plan is adopted by the Board of Trustees, it is submitted to Ohio EPA and Michigan DEQ with a request for Certification by the Governors as part of the *State Water Quality Management Plans*.

208 Plan Chapters and Significant Proposed Changes

1. Areawide Overview

This chapter serves as an introduction to the 208 Plan: it describes geography, natural resources, and environmental issues affecting our region. It also discusses the legal basis for the 208 Plan. This chapter was adopted by the TMACOG Board of Trustees on June 14, 2004, but has not been previously certified as part of the 208 Plan.

2. Environmental Policies

This chapter discusses state, federal, and international laws and agreements that form the basis of our environmental policies. Further, it codifies TMACOG's environmental policies and guidance on how they should be applied. Finally, it identifies TMACOG documents that are incorporated by reference as part of the 208 Plan. This chapter was adopted by the TMACOG Board of Trustees on June 15, 2005, but has not been previously certified as part of the 208 Plan.

3. Water Quality Management Framework

The 208 Plan is a statement of our region on what roles local governmental agencies have in implementing the Clean Water Act. For most counties, cities, villages, and water/sewer districts, the role is operating a sanitary sewerage system. Other roles include stormwater management (under NPDES Phase I and II regulations), septic systems (Health Districts), and agricultural runoff (SWCDs). Governmental agencies with roles in these areas are called “Designated Management Agencies,” or DMAs. This chapter lists who the DMAs are, and where their roles lie. In this update, the Village of Helena has been added as a DMA, being in the development of a sewerage system. Ohio EPA added the cities of Fostoria and Bowling Green to the Stormwater NPDES Permit program earlier this year; accordingly they are added as DMAs for stormwater. In addition, the legal discussion of the 208 Plan previously in this chapter has been moved to Chapter 1.

4. Public Wastewater Treatment

This is the chapter on sewage treatment. It consists of policies and issues covering the entire region, and 49 individual sanitary sewerage Facility Planning Area descriptions (FPAs). In general policies, language has been strengthened requiring privately-owned (“package”) sewage treatment plants to connect to available public sewers.

Each FPA addresses an existing or planned public wastewater treatment facility. In most cases, the treatment plant’s planning area covers parts of several political jurisdictions. FPA boundaries should be viewed as 20-year potential service areas. The Ohio Revised Code requires Ohio EPA to deny sewerage permits that are inconsistent with 208 plans. For this reason, keeping TMACOG's 208 Plan current, and meeting the needs of local jurisdictions is important.

Each FPA covers the following points:

- Who are the DMAs and what are their roles?
- What are the FPA boundaries, and where are sewers presently available?
- What are the present and projected populations of the FPA?
- What are the present sewerage facilities?

- What sewerage facility improvements will be needed to meet NPDES requirements, and how much will the necessary capital improvements cost?

Each FPA description may include its specific policies that direct what sewage treatment options should be available. In this update, three FPAs (Fremont, Clyde, Bellevue) have added a policy that new subdivisions within the FPA shall connect to public sewers. This policy applies only to individual FPAs where the DMAs request it.

Nearly all 49 FPAs have been updated to greater or lesser degrees. In 48 cases, the population figures have been updated. We did not change West Millgrove, because the Census Bureau figures are erroneous. The biggest changes were to the Port Clinton, Oak Harbor, and Erie/Bay FPAs. The Erie Township areas have been moved to the Port Clinton and Oak Harbor FPAs based on an agreement between Ottawa County and the City of Port Clinton. The Haskins FPA has also been enlarged, pending construction of its new wastewater treatment plant. Many other FPAs have other updates and changes based on sewerage facility improvements or pending projects. Please review any of interest to you.

5. On-Site Sewage Treatment

This chapter covers “onsite sewage treatment systems” meaning septic tanks and package plants. The language has been strengthened requiring on-site systems to connect to available public sewers. Critical Home Sewage Disposal areas, identified by the county health departments, have been updated based on the countywide Hone sewage Treatment System (HSTS) plans. There are changes to the Sandusky and Wood County critical areas; none to Lucas, Ottawa, or Monroe counties.

6. Agricultural Runoff

This chapter covers agricultural runoff issues. There are no proposed changes to the version adopted by the TMACOG Board of Trustees on October 15, 2003 and certified by the Governor of Ohio on June 9, 2004.

7. Urban Runoff

This chapter covers urban runoff issues, particularly Stormwater NPDES permit requirements. There have been updates resulting from Ohio HB 411 that enables counties to perform an enforcement role. The addition of Fostoria and Bowling Green as stormwater DMAs has also been incorporated. Fremont will not be required to have a Stormwater NPDES permit, and their “provisional” has been removed.

TMACOG AREAWIDE WATER QUALITY MANAGEMENT PLAN

October *2005*

Toledo Metropolitan Area Council of Governments
300 Dr. Martin Luther King Jr. Dr.
PO Box 9508
Toledo OH 43697-9508
419-241-9155

This document was produced with funding from the Members of TMACOG and grants from the US EPA through Ohio EPA.

TMACOG Areawide Water Quality Management Plan

Introduction

The TMACOG Areawide Water Quality Management Plan is a comprehensive document required by the Clean Water Act of 1972. It is a statement on behalf of our region (Lucas, Ottawa, Sandusky, and Wood Counties in Ohio and Bedford, Erie, and Whiteford Townships of Monroe County Michigan) as to what we — all of us — will do to meet the goals of the Clean Water Act.

You may often hear of this document called a "208 Plan" — because Areawide Water Quality Management Planning is required under Section 208 of the Clean Water Act. In Ohio there are six "Areawide" agencies that maintain 208 Plans for regions around major cities. All six of these Areawide Plans are part of the Ohio's Statewide Water Quality Management Plan. The State Plan includes:

- All six Areawide Plans
- WQMPs for all areas not covered by the six Areawide agencies

Some state responsibilities that are handled by state agencies and therefore not part of the Areawide plans, such as the NPDES wastewater discharge permitting system, dredge and fill permits, and Total Maximum Daily Loads (TMDLs) of pollutants to streams.

The Areawide Water Quality Management Plan is necessarily a broad-ranging document with several chapters in various stagers of revision. The original Plan was prepared between 1976-1980. One additional chapter was added in 1982. From 1982 to 1998 changes were made in the chapters affecting public sewage treatment (3 and 4) as needed. In 1998, TMACOG began major revisions of the entire Plan, which is now complete. The table below describes the various chapters and their status.

AWQMP Chapter	Title	Adopted Version	Content	Update Status
1	Areawide Overview	2005	Description of the Region and discussion of water quality for each watershed	Adopted by TMACOG Board of Trustees 10/19/2005
2	Areawide Policies	2005	Defines the environmental policies of TMACOG and its 208 plan	Adopted by TMACOG Board of Trustees 10/19/2005
3	Water Quality Management Framework	2005	What public agencies what responsibilities as "Designated Management Agencies," and how modifications to this Plan are adopted	Adopted by TMACOG Board of Trustees 10/19/2005
4	Public Wastewater Treatment	2005	Public sewerage systems, including Facility Planning Areas that detail sewage treatment needs for the next 20 years	Adopted by TMACOG Board of Trustees 10/19/2005
5	On-Site Sewage Treatment	2005	Package plant and individual sewage treatment devices (e.g., septic systems and home aerators)	Adopted by TMACOG Board of Trustees 10/19/2005
6	Agricultural Runoff	2005	Non point source pollution issues and Best Management Practices for Agricultural Runoff	Adopted by TMACOG Board of Trustees 10/19/2005
7	Urban Stormwater Runoff	2005	Non point source pollution issues and Best Management Practices for Urban Runoff	Adopted by TMACOG Board of Trustees 10/19/2005

This document was produced with funding from the Members of TMACOG, and grants from the US EPA through Ohio EPA.

Kurt Erichsen, P.E.
TMACOG
Vice President of Environmental Planning

October 27, 2005
Kurt@TMACOG.org

Entire *Areawide Water Quality Management Plan* is available at:
http://www.tmacog.org/208WaterManPlan

Table of Contents

Chapter 1
Areawide Overview

Introduction

Purpose of the Areawide Water Quality Management Plan

The *Areawide Water Quality Management Plan's* purpose is to assist efforts to achieve the "fishable and swimmable" water quality standards of the Clean Water Act. As the word "Areawide" signifies, this Plan takes a comprehensive regional approach to water quality protection.

The Areawide region covers Lucas, Ottawa, Sandusky, and Wood Counties in Ohio, and Bedford, Erie, and Whiteford Townships of Monroe County, Michigan — all at the southwest end of Lake Erie. In this region, there are 115 local governments, not counting Special Districts and Authorities. Many of these jurisdictions have a role in protecting water quality. In addition, there are many local, state, federal, regional, and bi-national governmental agencies with environmental protection duties. The purpose of this Plan is to provide these stakeholders with a means to address water quality issues on a regional level.

The *Areawide Water Quality Management Plan* contains seven chapters. They incorporate the region's environmental goals and policies, describe the responsibilities of specific local governments to implement the Clean Water Act and provide sanitary sewerage service, and identify best management practices to control water pollution from diffuse sources, especially due to stormwater runoff ("non-point sources"). The chapters are as follows:

1. Areawide Overview
2. Environmental Policies
3. Water Quality Management Framework
4. Public Wastewater Treatment
5. On-Site Sewage Treatment
6. Agricultural Runoff
7. Urban Runoff

This first chapter serves three purposes. First, it describes the lay of the land: the region's geology, geography, and natural resources. The intent is to provide enough background to understand the chapters that follow, and references for further information. Second, it summarizes the state of water quality in our region. Third, this chapter explains the legal basis for the "208" *Areawide Water Quality Management Plan*, and its amendment process.

Physical Setting and Water Quality

Water Quality Management

We are often inclined to assume, when we speak of water quality management, that both problems and solutions are directly related to what we do to "manage" water quality. Whether it is a question of supplying water for our uses, or of treating wastes, our thoughts first turn to technology and manipulation, as if the whole problem of water quality in the TMACOG region could be solved by a grand plumbing scheme and enough money to pay for it. This is not so. The problem is essentially a problem of land use; it is a problem that arises from the demands which human activities make upon a part of the land that cannot meet them. One of the consequences of the problem is its effect on water quality, but it does not follow that by treating the wastewater in a plant, the problem will be solved most economically or effectively.

We can reduce impacts from sewage by treating it and discharging clean effluent. Reducing impacts from diffuse non-point sources is a matter of prevention through “Best Management Practices” (BMPs). The term “refers to a practice that is determined by a state after examination of alternative practices to be practicable and most effective in preventing or reducing the amount of pollution generated by a non-point source to a level compatible with water quality goals.”[1] The general criteria for selecting BMPs are:

- A BMP should be effective in reducing water pollution from non-point sources
- A BMP should be effective in helping waterways meet Clean Water Act “fishable and swimmable” goals
- A BMP should be practicable[2]

Protection of water quality requires that we know the region and understand the natural environment’s processes. If we understand the limitations and capabilities of the place, and adapt policies to them, we will continue to have an excellent water supply and recreation on Lake Erie that will draw visitors nationwide.

In Ohio, non-point programs are managed by Ohio EPA and Ohio DNR. The *Nonpoint Source Assessment*[3] provided background and data on nonpoint source water pollution in Ohio. It was followed by the *Nonpoint Source Management Program,*[4] which identified sources of nonpoint pollution and policies to guide state programs. Ohio DNR developed its *Ohio’s Coastal Nonpoint Pollution control Program* specific to the protection and restoration of Lake Erie and its coastal zone.[5]

Both Ohio and Michigan administer cost-share programs to encourage BMPs with US EPA “§319” Nonpoint Source funds. These programs provide financial incentives for property owners to use BMPs that will reduce pollution from agricultural runoff and septic systems in particular. Use of these funds is guided locally through watershed plans. In the TMACOG region, the principle watershed councils are the Maumee RAP, Portage River Basin Council, Duck & Otter Creek Partnership, and Sandusky River Watershed Coalition.

Geography

The region includes four geological areas.

Starting from the west are Sand Hills, former beach areas of glacial lakes, and include the Oak Openings and prairies. Some areas are well drained, though the sandy soils are the region’s best farmland.

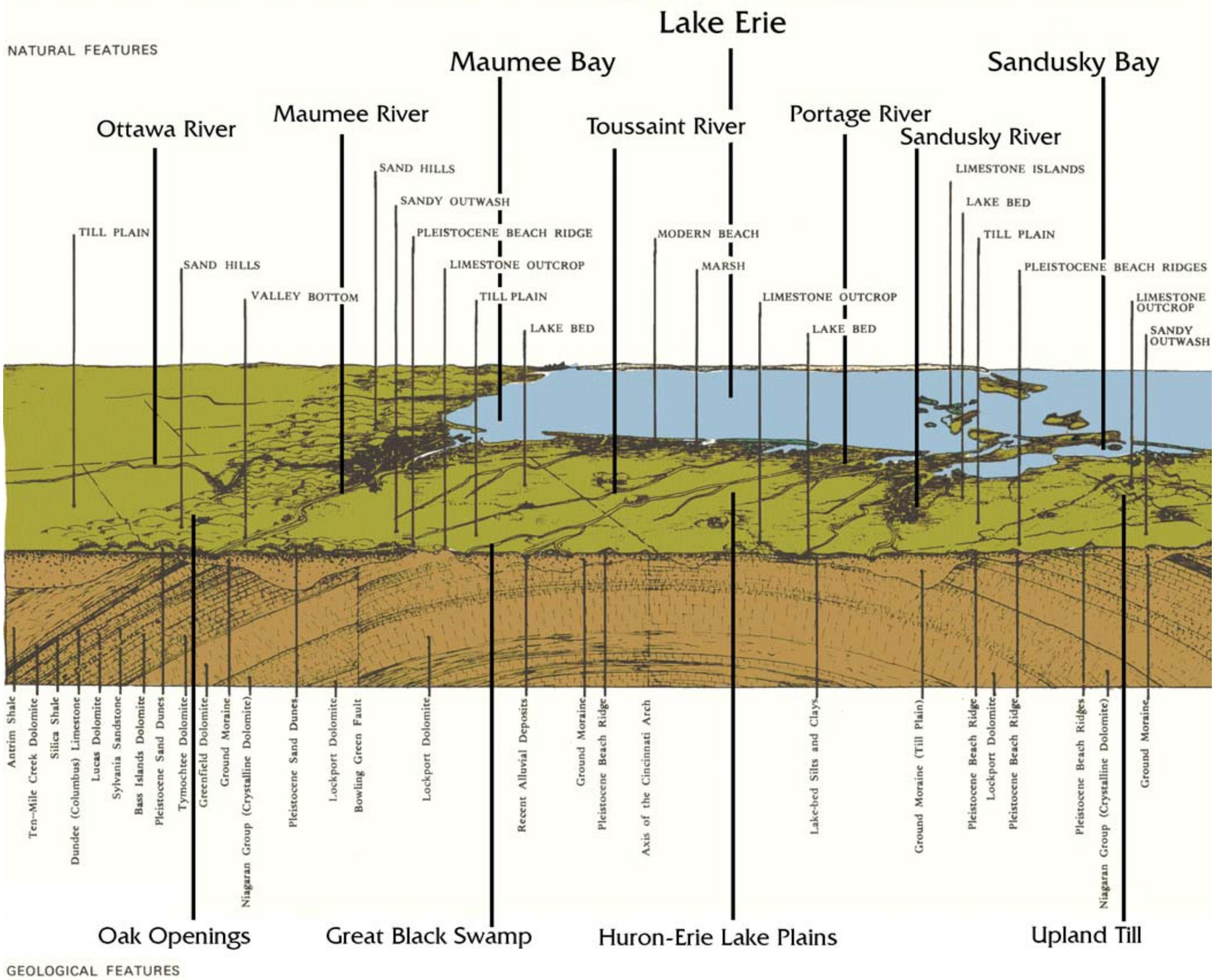
The center of the region is Lake Plain, former lake bottom, and includes the Great Black Swamp. This area is very flat, with heavy and slow-draining silt and clay soils. Originally there were many wet prairies, shallow lakes, and forests. After settlers cleared the forests and built artificial drainage, the area has become some of the state’s most productive farmland.

In the eastern part of the region are Uplands, characterized by limestone, shales, and sandstone either in outcrops or near the surface. This area generally has good drainage, but it also has sinkholes that can lead surface runoff into the aquifer.

The fourth geologic area is Lake Erie itself. All drainage from the region leads to Lake Erie. The Lake provides water supplies for residents and commerce; and recreation and habitat for fish and wildlife.

The region’s geographic areas, major water features, and underlying geology are illustrated in the following figure.

Aerial View of the TMACOG Region Showing Natural Features

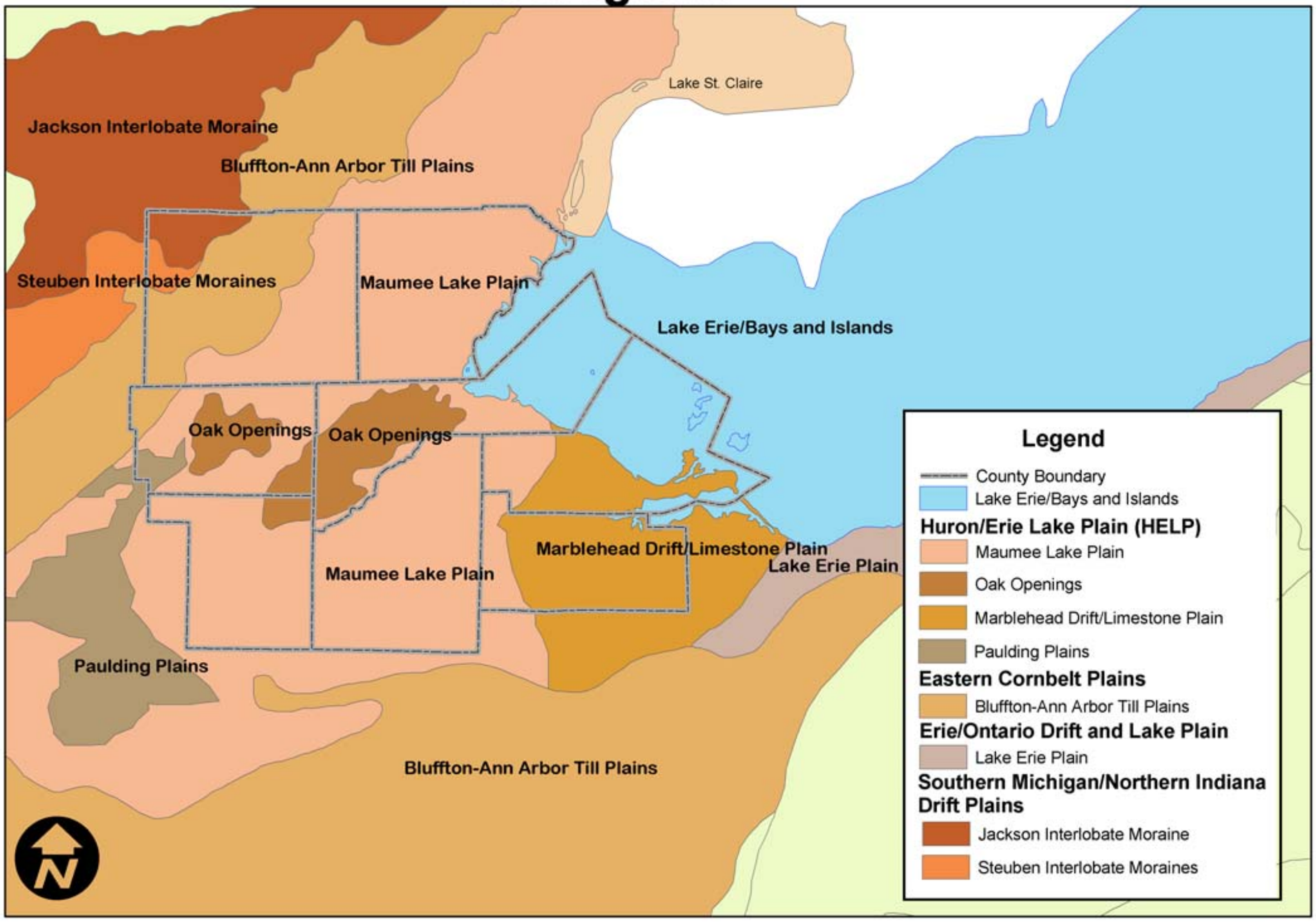


Ecological Areas

The Great Lakes area is divided into ecoregions, which denote areas of generally similar ecosystems. They are designed to serve as a framework for the research, assessment, management, and monitoring of ecosystems.[6]

Nearly the entire TMACOG region is within the Huron/Erie Lake Plains Ecoregion. The ecoregion takes its name from its being formed by retreating glacial lakes. US EPA describes it as “Fine, poorly-drained, water-worked glacial till and lacustrine sediment; also coarser end moraine and beach ridge deposits.”

Ecoregions



The Huron/Erie Ecoregion is divided into the sub-regions as shown in the accompanying figure[7, 8]. They are Oak Openings, corresponding to the Sand Hills geological area; and the Marblehead Drift/Limestone Plain, corresponding to the Uplands geological area.

Several areas of the region, described below, have special ecological importance.

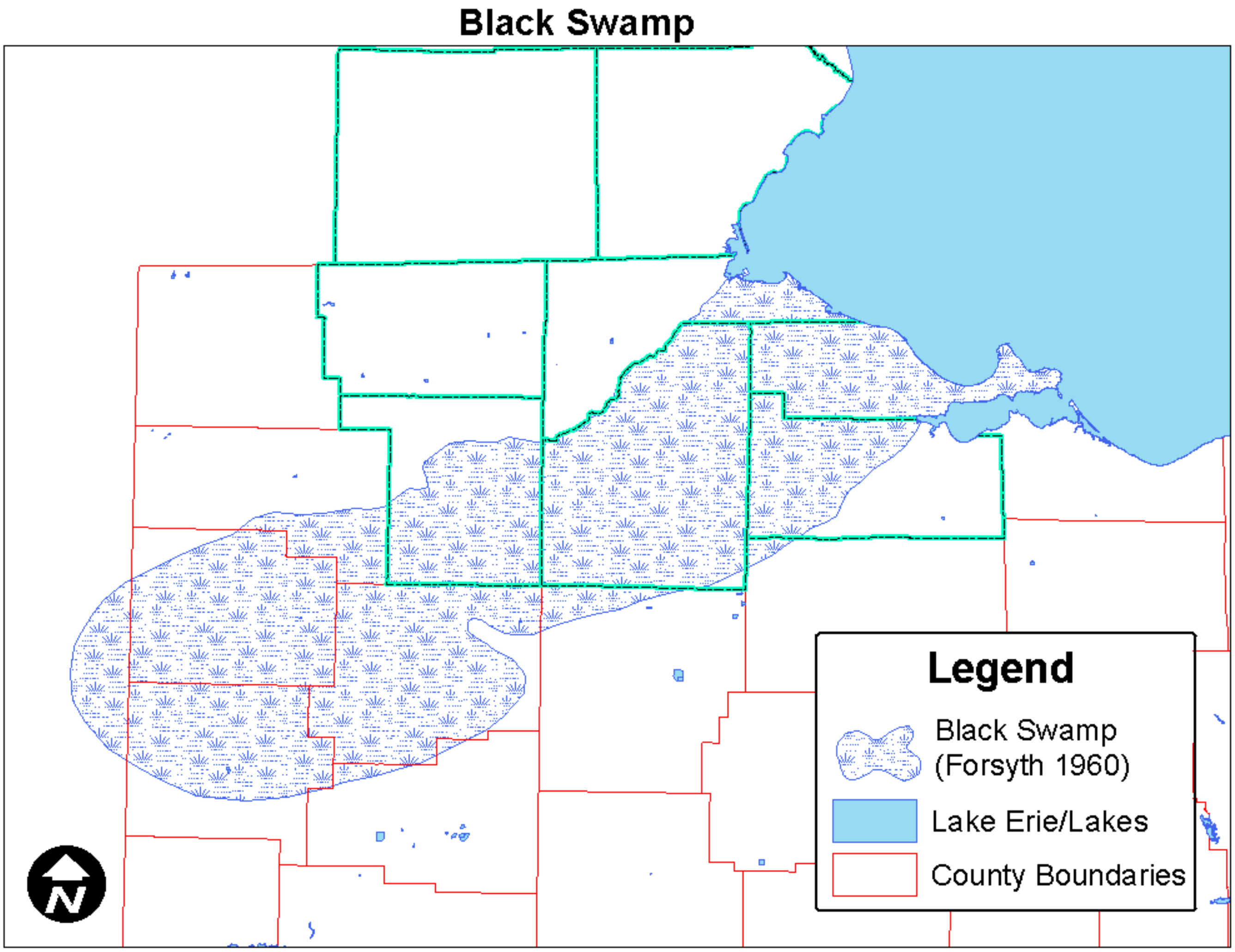
The Great Black Swamp

Part of the Lake Plains area is the Great Black Swamp. The entire Portage River Basin is in the swamp, as are large parts of the Maumee River and Maumee Bay watersheds, and Lake Erie direct drainage areas. Like the entire Lake Plains area, the swamp was glacial lake bottom. It is flat with impermeable silt and clay soils, though with occasional sand ridges or lenses. Some parts of the Lake Plains area have shallow bedrock, and seasonal high groundwater is common.

The swamp was covered with wet forests of hardwood, shallow lakes, and wet prairies. Between the water, the vegetation, the mosquitoes and malaria, and the heavy, sticky (and sometimes deep) mud, European settlers found the swamp an obstacle to development. As a result, northwest Ohio was the last part of the state to be settled.

Settlement and farming required draining the swamp through an extensive system of ditches. It has been estimated that there are three miles of man-made ditches to every mile of natural stream. Today, there are "square mile" ditches along many roads in Wood, Ottawa, and Sandusky Counties. Drainage ditches make productive farming possible, but many do not provide fish or wildlife habitat. Ditches that lack buffer areas and are farmed up to the ditch bank provide a route for nutrients and sediment runoff to Lake Erie.

Despite draining and channelizing streams, the swamp is still there. It remains subject to flooding, particularly along the Portage Middle Branch in eastern Wood County. Black Swamp streams could be good candidates for restoration and re-establishment of habitat by expanding floodplains and wetlands. Habitat areas on these headwater streams support the base of the food chain, which ultimately feeds Lake Erie.



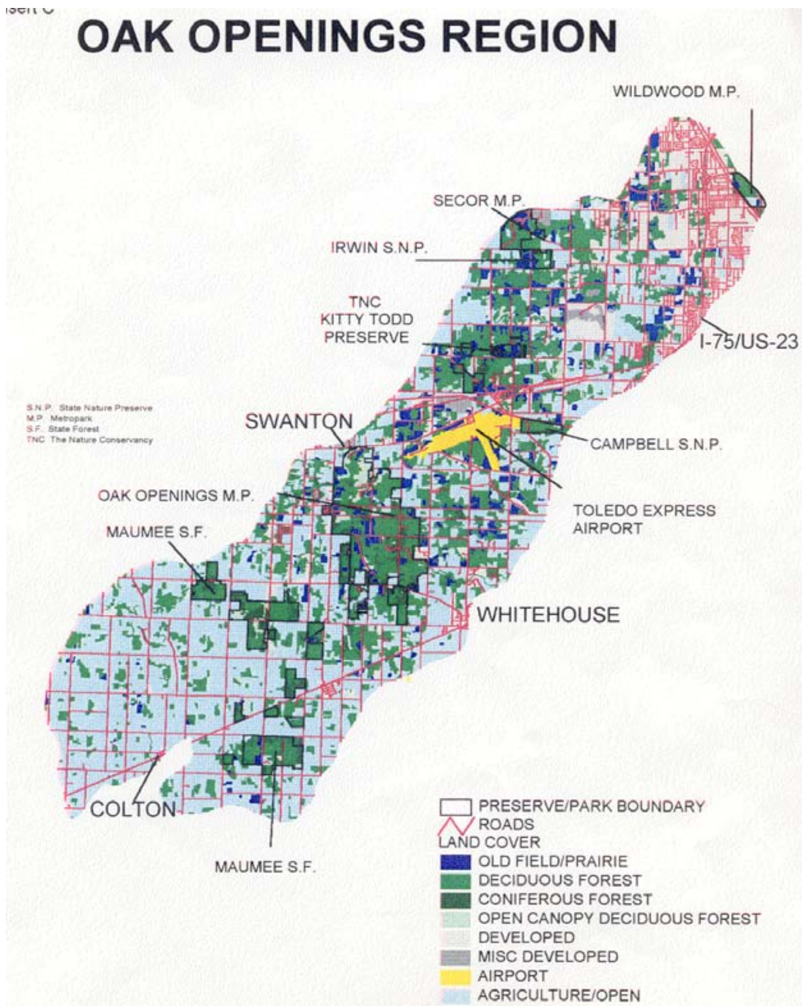
The name "Black Swamp" refers to a large flat area in northwestern Ohio that was once in truth a broad, deep swamp. Oriented northeast southwest along the south side of the Maumee River, it is about 100 miles long and 20-30 miles wide. The swamp was located on the broad plain that was once the bottom of an early, ancestral Lake Erie, whose surface was over a hundred feet higher than the modern lake because of a dam of glacial ice in the northeastern part of the Erie basin. This ice, the remains of the great glaciers that once covered much of Ohio, formed a dam holding back this early lake for a short time, and then melted away completely from the area. Here, where the bottom of that early lake had been lowest and flattest, and where the finest of the lake clays had been deposited, adequate natural drainage was impossible, resulting in the formation of the swamp. Black muck associated with this swamp gave the area its name.

Before the swamp was drained, it was the main impediment to travel between Ohio and Michigan. The difficulties presented by the swamp to the early settlers and soldiers are clearly indicated in their writings, of which the following are excerpts (taken from pages 3-7 of a paper by Martin R. Kaatz in the 1955 Annals of the Association of American Geographers). David Zeisberger, a Moravian missionary, describes the "deep swamps and troublesome marshes", where no bit of dry land was to be seen, and the horses at every step wading up to their knees", it took him two and a half days to travel from

Sandusky to the Maumee River, a distance of about 30 miles. Joseph Badger refers to the "hideous swamps" and Brown wrote about the problems faced by General Hull's army in the War of 1812: "man and hose had to travel mid leg deep in mud" and "the mud was ankle deep in our tents".
Early farmers ditched their land, but without major drainage ways to carry away the ditch water, this was not very effective. In 1859, a law providing for public ditches was passed, with the result that the entire swamp was drained and more people began to settle there. Rural population reached its peak about the turn of the century, 50 years later than in the rest of Ohio. Soils were so productive in this newly drained land that more of the land was put into crops here than anywhere else in Ohio. What was once a vast muddy swamp on the flats of an old postglacial lake-bed has become one of Ohio's most productive rural areas.[9]

The Oak Openings

The region's single most important natural habitat area is the Oak Openings region, bordering the Great Black Swamp. The Maumee RAP[10] calls for preservation and acquisition of fish and wildlife habitats, specifically recommending wet prairies and oak savannahs of western Lucas County, in the Oak Openings area. The *Swan Creek Plan of Action*[11] gives its highest priority to preserving floodplains and wetlands as natural habitats.



The Oak Openings Region, located within portions of the Swan Creek and Ottawa River watersheds, is a 130 square mile area supporting globally rare oak savanna and wet prairie habitats. It is home to more rare species of plants and animals than any other area of Ohio. Its trees, plants, sandy soils, wet prairies, and floodplains benefit the region by acting as natural filters for our air and water.

Natural floodplain corridors occur between the Oak Openings Region and Lake Erie along the Maumee River, Swan Creek, and Ottawa River. Preserved natural floodplains in these areas help to balance the effects of development and the resulting downstream effects of increased urban runoff. Floodwater is slowed within the broad forested areas of the floodplain allowing for groundwater replacement and evaporation to take place.

The Oak Openings Region with its wet prairies and savannas, together with the connecting corridors along the Maumee River, Swan Creek, and Ottawa River should be given the highest priority for preservation. By maintaining the natural character of these areas, they will continue to benefit humans and wildlife long into the future.

Coastal Wetlands

The TMACOG region includes the largest stretches of undeveloped Ohio Lake Erie coastline. The coastal natural areas provide important habitat for insects, small fish, and many birds. They include wetlands but also provide shoreline habitat and natural beauty for both recreation users and residents. With a good habitat base, the coastal areas are a strong tourism attraction for hunting, bird-watching, and hiking. Public areas set aside significant coastal areas as preserves and/or provide public access. These include Maumee Bay State Park, Cedar Point National Wildlife Refuge, Crane Creek State Park, East Harbor State Park, Ottawa Wildlife National Refuge, Metzger Marsh, Magee Marsh, Toussaint Creek Wildlife Area, and Little Portage Wildlife Area. The Davis Besse Nuclear Power Station site preserves a large area of coastal wetlands. Their habitat supports Lake Erie fisheries and wetlands that contain and remove pollutants.

Water Resources: Lake Erie

Lake Erie is the region's greatest water resource. Indeed, it is Ohio's greatest water resource. It provides fresh water for drinking, industry, shipping, transportation, recreation, and enjoyment for its own sake. Ultimately the purpose of this entire *Areawide Water Quality Management Plan* is the protection of Lake Erie.

Lake Erie is the oldest, smallest, and shallowest of the Great Lakes. It is also the warmest, most turbid, most biologically productive, and most eutrophic. Lake Erie is divided into eastern, central, and western basins. The Eastern Basin has an average depth of 80 feet and holds lake water 322 days. The Central Basin is the largest, with an average depth of 61 feet and a detention time of 635 days. The TMACOG region is on the Western Basin, which has an average depth of 24 feet and a detention time of 51 days. The Western Basin extends from the Lake's west end at Toledo to Cedar Point at Sandusky.[12]

Lake Erie is unusual among the Great Lakes for two reasons. First of all, it is extremely shallow. At its deepest, in the eastern end of its basin, the lake is 210 feet deep. In its western end, west of the series of islands north of Catawba, depths average only 24 feet and rarely exceed 30 feet. Secondly, the axis of the lake is oriented almost parallel to both the prevailing winds from the west and southwest, and to the less common but more destructive storm winds that comes from the northeast.

Wind, passing over a lake, creates waves. In addition, due to frictional drag, the wind actually pushes some of the surface water of the lake in the direction toward which it is blowing. … The water level at the eastern end of the lake may be raised by as much as 5-6 feet, while in the western end, near Toledo, will be lowered by an equal amount. …

This "slosh" back and forth is a characteristic feature of all lakes, and it is particularly strongly developed in lakes that happen to be large, long, and shallow, like Lake Erie. Technically, such an oscillation of water from one end of the lake to the other, produced by wind or by strong changes in atmospheric pressures, is called a <u>seiche</u>, or wind tide. The period, or time necessary for the water to move both ways across a lake, varies; in Lake Erie the period of the seiche is 14 hours. … The maximum difference in level of water recorded at the west end of the lake (at Toledo) is about 12 feet, but this maximum almost never occurs; most seiches produce a difference of not more than a foot or two in the elevation of the lake.[13]

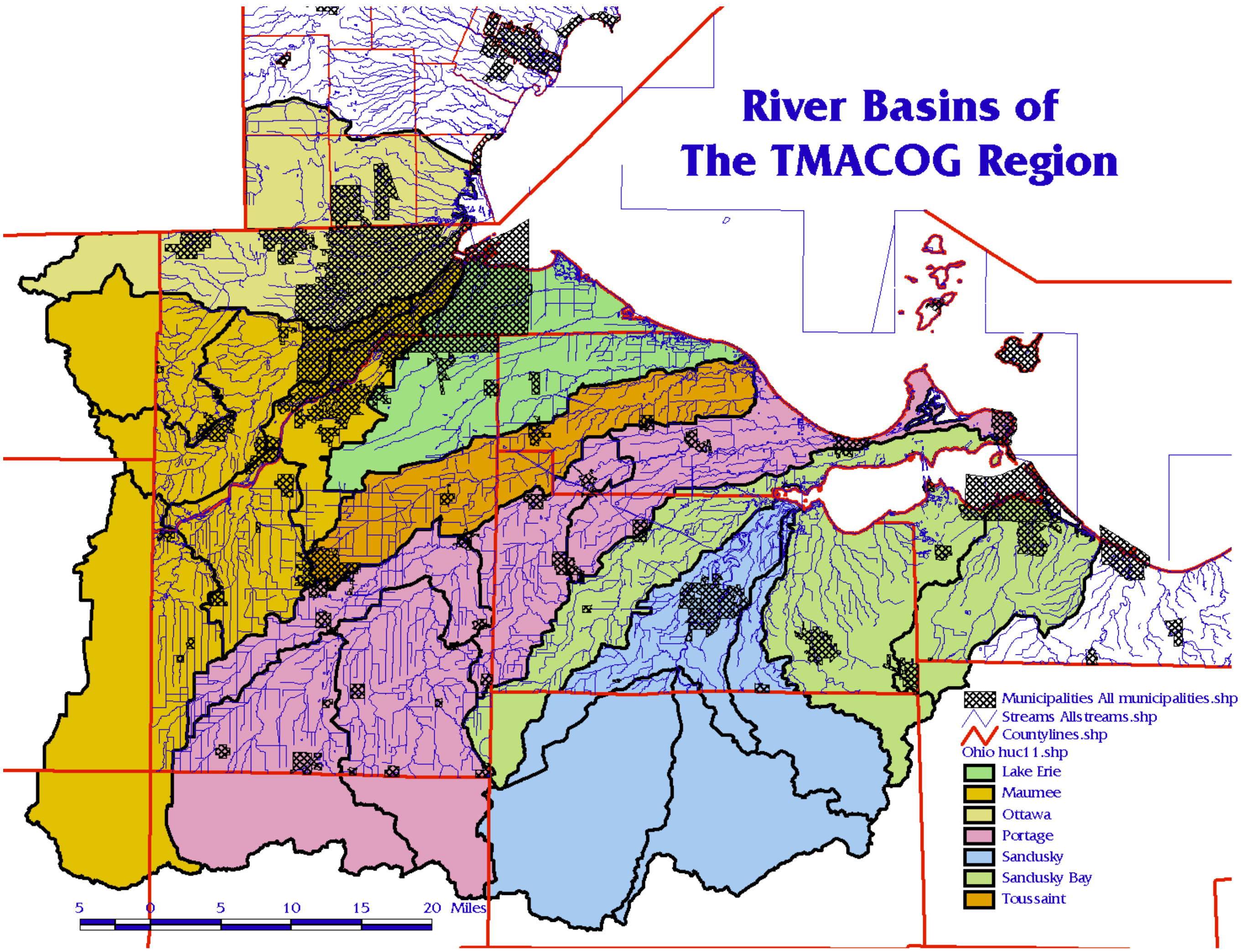
Lake Erie is sometimes likened to a long, shallow bathtub with Toledo on one end and Buffalo at the other. If you lift one end of the tub and drop it, water sloshes back and forth from one end to the other. The real Lake Erie behaves similarly, but due to wind. A wind storm can push the water northeast; levels rise at Buffalo and drop at Toledo. The weight of the high water at Buffalo then pushes back to Toledo. A seiche may include several cycles of water sloshing back and forth from one end of the lake to the other. The record water level difference between Toledo and Buffalo due to a seiche is 14 feet[14], but differences of several feet are common. The seiche causes local flooding and erosion. Southwest currents can be stronger than downstream river flows. As a result, the Maumee River flows backward as far as the Maumee-Perrysburg bridge (river mile 7), and the Portage as far Oak Harbor (River Mile 12). Other streams directly tributary to Lake Erie, or whose mouths are in the seiche zone, are similarly affected.

Rivers and Watersheds

The entire region drains ultimately to Lake Erie. Drainage occurs in three primary rivers, two secondary rivers, dozens of creeks, and hundreds of ditches. The US Geological Survey (USGS) defines drainage areas as "Hydrological Units." USGS nomenclature describes drainage through a hierarchical system of "Hydrological Unit Codes" (HUCs). The more digits in the drainage area's code, the smaller the area. Eight digit HUCs are roughly equivalent to river basins, 11 digit HUCs are equivalent to principle watersheds, and 14 digit HUCs are small sub-watersheds. For instance:

04 = Great Lakes [2 digits]
041000 = Western Lake Erie [6 digits]
04100010 = Cedar-Portage [8 digits]
04100010040 = Portage Middle Branch (below Rocky Ford to below S. Branch) [11 digits]
04100010040020 = Bull Creek [14 digits]

The river basins and "11 Digit Watersheds" are shown below.



The major watersheds of the region are listed below.

Hydrologica l Unit Code (HUC11)	Watershed	River Basin	Watershed Acres	Basin Square Miles (all or partly in TMACOG Region)	Total River Basin Area
4100010020	Toussaint Cr.	Toussaint	91,595	143	143
4100011010	Muddy Creek and north shore of Sandusky Bay	Sandusky Bay	87,300	405	
4100011140	South Shore Sandusky Bay Tributaries (above Mills Cr. to below Sawmill Cr.)	Sandusky Bay	66,742		
4100011130	South Shore Sandusky Bay Tributaries (below Sandusky R. to above Mills Cr.)	Sandusky Bay	104,859		
4100011110	Green Cr.	Sandusky	51,775	464	1,421
4100011090	Sandusky R. (below Honey Cr. to above Wolf Cr.)	Sandusky	74,620		
4100011120	Sandusky River (below Wolf Creek to Sandusky Bay [except Green Cr.])	Sandusky	69,388		
4100011100	Wolf Cr.	Sandusky	100,982		
4100010040	Middle Branch (below Rocky Ford to below S. Branch)	Portage	106,636	611	611
4100010030	Middle Branch (headwaters to below Rocky Ford)	Portage	107,826		
4100010050	Portage R. (below confluence of So. & Middle Branches to below N. Branch)	Portage	49,372		
4100010070	Portage R. (below Sugar Cr. to Lake Erie & Lake Erie Tribs [below Toussaint Cr. to Marblehead])	Portage	71,248		
4100010060	Portage River (below North Branch to below Sugar Cr.)	Portage	55,741		
4100001020	Ten Mile Cr./Ottawa River	Ottawa	94,017	147	178
4100009050	Maumee R. (below Bad Cr. to below Beaver Cr.)	Maumee	147,841	595	6,586 in Ohio; 8,316 total
4100009060	Maumee R. (below Beaver Cr. to below North Granger Island)	Maumee	53,509		
4100009090	Maumee River (below N. Granger Island to Lake Erie [except Swan Cr.])	Maumee	48,872		
4100009080	Swan Creek (above Blue Creek to Maumee River)	Maumee	69,252		
4100009070	Swan Creek (headwaters to above Blue Creek)	Maumee	61,184		
4100010010	Wolf Cr., Cedar Cr., Crane Cr. and Turtle Cr.	Lake Erie	130,995	205	

Primary Rivers

The Maumee River

The Maumee is the largest Great Lakes tributary, draining all or part of 17 Ohio counties, two Michigan Counties, and five Indiana Counties. The total river basin covers 8,316 square miles**.** The Maumee mainstem begins in Fort Wayne at the confluence of the St. Joseph and St. Mary's rivers. It flows through Defiance and Napoleon, and then into Toledo. Along the way the Maumee is joined by several major tributaries: the Tiffin, Auglaize, and Blanchard. In Wood and Lucas Counties, several smaller streams flow into the Maumee: Beaver Creek and Tontogany Creek from the south; and Swan Creek, which joins the Maumee in downtown Toledo. The area in Wood and Lucas Counties draining directly into the Maumee is comparatively small. Most drainage flows through the tributaries, and then into the Maumee. Most of the Oak Openings is in the Maumee River Basin. A large part of the basin south of the river is in the Great Black Swamp. From Grand Rapids in Wood County to Point Place near the mouth, the Maumee has a gradient of only 2 feet per mile. The steepest section is between Waterville and Maumee, at 5 feet per mile. Swan Creek's gradient is similar, at 2.1 feet per mile. Below Rossford, the Maumee is the same level as Lake Erie[15]

The Portage River

The Portage is a Black Swamp river, draining a large part of Wood County, smaller parts of Hancock, Ottawa, and Sandusky Counties, and a small area in Seneca County. The total river basin covers 611 square miles. The headwater streams are the only part of the basin with substantial fall, especially in Hancock County, in the Defiance Moraine. Most of the rest of the basin is very flat and historically was covered with wet prairies and forests, and shallow lakes with little natural drainage. Settlement and farming were made possible only through draining the swamp, and preventing floods. The headwater streams of Brush Creek, Yellow Creek, and West Creek originally flowed into the Portage North Branch. They were cut off through the Jackson Cutoff Ditch in 1878-1879. Today the Jackson Cutoff Ditch flows into the Maumee River through Beaver Creek. At Oak Harbor the Portage broadens into "Portage Pond," the estuary area. This lower reach is strongly influenced by Lake Erie and seiche flows. The highest headwater tributary is the East Branch, starting at 855' in Hancock County. The lowest headwater stream is the North Branch, starting at 700' where it was cut off from Brush Creek in Wood County. At a stream length of 60 miles, the Portage's gradient ranges from 2.1 to 4.7 feet per mile down to Lake Erie at 573'.[16]

The Sandusky River

The Sandusky River, at 1,421 square miles, is much smaller than the Maumee, but still the second largest Ohio Lake Erie tributary. The Sandusky drains parts of ten counties, with the central part of the basin covering Sandusky, Seneca, Wyandot, and Crawford Counties. The Sandusky River basin is different geologically from the Maumee and Portage, in that only the lower portion of the river is in the Huron-Erie Lake Plains Eco-Region; the upper watershed has more relief from moraine deposits. Overall, the Sandusky has a gradient of 3.9 feet per mile from headwaters to mouth at Sandusky Bay.[17] Many creeks are tributary to the Sandusky. In the TMACOG planning area, the principle tributaries are Muskellunge Creek, which drains central Sandusky County; Wolf Creek, which flows northeast from Fostoria and joins the Sandusky in Ballville Township; and Bark Creek, which flows north through eastern Fremont, and into the Sandusky near Wightman's Grove in Riley Township.

Secondary Rivers

The Ottawa River

The Ottawa River is 45 miles long with a drainage basin of 178 square miles. Its average gradient is 4 feet per mile. [18] The watershed begins in northeastern Fulton County (Ohio) where the river is known as Ten Mile Creek. It flows east through Lucas County (Ohio), where it is joined by a northern branch from Lenawee and Monroe counties (Michigan). The river continues through Lucas County until it joins Maumee Bay and Lake Erie in Monroe County.

The use of the lower Ottawa River for fishing and swimming was banned in the early 1990s by the Toledo Health Department and the Ohio Department of Health. Large signs are still posted to alert the public to avoid contact with the water. The recreational industry, which once included numerous marinas, fishing charters, and water ski clubs, has been affected by the inability to use these contaminated waters. Low lake levels and sedimentation have made the river shallow and difficult to navigate.

From river mile 7 to the mouth, the Ottawa River is directly influenced by Lake Erie storm surges and seiches.[19]

The Toussaint River

The Toussaint is a small Black Swamp river that flows from northern Bowling Green in Wood County, through Luckey, Genoa, and Rocky Ridge, and into Lake Erie in Carroll Township of Ottawa County. The drainage basin covers 143 square miles. The Toussaint's primary tributary is Packer Creek. Above their confluence, the Toussaint is considered a creek; below it, the Toussaint widens as it reaches lake level. In this lower reach, there are two important natural areas. One is the Toussaint Creek Wildlife Area. As Toledo Edison notes, "The other is the Davis Besse property. More than 700 of the 900-plus acres Davis-Besse site is dedicated as a wildlife preserve. The site is in the migration flyway of many kinds of waterfowl, including Mallard ducks and Canada geese."[20]

The Toussaint watershed is a highly agricultural area; the largest town is Genoa, with a population of 2,230 in 2000. The watershed includes dolomite limestone quarries near Woodville, Genoa, Clay Center, and Rocky Ridge. The former Brush Beryllium plant site in Luckey is planned for a clean-up of contaminated soil by the US Army Corps of Engineers.[21] The Davis Besse Nuclear Power Station is located at the mouth of the Toussaint.

Bays and Lake Erie Drainage Areas

Maumee Bay

The Maumee River flows into Maumee Bay, and from there into Lake Erie. The Bay is bordered by Woodtick Peninsula in Erie Township of Monroe County Michigan, and Little Cedar Point in Jerusalem Township of Lucas County. Maumee Bay has a number of important tributaries besides the Maumee River. They include the Ottawa River, Halfway Creek, and Silver and Shantee Creeks to the north of the Maumee River; and Duck Creek, Otter Creek, Wolf Creek/Berger Ditch, as well as numerous ditches. The Maumee Bay watershed is part of the Great Black Swamp. The bay is shallow, and its shoreline has retreated greatly over the years. The shoreline of Maumee Bay retreated southward as much as 20 feet per year, the fastest shoreline rescission in Ohio. Between 1844 and 1970 the southern shoreline of Maumee Bay retreated 2,000 feet. [22] In 1976 the average depth of Maumee Bay was 2 feet less than 1844, and the reduction has been attributed to deposition of sediments from culturally induced processes. "The shallow depths, wind, and wave activity tend to sustain high background turbidity in the Bay."[23] Maumee Bay coastal areas include important natural habitat areas, including the Maumee Bay State Park, and Cedar Point National Wildlife Refuge.

Sandusky Bay and Mud Creek Bay

At its mouth, the Sandusky River watershed is narrow. Drainage goes directly to Sandusky Bay, through Mud Creek, and many small streams. The Sandusky Bay watershed is in the Huron-Erie Lake Plains Eco-Region. Eastern Sandusky, western Erie, and northeast Seneca Counties are underlain by a karst limestone geologic formation that stretches from Seneca County to Lake Erie at Sandusky. Karst bedrock is porous, with sinkholes that allow surface runoff to drain directly into groundwater. Because karst limestone is porous, water flows through it much more quickly. Drinking water sources that draw their supply from the karst aquifer are very vulnerable to contamination. The Sandusky Bay coastline includes many wetlands and natural areas, some of which are preserved in the Pickerel Creek Wildlife Area and Blue Herron Reserve.

Groundwater

Understanding the groundwater of the region begins with bedrock, and the overlying layers of gravel, sand, silt, and clay left behind by glaciers and glacial lakes. Most of the bedrock in the region is dolomite, a magnesium-bearing form of limestone. There are a number of different layers of dolomite in the region, of different ages and chemical compositions. These differences result in differing commercial uses and values; physical strength; and presence, depth, and quality of groundwater. There are smaller areas of sandstone and shale, notably in northwestern Lucas County. Several reports present extensive information about the geology and hydrogeology of the region (Forsyth 1968, USGS 1991, ODNR 1970).

The soils and terrain of the region result from the advance and retreat of glaciers and glacial lakes. Between 14,000 and 12,200 years ago glaciers advanced and retreated across Ohio at the end of the Ice Age. During this time a series of lakes covered what is now the Lake Erie basin, at elevations ranging from 640 to 800 feet. Lake Erie came into existence about 12,000 years ago at an elevation of about 492 feet, compared with today's level at 571 feet. The glacial lakes, starting with the oldest, are known to geologists as Lakes Maumee, Arkona, Ypsilanti, Whittlesey, Warren, Wayne, Grassmere, Lundy, and Erie. Lake bottoms left behind flat silt-clay deposits that became the Great Black Swamp. Former beaches are now sand ridges, and retreating glaciers left behind moraines.[24]

Roughly 100,000[25] of the region's 716,000 residents in 2000 used private wells for drinking water. In addition, eleven villages supply public water from wells. Though the number of residents using groundwater has declined over the years, it remains an important source of drinking water, both for public systems and private wells. The depth of soil or till to bedrock varies widely. In some buried valleys, the depth to bedrock exceeds 100 feet. In other areas, scattered throughout the region, the bedrock is at the surface.[26]

Groundwater is pumped from aquifers in bedrock or glacial till. Except for the shale of northwest Lucas County and southwestern Monroe County, nearly all the bedrock in the region is dolomite, a magnesium-bearing form of limestone. Shallow wells draw water from sand, gravel, or soil overlying the bedrock. This shallow aquifer tends to be softer than water from a bedrock aquifer, but is more susceptible to contamination from the surface. Since most of the bedrock in the region is limestone or dolomite, water drawn from it is said to come from the carbonate aquifer.

Dolomite is quarried in several parts of the region for crushed stone and concrete aggregate. In eastern Ottawa County there are inactive gypsum quarries. In some areas the rock is pure limestone, and is quarried for cement or agricultural lime.

Dolomite is naturally, if slowly, soluble in water. Some types form underground cavities or caves over time. In some areas the solution cavities erode the bedrock, and the soil collapses in from above. Collapsed cavities in the bedrock are called sinkholes, and this type of geologic structure is referred to as a Karst formation. There are two karst formations in the region: in eastern Sandusky County[27], and in Monroe County[28]. Sinkholes are a threat to groundwater quality because they are a place where surface pollutants can quickly and easily enter. Karst formations are of concern because groundwater moves through a karst area very quickly compared to other types of bedrock. Contaminants entering a karst formation can move hundreds of feet per day.

Generally the region's groundwater is safe for drinking. Where wells are contaminated, the contamination is localized. A few of the sources of potential contamination are surface runoff entering the ground through a sinkhole or well casing, septic systems, or underground storage tanks. Generally speaking, pollutant on the ground that has a water pathway into the soil has the potential to contaminate drinking water. Safe drinking water is usually measured by concentrations of fecal bacteria, which would indicate the presence of sewage or manure; or nitrate concentrations over 10 mg/l. Chapters 5 and 6 discuss the human health impacts of nitrates, known as Methemoglobinemia, or "blue baby syndrome". In many parts of the region raw groundwater is undesirable for drinking and other household uses because of high levels of hardness, iron, and sulfur. Some form of treatment, therefore, is typically necessary when using this important source of water.

Two studies of private well water quality have been conducted. In 1985-1988 the US Geological Survey (USGS) studied groundwater quality in Lucas, Wood, and Sandusky Counties by testing 135 wells and 11 springs for 52 parameters. The study found 36 of 125 well samples unsafe based on total coliform bacteria counts (4 or more colonies per 100 ml). Two well samples exceeded the safe nitrate level of 10 mg/l.[29]

The Heidelberg College Water Quality Laboratory surveys private well water quality by offering well tests at an affordable cost. The program started in 1987 and still continues. Tests cover nitrates and inorganic chemicals, metals, pesticides, and volatile organic compounds. Heidelberg College notes, "The results of the program indicate that the extent of nitrate contamination varies greatly from county to county. Many agricultural counties have very little nitrate contamination in private wells, while other counties have considerable contamination. As of April 2003, 52,700 wells have been tested nationwide. Slightly less than half of the wells tested are from Ohio. No trace of nitrate contamination was found in 65.7% of the wells. In 4.2 % of the wells, nitrate concentrations exceeded the drinking water standard of 10 mg/l (ppm). Atrazine in excess of its drinking water standard of 3.0 ppb has been found in only 0.3 % of the 20,303 wells tested."[30] An older Heidelberg College study[31] analyzed the private well testing by County in Ohio.

County	Private wells tested (1988)	Percent of wells over 10 mg Nitrate per liter	Average Nitrate concentration, mg/l
Lucas	183	2%	0.65
Ottawa	184	4%	0.22
Sandusky	183	5%	0.71
Wood	81	4%	0.99

In some cases septic system failures have contaminated many private wells in an area. In Catawba Island Township of Ottawa County[32], and the Stearns Crest/Flechtner Heights[33] subdivisions near Fostoria, well contamination led to the installation of sanitary sewers. In Chapter 4, the Facility Planning Area descriptions note areas with groundwater contamination due to failed septic systems.

Water Quality Baseline

Water Quality Standards

The way we measure the cleanness of water has changed with our society. We put water to many uses, and each use has its own requirements as to how clean water needs to be:

Water Use	Water Quality Requirements
Commerce	Navigation
Industry, agriculture, power generation	Free of debris and pollutants to serve the industrial purpose, without damaging equipment or plumbing
Recreation (swimming, boating)	Microbes such as bacteria and viruses must be at low enough levels not to cause infection. Free of toxics and chemical irritants
Public supply	Must be safe to drink: free from toxics, microbes, and carcinogens, and free of unpleasant taste and odor.
Fishing	Water and sediments must be free of toxics. Nutrients (nitrates, phosphates) must be below levels that cause "toxic algae" blooms. River sediment deposits must not cover feeding or spawning areas. Water must contain dissolved oxygen to support life. Headwater streams must meet these standards to produce a food chain that ultimately feeds the fish in Lake Erie. Some fish (like carp and bluegill) are pollution tolerant, while others (like trout) are intolerant.
Natural habitat, rare or endangered species	Sediment loadings, nutrients, and toxics must be at low levels. Streams should have shaded areas to keep water cool, and riffles to provide oxygenation. The more streams that meet these qualities, including small headwater streams, the better the watershed habitat will be.

Measuring Water Quality

"Is this stream polluted?" "Is this stream cleaner than that stream?" These questions are more complicated than they sound. There are many different types of pollutants, with different impacts on human and ecological health. The earliest water pollution laws were concerned with eliminating odors and visible pollution from sewage and industrial waste. In the early days of the Clean Water Act, water was "clean" if it passed a series of chemical tests. Parameters used to measure water quality are summarized below.

Physical

Stream sampling usually includes physical characteristics of the water: temperature, acidity (pH), and sediment load (suspended solids, turbidity).

Chemical

All stream water contains chemicals. Many are benign in moderate concentrations. Some are necessary for a healthy ecosystem. Constituents include hardness (calcium, magnesium), chlorides, organic content (biochemical oxygen demand, BOD), nutrients (various forms of phosphorus and nitrogen), and dissolved oxygen. Dissolved oxygen is essential for aquatic animals; nutrients are discussed later in this chapter.

Other chemicals can be less benign, and may be toxic and/or carcinogenic.

Industrial

There are many industrial chemicals in waterways. Three categories are usually of greatest concern. Metals —cadmium (Cd), chromium (Cr), lead (Pb), copper (Cu), zinc (Zn), and mercury (Hg)— can cause toxic effects depending upon the metal and concentration. Polychlorinated biphenyls (PCBs) are recognized as probable carcinogens. Now banned, PCBs were once widely used in manufacturing. Polycyclic Aromatic Hydrocarbons (PAHs) are a related class of toxic chemicals, byproducts petroleum products, such as creosote. Other chemicals may be present, depending on the area's industries. Other industrial chemicals include arsenic (As), cyanide (CN), phenol, and beryllium (Be).[34] Many industrial contaminants have a tendency to bond or diffuse into organic particles such as silts and fatty tissues in biota. As a result, these types of chemicals are often concentrated in stream sediments, where they may stay for years, move with the sediment, or enter and biocumulate through the food chain posing risks to higher-level animals (for example osprey, eagles and mink) as well as humans. Many industrial chemicals, like PCBs and certain PAHs are also resistant to biodegradation and remain in the environment for decades.

Pesticides

Pesticides are used to protect gardens and farms from nuisance insects and weeds. DDT has been banned for years, and is gradually decreasing in the environment. A variety of pesticides are used for agriculture and residential gardens, including "Triazines," Atrazine and Simazine. At certain exposure levels, they are potential carcinogens. Public drinking water supplies are monitored and regulated for pesticides.[35] EPA notes:

Pesticides and their effects on human health are often the focus of debate between scientists, environmental groups, public water systems and the public. Two important issues included in the debate center on exposure, or the amount of these chemicals that people either ingest or inhale, and the duration of the exposure. Exposure is an important issue because the amount of a chemical either ingested or inhaled and the length of the exposure determine whether or not human health will be negatively affected. Consuming water that is contaminated with pesticides is one route of exposure that has made headlines over the last several years.

The U.S. EPA has established different drinking water criteria for both short term and long term exposure periods. For children, health advisories are established for exposure durations of 1-day, 10-days and 7-years. For adults, health advisories are calculated for 7-years and lifetimes (all health advisories are non-enforceable). In addition to health advisories, the U.S. EPA has established maximum contaminant levels (MCLs), which are enforceable standards that are based on a lifetime of exposure. Compliance with the MCL is based on a public water system's running annual average of all samples taken during a 12 month period. Consumption of water with chemical concentrations less than or equal to a health advisory or MCL for the duration of time covered by the criteria or standard is considered by U.S. EPA to pose negligible health risks.[36]

Bacterial

Bacterial water pollution refers to bacteria from the intestinal tracts of warm-blooded animals. They cause a variety of diseases, and are discussed later in this chapter.

Biological

Today water quality is measured by a stream's ability to support life. The chemical tests are still important, but so are spawning areas, siltation, and vegetation along the stream banks. Ohio EPA classifies each stream with a "use designation." A use designation calls up a set of standards based on the water quality that could be expected in a stream. For instance, the quality of a coldwater stream flowing down out of the mountains over a rocky stream bed would likely be higher than a flat stream with a muddy bottom. The flatness of most of the streams in our region means that they are less likely to achieve high standards than streams in other parts of the state with more slope and turbulence. The majority of streams in our region are classified as Warmwater Habitat (WWH) or Modified Warmwater Habitat (MWH).[37]

Ohio EPA measures a stream's Aquatic Life Use Designation attainment with a series of index scores. Two of the indexes are the Index of Biotic Integrity (IBI) and Invertebrate Community Index (ICI). These indexes are derived from the number of fish, insects, and invertebrates in a stream, their health, the number of different species, and how pollution-tolerant those species are. For instance, mayfly larvae are pollution intolerant, so their presence indicates good water quality.[38] The Ohio Water Quality Standards several other Use Designations as well, including Public water Supply and Recreation.

Another index, the Qualitative Habitat Evaluation Index (QHEI), measures a streams habitat quality. It considers the stream substrate (e.g., boulders, pebbles, sand, silt, mud), type and amount of vegetation on stream banks, and stream vegetation.

River Water Quality

To ask how clean a river is, ask what percentage of a river is in full attainment with water quality standards, in partial attainment, or in non-attainment. Is the water quality impaired [due to pollution]? What are the causes and sources of that impairment? The following tables summarize the water quality of the Maumee, Sandusky, and Portage Rivers in 2002.[39]

Assessment Unit Description		Watershed Size (sq. mi.)	
Maumee River Mainstem (Indiana border to Lake Erie)		6,608.0	
Aquatic Life Use Assessment			
Sampling Year(s) 1992, 1993, 1996, 1997	AU Total Length (miles):	107.87	
	AU Monitored Miles	94.35	
Aquatic Life Use(s): WWH (Warmwater Habitat)	# Sites Sampled:	51	
	# Miles Full Attainment:	44.00	
Impairment? Yes	# Miles Partial Attainment:	13.15	
	# Miles Non-Attainment:	37.20	
	% Attainment (Monitored Miles)		
	Full	Partial	Non
Large River AU Attainment Status:	46.7%	13.9%	39.4%

High Magnitude Causes	High Magnitude Sources
Flow Alteration	Nonirrigated Crop Production
Other Habitat Alterations	Channelization - Agriculture
Turbidity	Combined Sewer Overflow
Nutrients	Major Municipal Point Source
Unionized Ammonia	
Siltation	
Total Toxics	

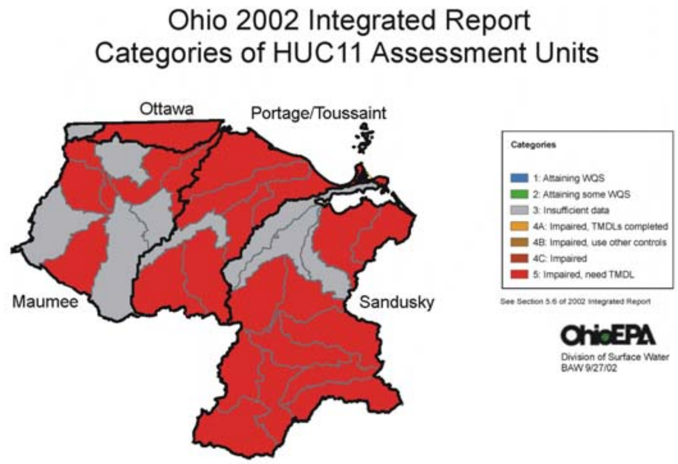
Assessment Unit Description		Watershed Size (sq. mi.)	
Sandusky River Mainstem (downstream Tymochtee Creek to mouth)[40]		1420.0	
Aquatic Life Use Assessment			
Sampling Year(s) 2001	AU Total Length (miles):	65.73	
	AU Monitored Miles	47.73	
Aquatic Life Use(s): WWH (Warmwater Habitat)	# Sites Sampled:	15	
	# Miles Full Attainment:	47.73	
Impairment? Yes	# Miles Partial Attainment:	0.00	
	# Miles Non-Attainment:	6.50	
	% Attainment (Monitored Miles)		
	Full	Partial	Non
Large River AU Attainment Status:	86.4%	0.0%	13.6%

High Magnitude Causes	High Magnitude Sources
Siltation	Hydromodification-Development
Other Habitat Alterations	Dam Construction-Development
Flow Alteration	

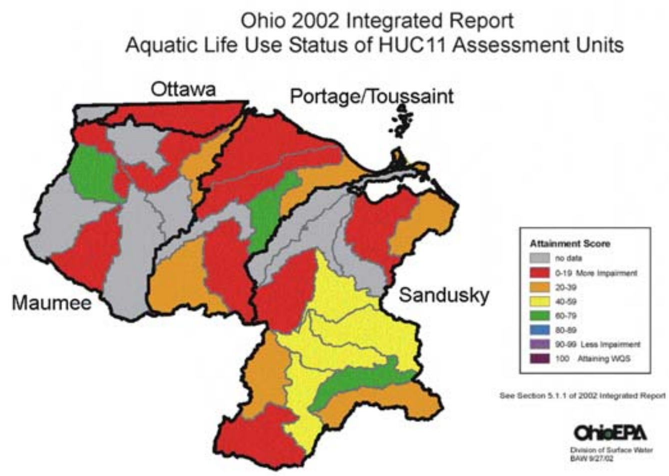
Assessment Unit Description		Watershed Size (sq. mi.)	
Middle Branch Portage River (headwaters to downstream Rocky Ford Creek)		168.6	
	% Attainment (Monitored Miles)		
	Full	Partial	Non
Small Streams (sites w/<50 mi^2 drainage):	25.0%	25.0%	50.0%
Large Streams/Rivers (sites w/>50 mi^2 drainage):	21.7%	78.3%	0.0%
Middle Branch Portage River (downstream Rocky Ford Creek to downstream South Branch)		166.7 sq. mi.	
	% Attainment (Monitored Miles)		
	Full	Partial	Non
Small Streams (sites w/<50 mi^2 drainage):	16.7%	0.0%	83.3%
Large Streams/Rivers (sites w/>50 mi^2 drainage):	0.0%	100.0%	0.0%
Portage River (downstream North Branch to downstream Sugar Creek)		87.1 sq. mi.	
	% Attainment (Monitored Miles)		
	Full	Partial	Non
Small Streams (sites w/<50 mi^2 drainage):	50.0%	0.0%	50.0%
Large Streams/Rivers (sites w/>50 mi^2 drainage):	96.2%	3.8%	0.0%
Portage River (downstream Sugar Creek to mouth); Lake Erie tributaries west of Marblehead		111.3 sq. mi.	
	% Attainment (Monitored Miles)		
	Full	Partial	Non
Small Streams (sites w/<50 mi^2 drainage):		0.0% (no data)	
Large Streams/Rivers (sites w/>50 mi^2 drainage):	22.3%	8.6%	69.1%

High Magnitude Causes (all Portage watersheds)	High Magnitude Sources (all Portage watersheds)
Siltation	Combined Sewer Overflows
Organic Enrichment/DO	Highway/Road/Bridge/Sewer Line
Turbidity	Onsite Wastewater Systems (Septic Tanks)
Flow Alteration	Upstream Impoundment
Other Habitat Alterations	Bridge Construction
	Major Municipal Point Source
	Nonirrigated Crop Production
	Pasture Land
	Channelization – Agriculture
	Drainage/Filling of Wetland - Ag.

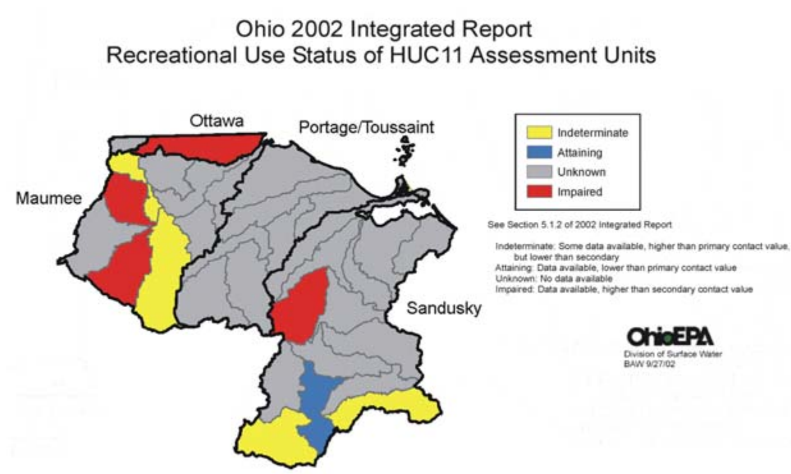
The Ohio EPA 2002 Integrated Report provides statewide maps showing the attainment status of watersheds.[41]



The first map shows overall whether individual watersheds ("HUC 11 Assessment Units") meet use attainments. Watersheds in our region are either impaired, or lack sufficient data.



The second map shows percentages of streams that meet aquatic standards. The majority of streams are less than 20% attainment, or do not have sufficient data. There are watersheds that score in the moderate to good range, notably the Portage and upper Sandusky.



The third map shows attainment based on recreational use. The Ottawa River is shown as impaired, and there is insufficient data for the rest of the region.

The water quality of our rivers can be summarized as follows:

- The majority of our streams are impaired and do not meet water quality standards
- Nonetheless, many individual streams are of good quality. The Sandusky and portions of the Portage mainstem are examples.
- The larger streams overall rate much better than the small streams. This is due to less streambank habitat along small streams; direct impact of nonpoint source pollutants from neighboring land.
- It is still important to operate and maintain municipal and industrial wastewater systems. However, the reasons rivers do not meet attainment are usually due to non-point source pollution, siltation, or stream alteration.

Advisories

When consumption of fish, or contact with water or stream sediments, may endanger public health, a regulatory agency may issue an advisory. It is advice to the public not to eat certain types of fish, or not to swim in certain streams.

In Ohio, fish consumption advisories are issued by the Ohio Department of Health and Ohio EPA. Current advisories and additional references are available on the web.[42] They advise not eating certain types of fish from some streams, or limiting how often you eat certain types of fish. A summary of the advisories is given below. Please refer to the Ohio EPA website, or the *Ohio Sport Fish Consumption Advisory* for a current and complete listing.[43]

Water Body	Fish Consumption Advisory	Contaminants
Lake Erie	Limits on consumption of about a dozen fish species. Advisory against eating channel catfish over 16"	PCBs
Maumee River	Limits on consumption of largemouth and smallmouth bass, carp and drum	Mercury and/or PCBs
Maumee River	Advisory against eating any channel catfish	PCBs
Ottawa River (I-475 @ Wildwood to mouth)	Advisory against eating any fish	PCBs
Portage River North Branch	Limits on consumption of carp	PCBs
Portage River	Limits on consumption of largemouth and smallmouth bass, channel catfish, and carp	Lead and/or PCBs
Sandusky River	Limits on consumption of largemouth bass, channel catfish, and carp	Mercury and/or PCBs

When a river is judged unsafe for swimming or wading, a regulatory agency posts an advisory. It is advice to then public to avoid physical contact with the waters of these streams. Ohio EPA and the Ohio Department of Health jointly issue advisories due to contaminants. Local Boards of Health may also post advisories due to fecal contamination. Long term swimming advisories in the region are given below.

Water Body Do Not Swim Advisory	Issued by	Reason
Ottawa River (I-475 @ Wildwood to mouth)	Ohio EPA and Ohio Department of Health	PCBs
Ottawa River	Toledo/Lucas County Health Department	Fecal bacteria

The Ohio Department of Health conducts a beach testing program[44]. Public swimming beaches are tested regularly throughout the season for fecal contamination, based on concentrations of fecal coliform or *E. coli*. When bacteria levels at a beach exceed standards, an advisory is posted. The advisory is taken down or re-posted as tests warrant throughout the summer. The region's public bathing beaches are listed below[45].

Public Bathing Beach	County
Maumee Bay State Park	Lucas
Crane Creek State Park	Lucas
Bay Point	Ottawa
Camp Perry	Ottawa
East Harbor State Park	Ottawa
Gem Beach	Ottawa
Lakeside	Ottawa
Port Clinton City Beach	Ottawa
Beachfront Condos (formerly Venture Beach)	Ottawa
South Bass Island State Park	Ottawa
Wild Wings Beach Club	Ottawa
Y-Condo Beach Club	Ottawa
Luna Pier Beach	Monroe

Lake Erie Water Quality

"Toxic Algae" Blooms and Dead Zones

All water in the region flows to Lake Erie, and that is the ultimate resource we seek to protect and enhance for the benefit of the region and its citizens. In the late 1960s national headlines heralded the death of Lake Erie, and talked about the Cuyahoga River catching fire. Industrial waste was part of the problem, but the fact that a river could catch fire was an effect, not the cause of, Lake Erie's dying.

"Eutrophic" is a term that describes a lake enriched with nutrients (phosphates and nitrates) and organic matter. That enrichment results in increasing biological productivity. In the case of Lake Erie, the eutrophication process has been accelerated by its over-nourishment. Studies in the 1970s and early 1980s identified phosphate as critical nutrient for eutrophication. The amount of phosphate entering Lake Erie dictated the rate of eutrophication.

For Lake Erie, "over-nourishment" meant accelerated nuisance growths (blooms) of cyanobacteria. These cyanobacteria are photosynthetic, and were once thought to be blue-green algae.[46] Their blooms are still popularly called "toxic algae." The immediate effect was to make Lake Erie an unpleasant recreation area because of the cyanobacteria's strong odor. Over the following winters, the mass of cyanobacteria would die and sink to the bottom of the lake. The following season, the dead cyanobacteria would decay at the bottom of the lake, and deplete oxygen dissolved in the water. Fish and other aquatic life also need oxygen. Areas of the lake without oxygen are called "dead zones" because fish can't live there. The bigger the dead zones, the worse the impact on Lake Erie fish.

In 1983 the US and Canada ratified Annex III of the Great Lakes Water Quality Agreement. This agreement called for the reduction of annual phosphorus loading to 11,000 metric tons, estimated to be enough to eliminate the "algae" blooms and the resulting dead zones.[47] The needed 11,000 ton reduction was allocated among the watersheds, and split between point and non-point source loadings. Ultimately the required non-point source reductions were assigned to individual counties, with targets for agricultural and urban runoff reductions. The phosphorus reduction targets for our region were:[48]

Tributary	Point Source Phosphorus Reduction Target, metric tons per year	Non-Point Source Phosphorus Reduction Target, metric tons per year	Total Phosphorus Reduction Target, metric tons per year
Ottawa	0.0	74.2	74.2
Maumee (the 74% in Ohio)	22.5	2,113.3	2,335.8
Portage / Toussaint	13.7	535.1	548.8
Sandusky	44.1	711.4	755.5

Public agencies took a number of steps to achieve these reductions in the amount of phosphorus entering Lake Erie:

- The discharge permit requirements for sewage treatment plants were strengthened. Phosphorus discharges were reduced to 1.0 mg/l for treatment plants discharging over 1 million gallons per day.
- The Ohio legislature banned phosphorus from laundry detergents sold in the Lake Erie drainage area (includes all of the TMACOG region)
- Sanitary sewers have eliminated thousands of septic systems. In the TMACOG region numerous small communities have public sewers that did not in 1982. All these communities had documented water pollution problems due to septic systems.
- Agricultural agencies and the county Soil and Water Conservation Districts promoted conservation tillage, buffer strips, and other Best Management Practices to reduce phosphorus runoff from farmland. Financial incentives have encouraged these practices through programs such as the Conservation Reserve Enhancement Program and the EPA “319” nonpoint source program. These incentives are discussed in Chapter 6.
- US EPA established the NPDES Stormwater Permit program. It requires urban jurisdictions to identify and control pollution from urban runoff. Large cities were required to apply for permits by 1998, and smaller jurisdictions in urban areas by 2003. The NPDES Stormwater program also regulates construction sites that disturb more than an acre of land. Chapter 7 discusses Stormwater permit regulations.

Throughout the 1980s and 90s the water quality of Lake Erie improved. The dead zones were greatly reduced, and the fish populations recovered.

In the 1990s Zebra Mussels spread throughout Lake Erie and changed the balance. These small filter feeders were accidentally introduced from eastern Europe. They thrived in Lake Erie and its tributaries, encrusting boats, docks, water intakes, and everything else in the shallow waters. They certainly made the lake clearer and more attractive. They did not make the lake cleaner, but they did change the routing of nutrients through the ecosystem. Their ecological impact is still not completely understood.

In 2002 and 2003 the dead zone reappeared in the Central Basin of Lake Erie, and the “toxic algae” bloom returned. “Toxic algae” extended into the Western Basin and Maumee Bay. The question is, what has happened in Lake Erie that the actions taken in the ‘80s and ‘90s are no longer having their full effect? There are many theories, but no conclusive answers yet.

In 2002 the International Joint Commission discussed the issue in its biennial report on Great Lakes Water Quality:

Twenty-five years ago, numerous scientific studies conducted by the Commission’s Pollution From Land Use Activities Reference Group resulted in the Parties adopting policies and programs to manage *phosphorus for each lake basin through a variety of point and nonpoint source control measures. This linkage of science and policy resulted in programs to reduce phosphorus loads to the Great Lakes based on reduction targets as set out in Annex 3. The achievement of a target load for each lake is currently represented by a specific outcome: concentrations of phosphorus in the open waters. For lakes Superior, Huron, Michigan and Ontario, concentrations indicate that progress has been sustained. In the case of Lake Erie, however, open water concentrations of phosphorus often exceed the guideline, indicating that phosphorus is being released into the lake by sources or processes not fully understood. …*

Major tributaries to Lake Erie, such as the Maumee River, have achieved notable decreases in suspended sediment discharges and reductions in phosphorus loads as a result of improved agricultural practices. However, these tributaries are still very large sources of phosphorus with year-to-year loads varying with the frequency and intensity of flooding. For example, phosphorus stored in the sediment of tributaries can build up during dry or average rainfall years and can serve as a substantial load to the lake during a single flood event. Such major events could become common in the Great Lakes as a result of climate change, adding a further management challenge to achieving target loads.[49]

Nutrients, Habitat, and Water Quality

Phosphorus is considered the critical nutrient where Lake Erie is concerned, but "algae blooms" also require nitrates. Concern over nitrate usually centers on its drinking water impacts, but does it also control algae growth? The question is important to public policy. Nitrates are soluble in water, so controlling nitrates means controlling water. Phosphorus attaches to sediment, so controlling phosphorus means controlling sediment. What should be the priorities of environmental agencies?

Ohio EPA discusses the critical factors of whether streams are likely to meet water quality standards.[50]

- Streams in the Huron-Erie Lake Plains and its neighboring Eastern Corn Belt Plains eco-regions have the highest background levels of phosphorus and nitrate [pages 1-2].
- Small streams with low phosphorus levels have the best aquatic communities, and therefore are more likely to meet water quality standards. As phosphorus levels rise, the aquatic community quality decreases [2].
- Habitat is a critical part of the stream environment. Best Management Practices to reduce erosion without considering habitat will not restore aquatic life to meet water quality standards, even though overall sediment and nutrient loadings may be reduced. Stream projects should restore the riparian functions that are lost when streams are channelized [3].
- Along streams where habitat has been irretrievably modified, habitat controls whether that stream meets water quality standards, rather than nutrient loadings [3].
- In streams and rivers phosphorus is more often a limiting factor in algal growth than nitrate [24].
- Nitrate is less frequently the limiting nutrient in algal growth. Nitrate levels only affect stream aquatic life scores in headwater streams with high nitrate levels (i.e., medians above 3-4 mg/l) [2, 29].

Our conclusion is that our primary focus needs to be reduction of sediment and phosphorus, but in conjunction with stream habitat restoration. Additional efforts to nitrate control may be needed for small streams with high average nitrate levels. Nitrate levels over 3-4 mg/l are not uncommon.

For bays and Lake Erie, research and policy emphasizes phosphorus and sediment reduction to control nuisance "algae blooms" and protect aquatic habitat. Continuing research could change those priorities.

The Heidelberg College Water Quality Lab conducts a Lake Erie Tributary monitoring program that provides nearly a thirty year continuous record of nutrient and sediment loadings. Two of its principle sites are the Maumee River at Waterville and the Sandusky River at Ballville.[51]

Sediment

Sediment is a pollutant in its own right. Ecologically it is important because phosphorus attaches to and is carried with sediment. Generally speaking, actions that reduce the amount of sediment going into the lake will reduce the amount of phosphorus. When sediment settles out, it covers the bottom of streams, bays, and the lake. Doing so, it covers fish feeding and spawning areas.

Accumulating sediment ultimately makes Maumee Bay and some nearshore areas inaccessible. The Toledo shipping channel connects the Maumee River with the Western Basin of Lake Erie. It is dredged some 20 feet below the floor of the Maumee River and Maumee Bay for a distance of 22 miles. Without annual dredging, which averages about 950,000 cubic yards per year[52], the Port of Toledo cannot operate. Recreational access is affected too. The Ottawa and Toussaint Rivers have needed dredging in recent years, as have some marinas. Access to marinas is also strongly influenced by the fluctuating lake levels.

The biggest environmental issue with sediment is what to do with the material dredged from the Toledo shipping channel?

Since the mid 1980s the dredged material disposal has been split between a Confined Disposal Facility (CDF) and open-lake disposal. Sediments contaminated by chemicals or metals are placed in the CDF. Uncontaminated sediments (which are still a pollutant) have been confined or dumped out in the lake, depending on CDF capacity. Here are the issues and trade-offs:

- CDFs are expensive to build. When a CDF is full, it is necessary to expand it or build another one.
- CDFs cover lake bottom, which is habitat for fish and other aquatic organisms.
- A new or expanded CDF can interfere with access and enjoyment of the lake by lakefront property owners.
- Placing dredged materials removes the sediment and any chemicals they contain from the ecosystem. Confining uncontaminated sediments benefits water quality by taking sediment and phosphorus out of the system.
- Open lake disposal of dredged materials may promote eutrophication by bringing sediment and phosphorus back into contact with the lake water.
- Dredged materials dumped out in the lake may be washed back into the bay by storms. By not removing sediments from the lake, we could be dredging the same sediments year after year. Sediment currents in Maumee Bay are not well understood, and are influenced by the seiche, the shallowness of the bay, and strong flows from the Maumee and Detroit Rivers. A recent study commissioned by the Toledo-Lucas County Port Authority has greatly contributed to our understanding of sediments in Maumee Bay.[53]
- Dredging is necessary for the Port of Toledo to operate. It is one of the largest ports on the Great Lakes, and it is economically very important to the region.

Bacteria

Fecal bacteria can carry a variety of disease organisms, including typhoid fever, cholera, dysentery, infectious hepatitis, and numerous others.[54] There were outbreaks of cholera in northwest Ohio before public sewerage systems came into use.[55] In terms of public health, fecal bacteria are the most critical pollutant. Waterborne disease can lead to sickness and death within days. Major outbreaks of these diseases are a thing of the past — a tribute to our public health and wastewater treatment systems.

The sources of fecal bacteria are birds, mammals, and humans. Sewage in water is detected by testing for "indicator" bacteria. One indicator group is called fecal coliform. These bacteria are present in sewage and contaminated water in far greater numbers than pathogens. As such, they are easier to detect, and demonstrate the presence of fecal matter. In recent years many regulatory agencies have begun using a test for a specific bacterium, *Escherichia coli* (*E. coli*).

In streams, the presence of fecal coliform has documented the need for sewerage facilities to eliminate septic systems, package plants, sewer overflows, and to mandate improved sewage treatment. Despite these improvements, fecal bacteria counts often exceed standards at public beaches. This problem is not unique to our area; in fact, it is very common on beaches nationwide.

There are many possible sources of fecal bacteria, as noted above. Understanding what bacteria sources contaminate a given beach is complicated by the question of survival. Normally fecal bacteria do not survive long in a waterway. Studies of Maumee Bay and Wolf Creek in eastern Lucas County indicate *E. coli* accumulate in stream sediment, where they may survive for extended periods and be stirred up again by a later storm.[56] Further research is needed for a better understanding of the sources of fecal contamination, survival, and travel in Maumee Bay and the Lake Erie nearshore.

Legal Basis of the *Areawide Water Quality Management Plan*

The final issue to cover in this chapter is background for the "208" *Areawide Water Quality Management Plan* itself. This includes the plan's legal basis, requirements, and the process by which it is updated or amended.

The Federal Water Pollution Control Act Amendments of 1972 called upon Areawide agencies such as TMACOG to develop Areawide Water Quality Management Plans. The Areawide Plan described under §208 of the Act, is certified by the Governor of State as part of the State's Water Quality Management Plan. Many agencies -- federal, state, areawide, and local - are given specific responsibilities to implement specific provisions of the Act.

Water Quality Management Plan Requirements

The Clean Water Act sets Water Quality Management Plan (WQMP) requirements for both states and Areawide Agencies. Section 208 describes the requirements for Areawide plans, and §303 describes state requirements. The state's WQMP incorporates all the Areawide plans. After amendments to an Areawide plan have been adopted by TMACOG, they go onto the State agency for certification and inclusion in the State plan. The TMACOG *Areawide Water Quality Management Plan* was originally certified by Michigan Governor William G. Millken on January 9, 1980; and by Ohio Governor James A. Rhodes on May 4, 1981.

Current US EPA regulations require fundamentally the same elements, but are less rigid about which are prepared by the State and which by the Areawide. The regulation, 40 CFR 130.6: Water Quality Management Plans, is summarized below:

A) Water Quality Management Plans. WQMPs consist of initial plans and certified updates. Continuing water quality planning shall be based upon WQMPs and water quality problems identified in the latest 305(b) reports. State water quality planning should focus annually on priority issues and geographic areas and on the development of water quality controls leading to implementation measures.

B) Use of WQMPs. WQMPs are used to direct implementation. WQMPs draw upon the water quality assessments to identify priority point and nonpoint water quality problems, consider alternative solutions and recommend control measures, including the financial and institutional measures necessary for implementing recommended solutions. State annual work programs shall be based upon the priority issues identified in the State WQMP.

C) WQMP elements. The following plan elements shall be included in the WQMP. Some are part of Areawide Plans, and others are covered instead by the Statewide Plan.
   i) Total maximum daily loads (State WQMP).
   ii) Effluent limitations (State WQMP).
   iii) Municipal and industrial waste treatment. Identification of anticipated municipal and industrial waste treatment works, including combined sewer overflows (Areawide WQMP).
   iv) Nonpoint source management and control (Areawide WQMP).
   v) Management agencies. Identification of agencies necessary to carry out the plan and provision for adequate authority for intergovernmental cooperation. Management agencies must demonstrate the legal, institutional, managerial and financial capability and specific activities necessary to carry out their responsibilities (Areawide WQMP).
   vi) Implementation measures. Identification of implementation measures necessary to carry out the plan (Areawide WQMP).
   vii) Dredge or fill program. Identification and development of programs for the control of dredge or fill material (State WQMP).
   viii) Basin plans. Identification of any relationship to applicable basin plans developed under section 209 of the Act (State WQMP).
   ix) Ground water. Identification and development of programs for control of groundwater pollution (State WQMP).

D) Update and certification. State and/or Areawide agency WQM plans shall be updated as needed to reflect changing water quality conditions, the results of implementation actions, new requirements or to remove conditions in prior conditional or partial plan approvals.

E) Consistency. Construction grant and permit decisions must be made in accordance with certified WQM plans as described in the code of federal regulations §§130.12(a) and 130.12(b). In addition, Ohio law provides that permit decisions must be made in accordance with adopted WQM plans. The Ohio Revised Code specifies this requirement:

> *6111.03(j)(2) An application for a permit or renewal thereof shall be denied if any of the following applies:*
>
> > *... (b) The director determines that the proposed discharge or source would conflict with an areawide waste treatment management plan adopted in accordance with section 208 of the Federal Water Pollution Control Act;...*

Basin Plans

Many water quality projects are implemented through river basin or watershed councils. Doing so allows project goals to focus on protecting and improving water quality without the limits of jurisdictional boundaries. This Plan recognizes and supports the goals of these watershed councils. Basin plans that are incorporated by reference as part of this Plan are listed in Chapter 2. The watershed councils are:

1. Maumee River Remedial Action Plan (RAP)
2. Duck and Otter Creek Partnership
3. Portage River Basin Council
4. Sandusky River Watershed Coalition

Plan Amendments

Maintaining this Plan is necessary to keep it relevant to local and regional needs. For two examples:

- Wastewater treatment facility needs (Chapter 4) change as communities replace or upgrade their systems, or provide service to new areas.
- Critical Home Sewage Disposal Areas (Chapter 5) change, as designated by local Health Districts, when stream or septic system testing indicates new areas, or when a sewer extension eliminates problems.

The TMACOG Environmental Council is the forum for review of *Areawide Water Quality Management Plan* amendments. Amendment requests may be made by members of the Environmental Council or Designated Management Agencies (DMAs). The Environmental Council makes recommendations on Plan amendments to the TMACOG Board of Trustees. The Board adopts the Plan. When all or part of the *Areawide Water Quality Management Plan* is amended by the TMACOG Board of Trustees, the new version supercedes all previous versions of that part of the Plan. After adoption by the Board of Trustees, the Plan is submitted to the Governors of Ohio and Michigan for Certification. See Chapter 3 for a description of the amendment process and a listing of Designated Management Agencies.

Bibliography

Ground Water for Planning in Northwest Ohio: A Study of the Carbonate Rock Aquifers Ohio Eater Plan Inventory Report Number 22, ODNR Division of Water 1970.

Groundwater Quality Baseline Report, TMACOG Region TMACOG 1982

TMACOG 208 *Areawide Water Quality Management Plan,* 1976

Lake Erie Protection & Restoration Plan Ohio Lake Erie Commission, 2000

References

CHAPTER 2
ENVIRONMENTAL POLICIES

Introduction

Areawide Water Quality Management Policies

One role of this *Areawide Water Quality Management Plan* is to describe the roles and responsibilities of the region's many local governments in carrying out specific aspects of the Clean Water Act. These roles protect the environment and public health through municipal sewerage services. They also include promoting good water quality and habitat by preventing non-point source pollution. These governmental services are laid out as *Areawide Water Quality Management Plan* policies in the five chapters following this one:

8. Water Quality Management Framework
9. Public Wastewater Treatment
10. On-Site Sewage Treatment
11. Agricultural Runoff
12. Urban Runoff

Treating or preventing water pollution does not completely fulfill the "fishable and swimmable" goals of the Clean Water Act. A healthy and productive Lake Erie fishery, for instance, requires more than just pure water. It requires a food chain to support the fish, all of which requires habitat and food sources throughout the lake, rivers, and all their tributaries. In addition, there are sources of water quality impairment that don't fit neatly into point or non-point categories. One purpose of this chapter is to record TMACOG's policies on such issues.

In addition to local governments, Designated Management Agencies (see Chapter 3), and regulatory agencies, there are many stakeholders in natural resources. Business and industry require clean water for manufacturing, commerce, transportation, and tourism, to name just a few uses.

Besides businesses, non-profit agencies, governmental agencies and special districts play important roles. Examples include park districts, land conservancies and trusts, and watershed councils. Some stakeholders work through TMACOG committees; others are part of another organization, sometimes with the participation of TMACOG members or staff. This chapter recognizes stakeholder plans in two ways:

- Documents developed by TMACOG committees or staff are incorporated by reference as part of this *Areawide Water Quality Management Plan*.
- Documents of other stakeholders are recognized as compatible plans, whose goals TMACOG supports.

Both types of documents so recognized are listed later in this chapter.

Water Quality Goals

Water quality is regulated through Water Quality Standards in the Ohio Administrative Code, and in the Clean Water Act through National Pollutant Discharge Elimination System (NPDES) Permits. NPDES permits legally require wastewater to be cleaned to specific parameters before it may be discharged. State and federal laws regulate wetlands, landfills, onsite sewage systems, animal feeding operations, among others. Other laws and documents define the principles of water quality protection.

Clean Water Act

The Clean Water Act (PL 92-500 and its revisions) is often characterized as calling for "fishable and swimmable" waters. Although the Act does not use this precise phrase, this is a concise way of putting it.

(1) it is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985;
(2) it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983;
(3) it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited;
(4) it is the national policy that Federal financial assistance be provided to construct publicly owned waste treatment works;
(5) it is the national policy that areawide treatment management planning processes be developed and implemented to assure adequate control of sources of pollutants in each State;
(6) it is the national policy that a major research and demonstration effort be made to develop technology necessary to eliminate the discharge of pollutants into the navigable waters, waters of the contiguous zone and the oceans; and
(7) it is the national policy that programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution[57]

The Water Pollution Control Federation, now the Water Environmental Federation, made these observations:

PL 92-500 established the following precepts: <u>First</u>, no discharger can assume the right to pollute navigable waters. All discharges must obtain a permit to continue such actions. <u>Second</u>, permits shall contain limitations on the composition and concentrations of the polluting substances in them. … <u>Third</u>, some of the permit conditions are based on the technological capability of control, rather than on the biological capability of receiving waters to purify themselves. "Dilution is not the solution to pollution," as the saying goes. … <u>Fourth</u> and finally, controls higher than the minimum are to be based on receiving water quality.[58]

The Six "Free-Froms"

Ohio Administrative Code, besides setting quantifiable water quality standards and stream use attainments, states clean water goals in qualitative terms that are easy to visualize. It includes six statements of types of pollution that streams are to be free from.[59] They define a desired future state for waterways, which discharge permits and numerical standards are intended to achieve.

The following general water quality criteria shall apply to all surface waters of the state including mixing zones. To every extent practical and possible as determined by the director, these waters shall be:

(1) Free from suspended solids or other substances that enter the waters as a result of human activity and that will settle to form putrescent or otherwise objectionable sludge deposits, or that will adversely affect aquatic life;
(2) Free from floating debris, oil, scum and other floating materials entering the waters as a result of human activity in amounts sufficient to be unsightly or cause degradation;
(3) Free from materials entering the waters as a result of human activity producing color, odor or other conditions in such a degree as to create a nuisance;
(4) Free from substances entering the waters as a result of human activity in concentrations that are toxic or harmful to human, animal or aquatic life and/or are rapidly lethal in the mixing

zone;

(5) *Free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae.*

(6) *Free from public health nuisances associated with raw or poorly treated sewage. A public health nuisance shall be deemed to exist when the conditions set forth in paragraph* [below] *are demonstrated.* [the Ohio Administrative Code goes on to define "nuisance."]

The Six "Free-froms" are also stated as general objectives of the Great Lakes Water Quality Agreement.[60]

The Great Lakes Water Quality Agreement

The United States and Canada signed the Great Lakes Water Quality Agreement in Ottawa on November 22 1978. The Agreement's stated purpose was:

The purpose of the Parties is to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem. In order to achieve this purpose, the Parties agree to make a maximum effort to develop programs, practices and technology necessary for a better understanding of the Great Lakes Basin Ecosystem and to eliminate or reduce to the maximum extent practicable the discharge of pollutants into the Great Lakes System.

Consistent with the provisions of this Agreement, it is the policy of the Parties that:

(a) *The discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated;*

(b) *Financial assistance to construct publicly owned waste treatment works be provided by a combination of local, state, provincial, and federal participation; and*

(c) *Coordinated planning processes and best management practices be developed and implemented by the respective jurisdictions to ensure adequate control of all sources of pollutants.*[61]

The International Joint Commission (IJC) is a binational organization established by the Boundary Waters Treaty in 1909 to advise the Governments of the United States and Canada on preventing or resolving problems along their common border. This includes addressing the pollution problems of the Great Lakes. Over the years the IJC has become involved in issues related to such matters as water and air quality, lake levels, and power generation.

Several Annexes to the Agreement have been adopted over the years. Two are of specific concern for this Areawide Water Quality Management Plan.

Annex 3, the Phosphorus Load Reduction Supplement was signed on October 16 1983.

The purpose of the following program is to minimize eutrophication problems and prevent degradation with regard to phosphorus in the boundary waters of the Great Lakes System. The goals of phosphorus control are:

(a) *Restoration of year-round aerobic conditions in the bottom waters of the Central Basin of Lake Erie;*

(b) *Substantial reduction in the present levels of algal biomass to a level below that of a nuisance condition in Lake Erie…*[62]

The Phosphorus Control Annex set specific targets for phosphorus load reductions to Lake Erie. It called for cutting annual loading from its 1976 level of 20,000 metric tons per year to 11,000 metric tons. It called for all wastewater treatment plants discharging more than one million gallons per day to meet an effluent standard of 1.0 mg phosphorus per liter. It was estimated that with this standard being met the annual phosphorus load to Lake Erie would be 13,000 metric tons. Therefore, another 2,000 metric tons in phosphorus load reductions would need to be achieved from other sources, 300 metric tons from Canada, and 1,700 metric tons from the United States. Reduction targets were set for each state, for each county, and within each county for agricultural and non-agricultural sources.[63]

County	Agricultural Phosphorus Reduction Target from 1982 baseline, metric tons/year	Urban Phosphorus Reduction Target	Total Phosphorus Reduction Target
Lucas	17.3	19.2	36.50
Ottawa	21.0	4.2	25.20
Sandusky	38.3	3.3	41.60
Wood	69.6	7.4	77.00
Total	**146.20**	**34.10**	**180.30**

On November 18 1987 Annex 2 for Remedial Action Plans and Lakewide Management Plans was signed in Toledo, Ohio. This Annex defined an “Area of Concern” (AOC) as “a geographic area that fails to meet the General or Specific Objectives of the Agreement where such failure has caused or is likely to cause impairment of beneficial use or of the area’s ability to support aquatic life.”[64] Four AOCs are located in Ohio: Ashtabula, Cuyahoga, Black, and Maumee Rivers.

Remedial Action Plans (RAPs) were undertaken for all forty-three of the AOCs to provide a coordinated cleanup and restoration of impaired beneficial uses of waterways. The Agreement identifies fourteen beneficial uses which may result from “a change in the chemical physical or biological integrity of the Great Lakes System.” RAPs were charged with undertaking “…a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses in Areas of Concern …”

The beneficial use impairments identified by Annex 2 of the Agreement are:

(1) Restrictions on fish and wildlife consumption;
(2) Tainting of fish and wildlife flavor;
(3) Degradation of fish and wildlife populations;
(4) Fish tumors or other deformities;
(5) Bird or animal deformities or reproduction problems;
(6) Degradation of benthos;
(7) Restrictions on dredging activities;
(8) Eutrophication or undesirable algae;
(9) Restrictions on drinking water consumption, or taste and odor problems;
(10) Beach closings;
(11) Degradation of aesthetics;
(12) Added costs to agriculture or industry;
(13) Degradation of phytoplankton and zooplankton populations; and
(14) Loss of fish and wildlife habitat.

The beneficial use impairments apply specifically to the lower Maumee River because it is an Area of Concern. The two other major rivers in the region, the Portage and the Sandusky, are not Areas of Concern. The beneficial use impairments also apply to these rivers because they are tributaries of Lake Erie, and beneficial use impairments are an issue for the Lake Erie Lakewide Management Plan (LaMP). The difference for the three rivers is that for the Maumee, an AOC, there is an emphasis on *restoration* of beneficial uses. For the Portage and Sandusky, not AOCs, there is a greater emphasis on *protection* of beneficial uses.

The Maumee RAP as an organization was established in 1987. It is a public-private partnership that includes Ohio EPA, TMACOG, stakeholders, and citizens. The Maumee RAP sponsors programs to address the beneficial use impairments through goals set in adopted documents, including the *Maumee RAP Recommendations for Implementation*[65] and the *Maumee Area of Concern Stage II Watershed Restoration Plan*[66].

Environmental Quality Policies

Use of Policies

This Plan adopts the following statements as TMACOG policy and guidance to staff. These policies are set to fulfill the goals of the Clean Water Act and the Great Lakes Water Quality Agreement at the local and regional level.

The policies set by this plan should be used for the following purposes:

(1) Set goals for the TMACOG *Annual Work Plan* and committees of TMACOG, subject to approval of the TMACOG Board of Trustees.

(2) Set goals for projects and funding applications to be conducted by TMACOG staff and committees of TMACOG subject to approval of the Chairman of the TMACOG Environmental Council.

(3) Support projects and funding applications of TMACOG members, project partners, and environmental stakeholders of the region, subject to the approval of the Chairman of the TMACOG Environmental Council.

(4) Support financial assistance requests through the "A-95" Regional Clearinghouse Review Process. Compatible projects should be recommended to the federal funding agency as "consistent with regional goals," subject to approval by the TMACOG Executive Committee.

(5) Support federal, state, and local legislation subject to approval by the TMACOG Board of Trustees

Policy and Goal Statements

The following policy and goal statements are endorsed by the Plan:

(1) Support public wastewater treatment infrastructure

- a) Support implementation and funding of public wastewater collection and treatment needs identified in Chapters 4 and 5 of this Plan
- b) Assist Designated Management Agencies (DMAs), as identified in Chapter 3 of this Plan, in planning, implementing, and financing sanitary sewerage infrastructure
- c) Coordinate DMAs and provide technical assistance to plan efficient and cost-effective sanitary sewerage facilities
- d) Coordinate DMAs and provide technical assistance to assist in meeting NPDES permit requirements

(2) Reduce Eutrophication and Nutrient Loadings

a) Reduce phosphorus loadings to Lake Erie and achieve targets of the Phosphorus Reduction Strategy

b) Reduce nitrogen loadings to Lake Erie and its tributaries to control eutrophication and protect drinking water sources

c) Support and provide financial assistance for best management practices to reduce nutrient loadings to Lake Erie and its tributaries.

(3) Reduce Sediment Loading and Erosion

a) Support and provide financial assistance for best management practices to reduce erosion and sediment loadings to Lake Erie and its tributaries, and achieve clear water

b) Reduce sediment loading to the Maumee River to maintain the economic viability of Toledo Harbor and its shipping channel

(4) Disposal/Reuse/Reduction of Maumee River Channel Dredged Material

a) Dispose of sediments classified by Ohio EPA and Michigan DEQ as "contaminated" in confined disposal facilities, approved upland sites, and/or railed for mine reclamation

b) Recognize phosphorus and sediment as pollutants and support their removal or source reduction from the ecosystem rather than open-lake disposal

c) Support beneficial upland reuses of dredge material

d) Oppose loss of Maumee Bay habitat from the construction of new confined disposal facilities

e) Support the beneficial long term reuse of confined disposal facilities, especially for natural habitat or recreation

(5) Support Stormwater Management

a) Coordinate and provide technical assistance to local governments to fulfill NPDES Stormwater permit requirements efficiently

b) Support and provide financial assistance for stormwater best management practices on a watershed basis

c) Reduce pollutant loadings to streams from stormwater runoff, including nutrients, sediment, pesticides, oil, and metals.

(6) Protect Natural Habitat

a) Preserve, protect, and restore wetlands and natural habitat areas

b) Recognize high priority areas for protection and restoration of natural habitat:

  i. The Oak Openings

  ii. The Maumee Bay South Coastline

c) Preserve, protect, and, where needed, expand floodplains and their stormwater storage capacity for the prevention of flooding and to provide riparian or aquatic habitat

d) Support voluntary, compensated acquisition of natural areas for the purpose of preservation or restoration by governmental or non-profit agencies.

e) Support recreational use of and public access to waterways and natural areas where they do not endanger the natural habitat

(7) Support Healthy Fish and Wildlife Communities

a) Eliminate consumption advisories for fish from Lake Erie and its tributaries in the TMACOG region

b) Sustain and increase fish populations of Lake Erie and its tributaries, both for number of fish and diversity of species. Reduce fish kills in power plant intakes. Consider the Walleye as our primary indicator species.

c) Sustain and increase wildlife populations of the region. Consider the Bald Eagle as our primary indicator species.

d) Restore and sustain a healthy benthic macroinvertebrate community to streams of the region.

(8) Reduce Pesticide Loadings to Lake Erie and its Tributaries

a) Support best management practices for use of pesticides, both for agricultural and residential purposes

b) Support reduced use of pesticides, and use of less persistent pesticides

(9) Eliminate Persistent Toxic Chemicals

a) Support remediation of land and stream sediments contaminated with persistent toxic chemicals

b) Support the Great Lakes Water Quality Agreement's goal to virtually eliminate discharges of toxic substances in toxic amounts.

c) Support funding and implementation of pollution prevention programs

(10) Reduce Bacterial Contamination

a) Reduce fecal bacterial loadings to Lake Erie, its tributaries, and their sediments to provide for safe water recreation throughout the bathing season

b) Reduce discharges of fecal bacteria and pathogens in wastewater effluent and surface runoff to protect human health and meet recreational use designations of water quality standards

c) Support and require replacement of onsite sewage treatment systems by public sewers wherever practicable

d) Promote and require proper operation and maintenance of onsite sewage treatment systems in areas where it is not practicable to replace them with public sanitary sewers.

e) Eliminate swimming or wading advisories for Lake Erie and its tributaries in the TMACOG region.

(11) Control invasive species and prevent introduction of additional invasive species

(12) Support and conduct environmental education programs for both the general public and targeted groups

(13) Support Beneficial Uses identified by Great Lakes Water Quality Agreement

a) Support restoration and protection of beneficial uses in the Lower Maumee River AOC

b) Support protection of beneficial uses in the rest of the TMACOG, and restoration where needed.

(14) Protect groundwater for a safe, reliable, and high quality source of potable water

(15) Protect surface drinking water supplies through watershed programs such as Source Water and Assessment Protection (SWAPs) plans.

(16) Support preparation of Total Maximum Daily Load (TMDLs) assessments for watersheds of the region.

(17) Support water quality monitoring and assessment to track progress in achieving these environmental policies.

Documents Incorporated into this Plan by Reference

Title	Author	Year	TMACOG Library Catalogue	Web Address
§208 of the Federal Water Pollution Control Act Amendments (P.L. 92-500) as amended by the Clean Water Acts of 1977, 1982, and 1987 (P.L. 95-271, 97-440, and 100-4)			On file at TMACOG	
Activities and Accomplishments in the Maumee Area of Concern 1991-2001	Hull & Associates, Maumee RAP	2002	NA	http://www.epa.state.oh.us/dsw/rap/MaumeeAOC1991-2001.pdf
American Heritage Rivers Nomination for the Maumee River	TMACOG I Toledo/Lucas County Port Authority	1997	1376-Mau	NA
Bylaws of the Toledo Metropolitan Area Council of Governments			On file at TMACOG	http://www.tmacog.org/Bylaws%20Approved%20by%20G.%20A.%201-30-03.pdf
Curriculum Guide: Water Quality Testing for Secondary Schools I Maumee Bay Watershed Project	TMACOG, Maumee RAP, Fraleigh	1993	7950-Cur	NA
Curriculum Guide: Water Quality Testing for Secondary Schools I Maumee Bay Watershed Project	TMACOG Maumee River Area of Concern Remedial Action Plan (RAP) Implementation Committee I Fraleigh	1993	7950-Cur	NA
Elmore Ohio: Wellhead Protection Plan	TMACOG	1993	1386-Elm (2 vol.)	NA
Environmental Resources Inventory: Landfills Dumps & Hazardous Waste Sites	TMACOG	1993	1472.5-TMACOG	NA
Environmental Resources Inventory: Prime Agricultural Land TMACOG Region	TMACOG	1993	1370-Env	NA
Environmental Resources Inventory: Wetland Areas	TMACOG	1992	1370-Env	NA

Title	Author	Year	TMACOG Library Catalogue	Web Address
TMACOG Region				
Environmental Resources Inventory: Wildlife Habitat Areas TMACOG Region	TMACOG	1993	1370-Env	NA
Federal Register §35.1521 et seq. Vol. 44 No. 101, Wednesday May 23, 1979, Rules and regulations			On file at TMACOG	NA
Flooding and Erosion Related to Urbanization: Swan Creek Watershed Lucas County Ohio	TMACOG I Metropolitan Park District of the Toledo Area I Earthview Inc.	1973	7560-Flo	NA
From Satellites to Earthworms:Improving Farm Management	TMACOG I RAP Agricultural Runoff Action Group	1996	1382-Sat	NA
Gibsonburg Ohio Wellhead Protection Plan	TMACOG	1992-4	1386-Gib (2 vol.)	NA
Lindsey Ohio: Wellhead Protection V.1: Ground Water Information	TMACOG	1991-2	1386-Lin 2 volumes	NA
Lucas County Summary of Phosphorus Load Changes from Non-Agricultural Sources: 1982 Vs. 1989	TMACOG	1990	1464-Luc	NA
Making Funding Work for Water & Sewer	TMACOG	1995	3568-Mak	NA
Maumee RAP Recommendations Report	TMACOG, Maumee RAP Advisory Committee	1991	1376-Mau	NA
Maumee RAP Stage I Report	Ohio EPA, TMACOG, Maumee River Remedial Action Plan Advisory Committee	1990	1376-Mau	NA
Maumee RAP Wetlands and Open Space	UT, TMACOG, RAP Open Spaces & Wetlands Action Group	2004	NA	http://www.epa.state.oh.us/dsw/rap/mau_WetlandProjectFinalReport.pdf

Title	Author	Year	TMACOG Library Catalogue	Web Address
Maumee River Basin Remedial Action Plan Rap: Investigation Report: Turtle Creek Packer Creek Toussaint River	TMACOG, RAP	1993	1376-Mau	NA
Maumee River RAP: Storm Drain Stenciling Program Project Handbook: Dump No Waste Drains to Lake	TMACOG	1995	1466-Mau	NA
Maumee River Remedial Action Plan Strategic Plan	Maumee RAP Implementation Committee	1997	1376-Mau	http://www.epa.state.oh.us/dsw/rap/mau-plan.pdf
Ohio Revised Code Section 167.01 - 167.08, "Regional Councils of Governments"			On file at TMACOG	
Ohio Revised Code Section 6111.03, "Powers of Director of Environmental Protection."			On file at TMACOG	
Ottawa County Summary of Phosphorus Load Changes from Non-Agricultural Sources: 1982 Vs. 1989	TMACOG,	1990	1464-Ott	NA
Ottawa River -- Swan Creek Urban Runoff Demonstration Project	TMACOG I Lucas SWCD	1993	1466-Ott	NA
Ottawa River Risk Assessments	Limno-Tech, Intertox, Parametrix for TMACOG	2001	1373-Eco	http://www.epa.state.oh.us/dsw/rap/mauOttawaRiverFinalSLRA_v1.pdf http://www.epa.state.oh.us/dsw/rap/mauOttawaRiverFinalHHRAReport.pdf
Ottawa River Sediment Remediation Priorities	TMACOG / Hull & Associates / Ohio EPA	2003	1373-Ott	NA
Ottawa River Sediment Remediation Priorities	Hull & Associates and Blasland Bouck and Lee for TMACOG	2004	1373-Ott	NA
Package Sewage Treatment Plant Inventory	TMACOG		Computer database on file at TMACOG	NA

Title	Author	Year	TMACOG Library Catalogue	Web Address
Paired Watershed Demonstration Project Third Year Annual Report	TMACOG, Heidelberg College WQL, Ottawa SWCD	1990	1386-Pai	NA
Paving Paradise	TMACOG - Maumee RAP - Swan Creek Action Group	1999	1466-PAV	NA
Pemberville Ohio Groundwater Protection Plan	TMACOG	1990-2	1386-Pem (2 vol.)	NA
Pesticides and Lawn Care	TMACOG	1993	1445-Pes	NA
Portage River - Journey to the Great Black Swamp	BGSU, TMACOG	2001	1376-Por	NA
Portage River Basin Council Volunteer Stream Corridor Survey	TMACOG	1999	1376-Por	NA
Portage River Basin Water Quality Study	TMACOG	1995	7950-Por (2 volumes)	NA
Portage River Hydrological Study	Finkbeiner, Pettis, & Strout for TMACOG	2002	NA	http://www.tmacog.org/Environment/portage%20hydro%20study%201.pdf http://www.tmacog.org/Environment/portage%20hydro%20study2.pdf
Portage River Watershed Restoration Action Strategy	TMACOG Portage River Basin Council	2003	7980.3-Por	NA
Portage River: a Resource Worth Protecting	TMACOG	1997	7950-Por	NA
Profiling the Ottawa River Volumes 1-6	Maumee RAP	1994 - 2002	1373-Pro (Vol 1-5)	http://www.epa.state.oh.us/dsw/rap/mau_profott3.pdf http://www.epa.state.oh.us/dsw/rap/mau_Proflng4.pdf http://www.epa.state.oh.us/dsw/rap/mau_Proflng5.pdf
Stormwater Management Standards Manual	TMACOG, Maumee RAP Urban Runoff Action Group	2002	NA	http://www.tmacog.org/Environment/Stormwater_Standards.pdf
Swan Creek Watershed Plan of Action	TMACOG	2002	1376-SWA	http://www.epa.state.oh.us/dsw/rap/mauSwanCreekPlanOfAction.pdf
Swan Creek Wetlands Re-Creation Project	TMACOG	1990	1370-Swa	NA

Title	Author	Year	TMACOG Library Catalogue	Web Address
Swan Creek Wetlands Re-Creation Project: Proposed Organizational Outline	TMACOG	1991	1370-Swa	NA
Swan Creek Wetlands Re-Creation Project: Site Data Report	TMACOG	1991	1370-Swa	NA
Syllabus: Ohio Attorney General's Opinion 79-018 (May 24, 1979)			On file at TMACOG	NA
TMACOG Environmental Resources Inventory: Landfills Dumps & Hazardous Waste Sites	TMACOG	1993	1472.5-TMACOG	NA
TMACOG Implementing Documents and Resolutions			On file at TMACOG	NA
TMACOG Region Environmental Resources Inventory: Flood Prone Areas	TMACOG	1992	1454-TMACOG	NA
Toledo Metropolitan Area Best Management Practices for Urban Stormwater	TMACOG	1991	1466-Tol	NA
Urban Cooperation Act of 1967, Michigan Public Act No. 7, §124.501 - 124.512 (Ex. Sess.).			On file at TMACOG	NA
Water Quality Monitoring Inventory in the TMACOG Region 1970-1992	TMACOG	1993	7950-Wat	NA
Wetland Identification and Restoration Plan for Duck and Otter Creeks	Duck and Otter Creek Partnership	2003		
Whitehouse Ohio Wellhead Protection Plan	TMACOG	1991-2	1386-Whi (2 vol.)	NA

Title	Author	Year	TMACOG Library Catalogue	Web Address
Wolf Creek Bacterial Impact on Maumee Bay State Park Beach Summary Report	TMACOG and University of Toledo Lake Erie Center	2003	NA	NA
Woodville Ohio Wellhead Protection V. 1: Ground Water Information	TMACOG	1992-5	1386-Woo (3 vol.)	NA

Documents of other stakeholders are recognized as compatible plans, whose goals TMACOG supports.

Title	Author	Year	TMACOG Library Catalogue	Web Address
City of Northwood Stormwater Management Plan	City of Northwood I Feller Finch & Associates	2003		
City of Oregon Stormwater Management Plan	City of Oregon	2003		
Environmental Trends for Toledo Ohio 1968-1990	Toledo Dept of Public Utilities Division of Pollution Control	1992	1376-Tol	
Fate of a River: Revisited	WGTE | Clear Water Inc | Hull & Associates	2002	1376-Fat	
Geohydrology and Quality of Water in Aquifers in Lucas Sandusky & Wood Counties Northwestern Ohio	US. Interior. Geological Survey (USGS) I Breen & Dumouchelle	1991	1386-Geo	
Groundwater Quality Baseline Report I Groundwater Management Strategies	TMACOG	1984	1386-Gro	NA
Herbicide Contamination in Municipal Water Supplies of Northwestern Ohio: Draft Final Report	Heidelberg College. Water Quality Laboratory I David B. Baker	1983	1458-Her	
Home Sewage Treatment System Plan Sandusky County	Sandusky County Health Department	2004		
Home Sewage Treatment System Plan: Ottawa County	Ottawa County Health Department	2004		
Home Sewage Treatment System Plan:	Wood County Health Department	2004		

Title	Author	Year	TMACOG Library Catalogue	Web Address
Wood County				
Hydrology, Water Quality, and Effects of Drought in Monroe County, Michigan	US Geological Survey	1996	1376-Hyd	
Karst in Southeast Michigan and Groundwater Regulations and Karst	Monroe County MSU Extension Office	2002	7171-Kar	
Karst Unified Source Water Protection Plan	Great Lakes Rural Community Assistance Program	2001	1458-Kar	
Lake Erie Protection & Restoration Plan	Ohio Lake Erie Commission	2000	1370-Lak	
Lake Erie Tributary Program: Maumee River Data Appendices	Heidelberg College Water Quality Laboratory	1995	1458-Lak	
Lake Erie Tributary Program: Sandusky River Data Appendices	Heidelberg College Water Quality Laboratory	1995	1458-Lak	
Landfills Dumps & Hazardous Sites	Toledo Division of Environmental Services	1994	1472.5-Lan	
Lucas County & 9 Joint Permittees Stormwater Meeting Plan (County, Villages of Holland and Waterville, and Townships of Jerusalem, Monclova, Spencer, Springfield, Sylvania, Washington, and Waterville)	Lucas County Engineer	2003		
Lucas County & 9 Joint Permittees Stormwater Meeting Plan 2004 Annual Report	Lucas County Engineer	2004		
Nitrate and Pesticides in Private Wells of Ohio: a	Heidelberg College Water Quality Laboratory I Baker	1989	1458-Nit	http://www.heidelberg.edu/WQL/welltest.html

Title	Author	Year	TMACOG Library Catalogue	Web Address
State Atlas I Groundwater				
Occurrence, Distribution and Loads of Selected Pesticides in Streams in the Lake Erie-Lake St. Clair Basin, 1996-98	USGS Dept. of the Interior	2002	4510.Nat	
Ohio Coastal Nonpoint Pollution Control Program Plan	ODNR Div of Soil and Water Conservation	2000	1458-Ohi	
Ohio Department of Transportation Stormwater Management Plan	Ohio Department of Transportation I ODOT I URS	2003		
Pesticide Concentration Patterns in Agricultural Drainage Networks in the Lake Erie Basin	Heidelberg College Water Quality Laboratory	1992	1458-Pes	
Sandusky River Watershed Resource Inventory	Sandusky River Watershed Coalition	2002	1376-San	http://www.sanduskyriver.org
Soil Evaluation Field Guide	Northwest Ohio Sewage Consortium | National Soil Survey Center - US Dept of Agriculture	2002	1382-Soi	
Soil Survey of Lucas County Ohio	US Agriculture (Usda) Soil Conservation Service (Scs) I Ohio Natural Resources (Odnr) I Ohio Agricultural Research & Development Center	1980	1382-Luc	
Soil Survey of Monroe County Michigan	US Agriculture Soil Conservation Service I Michigan Agricultural Experiment Station	1981	1382-Mon	
Soil Survey of Ottawa County Ohio	US Agriculture Bureau of Chemistry and Soils I Ohio Agricultural Experiment Station		1382-Soi	
Soil Survey of Ottawa County Ohio	US Agriculture Soil Conservation Service I Ohio Natural Resources	1985	1382-Ott	

Title	Author	Year	TMACOG Library Catalogue	Web Address
	(Odnr) Division of Lands & Soil I Ohio Agricultural Research & Development Center			
Soil Survey of Sandusky County Ohio	US Agriculture (Usda) Soil Conservation Service (Scs) I Ohio Natural Resources (Odnr) I Ohio Agricultural Research & Development Center	1987	1382-San	
Soil Survey of Wood County Ohio	US Agriculture Soil Conservation Service I Ohio Natural Resources Lands & Soil I Ohio Agricultural Expriment Station		1382-Woo	
Stormwater "NPDES Phase II" Management Plans: see Stormwater Coalition for list				
Study of Physical Features for the Toledo Regional Area	Trapa I Toledo-Lucas County Plan Commissions I Bowling Green State University. Geology Dept. I Jane Forsyth	1968	7171-Stu	
Trends in Nutrient & Suspended Sediment Concentrations in Lake Erie Tributaries, 1975-1990	Heidelberg College Water Quality Laboratory I Baker & Richards	1993	1458-Tre	
Valuing The Ottawa River: The Economic Values & Impacts of Recreational Boating	Ohio State University	19991	1376-Val	
Village of Holland Stormwater Management Plan 2004 Annual Report	Village of Holland	2004		
Village of Millbury Stormwater Management Plan	Village of Millbury I Poggemeyer Design Group	2003		
Village of Ottawa Hills	Village of Ottawa Hills	2003		http://www.ottawahills.org

Title	Author	Year	TMACOG Library Catalogue	Web Address
Stormwater Management Plan				
Village of Walbridge Stormwater Management Plan	Village of Walbridge I Feller Finch & Associates	2003		
Wood County & 3 Joint Permittees Stormwater Meeting Plan (County, and Townships of Lake, Middleton, and Perrysburg)	Wood County Engineer	2003		

Reference

CHAPTER 3
WATER QUALITY MANAGEMENT FRAMEWORK

Introduction

The Federal Water Pollution Control Act Amendments of 1972 called upon Areawide agencies such as TMACOG to develop Areawide Water Quality Management Plans. The Areawide Plan described under §208 of the Act, is certified by the Governor of State as part of the State's Water Quality Management Plan. Many agencies - federal, state, areawide, and local - are given specific responsibilities to implement specific provisions of the Act.

This Chapter of the Areawide Water Quality Management Plan identifies the responsibilities of TMACOG as the Areawide agency, of the local Designated Management Agencies, and how all agencies work together.

Designated Management Agencies

The Clean Water Act calls for local jurisdictions and agencies to carry out specific roles in protecting water quality. Agencies with specific responsibilities in implementing the Clean Water Act are called Designated Management Agencies, or DMAs. Several federal and state agencies have regulatory oversight in water quality management; local DMAs recognized by this plan are responsible for fulfilling legal requirements set by the federal and state agencies. The federal agencies are US EPA and US Department of Agriculture. The state agencies are Ohio EPA, Ohio DNR, Ohio Department of Agriculture, Michigan DEQ, and Michigan DNR. Chapter 4, public wastewater treatment, defines the specific role of each DMA.

Depending on its assigned role, a local DMA recognized by this plan must have the capability to:

- have legal authority to provide service to its designated area;
- carry out its assigned portion of the Areawide Water Quality Management Plan;
- accept and utilize grants or other funds from any source for waste treatment management or nonpoint source control purposes;
- raise revenues or other necessary funding, to implement its assigned portion of the Plan. Needed revenues may include staff funding, or for DMAs that own or operate sewerage systems, assessments of waste treatment charges;
- cooperate with and assist the TMACOG Environmental Council in the performance of its Plan responsibilities.

Several other DMA roles are specific to those that own and/or operate sewerage facilities:

- refuse to receive any wastes from a municipality, or subdivision thereof, which does not comply with any provision of the Areawide Water Quality Management Plan;
- accept treatment for industrial wastes;

- effectively manage waste treatment works and related point and nonpoint source facilities and practices in conformance with the Plan;
- directly or by contract, design and construct new treatment works, and operate and maintain new and existing collection and treatment facilities;
- have the capabilities to incur short and long-term indebtedness;
- assure, in the implementation of its portion of the Areawide Water Quality Management Plan, that each participating community pays its proportionate share of related costs;

The DMAs and their responsibilities are established under this Plan, which recognizes three types of DMAs:

- Counties, municipalities, and Regional Water and Sewer Districts that collect and/or treat municipal wastewater have the following responsibilities:
  - to protect water quality and public health by meeting the requirements of their NPDES permits, and
  - to protect water quality by managing stormwater runoff in compliance with the applicable single and general NPDES permit(s).
- County and municipal Health Department's responsibility is to protect water quality and public health by regulating the installation and maintenance of sewage disposal systems for one, two, and three household residences.
- Counties, municipalities, and townships are responsible for stormwater NPDES permits where required by Ohio EPA or Michigan DEQ.
- County Soil and Water Conservation District's responsibilities are:
  - to provide education and technical assistance to farmers in applying best agricultural management practices;
  - to prevent water pollution from sediment, nutrients, and pesticides;
  - and encourage fish and wildlife habitat consistent with productive agriculture.

The DMAs recognized by this Plan were established starting in the late 70s, with Designated Management Agency resolutions adopted by the elected officials, and cooperation agreements signed with TMACOG. The region's Designated Management Agencies are:

County	Designated Management Agency	Agriculture	Stormwater	Sanitary Sewerage or Onsite
Lucas	Lucas County		●	●
Lucas	Village of Berkey			●
Lucas	Village of Holland		●	●
Lucas	Village of Harbor View		●	●
Lucas	Township of Jerusalem		●	

County	Designated Management Agency	Agriculture	Stormwater	Sanitary Sewerage or Onsite
Lucas	City of Maumee		●	●
Lucas	Township of Monclova		●	
Lucas, Ottawa	City of Oregon		●	●
Lucas	Village of Ottawa Hills		●	●
Lucas	Township of Spencer		●	
Lucas	Township of Springfield		●	
Lucas, Fulton	Village of Swanton			●
Lucas, Monroe	City of Sylvania		●	●
Lucas	Township of Sylvania		●	
Lucas, Monroe, Wood	City of Toledo		●	●
Lucas	Township of Washington		●	
Lucas	Township of Waterville		●	
Lucas	Village of Waterville			●
Lucas	Village of Whitehouse			●
Lucas	Sylvania Township Regional Water and Sewer District			●
Lucas	Toledo/Lucas County Health Department			●
Lucas	Lucas Soil and Water Conservation District	●		
Monroe	Monroe County		●	●
Monroe	Township of Bedford		●	●
Monroe	Township of Erie		●	
Monroe	City of Luna Pier			●

County	Designated Management Agency	Agriculture	Stormwater	Sanitary Sewerage or Onsite
Monroe	Monroe County Health Department			●
Monroe	Monroe Soil and Water Conservation District	●		
Monroe	Township of Whiteford		●	
Ottawa	Ottawa County		●	●
Ottawa	Township of Allen		●	
Ottawa	Township of Clay		●	
Ottawa	Village of Clay Center			●
Ottawa, Sandusky	Village of Elmore			●
Ottawa, Sandusky	Village of Genoa			●
Ottawa	Village of Marblehead			●
Ottawa	Village of Oak Harbor			●
Ottawa	City of Port Clinton			●
Ottawa	Village of Put-in-Bay			●
Ottawa	Carroll Township Regional Water and Sewer District			●
Ottawa	Ottawa County Health Department			●
Ottawa	Ottawa Soil and Water Conservation District	●		
Sandusky	Sandusky County			●
Sandusky, Erie, Huron, Seneca	City of Bellevue			●
Sandusky	Village of Burgoon			●
Sandusky	City of Clyde			●
Sandusky	City of Fremont			●
Sandusky	Sandusky Township Sewer District			●

County	Designated Management Agency	Agriculture	Stormwater	Sanitary Sewerage or Onsite
Sandusky	Village of Gibsonburg			●
Sandusky, Seneca	Village of Green Springs			●
Sandusky	Village of Helena			●
Sandusky	Village of Lindsey			●
Sandusky	Village of Woodville			●
Sandusky	Sandusky County Health Department			●
Sandusky	Sandusky Soil and Water Conservation District	●		
Wood	Wood County		●	●
Wood	Northwestern Water and Sewer District			●
Wood	Village of Bloomdale			●
Wood	City of Bowling Green		●	●
Wood	Village of Bradner			●
Wood	Village of Custar			●
Wood	Village of Cygnet			●
Wood, Seneca, Hancock	City of Fostoria		●	●
Wood	Village of Grand Rapids			●
Wood	Village of Haskins			●
Wood	Village of Hoytville			●
Wood	Village of Jerry City			●
Wood	Township of Lake		●	
Wood	Village of Luckey			●
Wood			●	

County	Designated Management Agency	Agriculture	Stormwater	Sanitary Sewerage or Onsite
	Township of Middleton			
Wood	Village of Millbury		●	●
Wood	Village of Milton Center			●
Wood	Village of North Baltimore			●
Wood	City of Northwood		●	●
Wood	Village of Pemberville			●
Wood	City of Perrysburg		●	●
Wood	Township of Perrysburg		●	
Wood	Village of Portage			●
Wood	Village of Risingsun			●
Wood	City of Rossford		●	●
Wood	Village of Tontogany			●
Wood	Village of Walbridge		●	●
Wood	Village of Wayne			●
Wood	Village of West Millgrove			●
Wood	Village of Weston			●
Wood	Wood County Health Department			●
Wood	Wood Soil and Water Conservation District	●		

Designated Management Agencies accept responsibility to implement their part of the Clean Water Act, and thereby protect the region's water quality. DMA status is a prerequisite to participation in the Environmental Council, through which this Plan is maintained.

Inclusion of Adopted "201" Facility Plans

The following Facility Plans have been adopted and are incorporated into this Plan by reference. These plans are updated and superceded by this *Areawide Water Quality Management Plan.*

COUNTY	FACILITY PLANNING AREA	YEAR(S)	CONSULTANT
Lucas	Fuller's Creekside Estates I/I	1977	FPS
Lucas	Lucas Co./Central-Reynolds SS	1976	FPS

	#513		
Lucas	Lucas Co./Maumee River WWTP	1975, 83, 85	FPS
Lucas	Lucas Co./Jerusalem Twp	1994-2000	FPS
Lucas	Lucas Co./Neapolis	1980	FPS
Lucas	Lucas Co./Toledo Airport Area	1975	FPS
Lucas	Maumee Combined Sewer Overflows	1982	FPS
Lucas	Oregon	1974	FPS
Lucas	Oregon/Harbor View & Seaman Rd	1981	FPS
Lucas	Oregon/South Shore Park	1985	FPS
Lucas	Swanton	1975	FPS
Lucas	Toledo	1976,8,9, 86	Jones & Henry
Lucas	Toledo Combined Sewer Overflows	1978, 1986	Jones & Henry
Lucas	Whitehouse	1978	FPS
Lucas	Whitehouse	1981	Poggemeyer
Monroe	Monroe Co./Bedford Twp	1975	Consoer & Townsend
Monroe	Monroe Co./Luna Pier, Erie Twp	1982	FPS
Ottawa	Danbury Township	1976	Jones & Henry
Ottawa	Port Clinton - Catawba Township	1987	FPS
Sandusky	Clyde	1981	F. Browne
Sandusky	Gibsonburg	1976, 81	BG&R
Sandusky	Lindsey	1983	Poggemeyer
Sandusky	Woodville	1980	Poggemeyer
Wood	Bowling Green	1974, 76	FPS
Wood	Bradner	1985	FPS
Wood	Grand Rapids	1975	Poggemeyer
Wood	Hoytville/Wood Co. SSD 1500	1981	Poggemeyer
Wood	Haskins	1974	Poggemeyer
Wood	Luckey	1981	Poggemeyer
Wood	Northwood (Tributary to Toledo)	1979	FPS
Wood	North Baltimore	1987	FPS
Wood	Perrysburg	1977, 80	FPS
Wood	Tontogany/Wood Co. SSD 1200	1978	Poggemeyer
Wood	Walbridge	1979	Poggemeyer
Wood	Weston	1977	Poggemeyer
Wood	Wood Co. SSD 100, 120 Tracy/Metcalf	1980	FPS
Wood	Wood Co. SSD 102, Moline	1974	FPS
Wood	Wood Co. SSD 220, NE Wood Co.	1975	FPS
Wood	Wood Co. SSD 302, W. Perrysburg	1975	FPS
Wood	Wood Co. SSD 400, N. Perrysburg	1974	FPS
Wood	North Baltimore	1987	FPS

Toledo Metropolitan Area Council of Governments

Introduction

The Toledo Metropolitan Area Council of Governments (TMACOG) is the designated Areawide Water Quality Management Planning Agency for Lucas, Wood, Ottawa, and Sandusky, in Ohio; and Erie, Bedford, and Whiteford Townships and the City of Luna Pier in Monroe County Michigan. The TMACOG Areawide Water Quality Management Plan was adopted on December 19, 1976 and has been certified as part of the State Water Quality Management Plans by the Governors of Ohio and Michigan. Erie County, Ohio was originally certified as part of the TMACOG plan; it was removed in 2003. TMACOG's role as the designated Areawide agency is to maintain and coordinate the implementation of the Plan through the Environmental Council and its subcommittees.

TMACOG Responsibilities

The Areawide role includes:

- Continuing the planning and updating of the Areawide Water Quality Management Plan
- Providing a forum for Areawide policy decision-making on water quality concerns
- Coordination among the DMAs
- Coordinate activities among DMAs to solve point and nonpoint source water quality problems
- Serve as a regional advocate on environmental issues at the State and Federal levels
- Resolve conflicts among DMAs and with the Areawide Water Quality Management Plan
- Coordinate Areawide Water Quality Management Plan with other State, Federal, and Regional plans, including:
  - The State Implementation Plan (SIP) for Air Quality
  - Coastal Zone Management Plan
  - Watershed plans covering all or part of the major drainage basins: the Maumee, Portage, Sandusky
  - Sewerage funding programs through HUD, USDA, and the state revolving loan programs

The Environmental Council within the TMACOG Structure

The Environmental Council is the principal forum for reviewing and making the Plan. The Environmental Council uses a representative structure for broad participation, both in terms of geography and expertise. The Environmental Council Operating Procedures, presented in Appendix II-9 are included as part of this plan by reference.

Although not every DMA has a seat on the Environmental Council, DMAs may bring issues before the Environmental Council and request Plan Amendments. Membership in TMACOG is open to all DMAs, but is not a prerequisite for participation on the Environmental Council.

The Environmental Council is one of TMACOG's programmatic councils. Its Chair is a member of the Executive Committee. Plan Amendments recommended by the Environmental Council go to the Board of Trustees for final action. The TMACOG Bylaws and the TMACOG organizational chart are included in this Plan by reference.

Legal Basis

TMACOG has all of the authority necessary to assume responsibility for the Areawide monitoring, planning, coordination, and conflict resolution responsibilities that are assigned to it as the designated Areawide Water Quality Management Planning Agency. The current versions of the following documents are incorporated into this plan by reference:

- §208 of the Federal Water Pollution Control Act Amendments (P.L. 92-500) as amended by the Clean Water Acts of 1977, 1982, and 1987 (P.L. 95-271, 97-440, and 100-4)
- Federal Register §35.1521 et seq. Vol. 44 No. 101, Wednesday May 23, 1979, Rules and regulations
- Ohio Revised Code Section 167.01 - 167.08, "Regional Councils of Governments"

- Ohio Revised Code Section 6111.03, "Powers of Director of Environmental Protection."
- Urban Cooperation Act of 1967, Michigan Public Act No. 7, §124.501 - 124.512 (Ex. Sess.).
- Syllabus: Ohio Attorney General's Opinion 79-018 (May 24, 1979)
- Bylaws of the Toledo Metropolitan Area Council of Governments
- Implementing Documents and Resolutions

Plan Amendment Process

The Areawide Water Quality Management Plan is maintained by the Environmental Council, and may be amended between regular updates to meet changing conditions. The amendment process is as follows:

- A DMA or member of the Environmental Council may raise an issue regarding the Areawide Water Quality Management Plan, which, in their opinion, requires a Plan Amendment, to the attention of the Chair of the Environmental Council, or the TMACOG Vice President of Environmental Planning.
- TMACOG will convene meeting(s) of the affected parties to discuss the issues and attempt to reach a solution by mutual agreement.
- Following meeting(s) of the affected parties, the proposed Plan Amendment will be placed on the Environmental Council agenda at the request of any DMA or member of the Environmental Council. All parties to the issue will be given an opportunity to present their issues to the Environmental Council.
- The Environmental Council shall make recommendations on the proposed Plan Amendments according to its Operating Procedures. Its recommendation, regardless of outcome will be forwarded to the Executive Committee.
- The Executive Committee shall review the Environmental Council recommendation and vote whether or not to approve the requested Plan Amendment. Executive Committee shall forward both its and the Environmental Council's recommendations to the Board of Trustees.
- The TMACOG Board of Trustees shall review the recommendations of the Environmental Council and Executive Committee, and vote whether or not to adopt the requested Plan Amendment.
- DMAs recognize that a vote by the Board of Trustees on a Plan Amendment is TMACOG's final decision on proposed changes to TMACOG'S *Areawide Water Quality Management Plan*.

CHAPTER 4
PUBLIC WASTEWATER TREATMENT

Introduction

Clean Water Act

On October 18, 1972, the Federal Water Pollution Control Act Amendments became Public Law 92-500. These amendments established a comprehensive water pollution control program. The Act's objective was to *"restore and maintain the chemical, physical, and biological integrity of the Nation's waters."* It established programs to carry out these goals:

- uniform, enforceable national standards for clean water and regulations to enforce those standards;
- a national permit program for discharge from all point sources -- industrial, municipal, commercial, agricultural, and other facilities that release pollutants through pipes and sewers;
- federal funds for construction of sewage treatment systems;
- state and areawide water quality planning programs to coordinate pollution control decisions and to implement feasible methods to achieve clean water over the long term.

The Act was reauthorized and amended in 1977, 1982, and 1987. Among the many changes were to shift responsibility for management and funding from the Federal Government to State and Local agencies. In the 70s, the *Areawide Water Quality Management Plan* was used for issuing Construction Grants for public sewers and wastewater treatment under §201 of the Act. Today, the Construction Grants have been replaced with Revolving Loan programs administered by Ohio EPA and Michigan DEQ. US EPA provides the working capital for these programs through grants. Each State provides matching funds, and loans the money to local governments to build or upgrade public sewerage systems. Both State agencies have reduced interest rate funding available for projects based on financial need.

The Purpose statement of §201 states that: "*To the extent practicable, waste treatment management shall be on an Areawide basis and provide control or treatment of all point and nonpoint sources of pollution, including in place or accumulated pollution sources.*" This goal remains relevant despite the declining Federal role.

An Areawide Approach to Public Wastewater Treatment

Facility Planning Areas

Section 208(a)(2) of the Clean Water Act directs that: "*The Governor of each State ... shall identify each area within the State which, as a result of urban-industrial concentrations or other factors, has substantial water quality control problems...*"This language led to the establishment of Facility Planning Areas (FPAs) as a key element of this Areawide Water Quality Management Plan. An FPA may cover a municipality and surrounding developed areas, or areas where public wastewater treatment may be provided more economically or more effectively at a regional level than for each individual political jurisdiction. FPAs provide individual jurisdictions with a means of planning and cooperation to provide service to residents.

Service includes collection of household sewage in pipelines that carry it by gravity and pumping to a "wastewater treatment plant" (WWTP), which may also have a limited ability to treat industrial wastes and/or sludge pumped out of private septic tanks (septage). The term WWTP may also be applied to treatment facilities owned and operated by industries solely for their own process wastes; but in this Plan it normally refers to a municipal facility. The entire system of pipes, fittings, valves, pumping stations, and treatment facilities is called a sewerage system. A Publicly-Operated Treatment Works (POTW) refers specifically to a sewage treatment plant operated by a County, a municipal government, or a sewerage authority.

This chapter of the Areawide Water Quality Management Plan defines the region's FPAs—both physical boundaries and their application. FPAs are a mechanism for predicting future wastewater collection and treatment needs, and planning facilities to meet them. The FPAs also define the service areas of the designated treatment facilities for purposes of ORC. §6111.03(J)(2)(B).

For FPAs where there is an existing sewerage system, population forecasts corresponding to the FPA boundary allow pipelines, pumping facilities, and treatment equipment to be sized to provide wastewater treatment and meet NPDES permit requirements for the next twenty years. For areas where there is no existing sewerage system, the FPA predicts future needs to help select the best means of providing service to the area.

Regional Wastewater Management Issues

Several wastewater problems or issues are common throughout the TMACOG region. These issues are often referred to in the descriptions of individual FPAs, and discussed here to give the reader a general understanding.

Extraneous Flows

Infiltration and Inflow: Perhaps the single greatest problem experienced by WWTPs throughout the region is that of infiltration and/or inflow.

- ***Infiltration*** refers to extraneous water entering a sewer system below the ground. It includes leaking service connections - for example, from defective pipes, joints, connections, or manholes.
- ***Inflow*** refers to extraneous water entering a sewer system above ground through improper openings or connections. It includes catch basins, yard drains, and downspouts hooked into the sanitary sewer instead of a storm sewer; it also includes surface water getting into the sewer through a manhole cover.

Both sources of excess water overload sewers and interfere with the treatment plant's ability to do its job. The excess flow overloads the hydraulic capacity of the WWTP, resulting in by-passes of untreated wastewater during storm events. This issue becomes a critical factor when expansion of a WWTP is proposed due to growth when that growth could be accommodated by the present facility if the problem of infiltration was solved.

Anti-Degradation

US EPA set anti-degradation policy in 40 CFR 131.12 (40 FR 51400 November 8, 1983), stating:

> *"The State shall develop and adopt a statewide anti-degradation policy and identify the methods for implementing such policy ... consistent with the following:*
>
> *"Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected."*

A new package plant with a discharge to a local stream would come under anti-degradation requirements, especially where public sewers are available or proposed. In such a case the issue is whether a PTI ought to be issued to allow the package plant, or whether a sewer extension ought to be built instead.

Extensions of existing sanitary sewer systems often come under anti-degradation regulations. This happens when extraneous stormwater overloads the sewerage system, resulting in bypasses or untreated or incompletely treated sewage. Ohio EPA policy requires elimination of extraneous flows as a condition of the PTI. Usually there is a removal multiplier-requirement: e.g., three gallons of extraneous flow must be eliminated for every gallon of sanitary sewage to be taken on by the system. Michigan DEQ has similar regulations for removal of extraneous stormwater flows, but not through anti-degradation rules.

It is the recommendation that anti-degradation requirements for extraneous flows be consistent and based on a defined storm and removal multiplier.

Industrial Discharge Pre-Treatment

Industrial pretreatment is treatment of wastewater by an industrial facility before it discharges to a WWTP. Pretreatment removes industrial wastes that the WWTP was not designed to treat. Industrial wastes can create problems in sewers (fire, corrosion, explosion), inhibit municipal sewage treatment processes, and pass into the environment by accumulating in the POTW’s sludge. Industrial pollutants causing any of the above problems are incompatible with the POTW, and, if industry is to discharge into the public system, industrial effluent will require pretreatment before entering the system.

Under a pre-treatment program, the State and the public sewerage system can require the industry to treat its wastewater to set standards before discharging it to the public sewer. Pre-treatment programs have eliminated many separate industrial wastewater discharges throughout the region.

Package Wastewater Treatment Plants

In many unsewered areas, privately-owned treatment plants are used for sewage disposal. The most commonly-used type of facility is the *extended aeration* treatment plant, which works on a principle similar to the *extended aeration activated sludge* process used in municipal sewage treatment. These small “package” extended aeration treatment plants are manufactured in prefabricated modules, purchased and installed as a “package.” The term “package plant” as used in this plan covers all privately owned, sewage treatment plants serving businesses or residential uses with more than three families. The great majority of these systems are extended aeration plants, but the term as used in this plan and policies includes lagoons, trickling filters, Imhoff plants, and other mechanical sewage treatment devices. It does not include commercial septic systems.

Package plants typically range in design capacity from 1,500 to 100,000 gpd. They are used by commercial operations in unsewered areas when the amount of sewage is too great for disposal by a septic tank/leaching field system and/or where soil conditions won't permit a leaching field to operate properly. Package plants are commonly found at gas stations, restaurants, motels, mobile home parks, subdivisions, marinas, rest areas, schools, retail stores, and occasionally at private residences in outlying areas. Often, there is a high concentration of package plants just outside a city’s sanitary sewer service area.

Frequently these facilities are not properly operated or maintained. In Ohio, most do not have NPDES permits or licensed operators, although NPDES permits for package plants are becoming more common. In Michigan, all surface water discharges are required to comply with NPDES permits. Package plant owners are often reluctant to tap into a public sewer because they made a substantial investment in the package plant.

Wastewater Sludge Management

Sludge is the solid or slurry byproduct produced in the treatment of water or wastewater. Sewage is treated using a biological process: microorganisms remove organic matter from sewage by digesting it. In the process, the microorganisms grow and reproduce. Over time, it is necessary to remove excess microorganisms from the treatment plant - these excess microorganisms are referred to as "waste activated sludge."

Waste sludge undergoes further treatment before disposal. It may undergo further organic digestion. It may also be dewatered, changing a large volume of slurry into a much smaller volume of "sludge cake."

Waste sludge may be disposed of in one of three ways:

- By incineration
- By placement in a sanitary landfill
- By application to agricultural land

Application to agricultural land is the most common practice in our region, and it is the recommendation of this plan that land application be the preferred alternative. Incineration and land filling are simply disposal, discharging pollutants to the air, soil, and possibly waterways.

Land application recycles nutrients and organic matter in sludge by returning it to agricultural land. Land disposal is regulated by Ohio EPA and Michigan DEQ under Part 503 of Chapter 40 of the Code of Federal Regulations.

The regulatory controls on land application of sludge are extensive. Before a wastewater facility may apply waste sludge to land, it must have an approved Sludge Management Plan from the State agency. This document states how the facility will treat and apply sludge in such a manner as to meet regulatory requirements. Sludge application is limited by its nutrient and heavy metal content. Sampling is required for dioxin/dibenzofurans. Other regulations control the methods and locations of sludge application to prevent runoff, contamination of surface or groundwater, or becoming a nuisance while stockpiled.

Sewage sludges are classified as Class "A" or Class "B" depending on the thoroughness of the treatment process used in killing pathogens. Class "A" is a higher-quality sludge, and fewer restrictions apply to its land application.

Areawide Policies

Designated Management Agencies

For each FPA, one or more Designated Management Agencies (DMAs) are listed. DMAs have local responsibility for facility planning and requesting Plan Amendments as necessary. Each DMA's responsibility for collection and/or treatment of sanitary sewage is described later in this chapter in each facility planning area, and in the DMA table in Chapter 3. DMAs are responsible for planning and financing facilities needed to carry out their role, and all DMAs are responsible for cooperating in planning sewerage systems that involve multiple DMAs. Typically, the DMA is the County or municipality that owns and operates the central WWTP, but not always. In cases where an FPA does not include a treatment plant, the DMA is typically the entity responsible for building, operating, and maintaining the sewers.

The DMA's role includes:

- Preparing Facility Plans or sewerage studies to meet Ohio EPA or Michigan DEQ requirements and this Plan's environmental goals.

- Serve as lead applicant to arrange financing for the construction of needed sewerage improvements.
- Join into service agreements with other political jurisdictions within the FPA to operate and maintain sewers, administer billings, and other activities for system operation.
- Request Areawide Water Quality Management Plan amendments as necessary. Where a conflict arises among the jurisdictions of an FPA, any political jurisdiction may request a plan amendment. TMACOG encourages neighboring governments to resolve sewage service conflicts through a collaborative process. If the affected jurisdictions are unable to resolve conflicts regarding an amendment to TMACOG's plan through a collaborative process, then these issues will be resolved by TMACOG's Board of Trustees' vote on the plan amendment, which is TMACOG's final decision on the matter.
- The Environmental Council reviews the Ohio EPA and Michigan DEQ revolving loan fund priority lists, and makes any necessary recommendations to achieve the water quality goals of the region.
- DMAs cooperate with Environmental Council in the Plan Amendment and updating process.

Package plants may be permitted in areas of FPAs where public sewerage service is not available.

Facility Planning Area Descriptions and Data

The largest part of this chapter is devoted to discussing each FPA in turn. Each FPA description addresses, where applicable, the following:

- a map showing its boundaries, areas presently served with public sanitary sewers;
- population forecasts to help predict future needed collection and treatment capacity;
- description and capacity of current sewerage facilities, including known package plants, regardless of whether they are presently in use;
- discussion of sludge treatment and disposal practices, and availability of septage treatment services;
- industrial wastewater pre-treatment services, policies, and capacity;
- discussion of the adequacy of sewerage facilities to achieve the environmental goals; and
- recommends needed facility improvements to meet the environmental goals. Examples of these improvements include sewage treatment capacity expansion or upgrades, abatement of combined sewer overflows, elimination of stormwater from sanitary sewers, elimination of package plants, or extension of public sewerage service to presently unsewered areas.

Facility Planning Area Policies

The FPAs were first defined in the §201 Facility Plans, most of which were prepared between 1975 and 1985. Facility Plans were detailed engineering studies of the most cost-effective means of complying with Clean Water Act wastewater treatment requirements. The Facility Plan weighed the costs and benefits of various types of sewer and wastewater treatment plants, and reached a final recommendation. The recommendation was used as a funding request for a Construction Grant under §201 of the Clean Water Act.

The Areawide Water Quality Management Plan consolidates and updates the Planning Areas originally collected from the Facility Plans. This Plan supersedes the FPA boundaries in the Facility Plans, and provides the local governments with a means of fostering cooperation between neighboring Planning Areas.

Generally speaking an FPA is a current or proposed sanitary sewer service area. In most cases, the FPA has a central wastewater treatment plant. In some cases, the FPA is a discrete service area whose wastewater is treated by a neighboring plant. In such cases, a regional approach to wastewater treatment was found to be more cost-effective and/or more environmentally beneficial than a separate wastewater plant.

For the remaining unsewered FPAs, whether to build a new treatment plant or join an existing facility is a key decision, based on:

- Ability to protect public health and produce effluent that will not compromise the receiving stream's environmental quality
- Lowest cost to users
- Feasibility of providing service

Planning areas provide Ohio EPA and Michigan DEQ and local governments with a decision-making tool for the construction of public sewers. It is the policy of this Plan that:

- Ohio EPA and Michigan DEQ may approve sanitary sewer extensions proposed within FPAs if they are consistent with this Plan.
- Areas outside FPAs should be reserved open space, farmland, or low density residential. "Low density residential" is here considered development that is sparse enough to provide onsite sewage disposal according to the policies laid out in the Home Sewage Disposal Chapter of this Plan. Public sanitary sewers should not be extended to areas outside FPAs. Where a road is an FPA boundary, properties immediately adjacent to either side of that road may be served, as noted below under "Land Use Planning."
- If a DMA proposes serving an area outside its currently established Facility Planning Area, it may request a Plan Amendment as described in Chapter 3.
- Once an area has sanitary sewerage service as part of an FPA, it shall continue to be served by that wastewater facility, except:
    - When the wastewater facility is no longer able to meet its NPDES permit requirements due to extraneous water, unanticipated growth, or treatment quality problems.
    - By mutual agreement of the affected DMAs.
- Package plants within FPAs shall not be permitted where a public sewer is "available" under applicable state or local regulations. Availability of public sewers is determined by the DMAs responsible for providing sanitary sewerage service at the location in question. In Ohio, Ohio EPA makes a determination whether or not to require connection to a sanitary sewer when the permit to install is approved. The policies of this plan are that:
    - New or existing package plants shall be permitted inside FPAs only where public sewers are not available.
    - NPDES Permits shall be required for all package plants regardless of their size.
    - All Permits to Install and NPDES Permits for new or existing package plants shall be required to tap when public sewers become available.
    - No Permit to Install or NPDES Permit shall be issued for a new or existing package plant where a public sewer is available
    - No Permit to Install or NPDES Permit shall be issued for a new, expanded, or upgraded package plant where making a public sewer available would cost the same or less than the cost of the new, expanded, or upgraded package plant.
    - No NPDES permit shall be granted or renewed for either a new or existing package plant where a public sanitary sewer is available.
- Septic systems shall not be permitted within an FPA when a public sewer is available. Where sewers are not available within an FPA, septic systems shall be permitted, subject to policies set in the On-Site Sewage Treatment Chapter.

Considerations for Setting FPA Boundaries

The Clean Water Act calls for an areawide approach to water quality management, originally used to foster areawide cooperation in wastewater treatment: *"...shall identify each area within the State which, as a result of urban-industrial concentrations or other factors, has substantial water quality control problems..."* This very broad language takes on a new meaning with the elimination of most point source pollution problems, and the recognition that water quality control is now dependent on nonpoint source pollution and aquatic habitat.

The guiding principles used in delineating FPAs under this plan are:

FPAs must be in compliance with the Clean Water Act requirements, notably

a. "Waste treatment management shall be on an Areawide basis." [Clean Water Act §201(C)]
b. "Identification of those areas which, as a result of urban-industrial concentrations or other factors have substantial water quality control problems"[Clean Water Act §208(A)(2)]

FPAs should use sound planning practices to identify future needs for wastewater collection and treatment facilities. An FPA boundary is a planning area for a single specific present or future wastewater plant as well as a service area for the designated wastewater treatment plant. An FPA may include service areas for multiple treatment plants when those plants are interconnected to treat varying flow rates.

a. FPAs should be compact and contiguous concentrations of urban land uses without islands of one FPA surrounding another.

b. Remote service areas may be included in an FPA when connected by force main and separated by areas that should remain un-urbanized.

c. FPAs should be designed to serve residents in the most cost-effective manner without duplication of service.

d. FPA boundaries should be consistent with adopted local land use plans.

e. FPA boundaries should be developed through cooperative dialogue among affected local jurisdictions. TMACOG encourages neighboring governments to resolve sewerage service conflicts through a collaborative process. If affected local jurisdictions are unable to resolve conflicts regarding an amendment to TMACOG's plan through a collaborative process, then these issues will be resolved by TMACOG's Board of Trustees' vote on the Plan Amendment which is TMACOG's final decision in the matter.

Land Use Planning and Sewerage Facility Planning

Land use planning is inseparable from planning sanitary sewers service areas. The availability of public sewers is necessary for urban development, especially in a region where soil conditions are very often unsuitable for onsite sewage disposal. With urban development comes pollution from urban runoff, drainage of wetlands, and loss of farmland. A link between established land use plans and sewer planning allows local governments to anticipate infrastructure needed for growth, rather than reacting to water pollution problems.

Land use plans, zoning, and the Areawide Water Quality Management Plan are closely related and are coordinated through the TMACOG Growth Strategies and Environmental Councils. The FPAs are based on county and local land use, comprehensive, or master plans. Areas designated for urban development by these plans have been included within FPA boundaries. Where a sewer is built along a boundary road, it makes sense to serve both sides of the road. Land use and development policies should be applied to FPAs with this level of detail in mind. This Plan's policy is a sewer extension be approved:

- When a developed area is outside an FPA but contiguous to it, and
- Sewers in the FPA are close enough to be considered "available" under the applicable Ohio State law or local ordinance in Michigan.

Zoning is the local government's tool for implementing its land use plan. Since zoning controls what is built, and where, it is important for zoning and this Plan to support each other. FPAs and the information they contain are an integral part of land use planning. In deciding an area's future land use, it is essential to ask whether sewerage facilities will be adequate to provide service:

- Is the collection system adequate to handle the planned growth?
- Does the wastewater treatment facility responsible for providing service to the area have capacity for the planned growth?
- How much growth is projected for that wastewater treatment facility in the land use plans and zoning of other jurisdictions in its service area?
- Does the FPA's sewerage system have problems with sewer overflows, or extraneous stormwater entering the sewers? Will it be necessary to remove stormwater flows from the system in order to handle sanitary sewage due to planned growth?
- What will the ultimate development density be? If an area is developed as low-density and sewers are sized accordingly, the sewers may become overloaded if the density is increased later on.

Plan Amendment Process

This Plan is subject to regular updates as conditions change. Any changes are reviewed and enacted through the TMACOG Environmental Council, which has been charged with responsibility for maintaining the §208 Plan. The Environmental Council, through its operating procedures, provides representation throughout the region, including a seat reserved for each County and the City of Toledo. Designated Management Agencies recognized by this Plan may request a Plan Amendment. Please refer to Chapter 3, Water Quality Management Framework for detail.

State and Federal Programs

Overview

The goal of Areawide Water Quality Management set by the Clean Water Act is to clean up rivers, streams and lakes so that they can support fish and other aquatic life and be used for swimming. Once achieved, the goal is to keep the waters from again becoming polluted. Policies to carry out these goals are set by US EPA and implemented by the State regulatory agencies, Ohio EPA and Michigan DEQ. The main programs are described below.

Water Quality Standards and Regulations

Section 303 of the Clean Water Act provides that States are to adopt Water Quality Standards to serve as goals. These standards set "use classifications," for waters of the state, water quality criteria to support those uses, and an anti-degradation policy.

Effluent limitations are established as the maximum allowable rate of discharge, concentration, or amount of a pollutant that may be released from a point source into any body of water.

The level of treatment required is based on a *wasteload allocation*. The wasteload allocation assesses treatment responsibility to all sources discharging into a given stream so that each assumes an equitable share. Ohio EPA and Michigan DEQ have the responsibility to prepare these allocations.

NPDES Permits

The National Pollution Discharge Elimination System was established under Section 402 and is a principal enforcement mechanism for regulating point source discharges, including those from municipal wastewater treatment plants. The NPDES permit contains several significant items that affect the planning and operation of POTWs such as the effluent limitations. The degree of treatment to be achieved is defined by the effluent limitations developed by the Ohio EPA or the Michigan DNR. The specific effluent limitations vary with the nature of the receiving waters. The effluent limitations directly influence the type of treatment process, the physical treatment works and the operational efficiency required and are, therefore, of considerable importance.

The NPDES permit also contains limitations, conditions, or schedules that can require the municipality to undertake the construction, upgrading or expansion of its WWTP. Meeting the treatment and time requirements of the NPDES permit is often the stimulus for a community to participate in the SRL Program.

State Revolving Funds Capitalization Grants

In 1987 Amendments to the CWA (P.L. 100-4) began phasing out Construction Grants in favor of State Water Pollution Control Revolving Funds (SRFs) that are to be used by the State to help finance construction of wastewater treatment facilities and programs. These programs are administered by Ohio EPA and Michigan DEQ, and use priority systems to determine the use of funds.

Facility Plans and Sewerage Studies

Facility Plans and sewerage studies are two types of reports used to identify and request approval and funding for sewerage facilities.

The Facility Plans were extensive planning documents of prescribed format. They were a required step for funding of Construction Grants under §201. A **Facility Plan's** purpose is to weigh the alternatives for sewerage service in an area, and recommend the best, most cost-effective solution. A **General Plan** (Ohio EPA) or a **Detailed Engineering Report and Basis of Design** (Michigan DEQ) are more commonly used today. The evaluation of alternatives is less rigorous; it is a statement from the local jurisdiction of how it intends to comply with its NPDES Permit, and show a feasible financing plan.

State and Areawide Planning

There are planning programs for publicly-owned wastewater treatment services, at the State level and at the Areawide level. The State programs are carried by Ohio EPA and Michigan DEQ, while TMACOG is the designated Areawide agency.

State Level Planning: The States were given several planning responsibilities under the Clean Water Act.

1. The identification of relationship, linkages and strategies for programs authorized by the Clean Water Act, the Resource Conservation and Recovery Act and the Safe Drinking Water Act;
2. Construction Grant and Revolving Loan Fund management;

3. Administration of the permits programs;
4. Water quality management planning and certification;
5. Water quality standards development, review and revision;
6. Enforcement, including compliance assurance activities.

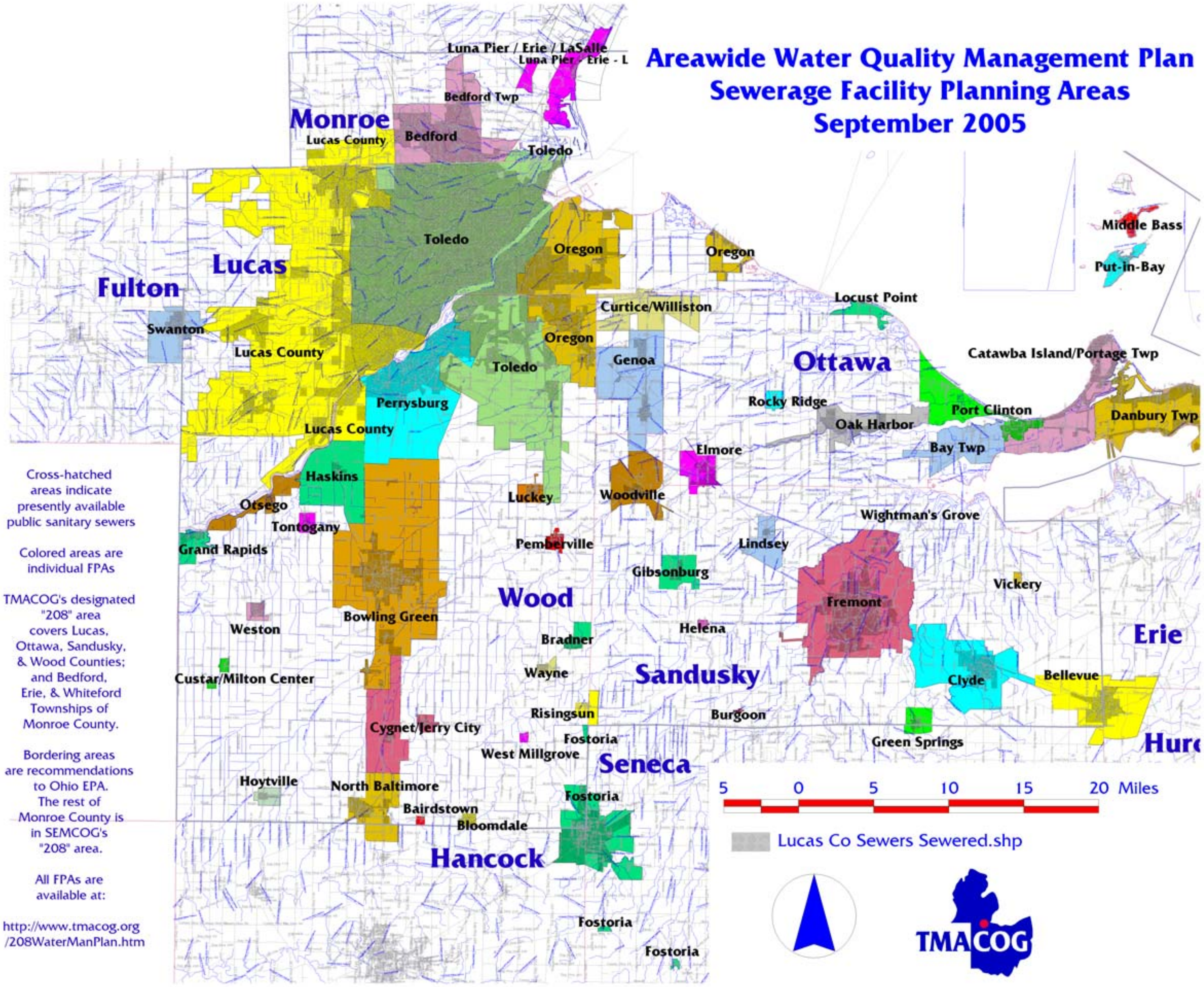
Areawide Water Quality Planning: The object of Areawide Water Quality Planning under Section 208 of the *Clean Water Act* is to develop a comprehensive program(s) for the collection and treatment of water and for controlling water pollution from all point and non-point sources. TMACOG, as the regional 208 planning agency has developed an Areawide strategy for the responsibilities for pollution abatement of participating jurisdictions in the region.

1. Establish and maintain an Areawide policy decision-making forum to oversee implementation of the 208 Areawide plan and resolve conflict that may arise among participants in the 208 Areawide plan,

2. Implement changes in the *Areawide Water Quality Management Plan* following the amendment process defined in Chapter 3 of this plan.

FACILITY PLANNING AREAS: AREAWIDE MAP

Areawide Water Quality Management Plan
Sewerage Facility Planning Areas
September 2005



Cross-hatched areas indicate presently available public sanitary sewers

Colored areas are individual FPAs

TMACOG's designated "208" area covers Lucas, Ottawa, Sandusky, & Wood Counties; and Bedford, Erie, & Whiteford Townships of Monroe County.

Bordering areas are recommendations to Ohio EPA. The rest of Monroe County is in SEMCOG's "208" area.

All FPAs are available at:

http://www.tmacog.org/208WaterManPlan.htm

LUCAS COUNTY FACILITY PLANNING AREAS

LUCAS COUNTY FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- Lucas County: Owns and operates the Maumee River WWTP. Owns and operates sanitary sewers in the unincorporated areas of Lucas County and various other communities by Agreement with same. The wastewater treatment plant provides treatment services to all or part of the following communities as specified in the Lucas County Facility Planning Area map, below.
- City of Sylvania: Owns and operates sanitary sewers within its corporate limits, has reserved allocated capacity in the Maumee River WWTP, and operates sanitary sewers within its sewer service area through an agreement with Lucas County.
- Village of Holland: Owns sanitary sewers within its corporate limits, which are operated by Lucas County through an agreement with the Village.
- City of Maumee: Owns and operates sanitary sewers within its corporate limits, has reserved allocated capacity in the Maumee River WWTP, and operates sanitary sewers within its sewer service area through an agreement with Lucas County.
- City of Perrysburg: Owns and operates sanitary sewers in portions of the FPA in Wood County.
- Village of Waterville: Owns and operates sanitary sewers within its corporate limits, has reserved allocated capacity in the Maumee River WWTP, and operates sanitary sewers within its sewer service area through an agreement with Lucas County.
- Village of Whitehouse: Owns and operates sanitary sewers within its corporate limits, has reserved allocated capacity in the Maumee River WWTP, and operates sanitary sewers within its sewer service area through an agreement with Lucas County.
- Sylvania Township Regional Water and Sewer District: Plans and constructs sanitary sewers in the Lucas County sanitary sewer service area of Sylvania Township. Once built, Lucas County assumes ownership and responsibility for operation.
- Northwestern Water and Sewer District: Owns and operates sanitary sewers in portions of the FPA in Wood County.
- Whiteford Township: Owns sanitary sewers in Whiteford Township areas served by Lucas County; sewers are operated by the Monroe County Drain Commissioner.

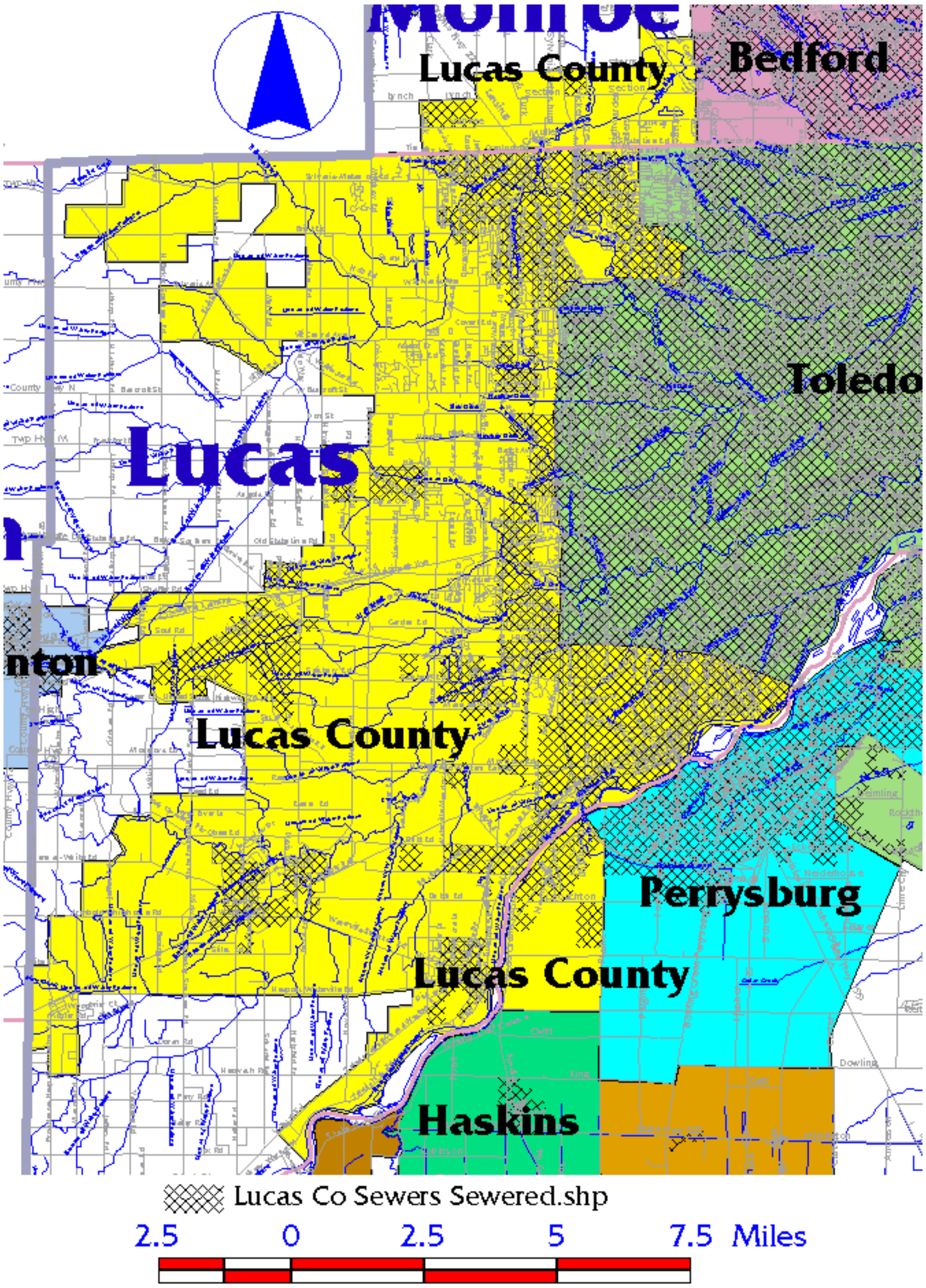


TABLE ONE

	2000	2030
Berkey, entire jurisdiction	265	261
Holland, entire jurisdiction	1,306	1,602
Maumee, entire jurisdiction	15,237	13,509
Perrysburg, entire jurisdiction	16,945	21,465
Sylvania, entire jurisdiction	18,670	20,164
Toledo, entire jurisdiction	313,619	254,184
Waterville, entire jurisdiction	4,828	5,486
Whitehouse, entire jurisdiction	2,733	2,880
Middleton Township, entire jurisdiction	1,960	2,227
Monclova Township, entire jurisdiction	6,767	19,015
Perrysburg Township, entire jurisdiction	13,613	16,501

TABLE ONE

	2000	2030
Providence Township, entire jurisdiction	3,454	4,100
Richfield Township, entire jurisdiction	1,308	1,593
Spencer Township, entire jurisdiction	1,708	1,791
Springfield Township, entire jurisdiction	22,817	26,561
Swanton Township, entire jurisdiction	3,330	3,360
Sylvania Township, entire jurisdiction	25,583	28,713
Waterville Township, entire jurisdiction	1,908	1,738
Whiteford Township, entire jurisdiction	4,420	5,065
Total Population inside the FPA boundary	**101,285**	**120,929**

Present Facilities

The Maumee River WWTP has a capacity of 22.5 mgd average daily flow, and 45.46 mgd peak, expanded in 2005. The plant had an average daily flow of 13 mgd in 1999, and a peak daily flow of 28.16 mgd. The treatment process uses the activated sludge process with anaerobic sludge digestion, belt filter press dewatering, and chlorination/dechlorination. Sludge is applied to land.

The major system improvements since the mid '70s have been expansion of the Maumee River WWTP, many sewer extensions, closing of two municipal wastewater plants, construction of an interceptor to serve the Toledo Express Airport area, and construction of the McCord Road interceptor. The Lucas County Planning Area now includes the individual service areas that use the Maumee River WWTP.

The Lucas County system provides pollution control to Tenmile Creek, Ottawa River, Swan Creek, the Maumee River and numerous ditches. The extension into unsewered areas, the elimination of many package plants and the closing of the Sylvania and Whitehouse Wastewater Plants brought about a pronounced cleanup of Tenmile Creek, Swan Creek and their tributaries. This was reflected by a great reduction in fecal coliform concentrations and oxygen demanding substances.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
23 Fuel Stop	Active	1974	MI036218	5,000
Arrowhead Trailer Park	Active	1979		35,500
Blue Creek I Toledo House of Correction	Inactive	1988		40,000
Charlie's Restaurant	Active	1988		7,000
Courts of Sylvania	Active	1974		2,000
Crossroads Community Church	Active	2005	MI0057625	1,000
Dorr St. Elementary School	Active	1974		13,000
Golden Garden Tavern & Restaurant	Active	1973		8,000
Hidden Lake	Active	1966, 1975		7,200
Hidden Lake Designs	Active			1,000
Hide-a-Motel	Active	1973		7,000
Independent Concrete Pipe	Active	1977 (filters)		1,500
Monclova Community Center	Active	1966		8,500
Oak Grove Mobile Court	Active	1970		8,500
Ohio Gas Co.	Active			2,000
Ohio Highway Patrol Post	Active	1961		1,500
Peaceful Acres Trailer Park	Active	1970		12,500

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Richfield Center Market	Inactive			1,000
Roe Commercial Building	Active	1970	2IQ00002	1,500
Sisters of Notre Dame, Lial Convent	Active	1975 (additions)		17,500
Swanton School	Inactive	1951		

Issues

Average flows to the Maumee River WWTP are approaching its design capacity, and is being expanded to increase capacity. The overall sewer system is subject to severe I/I problems. These rarely lead to bypassing, but can interfere with efficient plant operation and raise treatment costs.

The Lucas County FPA includes areas that are under pressure for development, and therefore sanitary sewer extensions. Most of the areas that were once pollution problems because of package plants or concentrations of septic systems have been tapped in. The continuing need will be to provide sewerage service to accommodate planned development and eliminate failed septic systems. Both Swan Creek and Ottawa River have a long history of high bacterial levels. Both streams often exceed water quality standards at the City of Toledo’s furthest upstream monitoring sites (Swan Creek at Eastgate, Ottawa River at Sylvania Avenue near Wildwood Metropark). Failed septic systems are believed to be major contributors to these bacterial levels.

Berkey

The Village of Berkey has no sewerage system. All sanitary wastes are treated using "on-lot" septic systems. Failed septic systems consistently contaminate Tenmile Creek with untreated sewage. Berkey was recognized as a *Critical Home Sewage Disposal Problem Area* in TMACOG's 1983 *Home Sewage Disposal Priorities* study. Raw sewage entering Tenmile Creek poses a possible public health hazard. The Village has discussed construction of a sewerage system with Ohio EPA, but is not under findings and orders.

The problem area is the central part of town, around the corner of Berkey-Southern and Sylvania-Metamora Roads. This area has the greatest concentration of older homes on small lots. It is also believed to be home to most of the lower income residents. Sewering this one relatively small area would eliminate most of the problem.

The problem with Berkey’s proposed sewerage project is cost. Financial assistance will be needed; a 1996 income survey was approved by USDA/Rural Development that documented a Median Household Income of $29,000.

A 1995 study by Feller and Finch Berkey recommended a gravity sewer system for Berkey connecting to the Lucas County system. The estimated cost was $1.7 million for a 96 user system, or $1.1 million for a 55 user system. With presently available funding, the system is too expensive for residents. The Toledo/Lucas County Health Department has dye tested many septic systems and will continue investigations. The Health Department will require failed systems to be upgraded.

Holland

Sanitary sewers were installed in Holland and tapped into the Lucas County system in 1990.

Maumee

Maumee was connected to the Toledo sewer system until 1973 when the Maumee River Treatment Plant began operation. Maumee separated its sewers and eliminated its CSOs in a four-phase program completed in 1997. In 2001 the entire city is sewered with two small exceptions. One is Old Trail Road, where about a dozen houses are not on the sewer system. The other is Valley Drive, which has about half a dozen unsewered houses.

Neapolis

Neapolis is an unincorporated, unsewered village in Providence Township, near the western edge of Lucas County. A 1988 population estimate, based on a house count, put the population of the village at 530. Presently the area is served by individual septic systems, and one package plant at the Peaceful Acres trailer park, on the edge of the village. It is a 12,500 gpd extended aeration plant without filters, built in 1970. There are 58 mobile homes in the park. In 2005 the Lucas County Court of Common Pleas ordered the mobile home park owners to bring the wastewater plant into compliance with OEPA standards.[1]

A Facilities Plan has been prepared for Neapolis[2], which documented water quality violations due to fecal coliform in local streams (Blue Creek and Aumend Ditch). The Lucas County Health Department notes in addition that septic system leach fields fail to function properly because of the seasonally high water table. High groundwater, which occurs in the spring and fall, is a continuous threat to drinking water supplies, which are from private wells. Neapolis is not under order from Ohio EPA to install sewers.

The Lucas County Health Department has agreed to installation of public water before sewers. Eliminating wells will allow more space on lot for septic systems, and will help alleviate system failures in the short term.

The project proposed in the *Neapolis Facilities Plan* was for conventional gravity sewers and a treatment lagoon, at a cost of $2 million. The grant was not awarded. In 1988, TMACOG did a study of lower-cost alternative technology systems for Neapolis, and proposed a system costing an estimated $530,000. No financial aid was available for the project, and it was not affordable. Neapolis continues to need a sewer system; financial assistance is needed to make it affordable to residents.

An updated General Plan is needed to identify best service options for the area and estimate current costs. The General Plan should include a financing plan. The town of Neapolis proper, the trailer park, and the Woodbrier subdivision stand a reasonable chance of qualifying for financial assistance, but an income survey will probably be needed. Lucas County plans on serving Neapolis by tapping it into the County system to the Maumee River wastewater plant.

Sylvania

Sewers in Sylvania were originally served partly by the city's 0.3 mgd wastewater plant. It began operation in 1957, and discharged into the Ottawa River. Additional portions of the city, up to 2.0 mgd of flow, connected to the Toledo system. Excess flows went into the Ottawa River. In 1977 the two systems were consolidated and the entire city was connected to the Lucas County Maumee River Wastewater Plant. In 2000 there are two areas in the Sylvania service area identified as needing sewers:

---

[1] "Owners get 1 Month to Right Sewage Woes," *Toledo Blade* April 5, 2005

2 Finkbeiner, Pettis, and Strout, 1980.

- Alexis/Whiteford area; the Toledo/Lucas County Health Department collected samples in this area and found elevated fecal coliform levels. Ohio EPA is considering Findings and Orders for sewers.
- The Northeast corner of King and Brint

Waterville

Waterville had its own 0.12 mgd treatment plant, which was abandoned around 1977 when the Village tapped into the Lucas County system. The storm and sanitary sewers were separated in 1975.

Whitehouse

Whitehouse had its own 0.29 mgd wastewater plant, which discharged to Disher Ditch. It was abandoned in 1989 when the village tapped into the Lucas County system. Whitehouse has also eliminated their combined sewers; the system is now entirely separate. The connections between the sanitary and storm sewers have been sealed off.

There are some unsewered areas remaining within the Village itself. Whitehouse Facilities Plan (Poggemeyer, 1981) makes note of these: "The Village should provide unsewered Village areas with service, as the density of development demands such facilities." Connecting unsewered houses within the Village to the public sewer will further reduce pollution to local streams.

Several areas near Whitehouse but outside of the village corporate limits need sanitary sewers. It is the recommendation of this Plan that these areas be connected into the village system:

- The Springbrook Farms/Davis Road area. It includes 92 houses, plus a package plant at the Lial School, and is located between the north corporate limits and Obee Road.
- SR 64 (Centerville Street / Waterville-Swanton Road) northwest of the corporate limits: about 10-15 houses.
- Camp Courageous and Bittersweet Farms are small residential facilities that do not have sewage treatment plants but are too large to use septic systems. They will need to tap into public sewers for service by the Maumee River WWTP.

Wood County Sewer District 307

The Maumee River Wastewater Treatment Plant also serves part of Wood County Sewer District 307, across the Maumee River from the treatment plant. This service is pursuant to an agreement reached between Lucas and Wood Counties in 1975. Four subdivisions in Sewer District 307 are served by Lucas County: Willowbend (at SR 65 and Roachton Road), Saddlebrook (south side of Roachton at Hull Prairie), and Carrington Woods (on the east side of SR 65, between Roachton Road and I-475, and The Sanctuary (the former Divine Word Seminary). Portions of this sewer district are inside the City of Perrysburg. The remainder of Sewer District 307 is unsewered but it is an area under pressure for development.

Future Needs

- The Maumee River wastewater plant was expanded to an average daily flow capacity of 22.5 mgd in

2005 at a cost of this expansion is $17.1 million.[3] The ultimate design capacity to which the WWTP could be enlarged at the current site is 30 mgd average daily flow, or 62.66 mgd maximum. Expansion to that size is not expected to be necessary before 2020.

- Extraneous flows may be high for the older sewers in the system. Sanitary Sewer Evaluation Study may be needed to identify and remove excess inflow and infiltration.
- Sewer extensions to eliminate remaining problem areas and provide service to new development. New package plants and septic systems should not be permitted in areas that may be served by public sewers.

---

[3] *Lucas County Ohio Maumee River WWTP Preliminary Design Report*; Finkbeiner, Pettis, & Strout, June 2001.

Oregon Facility Planning Area

Designated Management Agency Responsibilities:

- **City of Oregon**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **City of Northwood**: Northwood owns some of the sanitary sewers within the corporate limits in the Oregon FPA, and the Wood County Regional Water and Sewer District owns others. All sewers are operated by the Northwestern Water and Sewer District.
- **Village of Harbor View**: Owns the sanitary sewer system within the corporate limits, operated by the Lucas County Sanitary Engineer through an agreement with the Village.
- **Village of Millbury**: Wood County Regional Water and Sewer District owns and operates the sanitary sewer system within the corporate limits.
- **Lucas County:** Owns and operates collection system in Lucas County unincorporated areas, connecting to City system for treatment services.
- **Northwestern Water and Sewer District:** Owns and operates collection system in Wood County unincorporated areas, connecting to City system for treatment services.
- **Ottawa County:** Owns and operates collection system in Ottawa County unincorporated areas, connecting to City system for treatment services.

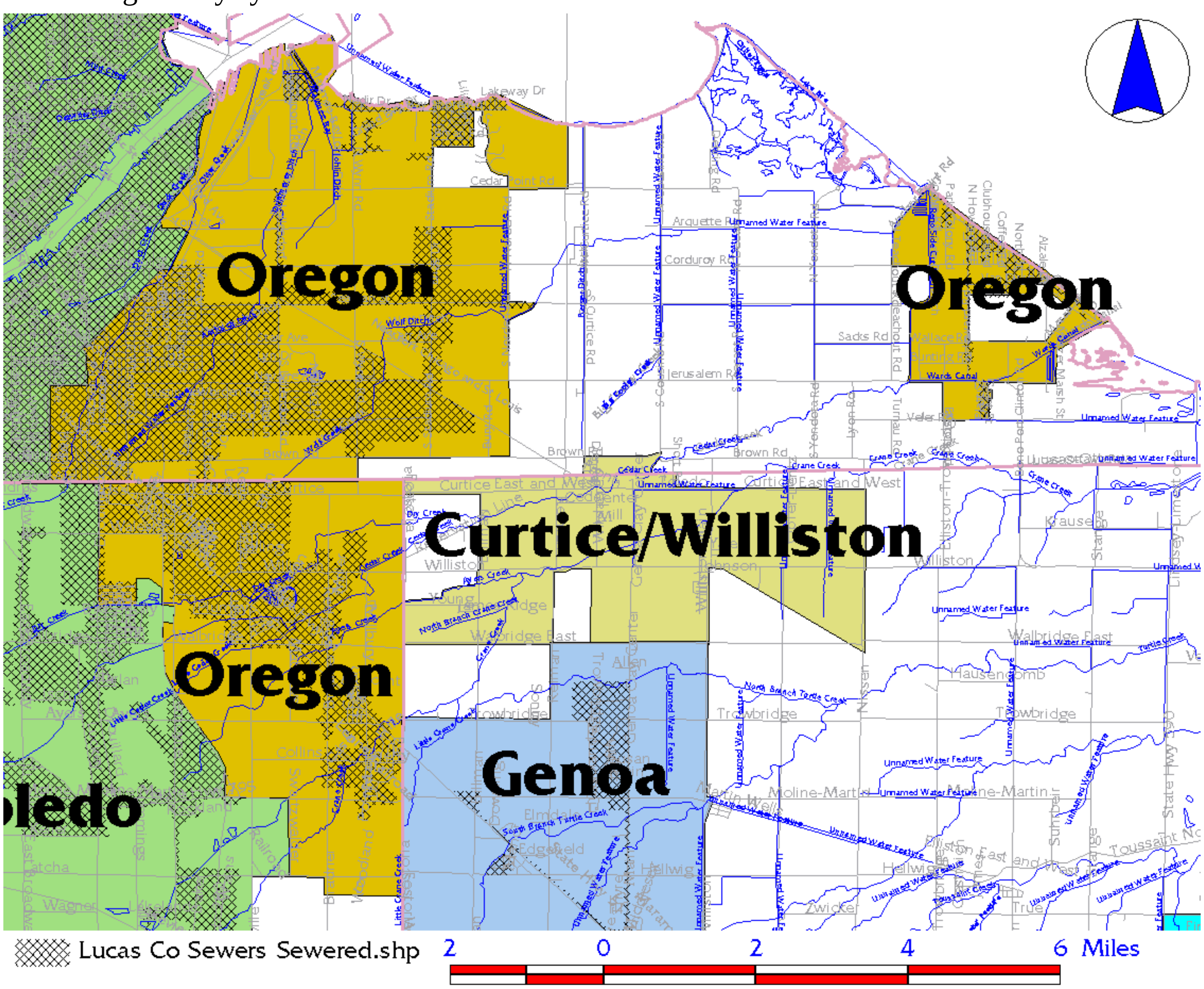


TABLE ONE

	2000	2030
Oregon, entire jurisdiction	19,355	21,535
Harbor View, entire jurisdiction	99	76
Millbury, entire jurisdiction	1,161	1,351
Northwood, entire jurisdiction	5,471	5,207
Jerusalem Township, entire jurisdiction	3,181	2,815
Lake Township, entire jurisdiction	6,643	7,450
Total Population inside the FPA boundary	**29,039**	**31,504**

Present Facilities

The Oregon DuPont Road wastewater plant is an 8 mgd activated sludge facility, designed to serve Oregon, Harbor View, Millbury, and the eastern half of Northwood. Its hydraulic capacity is 36 mgd. With an average flow of 5.41 mgd and peak flow of 21 mgd in 2000, the plant is expected to have the capacity for future needs.

Since the completion of the DuPont Road plant, its service area has been expanded through sewer extensions. The South Shore Park subdivision originally had its own package plant. It was abandoned in the late '80s, and the area is now connected to the main Oregon system. Harbor View and North Oregon were tapped in 1996 at a cost of $3.2 million.

Oregon became a city when the entire Township incorporated. Many areas remain sparsely developed or rural, and unsewered. Package plants in the FPA are listed in Table 2. It is the policy of this 208 Plan that package plants shall be required tap when public sanitary sewers become available.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
Anchor Point Marina (Condo Marine Properties)	Active	1964		10,000
BP Millbury Bulk Plant	Inactive?	1960		1,500
BP Oil Asphalt Plant	Active	1958, 1974		21,500
Berman's Supper Club/Christmas Shop	Inactive			12,000
Buckeye Pipeline	Active	1962	2II00019	
Butch and Denny's Bait/Sporting Goods	Active			1,500
CSX Presque Isle Docks	Active	1957	2IT00013	2,500
Cooley Canal Yacht Club	Active	1969		4,000
Diamonds Gentlemen's Club	Active			7,000
Eisenhower Middle School	Active	1961		20,000
Flying Bridge Restaurant	Active			6,000
Hide Fast Inn	Active	1974		2,000
Ivy Steel & Wire	Active	1973		3,500
Judy's Tavern	Active			1,500
Lakemont Landing	Active	1962		6,000
Maumee Bay Econo Lodge	Active	1988		15,000
Meinke Marina	Active			
Miller Brothers Carry Out	Active	1966		2,500
Our Lady of Mt. Carmel	Active	1967 (expansion)		4,000
Wolf Creek Sportsman's Association	Active	1965		2,000
Wynn Road Homes	Active	1981		2,000

Issues

The main challenge facing Oregon will be providing service to unsewered areas. Package plants, and in particular, failed septic systems, are a serious problem. Closings of the Lake Erie beach at Maumee Bay State Park have been attributed to failed septic systems. Health Department testing indicates that septic system failure is very common in the area. Some areas are densely settled enough to require public sewers. In 1998-9 the Lucas County Health Department conducted a stream and septic system testing program in Oregon and Jerusalem Township. In Oregon 11 of 19 stream sites showed bacteria levels above water quality standards. Trunk sewers were built along Stadium Road, Seaman Road from Lallendorf to Wolf Creek, and Stadium between Pickle and Corduroy Roads between 2001-2005 at an estimated cost of $3.3 million. These sewers eliminated hundreds of septic systems and several package sewage treatment plants. Oregon participates in the Maumee Bay Bacteria Task Force, a group of agencies and citizens that monitors bacteria levels in the bay, and undertakes investigation and implementation projects.

Reno Beach / Bono

Reno Beach, Bono, and the Howard Farms subdivisions are an unincorporated area of about 500 houses in eastern Jerusalem Township. The area was under orders from Ohio EPA to install sewers. They were completed for 400 of the residences in 2005 at a cost of about $11 million.

Curtice

Curtice is an unincorporated, unsewered community in Jerusalem Township in Lucas County and Allen Township of Ottawa County. Stream sampling conducted in 1998-9 by the Lucas County Health Department documented bacterial concentrations above water quality standards in ten out of ten stream sampling locations. About three quarters of the town is in Ottawa County, and is discussed in more detail in the Genoa FPA.

Future Needs

- Continue participation with Maumee Bay Bacteria Task Force to identify remaining bacteria sources in the Wolf Creek watershed, and determine solutions needed to protect the bay for recreation, especially the Lake Erie Beaches at Maumee Bay State Park.
- Work with Lucas County and Jerusalem Township on completion of the Reno Beach / Bono sewer project
- Work with Lucas and Ottawa Counties, and Jerusalem and Allen Townships in planning sewerage facilities for Curtice and Williston, where one possible option is connection to the Oregon system.
- Sewer extensions to eliminate remaining problems areas and provide service to new development. New package plants and septic systems should not be permitted in areas that may be served by public sewers

SWANTON FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Swanton**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Lucas County:** Owns and operates collection system in Lucas County unincorporated areas, connecting to Village system for treatment services.
- **Fulton County:** Will own and operate collection system if and when any Fulton County unincorporated areas connect to Village system for treatment services.

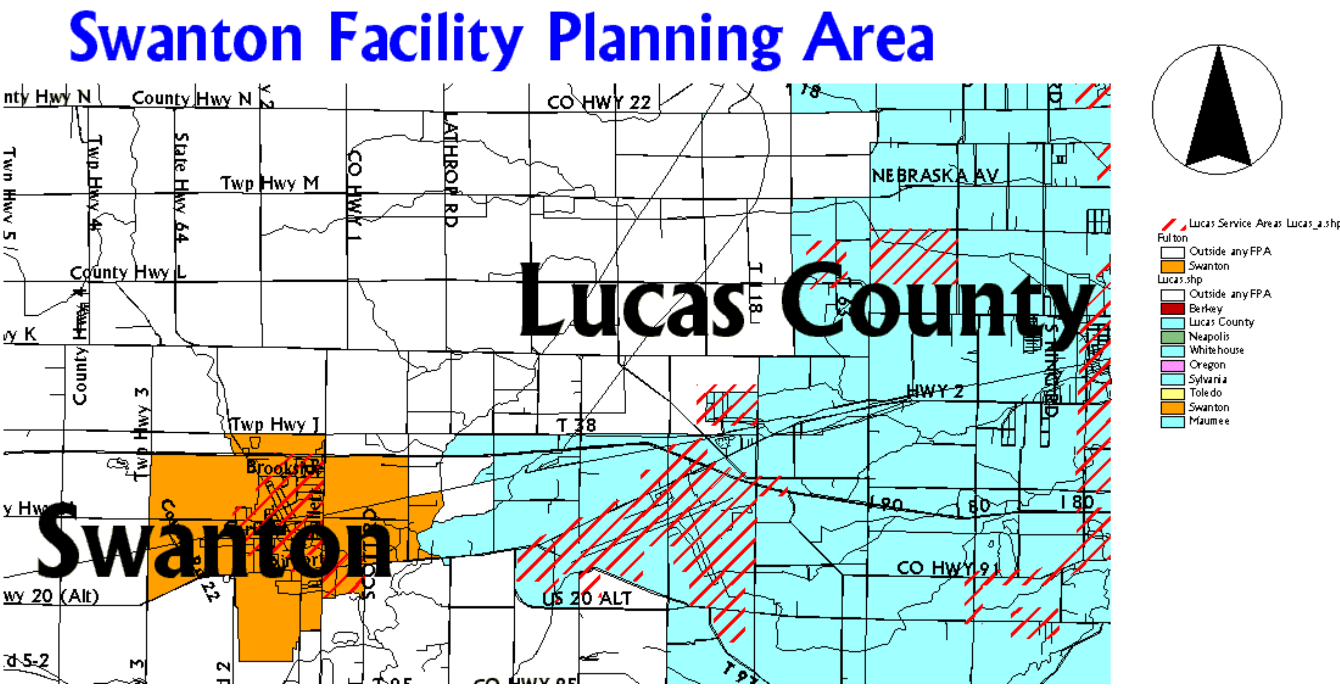


TABLE ONE

	2000	2030
Swanton, entire jurisdiction	3,307	3,716
Swanton Township, entire jurisdiction	3,330	3,360
Swan Creek Township, entire jurisdiction	5,178	7,277
Fulton Township, entire jurisdiction	3,261	2,096
Total Population inside the FPA boundary	4,597	5,204

Present Facilities

Swanton is served by a trickling filter WWTP rated at 0.92 mgd, with an average flow of 0.92 mgd and peak daily flow of 1.69 mgd in 1999. After final settling, effluent goes through tertiary sand filters, is chlorinated, and then discharged to Ai Creek. The plant has a 2.5 MG retention lagoon with chlorination to reduce bypasses of combined sewage during storm events. In 2002 the plant was upgraded by replacing the tricking filter media. Sludge is applied to farmland in liquid form.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Oak Openings - Fallen Timbers Service Plaza North	Active	1961 or earlier	2PP00003	150,000
Oak Openings - Fallen Timbers Service Plaza South	Active	1961 or earlier	2PP00003	150,000
Valleywood Golf Club	Active	1963		12,500

Issues

Most of Swanton is served by combined sewers, with three overflows to Ai Creek. Two storm sewer projects in the early '90s eliminated some combined sewers. The average flow rate of 257 gpcd indicates that the combined sewers also have a serious I/I problem that causes the WWTP to process a large quantity of extraneous water. Approximately 20% of the sewer system was separate, as of 2005. The Village estimates $3.8 million in repairs and improvements are needed.[4]

Swan Creek Township in Fulton County is an unsewered part of the Swanton FPA that is under pressure for development. Ohio EPA believes that failed septic systems are a pollution problem in this area, but there is no documentation and the area is not under orders. Public water is being planned for the area.

Future Needs

- Swanton has completed its inventory of combined sewers, and is preparing its CSO Long Term Control Plan, expected to be completed in 2004. Separation of combined sewers is the likely remedy.
- Swanton constructed a CSO separation project in 2002, and has another phase planned for 2003. The Long Term Control Plan should identify the phases and schedule.
- Ohio EPA notes that the Swanton WWTP will need to identify facilities to meet winter ammonia effluent limits by 2004.
- Stream and/or septic system testing is needed in Swan Creek Township to identify suspected problem areas.
- Fulton County in 2000 was preparing a countywide sanitary sewer comprehensive plan to address future needs.

[4] "Swanton leaders approve utility: Estimated $3.8 million in sanitary repairs expected" *Fulton County Expositor* April 28 2005

TOLEDO FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- Toledo: Owns and operates wastewater treatment facilities and collection system within its corporate limits. The wastewater treatment plant provides treatment services to all or part of the following communities as specified in the Toledo Facility Planning Area map, below.
- Ottawa Hills: Owns sanitary sewers within its corporate limits, which are operated by Lucas County through an agreement with the Village.
- Rossford: Owns and operates collection system within its corporate limits.
- Northwood: Owns and operates collection system within its corporate limits.
- Walbridge: Northwestern Water and Sewer District owns and operates collection system within the corporate limits.
- Lucas County: Owns and operates collection system in unincorporated areas of Lucas County.
- Northwestern Water and Sewer District: Owns and operates collection system in unincorporated areas of Wood County Sewer Dist 100.
- Erie Township: Will own sanitary sewers in Erie Township areas, if built, to be served by Toledo and operated by the Monroe County Drain Commissioner. Connection of Erie Township sewers to the Toledo system would be subject to availability of treatment and sewer capacity in Toledo and execution of necessary agreements between all governmental agencies.

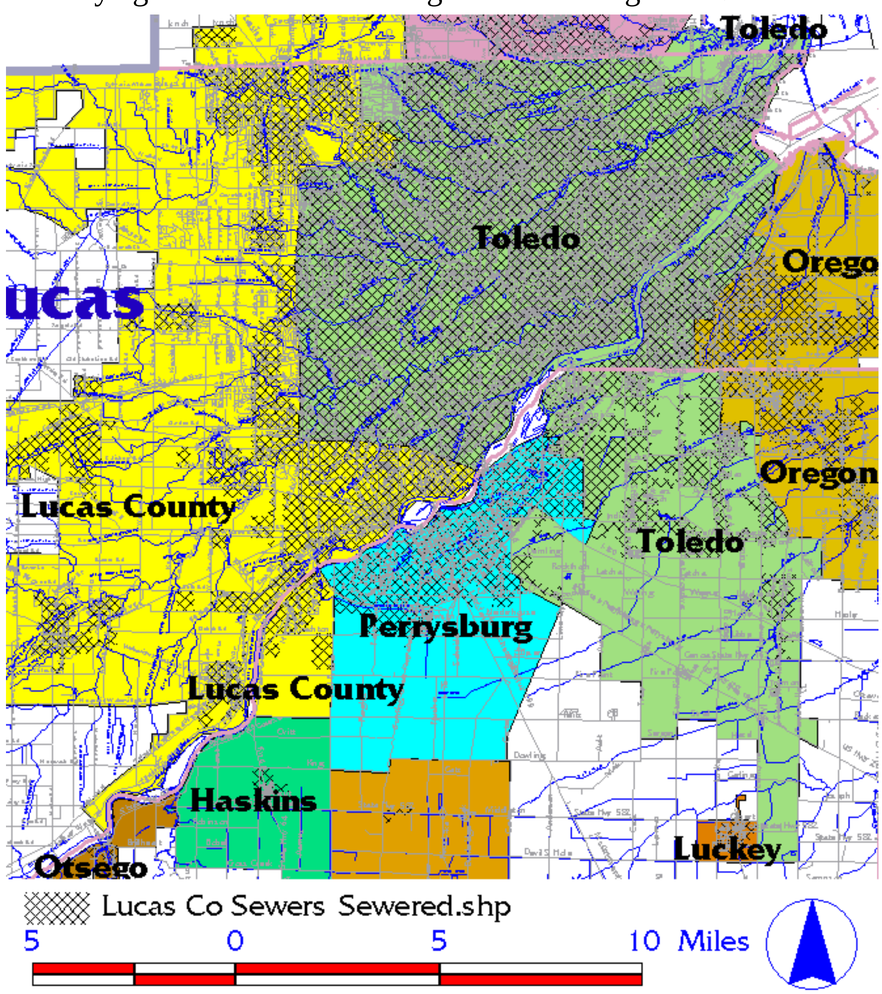


TABLE ONE

	2000	2030
Toledo, entire jurisdiction	313,619	254,184
Ottawa Hills, entire jurisdiction	4,564	4,820
Northwood, entire jurisdiction	5,471	5,207
Rossford, entire jurisdiction	6,406	8,903
Walbridge, entire jurisdiction	2,546	2,167
Lake Township, entire jurisdiction	6,643	7,450
Perrysburg Township, entire jurisdiction	13,613	16,501
Springfield Township, entire jurisdiction	22,817	26,561
Sylvania Township, entire jurisdiction	25,583	28,713
Troy Township, entire jurisdiction	3,357	4,107
Washington Township, entire jurisdiction	3,574	2,891
Erie Township, entire jurisdiction	4,850	6,002
Total Population inside the FPA boundary	**349,786**	**294,924**

Present Facilities

The Toledo sewerage system affects two major rivers and several smaller streams. Water quality violations of dissolved oxygen and fecal coliform are frequently recorded in the Maumee River and Estuary, Ottawa River and Estuary, and Swan, Silver, and Shantee Creeks. The main reasons for violations are combined and sanitary sewer overflows, urban runoff, failed septic systems, and upstream heritage.

The Toledo Bay View WWTP has an average daily capacity of 102 mgd; it treats the sewage from Toledo and all or portions of six adjacent jurisdictions. Older parts of the city — about 12,000 acres, or 22% of the city — are served by combined sewers, which carry both sanitary sewage and storm runoff. Presently, there are 17 combined sewer overflows along the Maumee, 8 along Swan Creek and 6 along the Ottawa River.

The Bay View WWTP has treated an average daily flow of 73 mgd over the past decade, which is 11 mgd less than the previous decade. This reduction in flow is due to sewer system improvements, improved flow monitoring, loss of population and industry.

The system has undergone a number of improvements over the years that have improved treatment and/or reduced sewage discharges. They include:

- The Tenmile Creek Relief Interceptor — reduced CSOs in north Toledo
- Swan Creek CSO Tunnels — substantially reduced CSOs into Swan Creek and Downtown by storing combined sewage for later treatment.
- Continuing combined sewer projects have reduced overflows from seven CSO areas by separating sewers where this approach was more cost-effective than storage-and-treatment.
- A relief pump station and sewer repairs in Point Place have reduced sanitary sewer overflows in this area.
- WWTP improvements have enabled the plant to meet its NPDES Permit requirements, improve its solids handling capabilities, increase its wet-weather capacity, improve equipment and process reliability and decrease residual chlorine and ammonia in the plant’s effluent.

- Renovated Solids Handling facilities produce both “Class B” and “Class A” sludge cake, which is applied to farmland.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Adult Pleasures/Four Star Books	Active			
ECM Transport	Active			
East Lane Mobile Manor	Active	1957		10,000
Grimes Builders' Supply	Active	1969	2PR00218	3,000
Leisure Village Mobile Home Park	Active	1966		4,000
Lime City School	Inactive	1948		1,840
Mill Mfg. Co.	Active	1960		1,500
Otterbein-Portage Valley Retirement Village	Active	1980	2PS00005	37,000
Pee-Wee Inn	Inactive? Gone?	1980		6,000
Pioneer 795 Truck Stop	Active	1966		1,500
Rudolph/Libbe Inc.	Inactive	1982		1,500
Stony Ridge KOA	Active			7,500
Utility International	Active	1986		12,000
Wagoner Apartments	Active	1974		5,000

Issues

To abate its combined sewer problems, Toledo’s first construction project was initiated in 1988. The approach was to store combined sewage for later treatment. On Swan Creek and the west side of the Maumee River in downtown, tunnels were constructed to catch the “first flush,” which washes accumulated sludge out of combined sewers. The storage tunnels hold combined sewage until the treatment plant is able to handle it. The downtown tunnel is designed to capture a first flush of 0.24” — about 50% of a normal rainfall; the Swan Creek tunnels are designed for 0.55”.

Remediation for the Ottawa River CSOs will use a similar principle. In addition, optimization projects will reduce CSOs, eliminate regulators, and/or separate sewers in areas where these approaches are more cost-effective. As noted below, some outlying communities have overflows and/or extraneous flow problems for their own sewer systems that ultimately flow into Toledo’s.

There are three major Sanitary Sewer Overflows (SSOs) in the Toledo system, all in the Point Place area. SSOs are overflows from sewers that were designed for sanitary sewage only. The SSOs are in a low-lying area near the lakeshore, and are subject to overloading from inflow and infiltration. Because SSOs are discharges from separate sanitary sewer systems, they are a high priority for elimination. Construction was initiated in 1999 to eliminate known points of inflow, and build a wet weather pump station to isolate the Point Place sanitary sewer system from the surcharged Manhattan interceptor into which it discharges.

Wood County Sewer District 100

Wood County District 100 covers a large part of north-central Wood County, and as sewers are constructed, they connect into the Toledo system. The District surrounds, but does not include, Rossford and Walbridge, which are also part of the Toledo system. Historically, this entire area was served by septic systems and package plants. Until the late 80s, there were about 20 package plants in the Ohio

Turnpike/I-280 interchange. Sewer extensions have eliminated this and most other problem areas. Sewer extensions are still needed to serve some areas, noted below.

Walbridge

Walbridge abandoned its own treatment plant in 1967, and is now served by a pump station to the Toledo WWTP. When this connection was originally made, there was an overflow line to Cedar Creek at the old WWTP site. This bypass has since been eliminated.

Northwood

The City of Northwood is partly tributary to the Toledo system; and partly tributary to the Oregon system. Northwood has some combined sewers, but no overflow points. The combined sewers are in the western part of the town, and flow north into east Toledo, which also has combined sewers.

Rossford

Nearly all of Rossford connects to the Toledo system. Some parts of the city are within Wood County sewer District #400. The areas that connect to the Toledo system connect to the 60" Wood County line into the East Side Interceptor. Rossford's sewers were separated in the early 1970s. Each of the three sewage pumping stations has an overflow; one to the Maumee [on Jennings Road near Hillcrest], and two to Grassy Creek [at Colony Road and at Glenwood Road]. Sewage bypasses during severe storms, or when equipment malfunctions.

Lake Township

Two areas of Lake Township have been identified by the Wood County Health Department as having significant septic system failures and installation of sanitary sewers has been ordered. One is the area between Walbridge and Millbury, including about 100 residences along Plumey, Owens, Walbridge, and Mathews Roads. The project was estimated at $1.426 million in 1999. Sewers have been ordered for Plumey, Owens, and Walbridge Roads by the Wood County Health Department, but not from Ohio EPA. Sewers for Mathews Road have been requested by petition.

The second area includes 28 houses on Truman Road, east of I-280. In 1996, the estimated cost of this project was $345,000. Sewers have been ordered for this area by the Wood County Health Department, but not from Ohio EPA.

Stony Ridge and Lemoyne

Stony Ridge and Lemoyne are two unincorporated communities in Troy Township on US 20. Stony Ridge includes about 175 residences and several small commercial buildings. Lemoyne encompasses around 80 residences, over a third of which are in a trailer park currently served by a package plant. Both towns are under orders from Ohio EPA to install sanitary sewers. When the sewers are built, they will connect into the Toledo system. The General Plan for these projects was completed in 1995, and was submitted to USDA/Rural Development in 1996 and rejected for non-availability of funds. It was re-submitted in 1998. The cost for both projects together is estimated at $2.8 million and are under Findings and Orders from Ohio EPA.

Stormwater Anti-Degradation

Ohio EPA anti-degradation regulations require removal of stormwater flows from a combined system in order to tap new sanitary flows. The removal rate is based on peak sanitary flow rate, or 3.33 times the average flow. In order to accept 10,000 gpd of new sanitary sewage, 33,333 gpd of stormwater is required to be removed from the system. This requirement applies to the sewer extensions noted above.

Future Needs

The main issue facing the Toledo WWTP and its tributary sewer systems is extraneous water. Through its past sewer improvements — such as the Tenmile Creek Interceptor and the Swan Creek/Downtown CSO storage tunnels — Toledo has made substantial improvements. Toledo still faces significant capital improvement needs to abate wet-weather pollution problems. The total wet weather program improvements may top $400 million, and will take 15 to 20 years to finance, design, and build. It seems unlikely that grant funds will be available from the State or Federal governments to pay for these projects.

It is the recommendation of this Plan that Toledo build the following schedule of capital improvements into its rate structure. In 1998, Toledo instituted a sewer rate increase program which raised rates 5.2% each year for 1999, 2000, 2001, and 2002. These increases will fund Toledo's current five year capital program, but will not be sufficient to address the Long Term Control Plan for CSOs, nor the Comprehensive Wet Weather Program for the WWTP. The City is currently in the Study and Planning stage for these issues.

Project	Cost ($ Millions)	Completion Date [Projected Date]
CSO Telemetry system to monitor overflows	$0.07	1976
Tenmile Creek Interceptor relief sewer; modified Ottawa River CSO regulators; added tide gates	$48.6	1982
Downtown CSO Phases 1 and 2	$13.6	1990
Swan Creek CSO Phases 3-7	$31.4	1991-1996
Point Place SSO Phase I	$4.1	2000
Point Place SSO Phase II	$20.0	[2006]
CSO Optimization Projects		
Installed tide gates on 20 regulators (Maumee, Swan)	$0.4	1988
Hawley and Ewing CSO regulator improvements (Swan)	$2.1	1989
Lockwood — improvements to control extraneous flow (Ottawa)	$0.1	1997
Williams — partially separated area by removing stormwater from overflows (Maumee)	$1.5	1998
DeVilbiss — partially separated area by removing stormwater and closing the overflow (Ottawa)	$0.3	1997
Woodsdale — regulator improvements reducing CSO volumes (Swan)	$1.7	2000
Lagrange — partially separate by redirecting flow from large sanitary area to interceptor (Ottawa)	$1.5	2000

Project	Cost ($ Millions)	Completion Date [Projected Date]
Columbus — Partial separation of CSO #23 area by redirecting flow from large sanitary area to interceptor (Maumee)	$3.0	[2002]
Parkside — disconnect sanitary sewer from Monroe regulator (Ottawa)	$01.1	[2003]
CSO Storage and Treatment Projects		
Ottawa River storage/treatment facility, Phase I, to collect flows from CSO areas 64, 65, and 67 (Lockwood, Ayres, Monroe)	$26.0	[2005]
Ottawa River storage/treatment facility, Phase II, to collect flows from CSO areas 61, 62, and 63 (Lagrange, Windermere, and DeVilbiss)	$10.0	[2006]
Bay View WWTP Projects		
Chlorination/Dechlorination System Improvements – Renovated the existing chlorination system and added a chlorine contact tank and dechlorination facilities.	$3.6	1994
Aeration System Improvements – Replaced existing aeration tank (AT) diffusers and added first pass feed pumps to ATs 7, 8 & 9	$2.8	1995
Solids Handling Control System Improvements	$0.5	1996
Final Tank #12, I-41B – Constructed an additional final tank and rebuilt 3 control houses	$6.7	1997
Belt Filter Press Control Panel Replacement	$.39	1996
Belt Filter Press Rebuilds	$1.0	1998-2000
Ferrous Chloride and Polymer System Renovations – Replaced existing tanks, added a contained unloading station and additional dry weather ferrous chloride pumps	$0.9	1999
PLC-3 Replacement Project – Upgraded obsolete PLC-3 processors with PLC-5 processors, installed fiber optic network	$0.55	1999
East Side Pump Station (ESPS) Electrical Renovation, I-43A – Renovated the complete electrical system at the ESPS	$1.2	1999
Bay View Pump Station (BVPS) & Primary Tanks (PT) Electrical Renovation – Renovated the complete electrical system at the BVPS & PTs	$3.34	2000
Secondary Renovations, I-44 – Renovated the existing 11 final tanks and 9 aeration tanks including new electrical service, valve actuators, safety handrails, concrete repairs, inlet valves, air flow meters and a new control house	$11.2	[2002]
Skimming Tank Separation Project, I-45 – Separate the existing two pass skimming tanks into four single pass tanks includes new electrical service to grit and skimming tanks, concrete repairs and safety handrails	$4.65	[2001]
Major Pump Station Renovation, I-46A, B & C – Includes the structural and mechanical renovation of the ESPS & BVPS and the complete renovation of the Windermere PS	$4.5	[2002]
Filling of the Mooring Basin, I-47A – Basin area is needed for additional plant expansion.	$8.2	[2003]
Wet Weather Treatment Facility, I-47B-Includes final effluent pump station and a new wet weather treatment facility designed to provide a minimum of equivalent primary treatment and disinfection to flows exceeding treatment plant capacity	$32.76	[2006]
Equalization Basin Land Acquisition, I-48A	$6.4	[2003]
Equalization Basin, I-48B-Includes the construction of a 60	$70.0	[2006]

Project	Cost ($ Millions)	Completion Date [Projected Date]
million gallon basin, odor control, pump station and preliminary treatment		
Final Tank #13-Includes a new final tank identical to final tank #12. Will provide a firm secondary treatment capacity of 195 mgd	$7.3	[2005]
Secondary Back-up Power-Provide back-up electrical power for secondary treatment and all new construction	$3.8	[2004]
Blower Renovation-Includes the replacement of existing diesel driven blowers	$5.32	[2005]

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
		CONSENT DECREE & 100% WPCLF PROJECTS: 2003 - 2007																				
Paid or Existing Loan		BayView / East Side Pump Station Renovations (I-46A and I-46B) Design	$5,748,750	$2,000,000	$3,000,000	$748,750																$5,748,750
Paid or Existing Loan		Windermere Pump Station Renovations (I-46C) Design																				$0
	100%	Bay View / East Side Pump Station Renovations (I-46A) & (I-46B) Construction																				$0

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
	100%	Windermere Pump Station Renovations (I-46C) Construction	$4,704,000	$2,000,000	$2,000,000	$704,000																$4,704,000
Paid or Existing Loan		Swan Creek Interceptor Rehabilitation																				$0
	100%	Point Place SSO Elimination Phase 2A	$6,227,384	$200,000	$5,800,000	$227,384																$6,227,384
10yr paybck	100%	River Road SSO Elimination - Sewer Lining																				$0
	100%	Secondary Renovations (I-44B) Construction	$4,236,786	$1,750,000	$2,000,000	$486,786																$4,236,786
		River Road SSO Elimination - Inflow Removal 2003	$1,570,000	$250,000	$1,570,000																	$1,820,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
	95%	River Road SSO Elimination - Phase 1 Design	$1,355,000	$355,000	$1,000,000																	$1,355,000
	80%	Maumee Av CSO Reg Return Line Replacement Construction	$1,000,000						$500,000	$500,000												$1,000,000
	80%	Point Place SSO Elimination Phase 2B	$7,271,000		$4,000,000	$3,271,000																$7,271,000
	80%	River Road SSO Elimination - Phase 1 Construction	$7,300,000		$730,000	$3,650,000	$2,920,000															$7,300,000
	95%	Back-up Power Design - Phase I	$1,513,000	$750,000	$763,000																	$1,513,000
	95%	Back-up Power Construction Phase 1	$16,382,000		$4,275,000	$10,750,000	$1,357,000															$16,382,000
	80%	Back-up Power Design &	$18,670,000		$1,867,000	$8,401,500	$4,200,000	$4,201,500														$18,670,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
		Construction Phase 2																				
	95%	ME Bldg Renovation/ Blower Replacement Design																				$0
	80%	ME Bldg Renovation/ Blower Replacement Construction																				$0
	80%	Final Effluent Pump Station Construction	$5,066,000				$2,026,400	$3,039,600														$5,066,000
	80%	Final Tank No. 13 Construction	$6,000,000		$1,200,000	$3,000,000	$1,800,000															$6,000,000
	80%	Equalization Basin Construction (I-48B)	$45,704,000			$9,140,800	$18,281,600	$18,281,600	$0													$45,704,000
	80%	Wet Weather Treatment Facility (I-47B) Construction	$33,988,000			$19,880,400	$14,107,600															$33,988,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
	95%	City-wide Sewer System Survey (SSES) - Parkside	$1,700,000	$400,000	$1,300,000																	$1,700,000
	80%	City-wide Sewer System Survey (SSES) - Bennett	$1,200,000			$500,000	$700,000															$1,200,000
	80%	I/I Reduction Program - Parkside Construction /CPS	$5,200,000				$1,550,000	$2,650,000	$1,000,000													$5,200,000
	80%	I/I Reduction Program - Bennett Design	$250,000				$125,000	$125,000														$250,000
	80%	I/I Reduction Program - Nebraska Design	$250,000							$250,000												$250,000
	80%	River Road SSO Elimination - Phase 2 Design	$630,000				$252,000	$378,000														$630,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
	80%	City-wide Sewer System Survey (SSES) - Manhattan	$250,000							$125,000	$125,000											$250,000
	80%	City-wide Sewer System Survey (SSES) - Nebraska	$1,200,000						$500,000	$700,000												$1,200,000
	80%	Point Place SSO Elimination Phase 2C																				$0
		Private Inflow Removal Program - 2004	$50,000		$50,000																	$50,000
		Mooring Basin/Effluent Channel	$5,282,000			$2,112,800	$3,169,200															$5,282,000
		River Road SSO Elimination-Phase 2 (Beverly) Construction	$5,700,000					$1,000,000	$4,000,000	$700,000												$5,700,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
		Wet Weather Grit Facility	$11,712,000			$7,027,200	$4,684,800															$11,712,000
Completed		Reynolds Rd Pump Station Controls Upgrade																				$0
Paid - Assessment		San Swr Ext (Detroit Av-St Line to Northgate)	$90,000			$45,000	$45,000															$90,000
Paid - Assessment		San Swr Ext (Cass Rd - Heathrdwns to Ohio TP)	$15,000								$7,500	$7,500										$15,000
Paid - Assessment		San Swr Ext (Detroit Av/Stateln Rd/RR)	$12,500		$6,250	$6,250																$12,500
Paid - Assessment		San Swr Ext (Detroit Av - Stateline & Benore)	$12,500				$6,250	$6,250														$12,500
Paid - Assessment		San Swr Ext (Detroit, RR to Alexis)	$25,000			$12,500	$12,500															$25,000
Paid - Assessment		San Swr Ext (Stateline, Detroit to	$20,000			$10,000	$10,000															$20,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
		Creek)																				
Paid - Assessment		San Swr Ext (Eastgate-Key to Pacquin)	$10,000							$5,000	$5,000											$10,000
Paid - Assessment		San Swr Ext (Laskey-Douglas to Secor)	$12,500							$6,250	$6,250											$12,500
CR&R		CSO Telemetry Upgrade	$100,000	$25,000	$25,000	$25,000	$25,000															$100,000
CR&R		Grit Tanks - Rebuild	$200,000	$200,000																		$200,000
CR&R		Annual Manhole Adjustment (2003 - 2007)	$500,000	$100,000	$100,000	$100,000	$100,000	$100,000														$500,000
CR&R		Aeration Tanks - Diffuser Replacement -2005	$50,000			$50,000																$50,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
		Primary Tank Renovations (I-45B) Design	$290,000					$290,000														$290,000
		Interceptor Inspection and Rehabilitation Program - Paine Construction	$2,000,000			$1,200,000	$800,000															$2,000,000
		Interceptor Inspection and Rehabilitation Program - Junction Avenue	$650,000	$200,000	$450,000																	$650,000
		Interceptor Ins. & Rehab. Program - West Side & Ten Mile Creek Construction	$1,400,000			$840,000	$560,000															$1,400,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
		Interceptor Inspection and Rehabilitation Program	$10,750,000			$250,000		$1,500,000	$2,750,000	$6,250,000												$10,750,000
		Bay View Potable Water System Upgrade Construction	$2,500,000			$1,250,000	$1,250,000															$2,500,000
		Bay View Potable Water System Upgrade Design/CPS	$730,000		$410,000	$205,000	$115,000															$730,000
		Interceptor Inspection and Rehabilitation Program-West Side & Paine Design	$220,000	$190,000	$30,000																	$220,000
		River Road SSO Elimination-Phase 3A (Bryne Rd.) Construction	$2,514,000			$2,000,000	$514,000															$2,514,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
		River Road SSO Elimination-Phase 3A (bryne) Design	$275,000		$275,000																	$275,000
	50%	Ottawa River CSO Phase 1 Construction	$18,575,000							$7,700,000	$8,600,000	$2,275,000										$18,575,000
	50%	Ottawa River CSO Phase 1 Construction Services	$1,400,000						$800,000	$500,000	$100,000											$1,400,000
	50%	Swan Creek CSO Design	$1,300,000							$1,300,000												$1,300,000
	50%	Construction Services Nebraska SSES	$0																			$0
	50%	Construction Nebraska SSES	$5,200,000								$3,000,000	$2,200,000										$5,200,000
	50%	Ottawa R. CSO Stor/Treat Fac. Ph 2 Design	$0																			$0
	50%	Ottawa River CSO Phase 2	$8,980,000								$2,960,000	$4,400,000	$1,620,000									$8,980,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
		Construction																				
	50%	Ottawa River CSO Phase 2 Construction Services	$0																			$0
	50%	Ottawa River CSO Phase 3 Design	$200,000								$200,000											$200,000
	50%	Swan Creek CSO Construction	$0																			$0
	50%	Swan Creek CSO Construction Services	$23,675,000								$8,575,000	$12,900,000	$2,200,000									$23,675,000
	50%	West Side CSO Design	$1,150,000								$1,150,000											$1,150,000
	50%	West Side CSO Construction	$23,825,000									$8,700,000	$12,950,000	$2,175,000								$23,825,000
	50%	West Side CSO Construction Services	$0																			$0
	50%	East Side CSO Phase 1 Design	$1,000,000									$1,000,000										$1,000,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
	50%	Ottawa River CSO Phase 3 Construction	$3,485,000									$1,125,000	$1,700,000	$660,000								$3,485,000
	50%	Ottawa River CSO Phase 3 Construction Services	$0																			$0
	50%	Ottawa River CSO Phase 4 Design	$530,000									$400,000	$130,000									$530,000
	50%	Ottawa River CSO Phase 4 Construction	$9,800,000										$3,800,000	$4,350,000	$1,650,000							$9,800,000
	50%	Ottawa River CSO Phase 4 Construction Services	$0																			$0
	50%	Ottawa River CSO Phase 5 Design	$145,000										$145,000									$145,000
	50%	East Side CSO Phase 1 Construction	$18,975,000										$6,425,000	$10,900,000	$1,650,000							$18,975,000
	50%	East Side CSO Phase 1 Construction Services	$0																			$0
	50%	East Side CSO Phase 2 Design	$1,000,000										$1,000,000									$1,000,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
	50%	Ottawa River CSO Phase 5 Construction	$0																			$0
	50%	Ottawa River CSO Phase 5 Construction Services	$2,090,000											$660,000	$1,100,000	$330,000						$2,090,000
	50%	East Side CSO Phase 2 Construction	$18,975,000											$6,425,000	$10,900,000	$1,650,000						$18,975,000
	50%	East Side CSO Phase 2 Construction Services	$0																			$0
	50%	East Side CSO Phase 3 Design	$1,000,000											$1,000,000								$1,000,000
	50%	East Side CSO Phase 3 Construction	$18,975,000												$6,425,000	$10,900,000	$1,650,000					$18,975,000
	50%	East Side CSO Phase 3 Construction Services	$0																			$0
	50%	East Side CSO Phase 4 Design	$1,000,000												$1,000,000							$1,000,000
	50%	East Side CSO Phase 4 Construction	$18,975,000												$6,425,000	$10,900,000	$1,650,000					$18,975,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
	50%	East Side CSO Phase 4 Construction Services	$0																			$0
	50%	East Side CSO Phase 5 Design	$1,000,000											$1,000,000								$1,000,000
	50%	East Side CSO Phase 5 Construction	$18,975,000												$6,425,000	$10,900,000	$1,650,000					$18,975,000
	50%	East Side CSO Phase 5c Construction Service													$0	$0	$0					$0
		Sewer System Replacement/Rehabilitation (2008 - 2020)	$20,000,000				$0										$4,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000	$20,000,000
		Bay View WWTP Miscellaneous Modifications (2008 - 2020)	$10,000,000						$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000				$10,000,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
		City Wide Sewer System Survey (SSES)-South	$500,000											$250,000	$250,000							$500,000
		City Wide Sewer System Survey (SSES)-Monroe	$1,200,000									$600,000	$600,000									$1,200,000
		East Side Grit Removal Construction	$7,400,000						$3,700,000	$3,700,000												$7,400,000
		Est Side Grit Removal Design/CPS	$1,100,000					$500,000	$300,000	$300,000												$1,100,000
		I/I Reduction Program-Monroe Design	$250,000										$250,000									$250,000
		I/I Reduction Program-South Design	$100,000												$100,000							$100,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
	80%	I/I Reduction Program - Bennett Construction /CPS	$5,200,000						$1,500,000	$3,700,000												$5,200,000
	80%	Point Place SSO Elimination Phase 2D	$2,200,000			$200,000	$1,500,000	$500,000														$2,200,000
		I/I Reduction Program - Manhattan Design	$100,000								$100,000											$100,000
		I/I Reduction Program - Manhattan Construction /CPS	$1,500,000									$1,000,000	$500,000									$1,500,000
		I/I Reduction Program - Monroe Construction /CPS	$5,200,000											$3,000,000	$2,200,000							$5,200,000
		I/I Reduction Program - South Construction /CPS	$3,000,000													$2,000,000	$1,000,000					$3,000,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
	80%	Solids Handling Renovations Phase 1	$15,000,000						$5,000,000	$5,000,000	$5,000,000											$15,000,000
	50%	Solids Handling Renovations Phase 2 - Design	$1,000,000						$1,000,000													$1,000,000
	50%	Solids Handling Renovations Phase 2	$10,000,000								$4,000,000	$4,000,000	$2,000,000									$10,000,000
CR&R		Annual Manhole Adjustment	$1,300,000						$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$1,300,000
	80%	Primary Tank Renovations (I-45B) Construction	$3,000,000					$1,000,000	$2,000,000													$3,000,000
	80%	Blower Building Renovations Design	$709,000					$709,000														$709,000
	50%	Blower Building Renovations Construction	$3,150,000						$2,625,000	$525,000												$3,150,000

COMMENTS	ESTIMATED WPCLF LOAN % (New projects)	PROJECT NAME	TOTAL PROJECT AMOUNT	ANNUAL EXPENDITURE (Loan debt service, Bond retirement, CR&R, Operations & Cash)																		TOTAL
				2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
	80%	Aerated Grit Removal - Design	$617,000							$617,000												$617,000
		River Road SSO Eliminataion -Phase 3b (Detroit Avenue)Design & Construction	$7,058,490							$7,058,490												$7,058,490
	50%	Preliminary Treatment Renovations - Construction	$7,700,000								$2,700,000	$5,000,000										$7,700,000

MONROE COUNTY FACILITY PLANNING AREAS

BEDFORD TOWNSHIP FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- Bedford Township: Owns the wastewater collection and treatment system.
- Monroe County Drain Commissioner: Operates and administers sewerage system under an agreement with the Township.

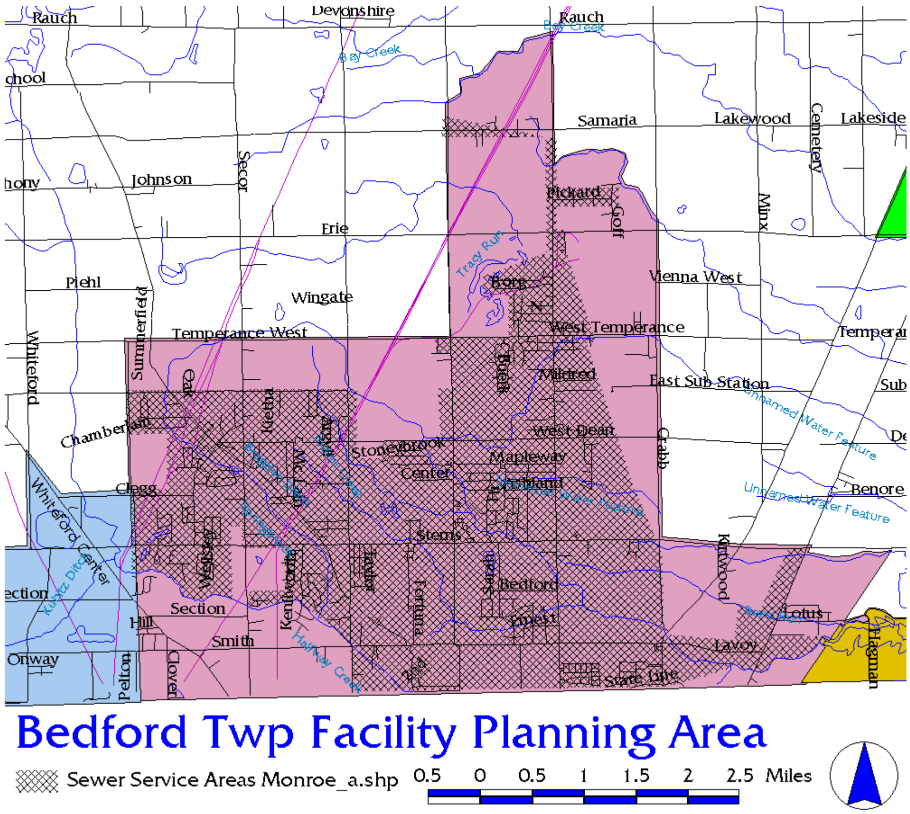


TABLE ONE

	2000	2030
Bedford Township, entire jurisdiction	28,606	39,288
Erie Township, entire jurisdiction	4,850	6,002
Total Population inside the FPA boundary	25,762	35,238

Present Facilities

The Bedford WWTP has a capacity of 6.0 mgd It has an average daily flow of about 3.0 mgd and a peak daily flow of around 4.5 mgd. Peak flow rates can exceed 10 mgd, and the plant occasionally treats flows up to its hydraulic capacity of 13.2 mgd.

Issues

With over 30,000 people and more development predicted, Bedford Township is the most populous Toledo suburb. Bedford Township's rising population continues to increase the demand for wastewater treatment capacity. The present service area includes developed portions of Bedford Township and a portion of Erie Township.

The plant requires expansion to meet present needs. On an average flow basis, the plant is treating half its rated capacity. The plant has adequate capacity for present needs. The system receives extraneous flows which require additional capacity. Continuing efforts are also needed to identify and eliminate sources of inflow and infiltration from the collection system.

Future Needs

- A 2002 study[5] recommended near-term and longer term plant improvements:
    - Plant equipment replacement and upgrades including influent chopper pumps, an additional grit tank, and aeration and digester equipment. The estimated cost of these near-term improvements of $846,000.
    - Sludge handling improvements are needed in the near term to improve sludge treatment, storage, and potentially dewatering and sludge quality. The study offers several alternatives: digestion and storage of "Class B" liquid sludge with construction costs of $1.11 million; digestion and dewatering of "Class B" sludge at $1.24 million; or digestion and drying of "Class A" sludge at $2.21 million.
    - Longer term, the plant will require additional treatment capacity. The plant could be expanded to 9 mgd average and 16 mgd peak at its current site. Plant expansion would include improvements to influent pumping, grit removal, primary and final settling, and aeration. The estimated cost of these improvements is $2.73 million, in addition to the near-term improvements described above.
- Efforts are needed to reduce the amount of extraneous flow entering the sanitary sewer system. The Township and County should continue efforts to identify and eliminate inflow sources from ditches and drains.

[5] *Bedford Township Wastewater Treatment Plan Performance and Capacity Analysis*, Finkbeiner, Pettis, & Strout

LUNA PIER, ERIE-LASALLE TOWNSHIP FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **City of Luna Pier**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Erie Township:** Will own and operate collection system outside the corporate limits in Erie Twp, connecting to City system for treatment services.
- **LaSalle Township:** Owns and operates collection system outside the corporate limits in North Shores and Grandview Beach, connecting to City system for treatment services. This area is covered by the SEMCOG Areawide Water Quality Management Plan, included here for completeness of this FPA.

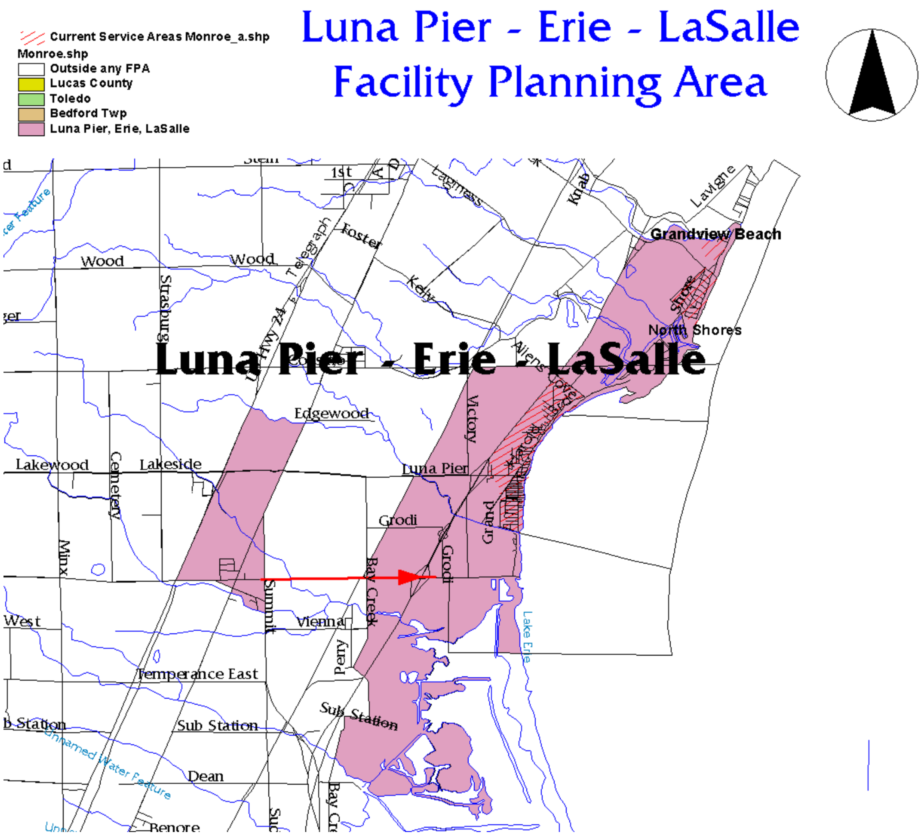


TABLE ONE

	2000	2030
Luna Pier, entire jurisdiction	1,483	1,417
Erie Twp, entire jurisdiction	4,850	6,002
LaSalle Twp, entire jurisdiction	5,001	7,081
Total Population inside the FPA boundary	2,623	2,900

Present Facilities

The City of Luna Pier has a 0.3 MGD activated sludge wastewater treatment plant with a phosphorus reduction and a polishing lagoon. The discharge enters Lake Erie via LaPointe Drain. The WWTP was constructed in 1969.

In 1987 a Southeastern Monroe County Facilities Plan Addendum for the Lakeshore Area of LaSalle Twp was approved, which included the areas of North Shores and Grandview Beach Subdivisions along with the North Cape Yacht Club. The Toledo Beach Marina Area was not included in this project.

An expansion of the Luna Pier WWTP was designed and approved in 1988 at a projected initial cost of $1,026,000. In January of 1991 the expansion was completed and the Lakeshore Area of LaSalle Twp went on line. The plant is expected to meet current and future needs.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Luna Pier Truck Stop	Active		MI055620	5,000
Mason Consolidated Schools	Active	1992	MI047201	10,000

OTTAWA COUNTY FACILITY PLANNING AREAS

CATAWBA ISLAND/PORTAGE TOWNSHIP FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Ottawa County**: Owns and operates the wastewater treatment plant and sanitary sewers.

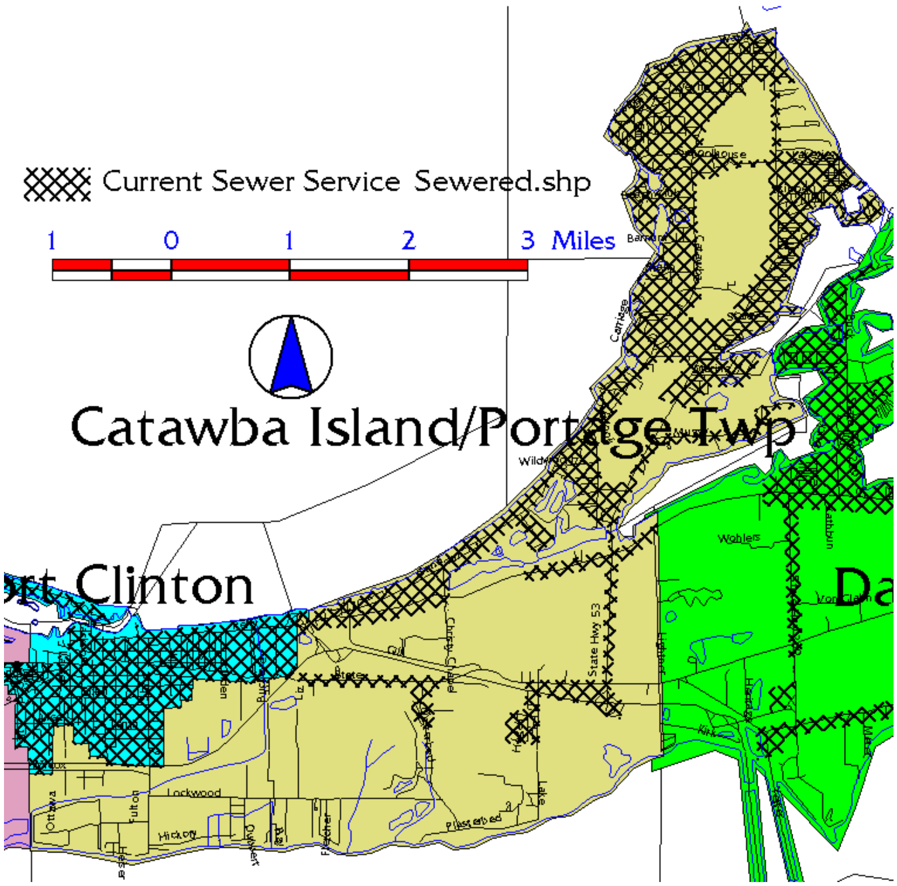


TABLE ONE

	2000	2030
Port Clinton, entire jurisdiction	6,394	4,297
Catawba Island Township, entire jurisdiction	3,157	3,085
Portage Township, entire jurisdiction	1,634	1,698
Total Population inside the FPA boundary	**4,858**	**4,830**

Present Facilities

The Catawba Island/Portage Township WWTP was built in 1991 with the region's last US EPA Construction Grant. Prior to that time, the area was served by private septic systems and more than fifty package plants in Catawba Island Township alone. A 1984 survey found a third of the township's wells contaminated.[6] The WWTP replaced the Catawba Island package plants and another ten in Portage Township, greatly improving sewage treatment. The facility is an activated sludge plant with two batch reactor units. Because these units operate on a batch rather than continuous flow-through basis, they are

---

[6] *Toledo Blade* March 22, 1984

able to accommodate widely varying flow rates. Final effluent goes through chlorination/dechlorination before discharge to Lake Erie. The plant has a summer average daily capacity of 1.34 mgd, a winter average daily capacity of 0.68 mgd, and a peak flow of 3.80 mgd. In 2004 average and peak summer daily flows were 0.56 and 1.35 mgd; average and peak winter daily flows were 0.52 and 3.03 mgd. The plant also has a septage handling facility.

The Catawba Island/Portage Township system is also unique in the region for its collection system. Much of Catawba Island Township has very shallow bedrock. To reduce construction costs, a pressure sewer system was installed. Individual houses tap into the sewer with grinder pumps, which are owned and operated by the County. The southern part of the system, in Portage Township, is served by conventional gravity sewers.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
Day's Inn / Trimotor Ford	Active	1987		8,300
Portage Elementary School	Active	1987		7,000
Sandy Shores Mobile Home Park	Active	1984		12,500

Issues

Portage and Catawba Island Townships in Ottawa County are especially popular areas for summer homes, boating, fishing, and other recreational use. These areas developed heavily without the benefit of public sewers. Failed septic systems and dozens of package plants contributed to severe problems with untreated sewage in ditches and streams. Construction of this wastewater plant eliminated many existing pollution problems and allowed further recreational development. Plant capacity is expected to be adequate for future needs.

Future Needs

- Additional sewer extensions are needed to serve areas not covered by the original construction or subsequent extensions. Beachfront housing on small lots, notably south of Lockwood Road in Sections 7, 8, and 9 of Portage Township, and replacement of the onsite sewage treatment facilities at Sorenson Products and other commercial facilities should be a priority.
- Replace 800+ grinder pumps in service area E-1, estimated at $1.45 million over a three-year period of 2006-8. [7]
- Re-route sanitary flow from State Road area via new force main on Christy Chapel Road. The estimated cost of $500,000, scheduled for 2010. [8]
- Sewer extension to serve the remainder of SR 163 in Portage Township, each of Christy Chapel Road. The estimated cost is $0.7 million, scheduled for 2010. [9] Ohio EPA stresses the need for sewers along SR 163 east from Christy Chapel to the area north of the airport.

---

[7] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004
[8] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004
[9] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004

- Sanitary sewers should be installed in Portage Township south of Port Clinton, identified as a Critical Home Sewage Disposal Area. The project has a target date of 2011. depending on development and funding. [10]
- Sewer extensions to eliminate remaining problems areas and provide service to new development. New package plants and septic systems should not be permitted in areas that may be served by public sewers.

[10] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004

CURTICE/WILLISTON FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Ottawa County:** Plans, owns and operates facilities in Ottawa County unincorporated areas.
- **Lucas County:** Plans, owns and operates collection system in Lucas County unincorporated areas.

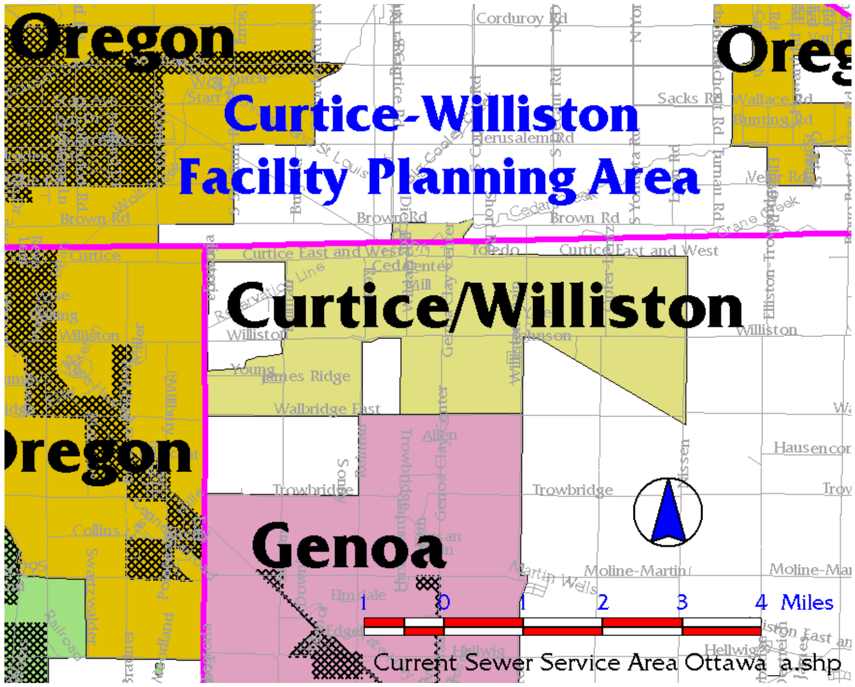


TABLE ONE

	2000	2030
Allen Township, entire jurisdiction	3,297	3,596
Jerusalem Township, entire jurisdiction	3,181	2,815
Total Population inside the FPA boundary	2,358	2,547

Present Facilities

There are no public sewerage facilities in this area. There are several package plants. The largest two are a 57,000 gpd plant at Wildflower Place Subdivision in Curtice and a 32,500 gpd plant at the Luther Home of Mercy in Williston.

Issues

Curtice is an unincorporated, unsewered community in Jerusalem and Allen Townships. About three quarters of the town is in Ottawa County, and is discussed in more detail in the Genoa FPA.

In 1985, there were 145 houses in Curtice, although there has been substantial new construction since. Six sewage bypasses to Cedar Creek were found in the village. Both the Lucas and Ottawa County

Health Departments have conducted sampling in the area, and found water quality violations due to high bacteria levels. Sewers are needed to solve the problem.

Williston

Williston is an unincorporated community in Allen Township. It is larger than either Clay Center or Rocky Ridge. Sewage is treated by home septic systems and one package plant. There is direct evidence that many septic systems have failed, in that there are obvious sewage bypasses to Crane Creek. The largest outfall is on the west side of Martin-Williston Road (Township Road 7), north of the Allen Township Cemetery. A large storm sewer discharges raw sewage and groundwater to the creek here. Ohio EPA or the Ottawa County Health Department should conduct stream and/or septic system tests to confirm the situation.

The single package plant in Williston serves the Luther Home of Mercy, and has a capacity of 32,500 gpd. In 1987, this facility served 127 residents and 300 to 350 staff. A house count at that time put a rough population estimate for Williston at 650. About 90,000 gpd of treatment capacity would be needed to serve the entire town.

Being close Williston to Curtice, Williston should be included in sewerage facility planning for Curtice - unless sampling fails to document a public health problem. Having both communities together in a sewage project improves the chances that the project will be financially feasible, in addition to solving sewage problems for both towns.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
Luther Home of Mercy	Active	1972, 1983	2PS000013	32,500
Wildflower Place Subdivision	Active	1999	2PW00010	57,000

Future Needs

- Work with Allen and Jerusalem Townships, Lucas and Ottawa Counties to plan and construct sewerage systems for Curtice and Williston. Genoa is a possible provider of treatment services for these communities, although there are several options that should be evaluated. A preliminary cost estimate based on connecting to Genoa is $2.3 million with a target date of 2010. [11]
- Curtice is 3½ miles from Oregon's present service area, and about 4 miles from the Genoa system. A General Plan or facilities study will be needed to evaluate service alternatives. They may include:
  - Tap into the Oregon system either through a Lucas County route or a route through Wood County
  - Tap into the Genoa system
  - Expand an existing package plant in Curtice to serve the entire community, and possibly Williston as well.

[11] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004

- Construct a new wastewater treatment plant for Curtice and Williston in the vicinity of the two communities. One possibility is the wastewater treatment lagoon at the closed Stokley's cannery in Curtice.

DANBURY TOWNSHIP FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Ottawa County**: Owns and operates the wastewater treatment plant and sanitary sewers in the unincorporated areas.

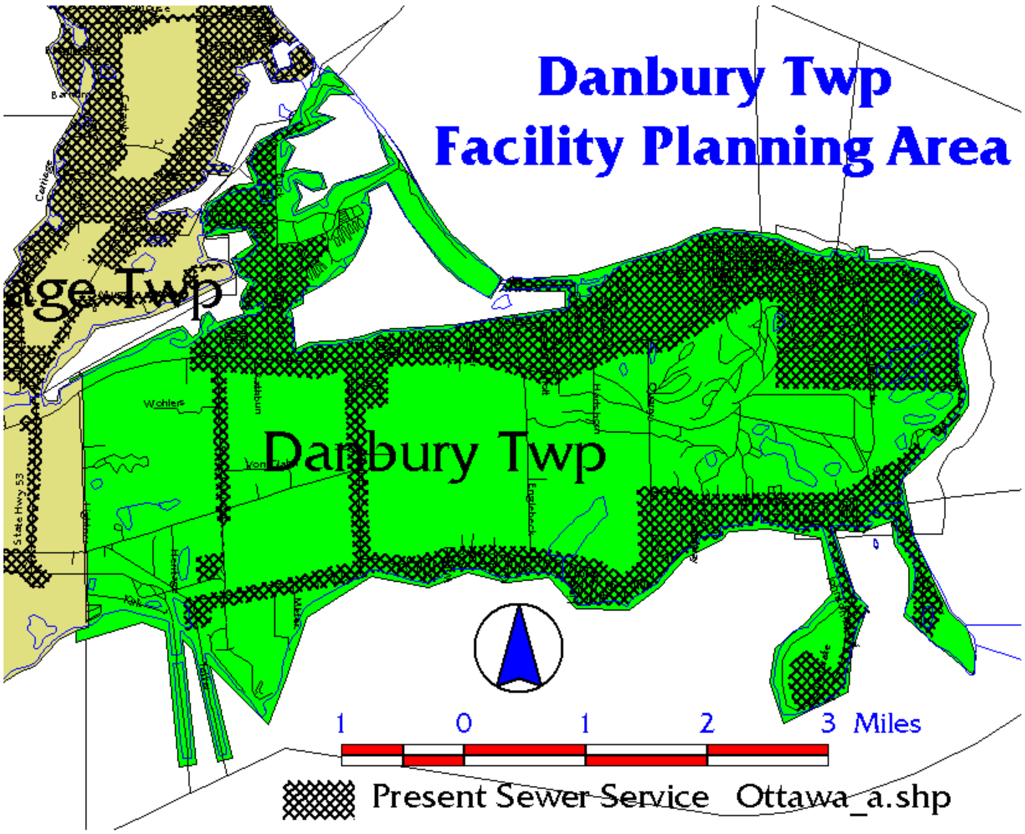


TABLE ONE

	2000	2030
Marblehead, entire jurisdiction	762	789
Danbury Township, entire jurisdiction	3,869	3,903
Total Population inside the FPA boundary	**4,648**	**4,710**

Present Facilities

The Danbury Township WWTP was built to serve the most densely-developed portions of the Township. The treatment plant, expanded in 2005, has three facultative aerated lagoons designed for an average flow of 3.8 mgd and peak flow of 6.0 mgd. In 2004 average daily flow was 1.1 mgd, and the peak daily flow was 2.94 mgd. Equipment includes a tertiary Actiflo unit to meet phosphorus limits. The effluent is chlorinated.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Bay Point Trailer Park	Active to be sewered 2006	1961; 1970		9,000

Issues

Danbury and Catawba Island Townships in Ottawa County are especially popular areas for summer homes, boating, fishing, and other recreational use. These areas developed heavily without the benefit of public sewers. Failed septic systems and dozens of package plants contributed to severe problems with untreated sewage in ditches and streams. Construction of this wastewater plant eliminated many existing pollution problems and allowed further recreational development. In the years since the construction of the treatment plant, there have been a number of sewer extensions, providing service to previously unsewered areas. Consequently, the flow has gradually increased.

Future Needs

- Additional sewer extensions are needed to serve areas not covered by the original construction. New service areas should include Johnson's Island, SR 269, and Englebeck Roads in the interior of the Township.
- Sewer extensions to eliminate remaining problems areas and provide service to new development. New package plants and septic systems should not be permitted in areas that may be served by public sewers.
- Rehabilitate outfall pipe, at an estimated cost of $182,759 scheduled for 2005.[12]
- Replace force main on SR 269 and Van Glahn Road at an estimated cost of $451,000. The replacement may be phased, depending on funding, scheduled for 2006-8.[13]
- Extend sanitary sewers along SR 163 west to the Danbury/Portage Township line. The project was petitioned in 2003; its estimated cost is $600,000, and is scheduled for 2006-7. [14]
- A Sanitary Sewer Evaluation Study is needed to identify and eliminate sources of extraneous water entering the system. Phases I and II were completed in 2002-3 phases III-VIII are estimated at $492,625 to be done in 2006-13.[15]

[12] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004
[13] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004
[14] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004
[15] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004

ELMORE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Elmore**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.

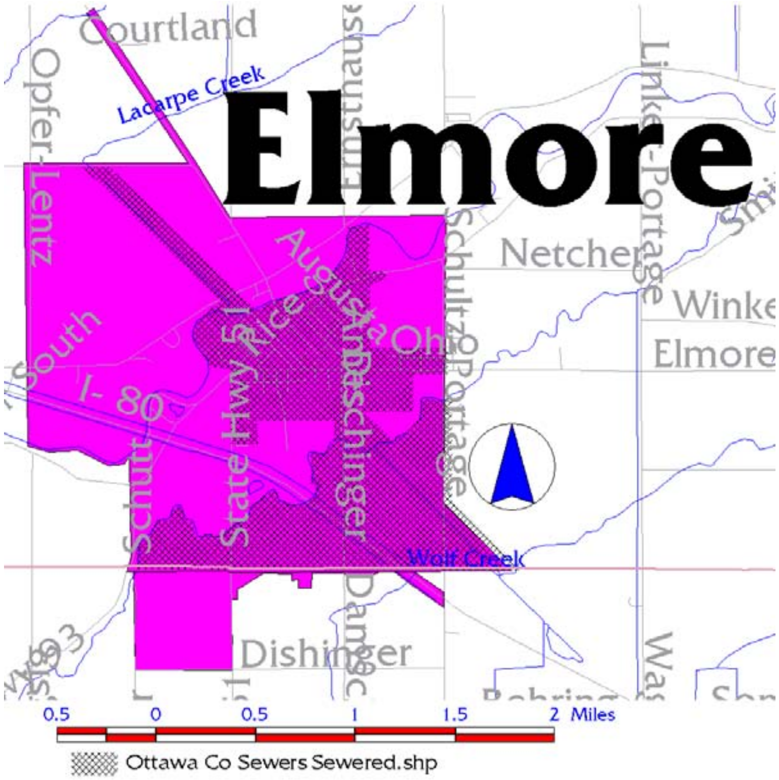


TABLE ONE

	2000	2030
Elmore, entire jurisdiction	1,426	1,500
Harris Township, entire jurisdiction	1,583	1,718
Total Population inside the FPA boundary	**1,834**	**1,944**

Present Facilities

The Elmore WWTP has a trickling filter with final clarifier and anaerobic sludge digestion with a design capacity of 0.18 MGD. In 2004 the average daily flow was 0.14 mgd, and the peak daily flow was 0.51 mgd. Liquid waste sludge is applied to farmland.

The Elmore sewer system was formerly combined sanitary and storm. In 1991, work began to completely separate the system. Separation was completed in 2000 at a total cost of $900,000[16], all constructed with local funds.
Package plants in the FPA are listed in Table 2.

[16] *Toledo Blade Neighbors East* April 4, 1996. Plus Approximately $200,000 each for Augusta and Congress Street Projects.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Elmore Ohio Turnpike Maintenance Building	Active	1989		2,500

Issues

Although Elmore's wastewater plant is adequate for current flows, it was built around 1965, and may require upgrades and/or expansion in the future. When the sewers were separated, it was done by construction new storm sewers. The sanitary sewers continue to have I/I problems.

Future Needs

- With completion of sewer separation, the bypass at the plant should be eliminated. Elmore is conducting a study of options to reduce I/I and eliminate the bypass. The NPDES permit calls for a plan by November 2006.
- Facility improvements under consideration in 2005 included rebuilding the secondary clarifier, changing disinfection from chlorine to ultraviolet, upgrading the trickling filters, and installing a 2.5 mg stormwater equalization tank. The costs of improvements were estimated at $3 million.[17]
- After completion of sewer separation, Elmore should assess long-range plans for its treatment plant. An engineering study may be needed to recommend and provide costs for future capacity.

[17] "Elmore Mulls $3 Million in Sewer Plant Upgrades," *Toledo Blade* 7/27/2005

ERIE/BAY TOWNSHIP FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Ottawa County:** Will plan and construct facilities; and own and operate them if and when built. Oak Harbor and/or Port Clinton may provide treatment services under contract with the County.

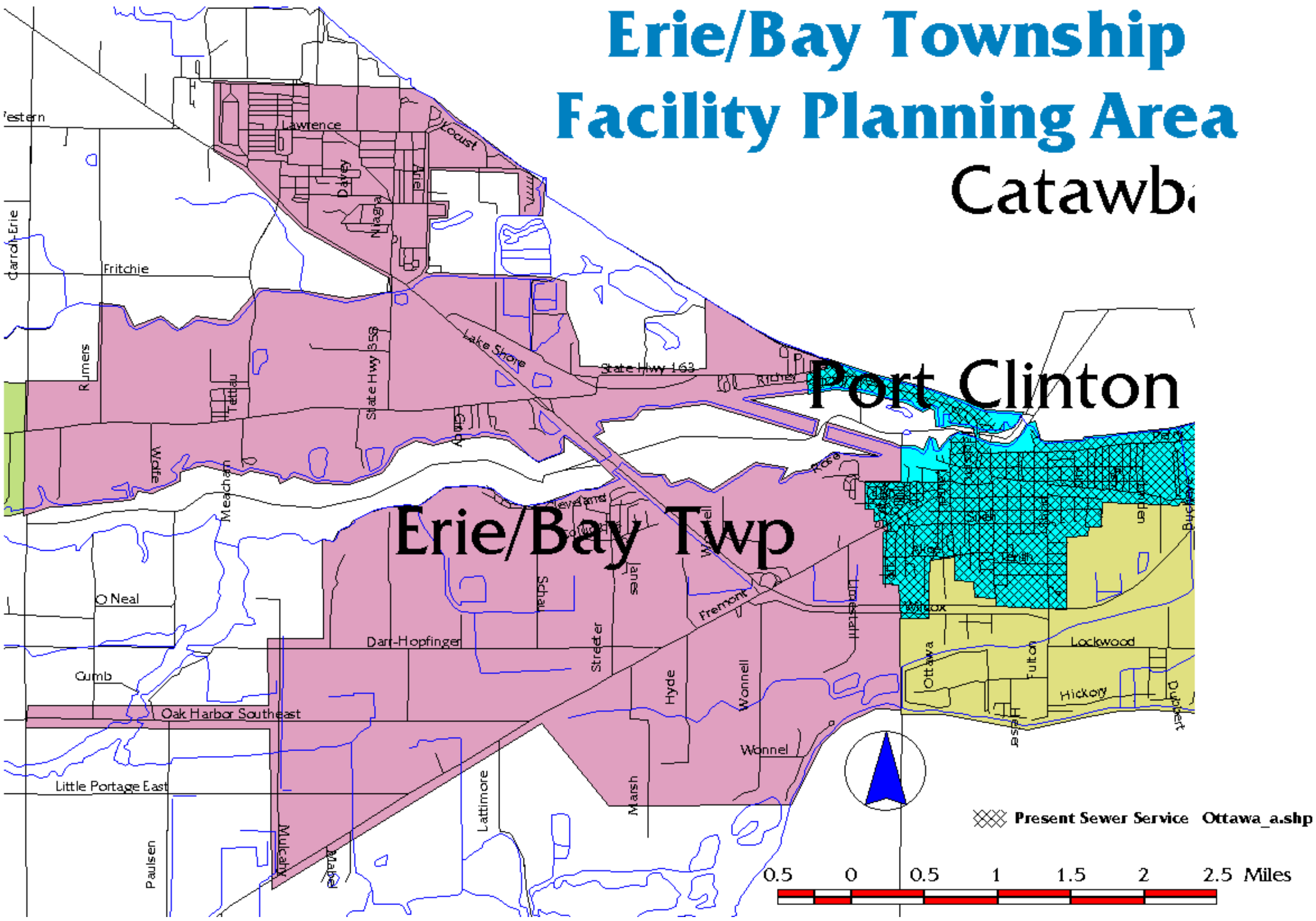


TABLE ONE

	2000	2030
Bay Township, entire jurisdiction	1,294	1,308
Erie Township, entire jurisdiction	1,328	783
Total Population inside the FPA boundary	2,127	1,705

Present Facilities

There are no municipal or county sewerage facilities in this area. There are two large private wastewater plants, and numerous package plants. The Camp Perry has a 388,000 gpd aerated lagoon system. Ohio EPA has advised that this plant should either be upgraded, or its discharge eliminated by connecting to a public system. USCO has a 220,000 gpd aerated lagoon plant. In addition, there are 18 package plants, most of which are concentrated along Lakeshore and Richey Roads in Erie Township.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Camp Perry	Active	1981	2PP00000	380,000
Eb's Place Tavern	Active			4,200
Erie Industrial Park (Erie Proving Grnds)	Active	1942, 1976	2IF00006	1,200,000
Erie Island Resort & Marina	Active	1989	2PS00008	110,000
Erie Township School	Inactive	1951		1,875
Hy-Miler/Shell	Active	1969		1,500
Johnny's Resort/Recreational Camp	Active	1990	2PR00150	12,500
Lakefront Marina	Active	1978, 1987		7,440
Lakefront Villa Condominiums	Active	1988		25,000
Mikey's Bar/Restaurant	Active	1989		7,000
ODOT Rest Area OTT-2-16.65 WB	Active	1998	2PP00044	5,000
Perry House	Active	1969		2,500
Portage Cove MHP	Active	1985		8,000
Portage View Mobile Home Park	Active	1985		12,500
Spinnaker Bay Yacht/Beach Club	Active			20,000
Sunset Inn	Active	1974		9,000
Transmissions Unlimited	Active	1971		5,000
Wagon Wheel Trailer Court	Active	1960		7,500
White Caps Campground	Active	1988		6,000
White Caps Motel & Trailer Park	Active	1963		7,500
Willow Beach Trailer Park	Active	1964		9,000
Yacht Port Beach Condominiums	Active	1987	2PR00135	27,500

Issues

Package Plants and Unsewered Areas

The Richey Road / West Lakeshore Drive area, in Erie Township, west of Port Clinton is a problem area identified by the Ottawa County Health Department due to package plants and failed septic systems. The recommended remedy is to replace these on-site systems with public sewers.

Future Needs

Public sanitary sewers are needed to eliminate existing package plants, upgrade the Camp Perry WWTP, provide treatment and disposal of wastewaters from the BFI landfill (currently trucked offsite for treatment), and eliminate failed septic systems. Several options, or a combination thereof, may be viable and should be evaluated:

- Connect to the Port Clinton system
- Connect to the Oak Harbor system
- Construct a new central WWTP owned and operated by Ottawa County.

Ottawa County is conducting a study to evaluate these alternatives and service area. It is expected to be completed in 2003.[18]

[18] "Erie Twp. Sewers May Flow Either to City or Oak Harbor," *Port Clinton News-Herald* 9/4/2002

Both the Erie/Bay Township and neighboring Port Clinton FPA will need additional treatment capacity in the coming years. Cooperation between the County and City on a joint system could benefit both areas, and should be explored.

GENOA FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Genoa**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Ottawa County:** Owns and operates collection system in Ottawa County unincorporated areas, connecting to Village system for treatment services. Genoa maintains sewers under contract with Ottawa County.

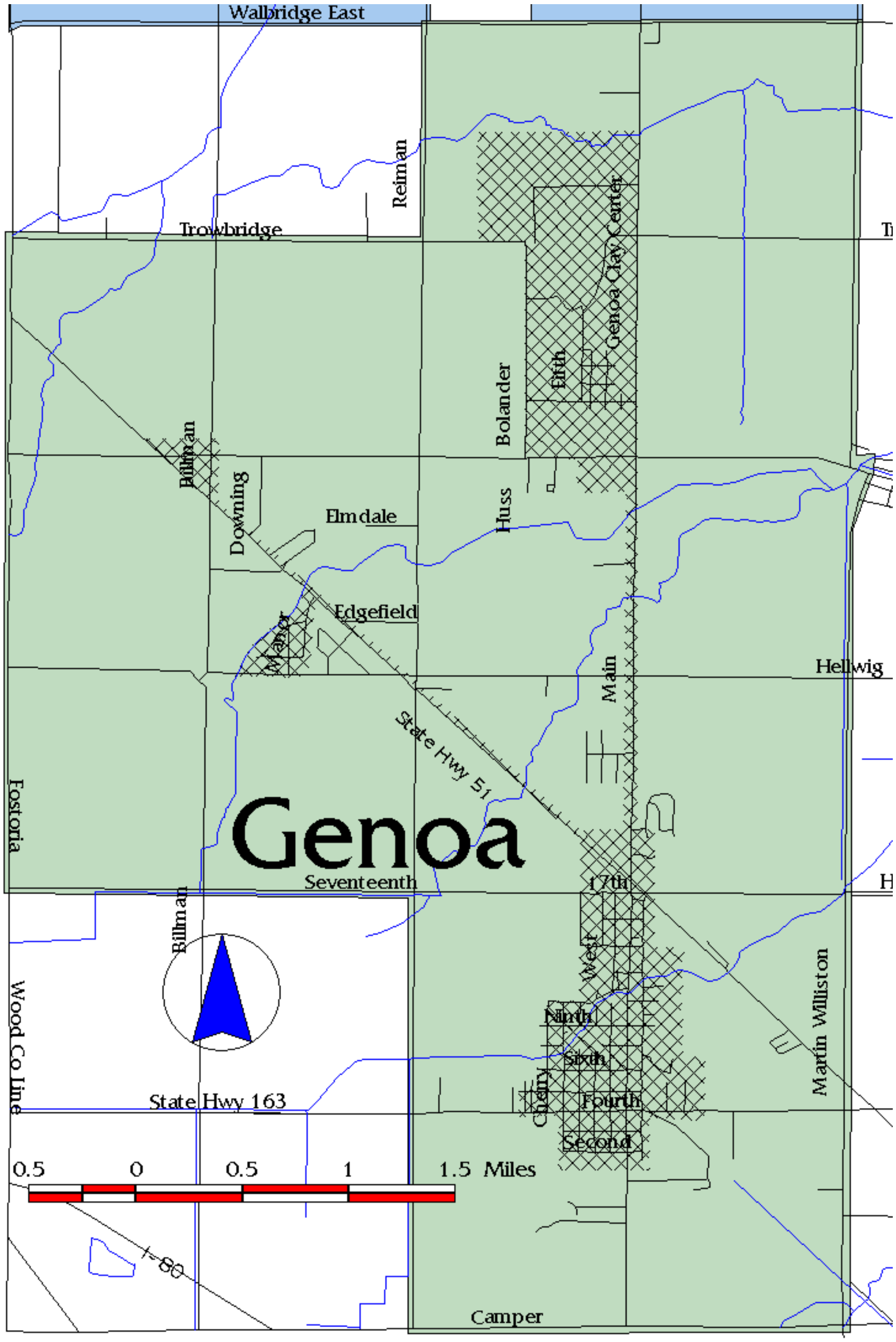


TABLE ONE

	2000	2030
Genoa, entire jurisdiction	2,230	1,870
Clay Center, entire jurisdiction	294	299
Allen Township, entire jurisdiction	3,297	3,596
Clay Township, entire jurisdiction	2,888	2,343
Woodville Township, entire jurisdiction	1,327	1,837
Total Population inside the FPA boundary	**4,963**	**4,259**

Present Facilities

Genoa has a lagoon treatment system with a design flow of 0.60[19] mgd. In 2004 the average daily flow was 0.33 mgd, and its peak daily flow was 0.56 mgd. There are several package plants in the area; several others have been eliminated by tapping into the Genoa system in recent years, including Woodland Estates, the rest areas at the Ohio Turnpike Rest Areas in Woodville Township, 1½ miles south of Genoa, Genoa High School and Guardian Industries. Phase III of the Clay Township sewer project, serving areas between Woodland Acres and Genoa, is planned. Financial assistance is being sought to make this project feasible.

Genoa completed separation of its sanitary sewer system and elimination of all combined sewer overflows in 2001.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
Allen Elementary School	Active	1971	2PT00042	7,500
Blue Moon Apartments	Active	1991	2PW00019	2,000
Ernesto's Restaurant	Active	1964,2000		7,000
Greenwood Trailer Park	Active: ->Genoa planned	1969		13,500

Issues

The Toussaint River TMDL[20] included sampling at three locations near Genoa,

> *"Three sampling locations were selected in close vicinity of the Village of Genoa. Samples were collected at Camper Road (RM 20.20) upstream from the discharge from the Genoa WWTP, downstream from the discharge adjacent to Fulkert Road (RM 19.65) and at Fulkert Road (RM 18.40). … Increased nitrate+nitrite and phosphorus concentrations were observed downstream from the Genoa WWTP …. At Camper Road (RM 20.20), fecal coliform bacteria levels exceeded the PCR* [Primary Contact Recreation] *… criterion on two occasions. Because Genoa's sanitary sewer system does not extend south to Camper Road, the most likely source of fecal coliform bacteria contamination was poorly treated sewage from failed on-lot septic systems.*

[19] Ohio EPA 2003

[20] *Biological and Water Quality Study of the Toussaint River and Rusha Creek Basins* Ohio EPA 2005, pages 12, 29-30

"Downstream from the wastewater treatment plant adjacent to Fulkert Road (RM 19.65), sample results indicated one fecal coliform bacteria exceedence of the PCR criterion. Median phosphorus levels remained below the respective target value. At Martin Wilson Road (RM 11.30) nitrate+nitrite decreased compared to levels upstream at RM 14.73, but remained above the target value. Median phosphorus levels approached the target value of 0.1 □g/l."

The TMDL (page 12) shows the attainment status of the Toussaint River at miles 20.2 and 19.7 as "full," and at 18.4 as "partial" due to sedimentation, noting row crop agriculture and the quarry as sources. The data show exceedences (page 32) for fecal coliform and strontium at all three sites, and total dissolved solids as well at river mile 18.4.

Clay Township

High bacteria counts in streams due to failed septic systems have long been documented.[21] The areas of concern are in Clay Township Section 20. Sewering these areas would significantly improve South Branch Turtle Creek. The health problem indicated by the County Health Department would also improve dramatically. In response to these problems, a building ban was imposed a number of years ago. Ottawa County, the Village of Genoa, and the Village of Clay Center developed plans for expansion of the Genoa WWTP costing $500,000, and phased extension of sanitary sewers. Several phases have been built; sewers for the Village of Clay Center and along Genoa-Clay Center Road were completed in 2004.

Future Needs

Continue and complete Allen/Clay Township and Clay Center sewers. Phase IV of the Clay Township sewers is estimated at $1.292 million and scheduled for construction during 2005. The remaining phases are estimated cost of $2.1 million, scheduled for 2007-2011 depending on financing.[22]

---

[2] *Home Sewage Disposal Demonstration Project for Clay Township, Ottawa County*; TMACOG, June 1986

[22] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004

LOCUST POINT FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Carroll Township Regional Water and Sewer District**: Responsible for planning sewerage facilities, and will own and operate a system if and when built.

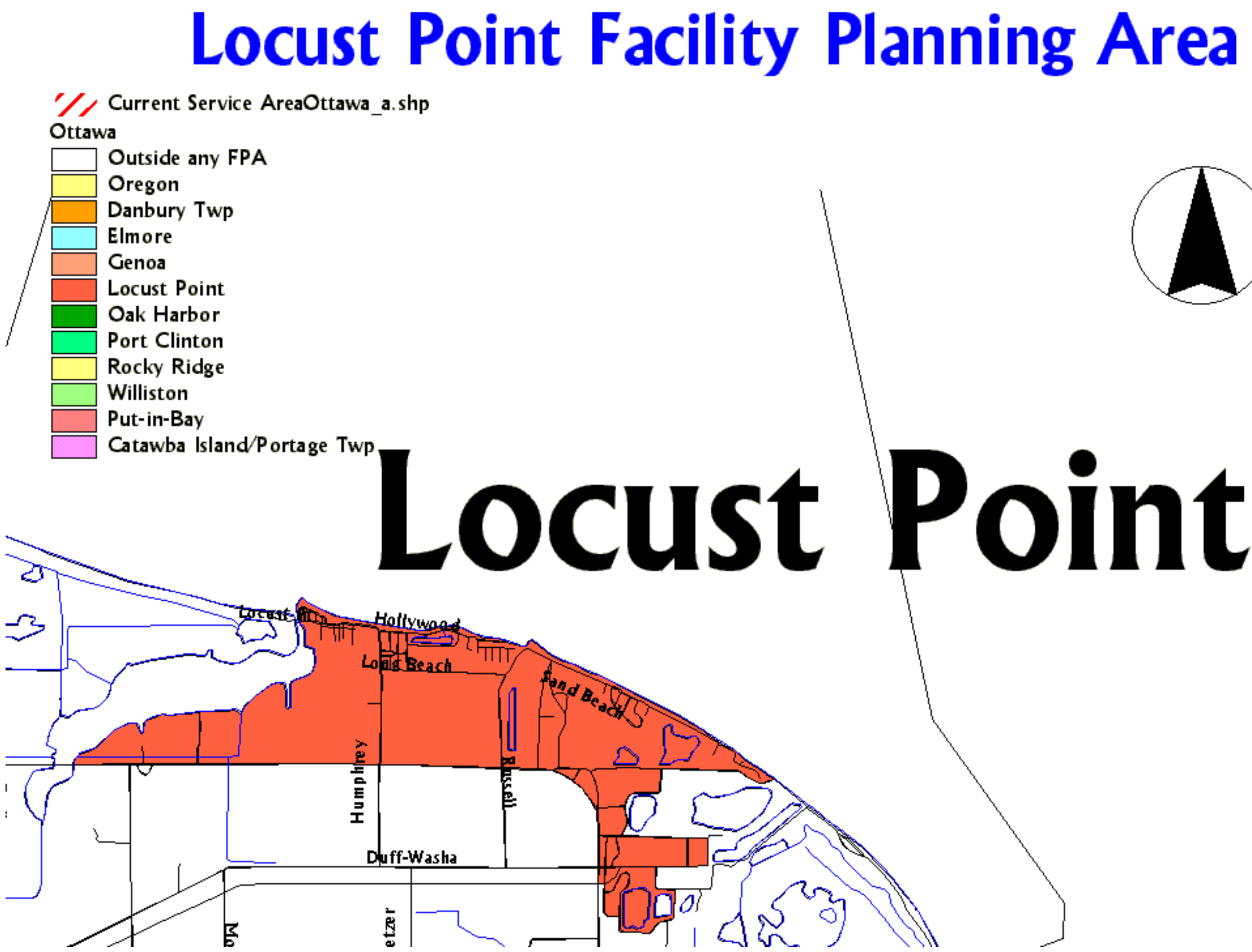


TABLE ONE

	2000	2030
Carroll Township, entire jurisdiction	1,931	2,087
Total Population inside the FPA boundary	461	498

Present Facilities

The Locust Point area includes numerous marinas, mobile home parks, summer and permanent residences, and the Davis-Besse nuclear power plant. There are a number of package plants in this area, and several marinas use honey tanks. Like Danbury and Catawba Townships, the recreation industry provides pressure for growth, and adequate sewage treatment is needed to accommodate the growth.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area **Table Two**				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Beach Carte Tavern	Active	1988		5,000
Davis Besse Nuclear Power Plant	Active	1974	2IB00011	15,000
Davis Besse Nuclear Power Plant	Active	1974	2IB00011	23,000
Fenwick Marina	Active		2PR00130	15,000
Green Cove Condominiums	Active	1987	2PS00007	77,000
Inland Mobile Home Park/Marina	Active			35,000
Magee Marsh Nature Center	Active	1971		6,000

Issues

Although less heavily developed than Danbury or Catawba Island Townships, the situation is similar: pressure for lakefront recreational development has preceded the availability of sanitary sewers. Ohio EPA notes septic sewage in storm sewers in beach front housing areas. Existing package plants would be better to tap into a joint system than upgrade.

The density of development, especially along the lake front where many houses are on small lots, calls for a public sewer system. Additional development will only make the problem worse, and the need greater.

Ohio EPA plans to conduct a Total Maximum Daily Load (TMDL) study of the Toussaint River in 2003, which include part of this FPA.

Future Needs

- A General Plan or facilities study will be needed to determine how best to serve this area.

MIDDLE BASS FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Ottawa County:** Owns and operates sewerage system if and when built.

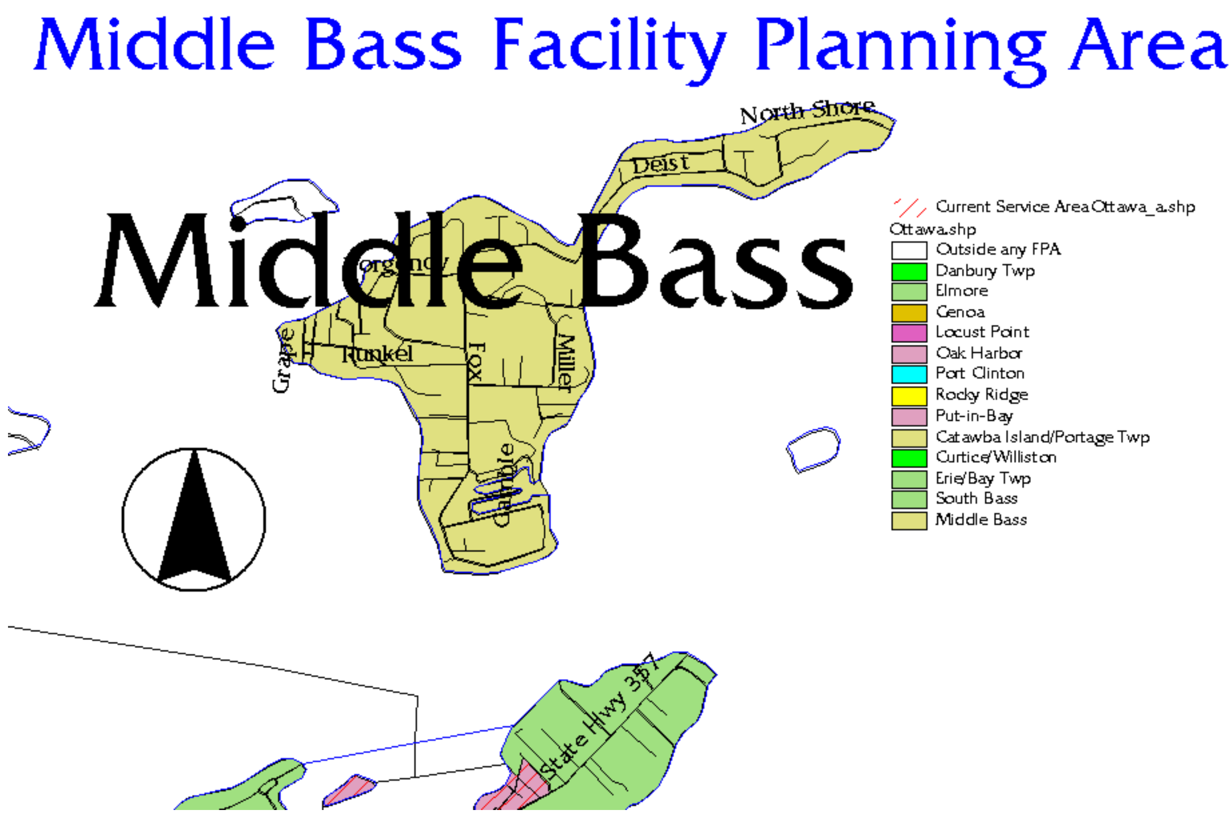


TABLE ONE

	2000	2030
Put-in-Bay Township, entire jurisdiction	635	686
Total Population inside the FPA boundary	95	103

Present Facilities

There are no public wastewater treatment facilities in this FPA.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
East Point Villas	Active	2005	2PW00017	40,000
Lake Erie Utilities Co.	Active	1988	2PR00057	62,000
Lonz's Winery	Inactive	1986		15,000
Middle Bass Club	Active	1980		5,000
St. Hazard	Active		2PR00117	35,000
Walleye's, J.F. Restaurant	Active	1997	2PR00125	15,000

Issues

Like South Bass Island, sewage treatment needs for Middle Bass are driven much more by peak recreational use during the summer than by year-round residents. In the near term, as part of redeveloping the Lonz Winery property, Ohio DNR will need to replace the package plant for the facility with a new unit.

In the longer term, the need for a central sewerage system for the island will increase. Development has continued, and individual systems are an increasing problem. Of note are the Burgundy Bay Subdivision package plant, which is an aging facility that will need upgrading; beach front housing on small lots, notably on the island's north pan-handle; and new night clubs near the south end of the island.

Future Needs

- The Township and County should evaluate long-term options to meet wastewater treatment needs. A facilities study should be prepared to evaluate need, feasibility, and financing. Options may include:
  - A single wastewater plant serving the entire island
  - A single wastewater plant serving all of Middle Bass Island and all or part of South Bass Island
  - Provide wastewater treatment service for all of Middle Bass Island and all or part of South Bass Island by connecting to the Catawba Island/Portage Township WWTP

OAK HARBOR FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Oak Harbor**: Owns and operates wastewater treatment facilities and collection system within the corporate limits, and operates the collection system in unincorporated areas, connecting to the Village system.
- **Ottawa County:** Owns the collection system in Ottawa County unincorporated areas, connecting to Village system for treatment services.

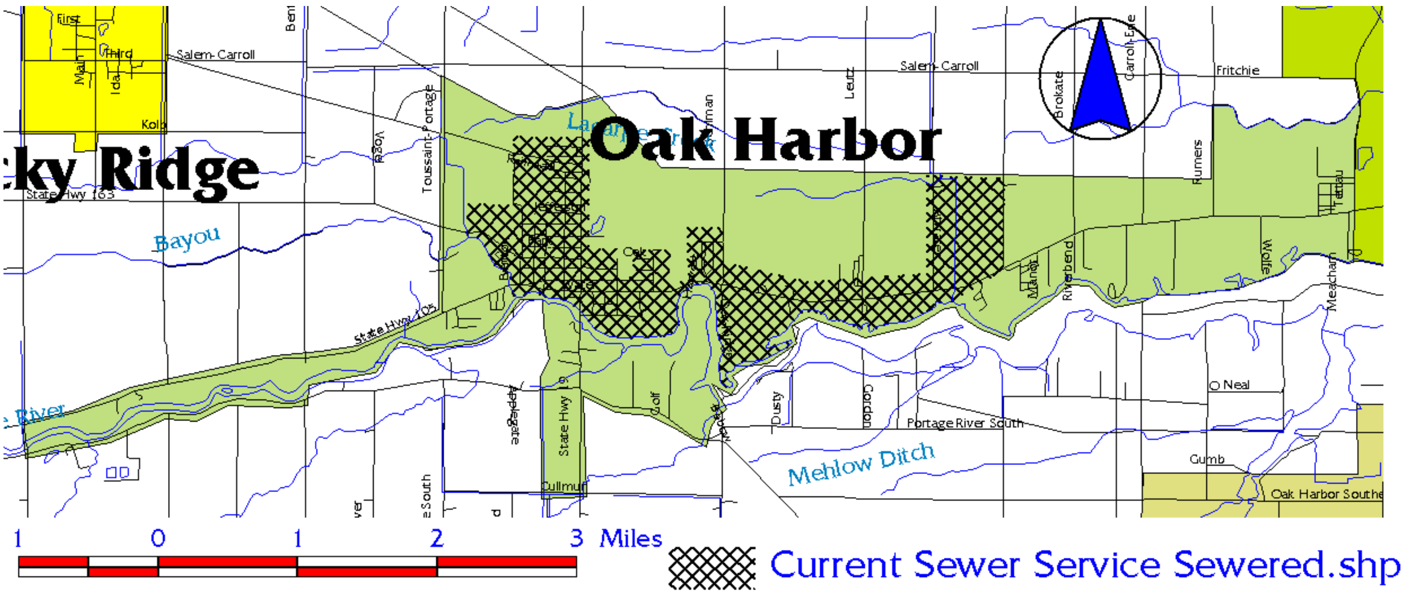


TABLE ONE

	2000	2030
Oak Harbor, entire jurisdiction	2,841	2,951
Harris Township, entire jurisdiction	1,583	1,718
Salem Township, entire jurisdiction	2,676	2,817
Total Population inside the FPA boundary	4,540	4,577

Present Facilities

The Oak Harbor WWTP is a trickling filter plant with an average flow capacity of 0.735 mgd. In 2004 its average daily flow was 0.71 mgd, and the peak daily flow was 2.58 mgd. The treatment processes include primary settling, pre-aeration, trickling filters, final settling, and ultra-violet disinfection. The peak capacity whole meeting effluent standards is 2.16 mgd. The peak hydraulic capacity is 4.33 mgd at which rate 2.16 mgd receives complete treatment, and the additional 2.17 mgd receives primary treatment and disinfection. Sludge handling facilities have been upgraded. The new facilities, completed in 2000 at a cost of $846,000, include aerobic digestion and a belt filter press. Sludge cake is applied to farm land.

In 1990, Oak Harbor completed major storm sewer improvements, to separate storm runoff from the sanitary sewer system. Four major storm sewers were built: Locust Street, from Main to the Portage River; Finke Street, its entire length to the river; Toussaint Street from Walnut to the river; and Locust from North Railroad Street to Lacarpe Creek. The project cost was $1.276 million, locally-funded. These improvements will substantially reduce Oak Harbor's I/I problems, and reduce bypassing.

In 1992, the Village completed another storm sewer project in the northwest section of town. This project also reduced stormwater inflow into the sanitary system.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Brush-Wellman	Active		2EI00000	30,000
Portage Pointe Condos/Oak Harbor Golf Course	Active	1986	2PR00127	12,000

Issues

Combined Sewer Overflows

The Oak Harbor sewer system has nine sewer overflow points. The Village has separated sewers in some areas, as noted above, but still faces substantial capital improvements to complete the system. Oak Harbor completed its Long Term Control Plan, which Ohio EPA approved in 2004. The Plan calls collection and treatment solution, with an intercepting sewer between the present CSOs and the river and a 5 million gallon retention basin.

Future Needs

- Sewer extensions to eliminate remaining problems areas and provide service to new development. New package plants and septic systems should not be permitted in areas that may be served by public sewers. Several areas have been identified as needing service:
  - South of the Portage River, Ohio EPA testing found septic sewage in a ditch crossing SR 19.
  - The Waterford Place Subdivision, about half a mile east of the County Fairgrounds on SR 163. The County Health Department has received complaints of failed septic systems. A sewer line to service this subdivision and Manor Court is planned for 2006-7 an estimated cost of $66,000. [23]
  - Tap residences along SR 19 north of the village into the sewer system, up to Salem-Carroll Road.
  - Behlman Road Sewer Extension, north of SR 163; this project has an estimated cost of $370,000 and a target date of 2010. [24]
- Implement the CSO Long Term Control Plan, which includes an interceptor sewer to transport the flows to a 5 million gallon retention basin near the wastewater plant. Other improvements include screening and pumping facilities for the retention basin. Project design is scheduled to begin in 2005, with complete plans and Permit to Install in 2006. Construction is scheduled to start in 2007, with the new facilities on line in 2009. Oak Harbor plans to request financing through Ohio Water Pollution Control Loan Fund. The project will cost an estimated 2.76 million.[25]

PORT CLINTON FACILITY PLANNING AREA

[23] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004

[24] Ottawa County Sanitary Engineering Department Five Year Capital Improvement Plan, October 2004

[25] WPCLF Application from the Village of Oak Harbor to Ohio EPA, May 2005

Designated Management Agency Responsibilities:

- **City of Port Clinton**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Ottawa County:** Will own and operate the collection system in unincorporated areas, if and when built, connecting to the Port Clinton system for treatment services under contract with the County.

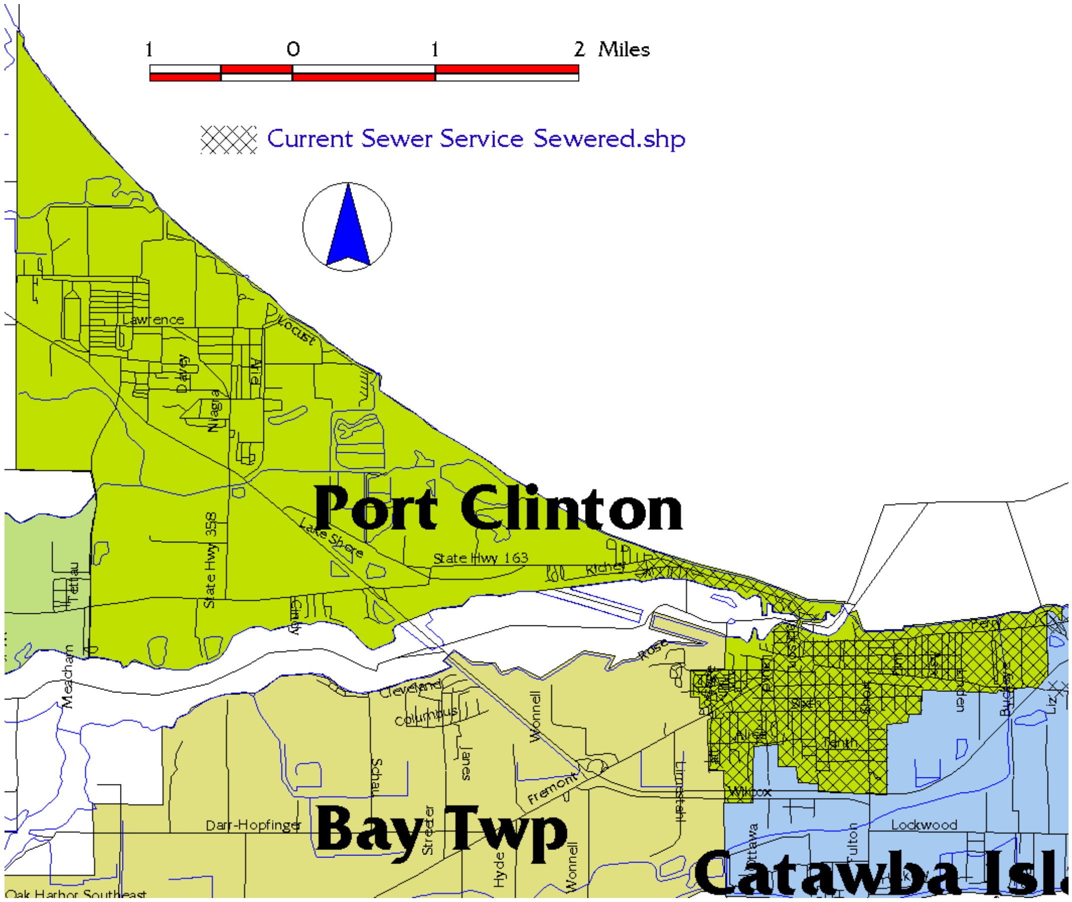
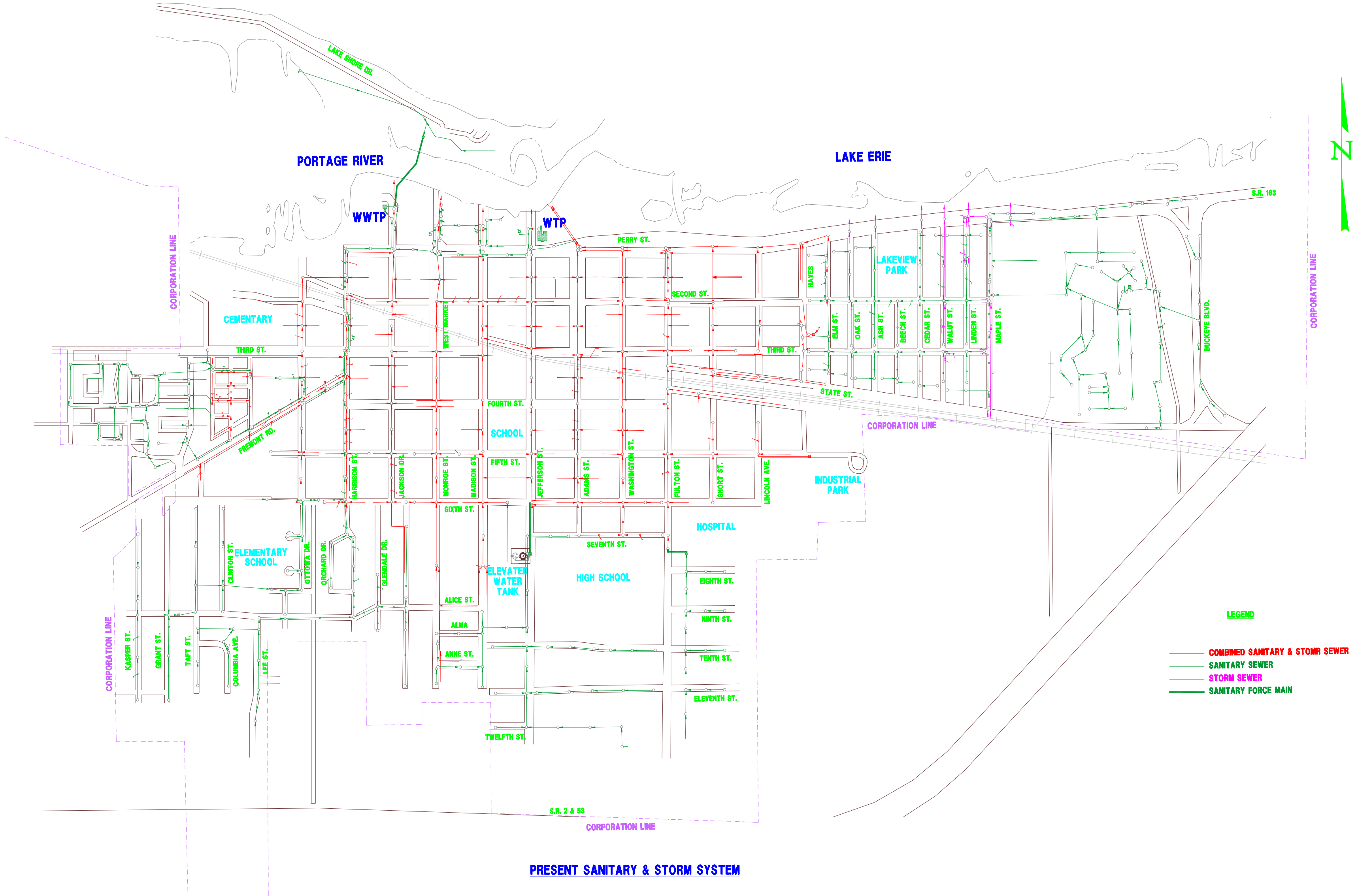


TABLE ONE

	2000	2030
Port Clinton, entire jurisdiction	6,394	4,297
Erie Township, entire jurisdiction	1,328	783
Total Population inside the FPA boundary	**7,178**	**4,765**



PRESENT SANITARY & STORM SYSTEM

Present Facilities

Port Clinton has an activated sludge plant which experiences heavy I/I flows. The treatment plant has begun expansion with the completion of Phase I in 2004. Phase I included new primary treatment, chlorination, and the Actiflo system. The design average daily flow rate is 1.5 mgd; the plant has a peak daily design for secondary treatment of 4.0 mgd, and a peak daily flow rate of 24 mgd for there Actiflo system. In 2004 the average flow for all days was 1.79 mgd, or 1.2 mgd for dry days. The peak daily flow was 15.54 mgd.

The Port Clinton system experiences heavy I/I flows; the purpose of the Actiflo system is to enable the plant to meet permit requirements under high flow conditions. The extraneous water results in overflows from the system's CSO into the Portage River. Flap valves were installed on the CSOs in the late 90s, decreasing peak flows by about 1 mgd. The amount of inflow the system receives is influenced by the lake level. Dechlorination facilities were added to the plant in 1995.

There are numerous of package sewage treatment plants in the Port Clinton FPA. They are listed in Table 2

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
Camp Perry	Active	1981	2PP00000	380,000
Erie Industrial Park (Erie Proving Grnds)	Active	1942, 1976	2IF00006	1,200,000
Erie Township School	Inactive	1951		1,875
Lakefront Marina	Active	1978, 1987		7,440
Lakefront Villa Condominiums	Active	1988		25,000
Mikey's Bar/Restaurant	Active	1989		7,000
ODOT Rest Area OTT-2-16.65 WB	Active	1998	2PP00044	5,000
Perry House	Active	1969		2,500
Portage View Mobile Home Park	Active	1985		12,500
Spinnaker Bay Yacht/Beach Club	Active			20,000
Sunset Inn	Active	1974		9,000
Transmissions Unlimited	Active	1971		5,000
Wagon Wheel Trailer Court	Active	1960		7,500
White Caps Campground	Active	1988		6,000
White Caps Motel & Trailer Park	Active	1963		7,500
Willow Beach Trailer Park	Active	1964		9,000
Yacht Port Beach Condominiums	Active	1987	2PR00135	27,500

Issues

Combined Sewer Overflows

Port Clinton's combined sewer overflows need to be addressed per the Consent Decree with EPA. The wastewater plant will require additional capacity.

The city is under a consent decree with US EPA for its CSOs. In 2000, Port Clinton eliminated two CSOs, is not accepting new sewer taps in the combined sewer area, and installed flap valves on all remaining regulators. In 2003 the pump stations were upgraded, with new pumps and controls, greater capacity, at a cost of $700,000. In 2004, Jackson Drive CSO regulator was eliminated, therefore leaving the Port Clinton system with one CSO point (Adams Street).

Future Needs

- The Consent Decree required the City to prepare a CSO abatement Plan, which is now being implemented. The wet weather design uses an “Actiflo” system capable of handling 20 mgd. The “Actiflo” system is a compact device that includes screening, flocculation, settling, and disinfection. Continued improvement of the Actiflo system will be included in the first phase (Phase IA).
- Ottawa County and the City of Port Clinton have entered into a wastewater treatment services agreement for a portion of Erie Township, including Camp Perry, the Erie Industrial Park, and the BFI landfill. The sewer design, estimated to cost $3.42 million[26], calls for a combination of pressure and gravity lines, oversized to provide capacity for future service. The General Plan recommended a phased approach, with the first areas served being Camp Perry, Fenner Dunlop, the BFI landfill’s leachate, fourteen package sewage treatment plants, and residences and businesses to which the sewers are available. As of July 2005, the project lacked funding to pay for the sewer oversizing. The General Plan identifies a need for significant grant funds to make the project affordable.
- The treatment plant will continue to undergo an extensive upgrade and expansion. These improvements will increase the capacity from its current 2.3 mgd average daily to 4 mgd average daily flow, and 24 mgd peak.
    - The first phase (Phase IA) will modify the influent coarse screening, replace influent fine screening, modify chlorine contact chamber, and install bypass pumps for Actiflo. The normal daily flow will be sent directly to Secondary treatment while the Actiflo system will only be used during wet weather flows.
    - The second phase will expand the biological treatment, final clarifiers, and sludge handling. The upgraded plant will produce dried Class A sludge, and is anticipated to be completed in 2007.
- The upgraded WWTP will handle wet weather flow substantially better than the old system. Port Clinton will continue to separate sewers as feasible.
- Since 1999, Port Clinton has received a series of state and federal grants, including federal line-items of $1.4 million in 1999, $485,000 in 2001, and $630,000 and $607,433 in 2003. In addition, Port Clinton secured an Ohio Public Works Commission grants/loans, STAG grant of $257,957. In all, Port Clinton raised $3.7 million in federal and state grants from 1999-2003.[27]

---

[26] *General Plan for Wastewater Collection and Treatment for Erie Township* Arcadis FPS, July 2004
[27] “More Money Flows in for Upgrade of City’s Wastewater Treatment Plant,” *News-Herald* 3/45/2003

TABLE THREE

PHASE IA IMPROVEMENTS

	Estimated Cost	Projected Completion
Secondary Treatment for Normal Daily Flow	$145,500	2006
Replacement of Fine Screen	$390,000	2006
Chlorine Contact Chamber	$76,500	2006
Secondary Pumps	$15,000	2006
Change Orders - Outstanding	$50,000	2006
Construction / Engineering / Permits / Testing Allowance	$375,000	2006
Total Project Cost for Phase IA Improvements	$1,052,000	

PHASE II IMPROVEMENTS

Secondary Treatment	$1,095,000	2007
Solids Handling	$883,000	2007
Street Sweeping Drainage Pad	$14,000	2007
Control Building / Laboratory Modifications	$177,000	2007
Construction / Engineering / Permits / Testing Allowance	$434,000	2007
Total Project Cost for Phase II Improvements	$2,603,000	

Put-in-Bay Facility Planning Area

Designated Management Agency Responsibilities:

- **Village of Put-in-Bay**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits. Sets standards for collection system in unincorporated area, which the Village will own and operate after construction.
- **Ottawa County:** Plans and may construct the collection system in unincorporated areas, connecting to Village system for treatment services.

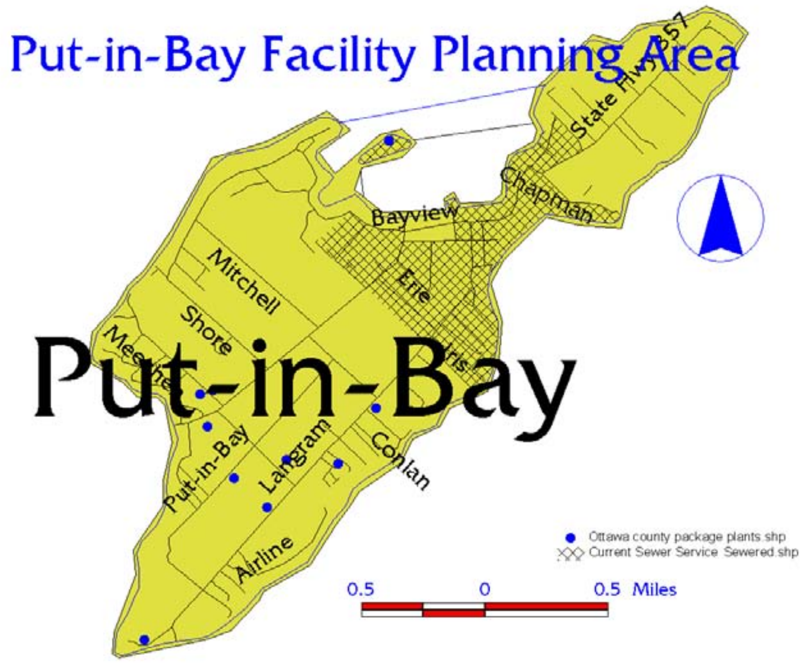


Table One

	2000	2030
Put-in-Bay, entire jurisdiction	128	99
Put-in-Bay Township, entire jurisdiction	635	686
Total Population inside the FPA boundary	631	642

Present Facilities

The Put-in-Bay wastewater plant was built in the early 80s, originally to serve the central downtown area of the village, eliminating package plants and individual septic systems. Like other coastal areas in Ottawa County, the served population on a summer weekend is far greater than the permanent residents. While there are only 128 year-round residents in the village, there are often 10,000 persons in town during the spring and summer.[28] The treatment plant is a sequencing batch reactor (SBR) activated sludge facility with a design capacity of 250,000 gpd in two SBR units. In 2004 the summer average daily flow was 0.1 mgd, and the peak daily was 0.31 mgd. The winter average daily flow was 0.03 mgd and the peak daily was 0.28 mgd. The WWTP was originally designed based on a waste stream of 300 mg/l BOD_5. As the service area has expanded, the influent strength has approached a more usual 200 mg/l BOD_5. The present WWTP site has room to add a third SBR unit.

[28] Funding application from the Village of Put-in-Bay to USDA Farmers' Home Administration, August 14, 1981; prepared by Poggemeyer Design Group.

Before the installation of the current treatment plant, the Village used a 0.12 mgd extended aeration plant. This plant is still used as an aerobic digester during summer months when the system experiences its peak organic loadings.

Also in the village is Gibraltar Island, where the Ohio State University Stone Lab is located. This facility, offshore from downtown Put-in-Bay, is served by a 5,000 gpd extended aeration plant with tertiary filters. This package plant is owned and operated by Ohio State University. A sewer from Gibraltar Island to South Bass is planned; when built, the OSU Stone Lab plant will be eliminated. There are several package plants in the unincorporated areas of South Bass Island. They are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Bird's Nest	Active	1982	2PR00208	7,000
Clinster's	Active	2001	2PR00209	1,500
Fox's Den Campground	Active	1980	2PR00207	5,000
Island Club MHP	Active	1988	2PR00074	29,000
Miller Boat Lines	Active		2PR00154	5,000
OSU Gibraltar Island Complex	Active	1985	2PT00046	5,000
Saunder's Vacation Cottages	Active	1983	2PR00133	4,000
Skyway Lodge / Mobile Home Park	Active	1987		10,000
South Bass Island State Park	Active	1992	2PP00045	20,000
Victory Park Resort	Active	1958	2PA00093	1,500

Issues

The existing village system should be expanded to serve the entire village. Most of the Village is presently served; the remaining areas should be connected. A public sewerage system is needed to serve as much of the developed part of South Bass Island as possible. Conventional extended aeration package plants are poorly suited to handle widely varying flow rates. When small treatment plants receive surge flows, they provide little wastewater treatment.

The Ottawa County Health Department believes there are significant numbers of failed septic systems on South Bass Island. The Health Department or Ohio EPA should conduct testing to confirm the situation. Priority areas should be unsewered portions of the Village and beachfront housing on small lots, particularly in the West Shore Boulevard/Peach Point area. Development trends and zoning show the need for public sewers for most, if not all, of South Bass and Gibraltar Islands.

Future Needs

- Sewer extensions will be needed to provide service in the Township portions of South Bass Island, and some parts of the Village of Put-in-Bay as well. New package plants and septic systems should not be permitted in areas that may be served by public sewers.

- The existing wastewater plant requires additional capacity for current and near-term needs. The Village, Township, and County have entered into a long-term agreement that addresses service needs for South Bass and Gibraltar Islands.[29] Sewage flows vary greatly by season and weekday versus weekend. Multiple sewage treatment plants may be needed to handle peak flows. Treatment plants may be connected by force mains, which act as pump stations during low flow periods, and being re-activated as treatment facilities to handle high flows.
- Tourism will determine the needed wastewater treatment capacity, rather than year-round population. The projected wastewater treatment capacity needs are as follows:[30]

Wastewater Treatment Plant Capacity Requirements
Table Three

Service Area and Time Frame	WWTP Capacity, gpd
Present WWTP capacity	250,000
Capacity required in the near term for current service area (most but not all of the village)	375,000
Near term capacity requirement for the entire FPA	563,223
Long term capacity requirement for entire FPA	772,910

[29] *Village of Put-in-Bay, Put-in-Bay Township, and Ottawa County Water and Sewer Agreement*, 2004
[30] *Water Supply and Sanitary Sewer General Plan, South Bass Island* Poggemeyer Design Group, December 2003 pages 30, 34, and 35

ROCKY RIDGE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Rocky Ridge**: Responsible for planning public sewerage system; and will own and operate it if and when built.

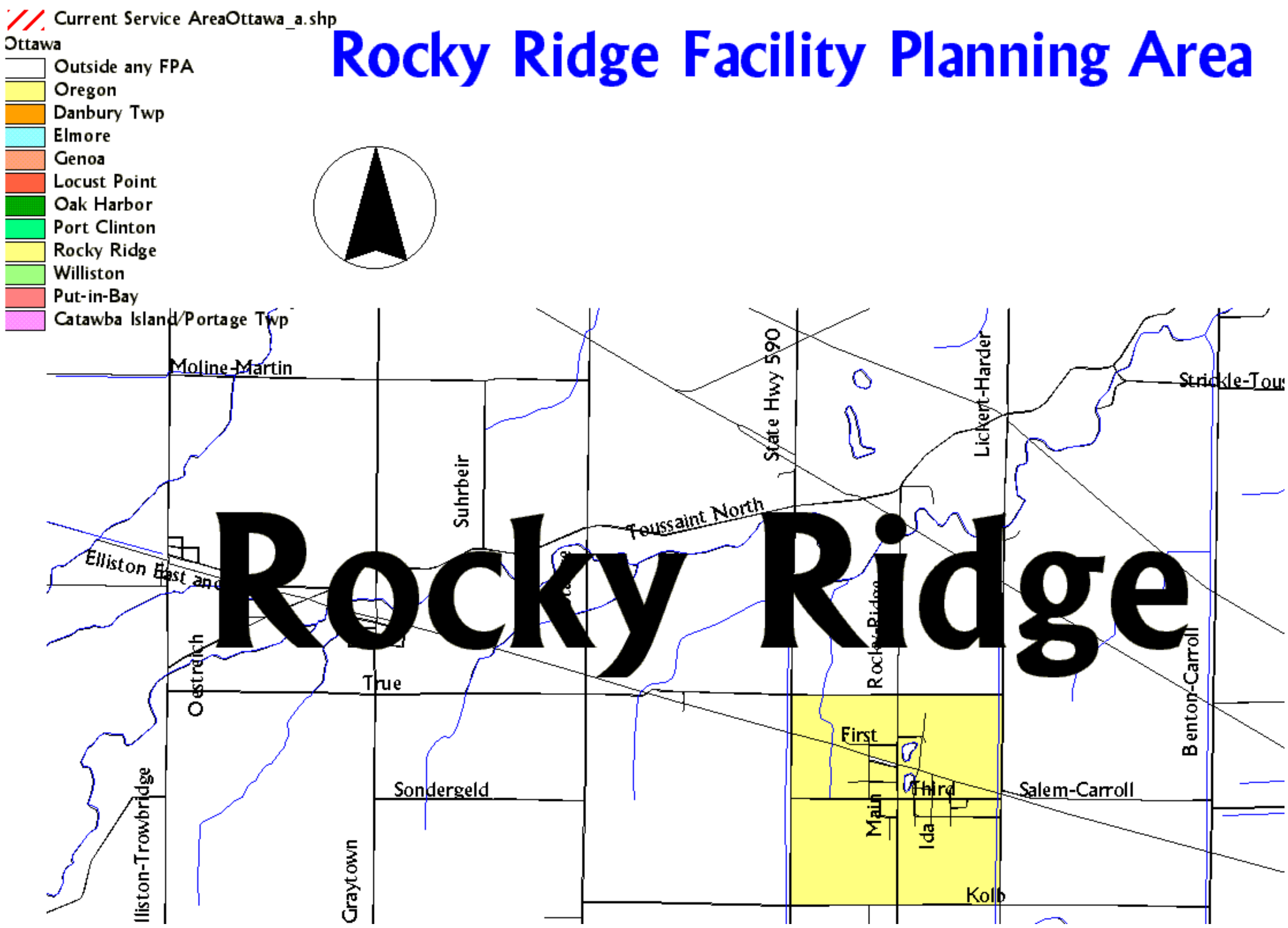


TABLE ONE

	2000	2030
Rocky Ridge, entire jurisdiction	392	285
Total Population inside the FPA boundary	392	285

Present Facilities

The Village of Rocky Ridge does not have a treatment or a collection system and has been identified as having health problems due to the presence of septic tank effluent in the ditches. The Rocky Ridge School has a 2,000 gpd package plant; otherwise, the village is served by individual septic systems, many of which are believed to have failed.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area **Table Two**				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Rocky Ridge School	Active	1984	2PT00029	2,000

Issues

Rocky Ridge's needs for a public sewerage system has been long documented.[31] The town is not under orders, however, and there is no currently active project.

The Toussaint River TMDL[32] notes, "Further downstream at Rocky Ridge Road (RM 10.45), fecal coliform bacteria levels exceeded the PCR [Primary Contact Recreation] criterion on one occasion and strontium levels remained elevated. Bacteria levels were likely influenced by the discharge of poorly treated sewage from the unsewered Village of Rocky Ridge.".

Future Needs

Rocky Ridge should prepare a General Plan to identify the most cost-effective sewerage option. Implementation should include preparing a financing plan that will make the system affordable to residents. An income survey may be needed to support grant and low interest loan applications.

Building sewers in Rocky Ridge would be expensive because of its shallow bedrock. On the positive side, the village seems likely to qualify for grant programs. If a sewer system were built, the most likely treatment options would be:

- A new treatment plant for Rocky Ridge, probably a lagoon system
- Tap into the existing Oak Harbor system: the western edge of the Oak Harbor FPA is about 2½ miles from the eastern corporate limits of Rocky Ridge.

[31] *Rocky Ridge Appropriate Technology Wastewater Collection And Treatment Facilities Plan*; TMACOG, 1985

[32] *Biological and Water Quality Study of the Toussaint River and Rusha Creek Basins* Ohio EPA 2005, page 30

SANDUSKY COUNTY FACILITY PLANNING AREAS

BELLEVUE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **City of Bellevue**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Sandusky County:** Owns and operates collection system in Sandusky County unincorporated areas, connecting to City system for treatment services.
- **Erie County:** Owns and operates collection system in Erie County unincorporated areas, connecting to City system for treatment services.
- **Seneca County:** Owns and operates collection system in Seneca County unincorporated areas, connecting to City system for treatment services.
- **Huron County:** Owns and operates collection system in Huron County unincorporated areas, connecting to City system for treatment services.

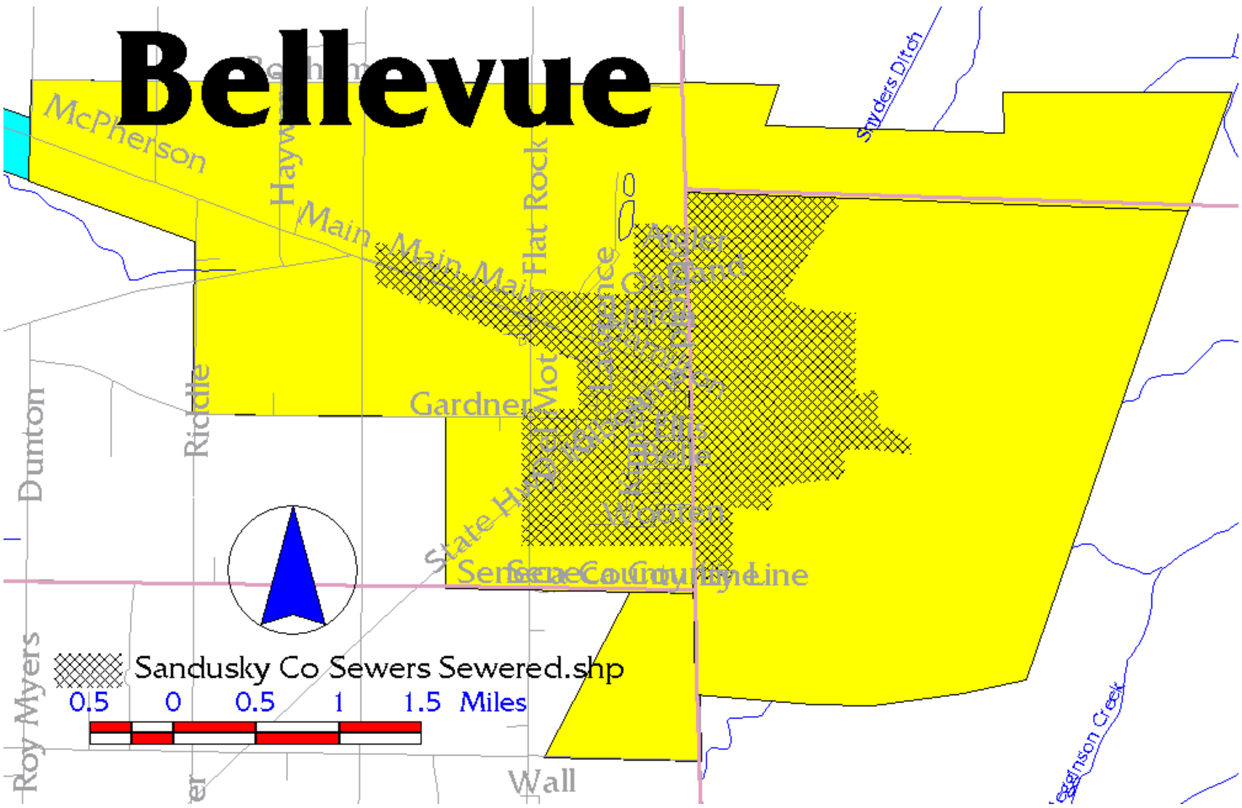


TABLE ONE

	2000	2030
Bellevue, entire jurisdiction	8.193	9,107
Groton Township, entire jurisdiction (Erie County)	1,384	1,445
York Township, entire jurisdiction (Sandusky County)	2,512	2,720
Thompson Township, entire jurisdiction (Seneca County)	1,422	1,234
Lyme Township, entire jurisdiction (Huron County)	968	1,059
Total Population inside the FPA boundary	**9,563**	**10,583**

Present Facilities

The Bellevue WWTP was originally built in 1969. With upgrades in 1988 and 1993, its capacity was raised to 2.0 mgd, last expanded in 1997. Average daily flow in 1997-8 was about 1.2 mgd, with a peak hourly flow was 4.8 mgd. It is a contact stabilization plant with nitrification towers, aerobic sludge digestion and ultraviolet disinfection. Sludge is applied to land in liquid form or dewatered by belt filter press and disposed of in a landfill.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
York School	Active	1961, 1979		7,000

Issues

Ohio EPA has raised concerns about Flat Rock, an unincorporated town of about 80 houses plus a Children's Home in Thompson Township of Seneca County. It is unsewered and septic systems in the area are believed to be discharging to sinkholes in the karst bedrock. The Children's Home is served by a package plant.

The Bellevue plant does not presently meet EPA standards, and is under orders to upgrade. Specific issues include molybdenum levels in the sludge, and aeration capacity.[33] Bellevue's *Long-Term Biosolids Processing Plan*[34] recommends upgrades to sludge stabilization, an increase in aerobic digestion capacity, and other equipments upgrades/replacements. These improvements are detailed below under "Future Needs."

New Subdivisions

It is the policy of the Plan that all new residential subdivisions that are required to be platted under Sandusky County subdivision regulations within the FPA boundary shall connect to public sewers and be served by the Bellevue wastewater treatment plant. Neither package plants nor septic systems for each individual lot shall be permitted in these cases.

Karst Bedrock Formations

Bellevue lies in the heart of a karst limestone geologic formation that stretches from Seneca County to Lake Erie at Sandusky. Karst bedrock is porous, with sinkholes that allow surface runoff to drain directly into groundwater. Because karst limestone is porous, water flows through it much more quickly. Drinking water sources that draw their supply from the karst aquifer are very vulnerable to contamination. Contaminated water may also reach Lake Erie through karst formations. Discharges of wastewater effluent from public or private treatment plants, or drain septic tanks into sinkholes should not be permitted.

[2] "Bellevue Sewer Hike to Cost About $2 a Month", *Sandusky Register*, 5/30/2002
[34] *Long-Term Biosolids Processing Plan*, *URS* Greiner Woodward Clyde, April 2000

Future Needs

- Bellevue plans upgrades to its WWTP in 2004, and has been awarded a WPCLF loan of $5,911,250[35]. Bellevue's *Long-Term Biosolids Processing Plan* recommends improvements for sludge handling and stabilization. The Plan's recommendations include:
  - Top priority is installation of a sludge stabilization to meet US EPA "503" regulations. The Plan recommends an in-vessel composting facility to achieve Class stabilization. Estimated construction cost is $2.759 million with an annual operation and maintenance cost of $1.504 million.
  - The second priority for the plant is aeration capacity expansion and replacement of equipment that dates from 1968. These improvements are estimated at $825,000 for the aeration system and $140,000 for sludge handling and transfer.
  - In addition, the plan recommends other equipment upgrades and replacements including the caustic soda and alum feeds, the clarifiers, standby power generation, lighting, UV disinfection unit covers, and records storage. These improvements are estimated at $558,000[36]
- Flat Rock is about half a mile south of the Bellevue FPA boundary. Since it is in Seneca County, it is not in TMACOG's designated planning area. Including Flat Rock in the Bellevue Planning Area would be contingent upon an agreement between Seneca County and the City of Bellevue. FPA boundary changes in Seneca County would need to be approved by Ohio EPA.
- Ohio EPA recommends the York School be served by a public sewer when feasible, probably connecting to Bellevue.

[35] Ohio EPA WPCLF project list for 2003, NWDO

[36] *Long-Term Biosolids Processing Plan*, *URS* Greiner Woodward Clyde, April 2000; pages 1-6, 57

BURGOON FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Burgoon**: Responsible for planning, building, and operating its public sewerage system. Treatment services will be provided by the Bettsville WWTP.

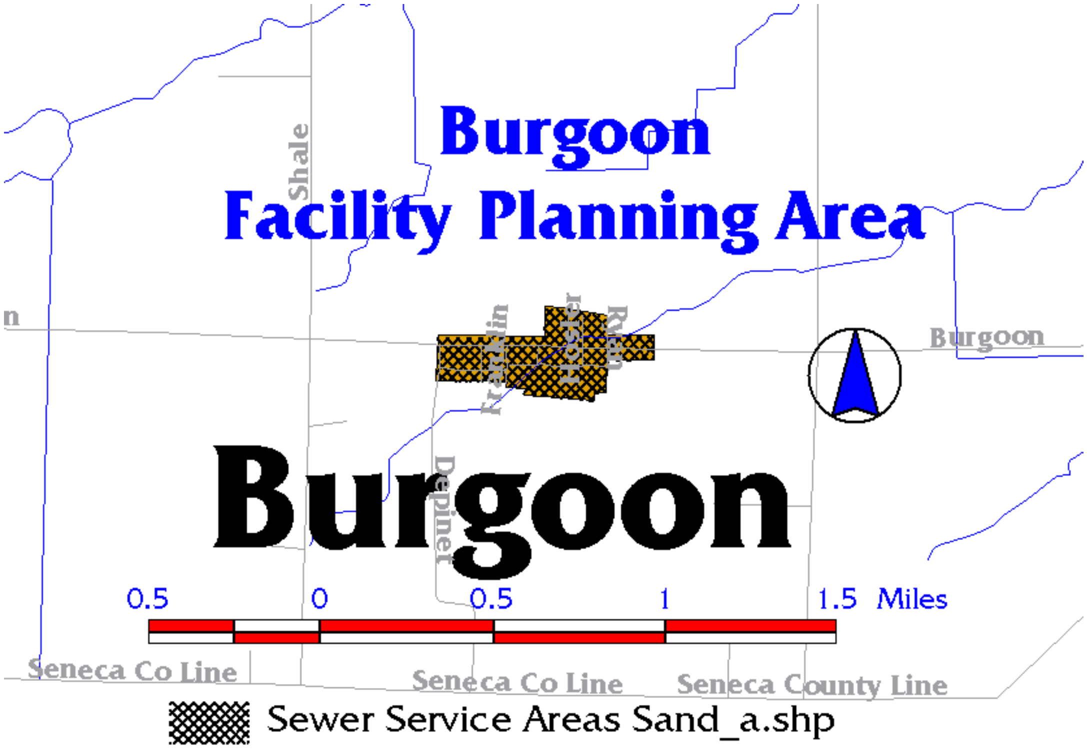


TABLE ONE

	2000	2030
Burgoon, entire jurisdiction	198	147
Total Population inside the FPA boundary	198	147

Present Facilities

Burgoon presently has no treatment or collection system. Burgoon is identified as a Critical Home Sewage Disposal Area (see chapter 5).

Issues

Burgoon has enough failed septic systems to require a public sewer system, which have a severe impact on Wolf Creek.

Future Needs

- The Sandusky County Health Department has recommended that a sanitary sewerage system be built. The entire project for both communities, including sewer systems and a WWTP is estimated at $6.7 million. Ohio EPA has issued a Permit to Install. Completion is pending, originally scheduled for 2004.[37] The wastewater plant's cost is estimated at $4.9 million, and Burgoon's sewer system at $1.8 million. Burgoon will connect to the Bettsville WWTP, 1½ mile away, via force main.

[37] "Bettsville, Burgoon Set to Build Combined $6.7M Sewer System" *News Messenger* 1/9/2003

CLYDE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **City of Clyde**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Sandusky County:** Will own and operate collection system, if and when built, in Sandusky County unincorporated areas, connecting to City system for treatment services.

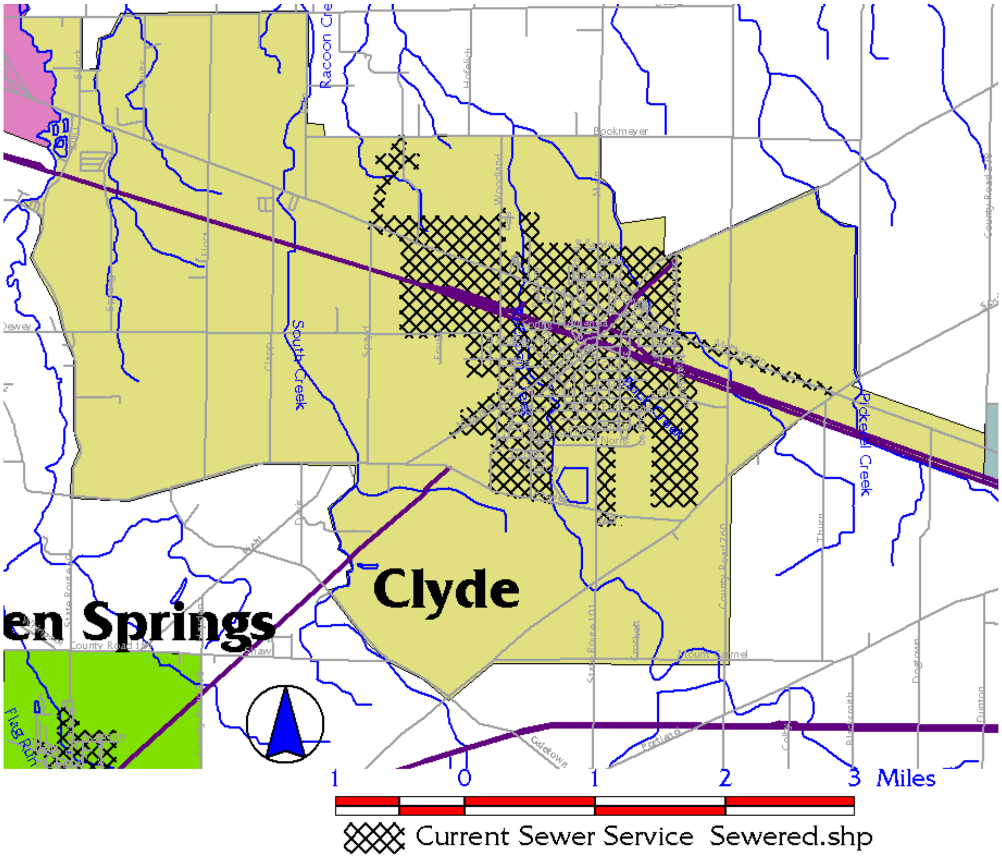


Table One

	2000	2030
Clyde, entire jurisdiction	6,064	6,575
Green Creek Township, entire jurisdiction outside city	3,463	2465
York Township, entire jurisdiction	2,512	2,720
Total Population inside the FPA boundary	8,355	8,271

Present Facilities

The Clyde WWTP is an oxidation ditch plant, with aerobic digesters, sludge thickeners, and UV disinfection. The treatment process is followed by a pair of tertiary lagoons before discharging to Raccoon Creek. This has an average daily flow of 1.9 MGD. The plant has a short term duration capacity of 7.5 mgd for a 2 to 3 hour event. The facility begins to flood at 9.0 mgd. In 2004 the average daily flow was 1.8357 mgd and the peak flow was 3.3883 mgd.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
Club Rog	Active	1986	2PR00170	2,000
Emerald Estates	Active	1969		17,000
Green Hills Inn and Golf Course	Active	1964		13,000
Mid City Mobile Homes	Active	1970		30,000
Wahl Refractories	Active	1990		3,000

Issues

Clyde's system has one CSO. This CSO was upgraded during 2004 by the installation of a CSO Screening Facility. Clyde operates under a Consent Decrees entered into during the summer of 2004. The essence of the decree is that Clyde shall operate their wastewater treatment plant within the limits of the NPDES Permit; shall be subject to fines for violations of the permit, and shall submit a Long Term Control Plan by January 1, 2006.

In 2004 Clyde designed a sanitary sewer system to serve Frank's Subdivision, aka Woodland Heights, west of Clyde. The Sandusky County Health Department has identified the subdivision as a *Critical Home Sewage Disposal Area.*

In 2002 Clyde hired GGJ to conduct a 24-month study to request a mercury variance from EPA. Clyde will be formally requesting a Mercury Variance from OEPA.

The Sandusky County Health Department has identified the area of Erlin Rd, CR 232 from US 20 to Bockmeyer Road as a *Critical Home Sewage Disposal Area.*

New Subdivisions

It is the policy of the Plan that all new residential subdivisions that are required to be platted under Sandusky County subdivision regulations within the FPA boundary shall connect to public sewers and be served by the Clyde wastewater treatment plant. Neither package plants nor septic systems for each individual lot shall be permitted in these cases.

Karst Bedrock Formations

Clyde lies along the west edge of a karst limestone geologic formation that stretches from Seneca County to Lake Erie at Sandusky. Karst bedrock is porous, with sinkholes that allow surface runoff to drain directly into groundwater. Because karst limestone is porous, water flows through it much more quickly. Drinking water sources that draw their supply from the karst aquifer are very vulnerable to contamination. Contaminated water may also reach Lake Erie through karst formations. Discharges of wastewater effluent from public or private treatment plants, or drain septic tanks into sinkholes should not be permitted.

Future Needs

- Wastewater treatment plant long term plans call for:
    - Installation of a bio-solids centrifuge
    - Installation of an “Actiflo” ballasted flocculation system or chlorination/dechlorination at the CSO Screening Facility for wet weather overflows
- Sewers should be extended to serve Woodland Heights.
- Clyde plans to provide service to developing areas through sewer extensions. The schedule will depend demand and development. The areas include:
    - Main Street north of present service area
    - Woodland Avenue north of present service area
    - Service to the Sandusky County Airport; Clyde will be there provider of sanitary sewerage facility to the Airport and the proposed industrial park.
    - Franks, Coe, and Woodland Court
    - Maple-Woodland-Limerick area southwest of current service area
    - Main Street south of Fox, Limerick, and South Ridge, south of present service area
    - East of present service area, bounded by Durnwald and South Ridge, and along the north side of US 20
- Combined sewers in several areas have been identified for the next phase of sewer separation, and are listed in the Capital Improvement Schedule, below.
- The neighboring Village of Green Springs plans to abandon is present wastewater treatment plant and connect to Clyde for treatment services.

Capital Improvement Schedule for the Facility Planning Area Table Three						
Project Name / Description	**Total Cost**	**Annual Capital Improvement Needs**				
		2006	**2007**	**2008**	**2009**	**2010**
Green Creek sewers (Franks Coe, and Woodland Court)	$1,125,000			$410,000	$715,000	
Bio-Solids Centrifuge			$250,000			
Actiflo System				$350,000		
East Street sewer separation		$500,000				
Forest Street sewer separation				$850,000		
Buckeye Street sewer separation						$1,000,000

FREMONT FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- Fremont: Owns and operates the wastewater treatment plant, and sanitary sewers within its corporate limits.
- Sandusky Township Sewer District: Owns and operates local collector sanitary sewers within its boundaries.
- Sandusky County: Owns and operates sanitary sewers in unincorporated areas outside the Sandusky Township Sewer District. In addition, Sandusky County operates and maintains an interceptor sewer and pump stations within the Sandusky Township Sewer District. The District's local collector sewers discharge to the interceptor sewer, which conveys wastewater to Fremont.

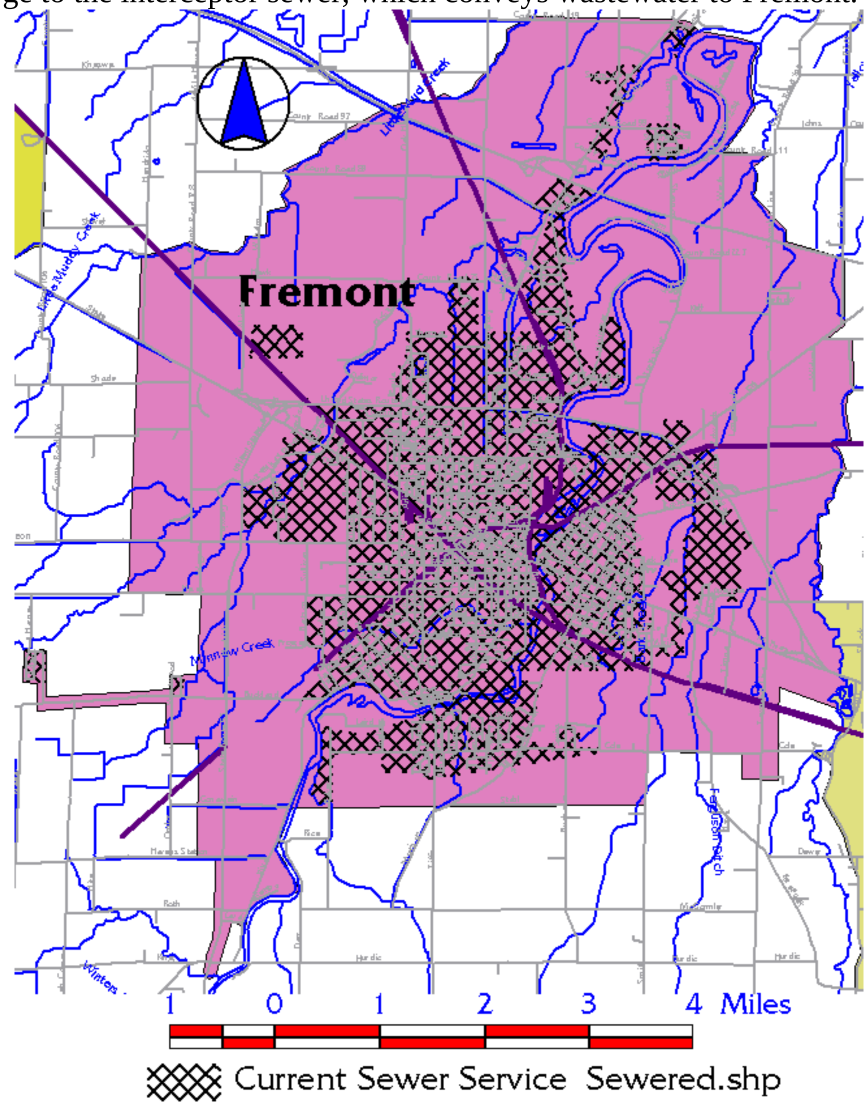


TABLE ONE

	2000	2030
Fremont, entire jurisdiction	17,375	16,407
Ballville Township, entire jurisdiction	6,395	6,615
Green Creek Township, entire jurisdiction	3,463	2,465
Rice Township, entire jurisdiction	1,437	1,298

Riley Township, entire jurisdiction	1,302	999
Sandusky Township, entire jurisdiction	4,087	3,214
Total Population inside the FPA boundary	**27,447**	**25,651**

Present Facilities

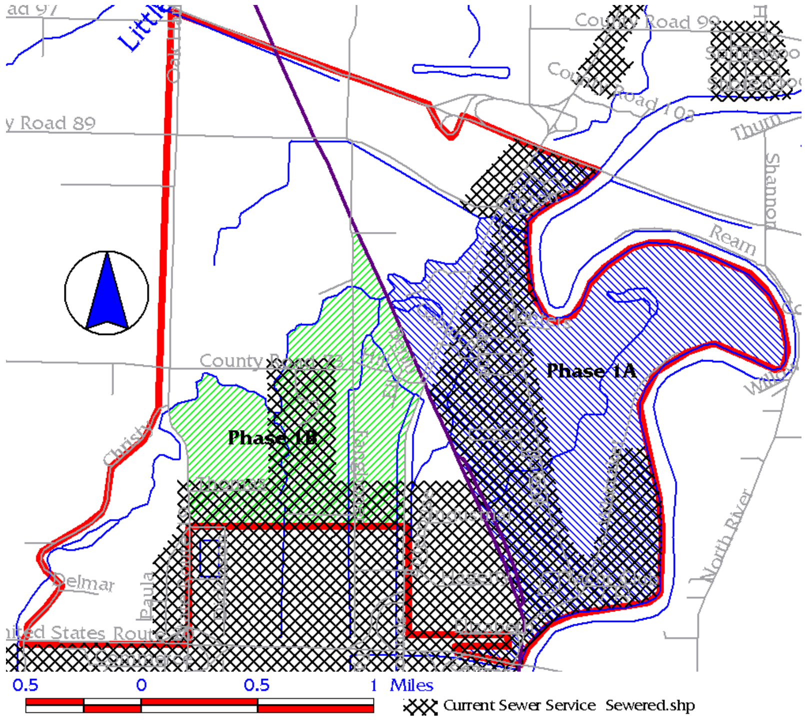
Fremont's WWTP is a conventional activated sludge plant rated at 9.0 mgd average and 14.0 mgd peak, based on the City's capacity analysis. Its facilities include tertiary filters, anaerobic digestion, and chlorination/dechlorination. Sludge is applied to land in liquid form. Average flow is 6.5 MGD, and peak is 9. The plant was upgrade was in 1988, at a cost of $5.5 million; and another $2.5 million to the sewer system. Sludge system upgrades are planned to produce Class A biosolids of 20-30% solids; completion is anticipated in 2006[38], depending on funding. These will be land applied, used in compost facilities, or landfilled.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
Adam's Acres Subdivision	Active	1977	2PG00082	35,000
Fremont Baptist Temple & Christian Academy	Active	1973		8,000
Gibbs Equipment Co.	Inactive	1969		10,000
Golden Chance Apartments	Active	1971		2,500
Holiday Inn	Active	1969	2PR00047	36,000
Plaza Lanes	Active	1984		5,346
Westwood Subdivision	Active	1973	2PG00023	20,000

[38] "City Delays Sewer Plans," *News-Messenger*, 12/2/2004



Sandusky Township
Sewer District
within Fremont Facility Planning Area

Issues

The area north of Fremont along US 53, up to and around its interchange with the Ohio Turnpike (Interchange #6) is now mostly sewered. Only one package plant still remains: Holiday Inn. Like the other package plants in the area, it is essential that this wastewater plant be taken out of service, and tied into the public sewer. This Plan's policy is that this package plant shall be abandoned and replaced by public sewers at the earliest possible date.

The smaller a treatment plant is, the more susceptible it is to upset due to flow surges. Most smaller treatment plants do not have trained operators on site. A larger treatment plant, such as Fremont's, is able to provide stable, good quality treatment because it has comparatively constant flow, and is run by licensed full-time operators.

The Sandusky Township Sewer District developed phased plan to provide service within its jurisdiction. Construction of Phase 1A was completed in 2001 at an estimated cost of $2.5 million[39]. Construction of Phase 1B is anticipated to be completed in 2006. The project will serve the Sandusky Township Hall, seven 3-unit apartment buildings, and 52 residences. The cost of Phase 1B is estimated at $700,000+, with funding being requested from the Ohio Public Works Commission and the Ohio Water Development Authority.

Growth of commercial establishments, notably restaurants, along SR 53 is an issue for the Fremont WWTP, for two reasons:

- Wastes from these establishments are high in grease, and present challenges when the grease traps are not adequately maintained.
- As package plants are removed from service and their flow treated by the Fremont plant, consideration must be given to increasing the WWTP capacity.

[39] "Late Summer State for Sewer Work," *News-Messenger* 1/7/2003

- The Sandusky County Health Department identifies the following Critical Home Sewage Disposal Areas where public sewers are needed:
    - West Hayes Ave, Ballville and Sandusky Townships
    - Edwards Drive, Sandusky Township
    - Country Club Estates, Sandusky Township
    - US 6 east of the Fremont city limits

New Subdivisions

It is the policy of the Plan that all new residential subdivisions that are required to be platted under Sandusky County subdivision regulations within the FPA boundary shall connect to public sewers and be served by the Fremont wastewater treatment plant. Neither package plants nor septic systems for each individual lot shall be permitted in these cases.

Combined Sewers

Like many municipalities, Fremont’s sewer system is combined sanitary and storm. After rain storms, sewage overflows into the Sandusky River at thirteen combined sewer overflows (CSOs). Of these, five are active. The others are blocked off and used only in emergency situations.

In 1991, Fremont began a multi-phase sewer separation program. By 1999, seven phases were complete, with #8 scheduled for 2000. In addition, Fremont has separated sewers in the following areas: East State Street, West State Street, Castalia Road, Walnut Street, and Morrison Road. In all, combined sewer overflow volumes have been reduced by approximately 30-35%.

Fremont’s combined sewer abatement program is based on a 1972 Floyd Browne Associates study. The study calls for separation of all combined sewers. It is being constructed as funding is available. The City instituted an income tax increase to fund these improvements. To date, Fremont has spent $5.3 million upgrading its combined sewer system.

County Operated Package Plants

The Sandusky County Sanitary Engineering Department operates and maintains package plants that serve two subdivisions (Adams Acres and Westwood) in otherwise unsewered areas. All are extended aeration plants with surface sand filters, and unlike most package plants, have NPDES permits. Both plants have a problem of increasing maintenance requirements, and costs, as they get older, and a limited customer base to pay for repairs.

Adam's Acres

Adam's Acres is subdivision located in Jackson Township west of Fremont, off SR 6. The plant's design flow is 35,000 gpd, and its average flow was 16,100 gpd in 2003. It has I/I problems, and discharges to Muskellunge Creek.

If Fremont's sanitary sewer service area expands far enough west to make it economically feasible, Adam's Acres should tie in. At present, Fremont's service area ends four miles east of Adam's Acres, and the subdivision is a mile and a half west of the Facility Planning Area border. It is unlikely that tapping in will become feasible in the foreseeable future. The Adam's Acres package plant is scheduled for replacement; see "Future Needs" for details.

Westwood

Westwood Acres is off CR 41 in Ballville Township, west of SR 53. The Westwood Acres plant has a design capacity of 20,000 gpd, and received an average flow of 14,400 gpd in 2003.

The plant is in the Fremont Facility Planning Area and should consider eventual tie-in with the city. Westwood Acres is about a mile and a half west of Fremont's service area. Sewers are not expected to be available in this area in the foreseeable future. The Westwood package plant is scheduled for replacement; see "Future Needs" for details.

Unsewered Areas

The Sandusky County Health Department has identified several unsewered portions of the Fremont FPA as *Critical Home Sewage Disposal Problem Areas*. These include:

- Areas along the east bank of the Sandusky River in Sandusky and Riley Townships, especially Muncie Hollow and the areas between Kelly and Scranton Roads.
- The Barkshire Hill subdivision in Riley Township.
- Timpe Road, south of US 6, east of Fremont, in Ballville Township.
- Rambo Lane and South River Road, south of Fremont in Ballville Township along the river between Roth and Havens Station Road.

Future Needs

- Continue financing and constructing the planned combined sewer abatement program discussed above.
- Extend sanitary sewers to developed unsewered areas throughout the Planning Area. The top priorities should be the Sandusky Township Sewer District area and the Critical Home Sewage Disposal Problem Areas.
- Eliminate package plants by connecting them to the public system when proximity of sewers makes this financially feasible.
- As package plants and septic systems are eliminated additional WWTP capacity should be considered. It is the recommendation of this Plan that Ohio EPA approve expansion of the Fremont WWTP for additional capacity under anti-degradation rules. The Fremont WWTP provides substantially better treatment than package plants and septic systems; therefore its expansion will reduce pollutant loading to the Sandusky River.

Capital Improvement Schedule for the Facility Planning Area Table 3						
Project Name / Description	**Total Cost**	**Annual Capital Improvement Needs**				
		2005	**2006**	**2007**	**2008**	**2009**
Joint Facility Sewers	$1,524,000					
East SR 6 Sewers	$650,000	$580,000	$70,000			
Grandview Lift Station Replacement	$75,000		$75,000			
Westwood Wastewater Plant Replacement	$350,000		$350,000			
Sandusky Township Sewer District Phase 1B	$700,000		$700,000			
Adams Acres Wastewater Plant Replacement	$400,000			$400,000		
West Hayes Sewers	$635,000			$550,000	$85,000	
Bark Lane Lift Station Replacement	$75,000				$75,000	
Sewer Rehabilitation	$350,000				$350,000	
SR 20 sewers	$800,000				$725,000	$75,000
Timpe Road sewers	$1,300,000					$1,300,000
Rice Township Sewers, Phase 4	$370,000					$370,000
Rambo Lane sewers	$1,100,000					$1,100,000

GIBSONBURG FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Gibsonburg**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Sandusky County:** Will own and operate collection system, if and when built, in Sandusky County unincorporated areas, connecting to Village system for treatment services.

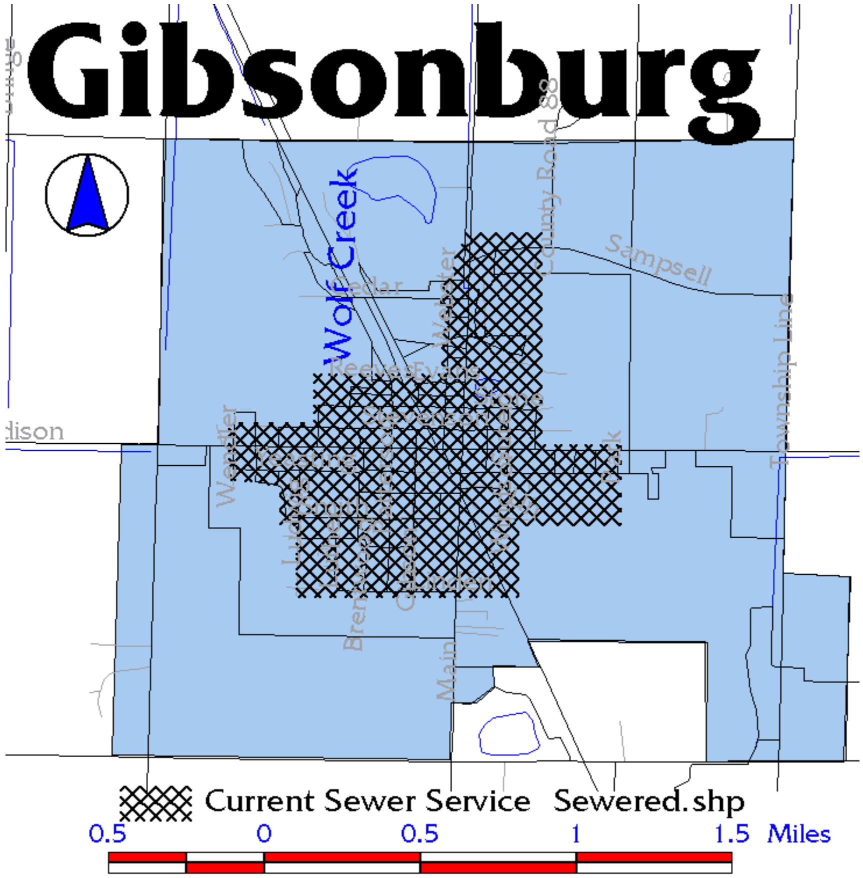


TABLE ONE

	2000	2030
Gibsonburg, entire jurisdiction	2,506	2,153
Madison Township, entire jurisdiction	1,215	1,583
Total Population inside the FPA boundary	2,729	2,444

Present Facilities

The Gibsonburg WWTP is an oxidation ditch facility with aerobic digestion, chlorination/dechlorination, and sludge drying beds. Its rated capacity is 0.5 mgd average daily, and 1.23 mgd peak daily. In 2003 it had an average daily flow of 0.414 mgd, and a maximum daily flow of 0.911 mgd.

The sewers were designed as a combined system, using existing storm sewers and septic tanks. The septic tank effluent discharges to the combined sewer system; the village is responsible for the handling of septage. The septic tanks reduce the strength of raw sewage by settling out solids; BOD_5 is about 125 ppm. Effluent discharges to Hurlbut Ditch and Dromm Ditch/Wolf Creek, both Portage River tributaries.

The sewer system has three CSOs and a 1.748 million gallon overflow retention basin with an overflow. The basin is aerated, with a design storm of 0.25 inches/hour

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Atlas Engine Works	Active	1975	2IS00003	8,000

Issues

The existing wastewater treatment plant does not have the capacity for additional customers.[40] In order to provide service to the Facility Planning Area, either treatment capacity will need to be added by a plant expansion; or freed up by removing stormwater from the sanitary system.

The Sandusky County Health Department has identified Rodriguez Street area in Madison Township as a *Critical Home Sewage Disposal Problem Area*. This area is on the south side of SR 600 just east of the Village limits.

Gibsonburg prepared a CSO abatement study.[41] A phased village-wide sewer separation was estimated to cost $7.7 million. The first phase, a $45,000 project along Linden Avenue for the Quarry Village Apartments area, was constructed in 1998.

In 2004 the Village prepared its *Combined Sewer System Long Term Control Plan*, which has been submitted to Ohio EPA. The study found that the great majority of combined sewerage overflows came from the West Branch CSO. A large part of the extraneous flow comes from 584 acres of agricultural land south of the village. This area drains to Hurlbut Ditch; and the flow from the ditch enters the combined sewer system, overloading the West branch CSO area. Re-routing Hurlbut Ditch around the village so that these flows do not enter the sewer will greatly reduce extraneous flows.

Future Needs

- Gibsonburg should implement recommendations of its Long Term Control Plan, estimated at $3.762 Million.[42]
  - Relocate Hurlbut Ditch to the west of village, eliminating 584 acres of agricultural runoff from the combined sewer system
  - Install a new 33” interceptor and list station from the West Branch CSO to the wastewater plant, to increase the amount of wet weather flow that could be treated
  - Construct improvements to the stormwater retention basin, which will also provide primary treatment to wet weather flows before discharge
- Sandusky County should install sanitary sewers to serve the unincorporated Rodriguez Street area.

---

40 *Comprehensive Water & Sanitary Sewer General Plan: Sandusky County, Ohio*. MS Consultants, Inc. October 1997.

41 “Village gets OK on ditch project” — *Fremont News-Messenger* August 25, 1998

42 *Village of Gibsonburg Combined Sewer System Long Term Control Plan* Poggemeyer Design Group, January 2004

GREEN SPRINGS FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Green Springs**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Sandusky County**: Will own and operate collection system, if and when built, in Sandusky County unincorporated areas, connecting to Village system for treatment services.
- **Seneca County**: Will own and operate collection system, if and when built, in Seneca County unincorporated areas, connecting to Village system for treatment services.

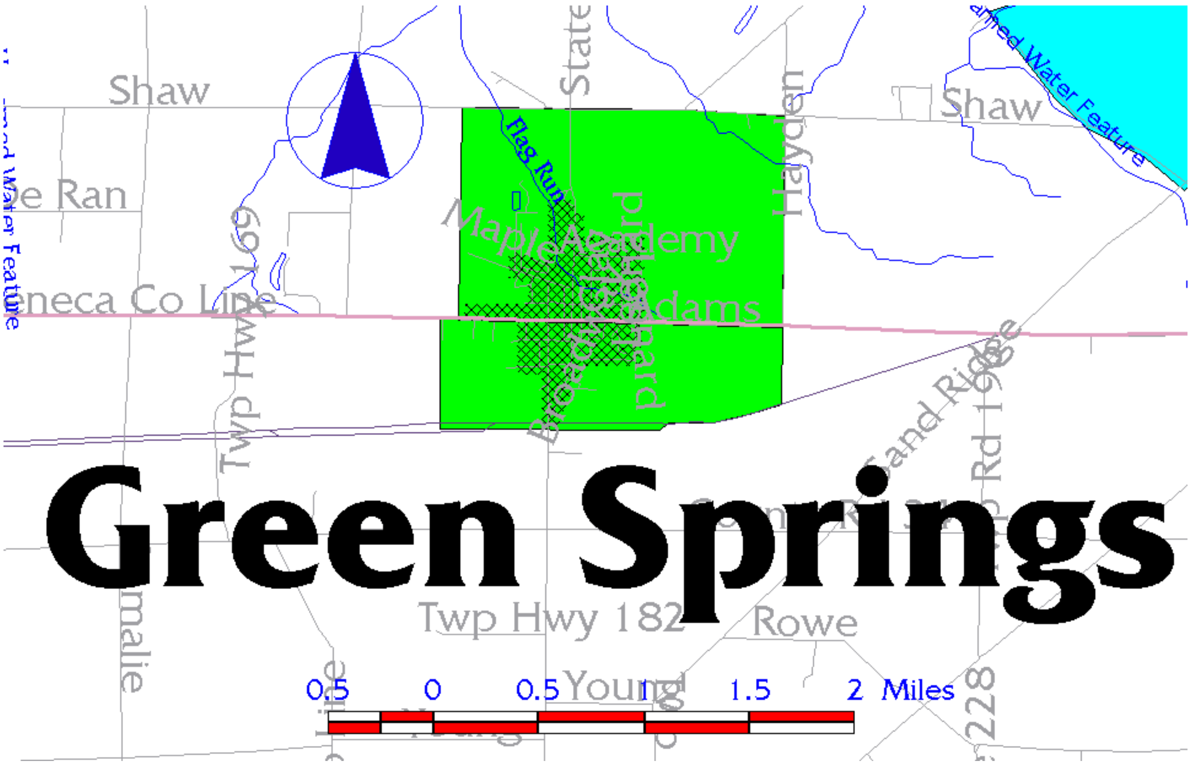


TABLE ONE

	2000	2030
Green Springs, entire jurisdiction	1,248	1,018
Green Creek Township, entire jurisdiction outside city	3,463	2465
Adams Township, entire jurisdiction	1,337	1,160
Total Population inside the FPA boundary	1,328	1,632

Present Facilities

The Village has an aerated stabilization pond that discharges to Flag Run Creek. The treatment plant was designed for an average daily flow of 0.24 mgd and peak daily of 0.48 mgd, though MS Consultants notes it can handle 0.362 mgd.[43] The treatment plant is a lagoon system with two floating aerators. A

[43] *Comprehensive Water & Sanitary Sewer General Plan: Sandusky County, Ohio*. MS Consultants, Inc. October 1997.

baffle separates aerated and quiescent zones. Average daily flows in 2003 and 2004 were 0.480 and 0.435 mgd, respectively. The peak daily flow in 2003-43 was 0.56 mgd. Maximum pumping capacity to the plant is 0.619 mgd.

The sewer system has one active overflow, a bypass at the wastewater plant. Flows in excess of the lift station's capacity of 0.619 mgd go through a 38,000 gallon Imhoff tank, and then are discharged to Flag Run Creek. In addition, there are two inactive CSO structures, on Maple Lane and Clay Street[44]. The plant bypass is the only discharging CSO at present.

Issues

The serious combined sewer and I/I problems account for a significant portion of the flow. During wet weather, excess flows overflow and discharge to Flag Run Creek. Between 1996 and 2002, Green Springs completed several sewer separation projects along Catherine, South Leonard, Euclid, and West Adams Streets; between Euclid and West Adams; and for Kansas Street south of Adams. The Long Term Control Plan indicates that about 60% of the sanitary sewers in the village are to some degree separated from storm sewers. [45]

Future Needs

- The wastewater plant is currently at or above its design flow. The Village has constructed several sewer separation projects to reduce extraneous flows, but I/I is still an issue. The draft Long Term Control Plan, submitted in 2005, evaluates several options for meeting NPDES permit requirements.
- In 2005 Green Springs developed a draft Long Term Control Plan that recommended wastewater treatment plant improvements at an estimated cost of $3.325 million. The village has decided instead to Abandon the current wastewater plant and connect to the Clyde system for treatment services. No cost was yet available in September 2005. It is anticipated that financial assistance will be needed for the project to be affordable to residents. Census figures indicate Green Springs should qualify for a grant and loan funding package from USDA/Rural Development. This Plan supports approval of that and other grants and loans for Green Springs.

HELENA FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Helena**: Responsible for planning public sewerage system; and will own and operate it if and when built.

[44] *Green Springs Ohio Combined Sewer System Long-Term Control Plan* Poggemeyer Design Group, March 2005, plates 3&4

[45] *Green Springs, Ohio Combined Sewer System Long-Term Control Plan* Poggemeyer Design Group, March 2005

Helena Facility Planning Area

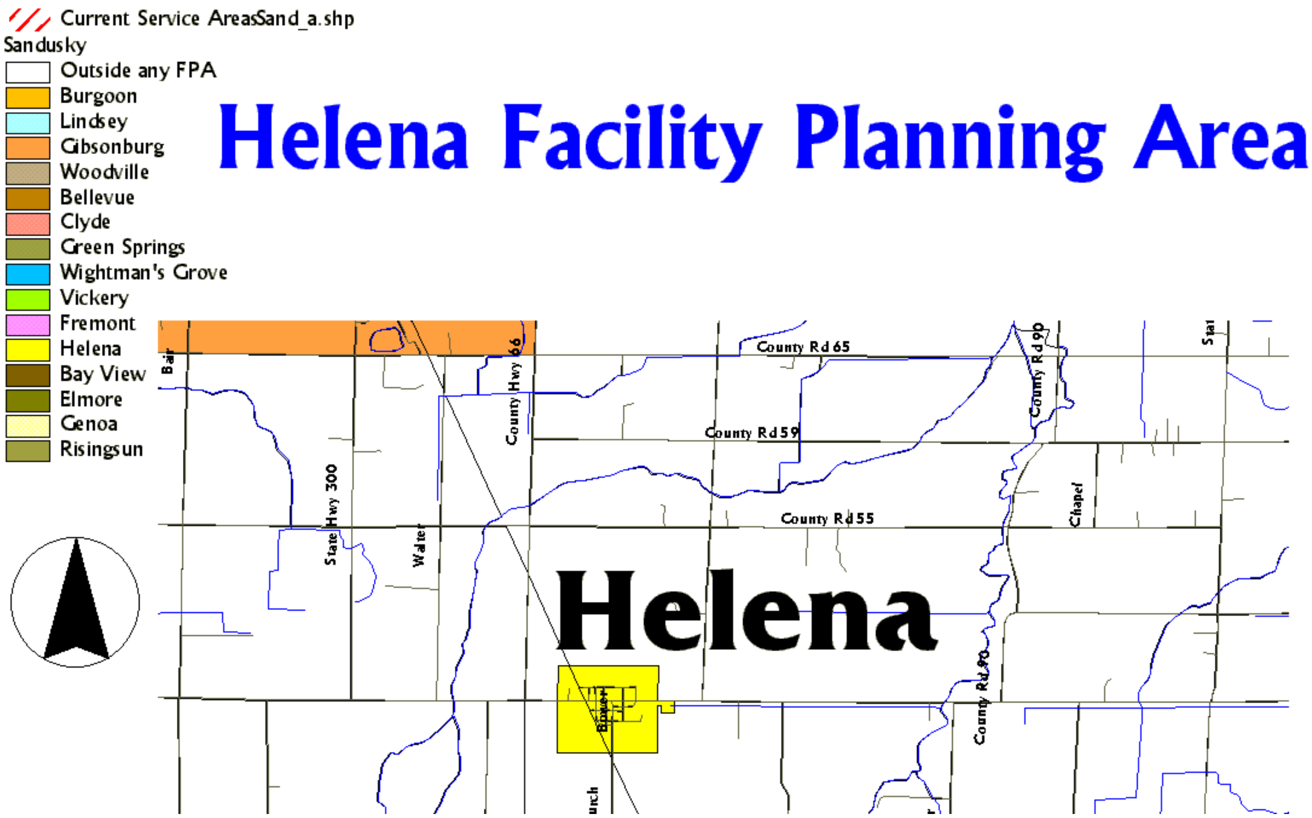


TABLE ONE

	2000	2030
Helena, entire jurisdiction	236	168
Total Population inside the FPA boundary	236	168

Present Facilities

Helena has no public treatment or collection system; sewage treatment is provided by individual septic systems.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Helena Migrant Head Start I Texas Migrant Council	Active	1959, 2001	2PT00032	4,000

Issues

The Sandusky County Health Department has identified Helena as a *Critical Home Sewage Disposal Problem Area*. The area has shallow bedrock; effluent from septic systems may drain into the bedrock through cracks rather than flowing out to local ditches. State Route 6, a major highway, passes through Helena, so there is potential for growth if a sewer system is installed.

Future Needs

- The Sandusky County Health Department has recommended that a sanitary sewerage system be built. In 2004, the Village of Helena submitted a project proposal to USDA/Rural Development. The proposal is for sanitary sewers and a new wastewater plant located in the southeast corner of the village. The project cost is estimated at $1,598,317.[46]
- Should Helena proceed with a sewerage project, including Millersville (about two miles away) may be worth considering. The Sandusky County Health Department has cited both towns as needing sewerage improvements.[47] Millersville is not presently part of this FPA.

---

[46] "Village of Helena Wastewater Collection and Treatment System," project proposal to USDA/Rural Development, May 2004, Poggemeyer Design Group

[47] *Comprehensive Water & Sanitary Sewer General Plan: Sandusky County, Ohio*. MS Consultants, Inc. October 1997.

LINDSEY FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Lindsey**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Sandusky County:** Will own and operate collection system, if and when built, in Sandusky County unincorporated areas, connecting to the Village system for treatment services.

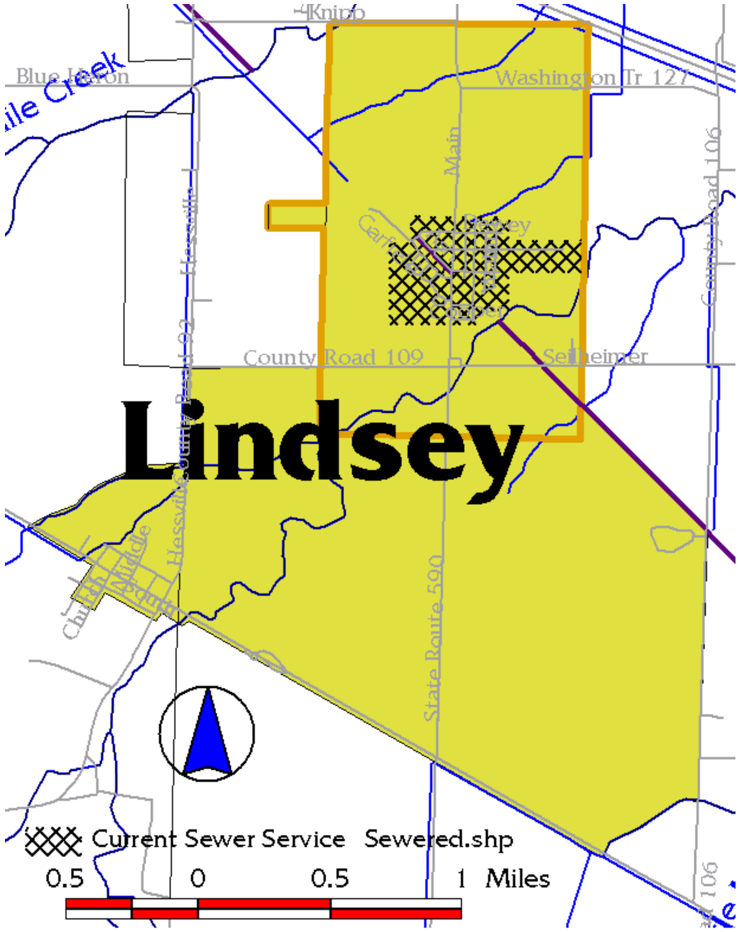


TABLE ONE

	2000	2030
Lindsey, entire jurisdiction	504	404
Washington Township, entire jurisdiction	1,892	2,447
Total Population inside the FPA boundary	719	682

Present Facilities

The Lindsey treatment plant is a 0.215 mgd extended aeration facility, which tertiary sand filters. The average daily flow was about 0.1 mgd in 1996 and 0.053 mgd in 1999. In 2003 chlorine disinfection of final effluent was replaced by ultraviolet.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Toledo Edison Headquarters Bldg.	Active	1973		2,000

Issues

Lindsey's NPDES permit cites poor plant performance and a statement that excessive I/I is a cause. The permit set a schedule of deadlines to address the issue.

Hessville

Hessville is an unincorporated, unsewered town near Lindsey. Houses are served by septic systems, many of which do not have functioning leaching fields. As a result, local streams are polluted by septic tank effluent. Hessville is considered a *Critical Home Sewage Disposal Problem Area* by the Sandusky County Health Department. Ohio EPA does not have documentation of a sewage problem in the area, and Hessville is not under orders.

The *Lindsey Facilities Plan* recommended sewering Hessville, and building an interceptor to Lindsey for treatment. This portion of the project was not built because it would have resulted in user rates that were too high, even with a 75% grant. Substantial financial assistance and/or a lower-cost treatment facility will be necessary to serve Hessville. The Lindsey WWTP has adequate capacity to serve Hessville.

Future Needs

- The Sandusky County Health Department has recommended that a sanitary sewerage system to serve Hessville be built. Lindsey has available treatment capacity to serve the town, but financial assistance will be required. Sandusky County should prepare a General Plan to evaluate options and lay out a financing plan.
- The entire collection system was grouted in 1995 to reduce extraneous flows, but the system continues to have problems with extraneous flows, as noted in the NPDES permit issued in February 2003. The Permit called for a new I/I study within 24 months to determine if I/I is excessive, and a Sewer System Evaluation Survey within 36 months with abatement recommendations and completion dates.[48] The permit calls for the eliminations of a Separate Sewer Overflow to Muddy Creek at the pump station.

[48] NPDES Permit 2PA00024*HD draft, May 2001; OEPA website indicates final date of 2/20/2003.

VICKERY FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Sandusky County**: Responsible for planning public sewerage system; and will own and operate it if and when built.

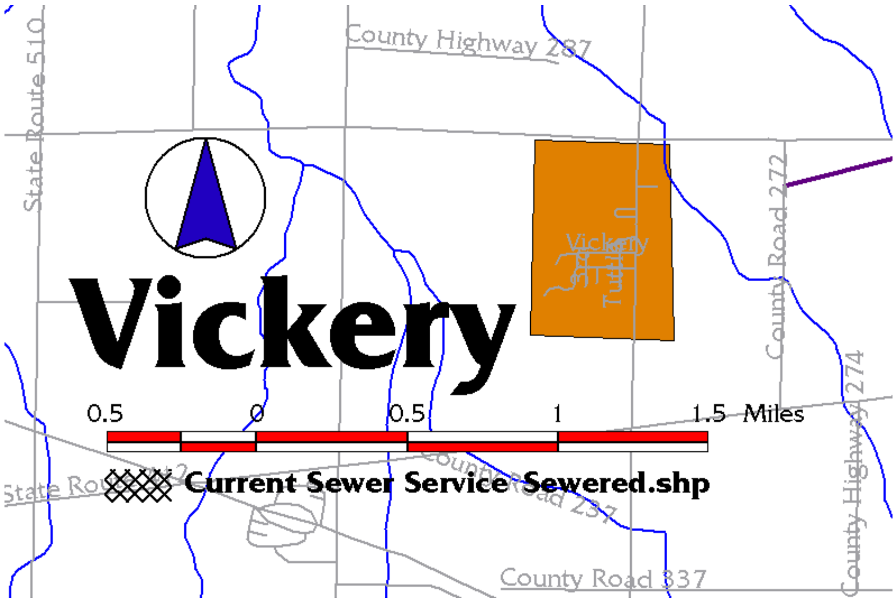


TABLE ONE

	2000	2030
Townsend Township, entire jurisdiction	1,670	2,041
Total Population inside the FPA boundary	117	143

Present Facilities

Vickery is an unincorporated community of about 85 houses in Townsend Township. There is no public sewerage system; sewage treatment is provided by individual septic systems. Soils in this area belong to the Toledo-Fulton Association, which are mostly level, very poorly to somewhat poorly drained clays. Suitability for sewage disposal is poor. Vickery is considered a *Critical Home Sewage Disposal Problem Area* by the Sandusky County Health Department.

Issues

The concentration of homes using septic systems on small lots, in soils poorly suited for leaching fields, makes Vickery likely to need a public sewerage system. Ohio EPA conducted sampling in 2000 which indicated failed septic systems.

Future Needs

A sewerage system will be needed in Vickery eventually. There are several communities in Sandusky County that involve larger populations and bigger problems, and they should receive higher priority.

WIGHTMAN'S GROVE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Sandusky County**: Responsible for planning public sewerage system; and will own and operate it if and when built.

Table One

	2000	2030
Riley Township, entire jurisdiction	1,302	999
Total Population inside the FPA boundary	74	57

Present Facilities

There are no public sewerage facilities in Wightman's Grove. Sewage treatment is provided by individual systems, many of which are believed to have failed. A 1986 house count and field survey TMACOG performed found that 52 of the 93 residences and businesses had privies. Health Department records showed 22 septic systems installed, and one aerator system, leaving 18 unknown.

Issues

Wightman's Grove is an unincorporated community on the south bank of the Sandusky River near its outlet into Sandusky Bay. The soils in this area belong to the Marsh Land Association, which are level, very poorly drained, and subject to flooding. These soils are very poorly suited for on-site sewage disposal. Wightman's Grove is considered a *Critical Home Sewage Disposal Problem Area* by the Sandusky County Health Department.

Water quality sampling was performed in 1987 at two points on the river, and in the marsh in the southeast corner of the community. The results showed a count of 260 fecal coliform/100 ml in the marsh, and < 7/100 ml on the river. It is strongly suspected that there are a number of sewage outfalls to the river, but the current usually prevents bacteria counts from becoming high. However, when flooding occurs, residents have to bring in bottled water for drinking. Health Department well tests (all dated 1982) found that three out of sixteen wells tested unsafe.

Future Needs

The Wightman's Grove sewage problems are further complicated by economic problems. Most of the houses here do not have adequate plumbing, and were never intended to be full-time residences. A sewerage system is definitely needed here, but housing improvements must be included in the solution. A General Plan should be the first step; its implementation should include a financing plan that will make the system affordable to residents. An income survey would be needed to support grant and low interest loan applications. The area is a likely candidate for the USDA and CDBG grant programs.

Capital Improvement Schedule for the Facility Planning Area
Table Two

Project Name / Description	Total Cost	Annual Capital Improvement Needs				
		2005	2006	2007	2008	2009
Wightman's Grove sewers	$1,300,000				$1,300,000	

WOODVILLE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Woodville**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Sandusky County:** Will own and operate collection system, if and when built, in Sandusky County unincorporated areas, connecting to Village system for treatment services.

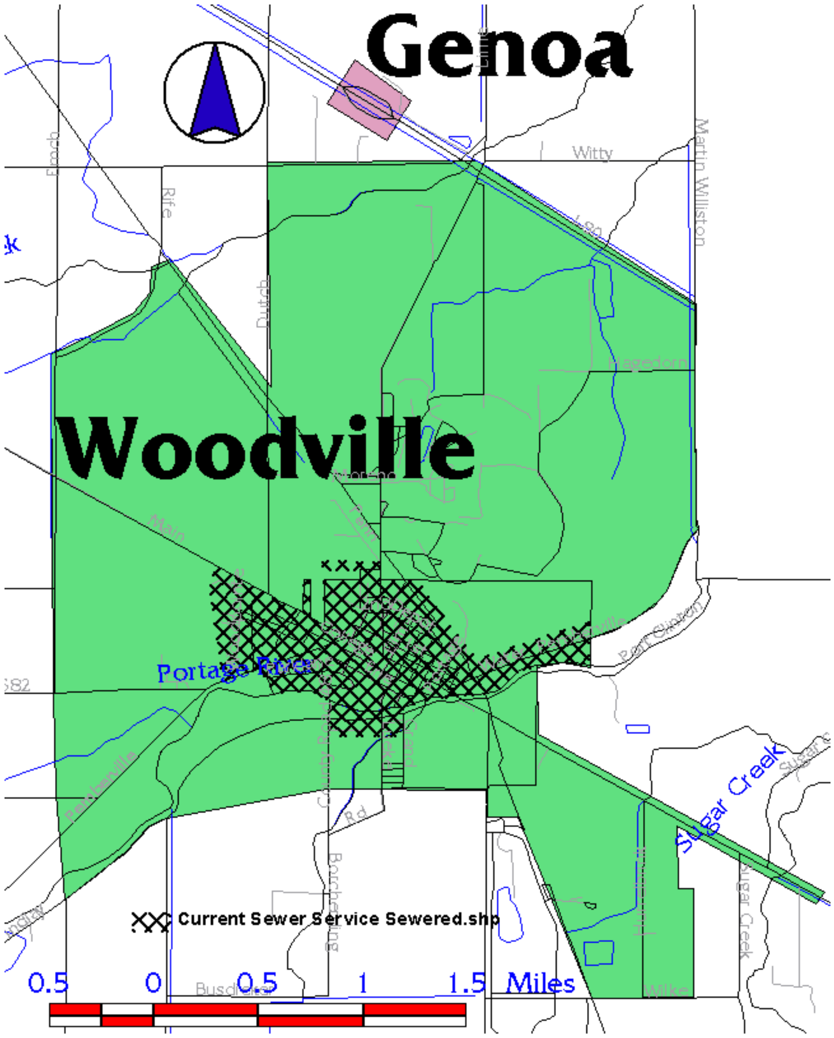


TABLE ONE

	2000	2030
Woodville, entire jurisdiction	1,977	2,032
Woodville Township, entire jurisdiction	1,327	1,837
Total Population inside the FPA boundary	2,289	2,464

Present Facilities

The Village of Woodville owns and operates an aerated lagoon WWTP with an average daily capacity of 0.3 mgd and peak capacity of 1.0 mgd. The sewer system is combined. Average flow in 1999 was about 0.48 mgd. The combined sewers are a problem, discharging stormwater and untreated sewage to the Portage River and its tributaries. Woodville is preparing its CSO abatement plan. The selected plan is to separate the sewers. By 1995 the original 19 CSOs had been reduced to 12. Flap gates were put on the remaining CSOs to prevent river water from flowing into the sewer system. The regulator weirs were raised, and larger pumps were installed to reduce overflows and increase the amount of sewage treated. These improvements were constructed between 1996 and 1999. An aerated lagoon was constructed in 2000; it stores stormwater for treatment.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
Area Rock Quarry	Active	1974	2IJ00097	1,500
Atlas Industries	Inactive -- closed 8/95			1,000
Martin Marietta	Active	1975	2IJ00040	2,000
Martin Marietta	Active	1975	2IJ00040	5,000
Munson Transportation	Active	1992		2,000

Issues

The Woodville WWTP has experienced permit violations on suspended solids and fecal coliform levels due to wet weather flow surges with monthly flows as high as 0.645 mgd.[49] CSO abatement is needed not only to eliminate overflows of untreated sewage, but also to allow the treatment plant to operate efficiently.

With improvements to the CSO regulators, addition of flap gates, and completion of the stormwater lagoon, the plant was still not meeting its effluent limits in 2003.

In 1987, Ohio EPA issued the Village Findings and Orders implement its CSO abatement plan. The Village has built two phases —Lueke Avenue sewer separation in 1992 and Lime Street sanitary sewer replacement in 1993. Three or four of the remaining CSOs commonly discharge during storm events.

Future Needs

- Additional WWTP improvements will be needed to meet NPDES permit limits. With the average flow exceeding the design capacity, greater treatment capacity and/or elimination of more extraneous flows will be needed.

[49] *Comprehensive Water & Sanitary Sewer General Plan: Sandusky County, Ohio.* MS Consultants, Inc. October 1997.

WOOD COUNTY FACILITY PLANNING AREAS

BAIRDSTOWN FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Bairdstown:** Responsible for planning public sewerage system; and will own and operate it if and when built.

TABLE ONE

	2000	2030
Bairdstown, entire jurisdiction	127	89
Total Population inside the FPA boundary	127	89

Present Facilities

Bairdstown has no public sewerage system; sewage treatment is provided by individual septic systems. The soils are Hoytville clay over shallow bedrock, and are poorly suited for leaching fields. There eis one package plant in the FPA, no longer in use.

Package Plants In The Facility Planning Area **Table Two**				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Burris Carry-Out	Closed 1996	1960		1,500

Issues

The concentration of homes using septic systems in soils poorly suited for leaching fields, makes Bairdstown a likely to need a public sewerage system. Because of its small size and lack of projected growth, Bairdstown will probably not be a high priority.

Future Needs

- Bairdstown could be served by 1) Its own treatment plant; 2) A force main pumping to North Baltimore; or 3) A force main pumping to Bloomdale. Connecting to the existing sewerage system of one its neighbor villages is likely to be more financially feasible than a new facility for the Village of Bairdstown. The first step would be a General Plan. Bairdstown may be a good candidate for financial assistance through USDA and/or CDBG; an income survey may be required.

BLOOMDALE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Bloomdale**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Northwestern Water and Sewer District:** Owns and operates collection system in unincorporated areas, connecting to Village system for treatment services.

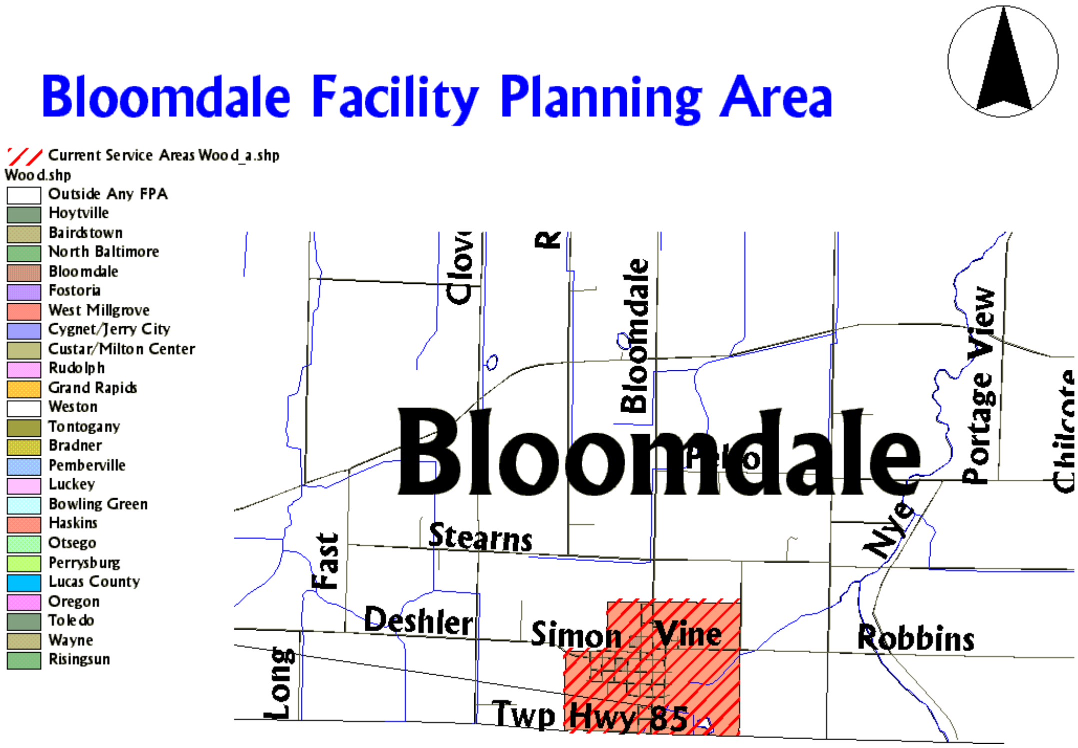


TABLE ONE

	2000	2030
Bloomdale, entire jurisdiction	725	809
Total Population inside the FPA boundary	725	809

Present Facilities

The Bloomdale WWTP is an aerated lagoon system with final clarifiers, chlorination and dechlorination, and an aerated sludge holding lagoon. Average design capacity is 0.08 mgd, with a peak design flow of 0.27 mgd. In 2004-5 the average daily flow was 0.06 mgd and peak was 0.1 mgd. The plant and separate sewer system were constructed in 1991.

BOWLING GREEN FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **City of Bowling Green**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Northwestern Water and Sewer District:** Owns and operates collection system in unincorporated areas, connecting to City system for treatment services. Owns and operates the package sewage treatment plant serving the Arlington Woods subdivision.

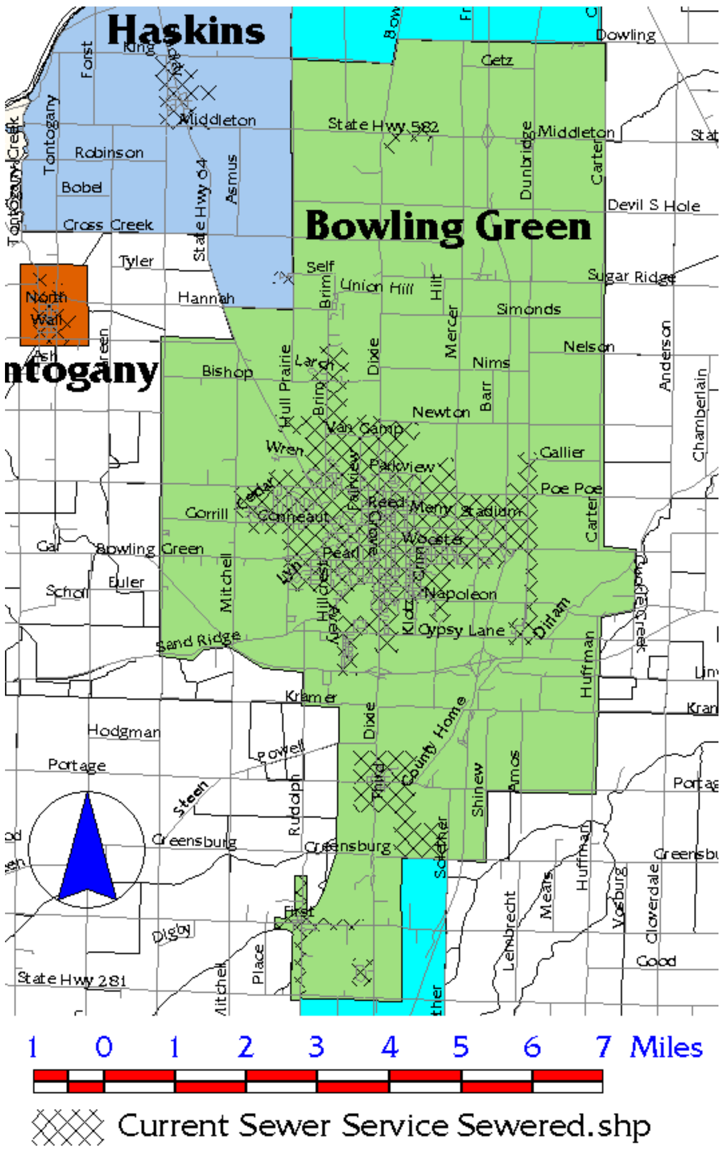


TABLE ONE

	2000	2030
Bowling Green, entire jurisdiction	29,636	36,067
Portage, entire jurisdiction	428	307
Center Township, entire jurisdiction	1,246	1,828
Liberty Township, entire jurisdiction	1,862	1,772
Plain Township, entire jurisdiction	1,706	1,465
Portage Township, entire jurisdiction	1,088	1,163
Total Population inside the FPA boundary	**33,782**	**40,466**

Present Facilities

Bowling Green built its current WWTP in 1982. It is an activated sludge plant facility with tertiary sand filters, aerobic sludge digestion, ultraviolet disinfection, and a septage receiving station. Biosolids are Class A, and applied to agricultural land.

The plant uses a centrifuge to dewater biosolids for storage during periods when farmland is frozen or too wet for land application.[50] The plant has an average design capacity of 10.0 mgd, with a peak capacity of 20 mgd. In 2004-5 the average flow was 6.7 mgd. The Bowling Green WWTP does not presently have a pre-treatment program, but is developing one, and is expected to be operational in 2004.[51]

The Bowling Green system includes combined sewers serving an area of 1,940 acres (out of about 5,400 acres for the whole service area). When the wastewater plant was built, an underground combined sewage overflow retention tank was included. The retention tank substantially reduces, but does not entirely eliminate overflows. It contains a "first flush" rainfall of about 1.0" before an overflow occurs.

Portage was included in the Bowling Green Facility Planning Area and accounted for in sizing the plant. Portage installed sanitary sewers and tapped into the system in 1991.

The east side of the SR 582/US 25 intersection, in the Sugar Ridge/Dunbridge FPA, is served by the Bowling Green system. It connects to the system via force main following US 25, Union Hill, Bishop Roads.

Rudolph, unincorporated community of about 200 residences in Liberty Township, is sewered and connects to Bowling Green for treatment services via force main. The Rudolph sanitary sewer system was completed in 2003 at a cost of $2,208,270. The project received CDBG and USDA grants totaling $1,188,000; the balance of the capital costs will be paid by residents through rates.[52]

---

[50] "EPA Rules Impact Bowling Green Wastewater," Sentinel-*Tribune* 4/15/2003

[51] "EPA Rules Impact Bowling Green Wastewater," Sentinel-*Tribune* 4/15/2003

[52] "Rudolph to Meet EPA Orders for Sewer," *Sentinel Tribune*, 9/9/2002

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area **Table Two**				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Agricultural Incubator	Active	1966		2,000
Elmview C.S.A. Apartments	Active			1,500
Elmview C.S.A. Apartments	Active			1,500
Heritage Acres Campground	Active	1980		2,000
Industrial Services	Active			1,500
Maurer Trailer Park	Active	1967, 1969	2PY00005	30,000
Principle Business Enterprises, Inc.	Active	1976, 1978		1,500
Tosh Electronics	Active			1,500

Issues

The city plans to extend Newton Road from Brim west to Haskins Road. The project will include a pump station and 2,600 feet of force main along Haskins Road to tie in with an existing gravity sanitary sewer coming out of the Quail Hollow subdivision. Construction is anticipated in 2003.[53]

The FPA covers part of the corridor US 25 / I-75. The Wood County Comprehensive Plan[54] identifies this area for employment opportunities and is therefore included in the FPA with a potential for requiring future service. The area is presently rural with no public sewerage facilities in this area, active package plants, or unsewered developed areas

Critical Home Sewage Disposal Areas

Several areas in the Bowling Green FPA have been identified as Critical Home Sewage Disposal Areas by the Wood County Health Department and/or Ohio EPA. Public sanitary sewers are needed for all of these areas and should be installed as soon as feasible.

- **Kramer and Huffman** is a problem area with failed septic systems that includes about a dozen houses around Kramer and Huffman Roads. This area is at the edge of the Bowling Green FPA, and tapping into the City's system may not be financially feasible in the near future. Connecting via a lift station or installing a temporary package plant may be an option.
- **Sugar Ridge** is an unincorporated community of about 100 residences in Center and Middleton Townships. It is about 3 miles from Bowling Green, 6 miles from Haskins, and 7 miles from Tontogany. The original town of Sugar Ridge lies between the railroad crossing at Sugar Ridge Road on the west and I-75 on the east. More recent development has spread west along Sugar Ridge Road and north and south along Mercer Road.
  There are no wastewater treatment plants in the Sugar Ridge FPA; sewage is handled by on-site systems. The soils belong to the Hoytville (poorly drained clays) or Millsdale-Randolph-Romeo (shallow limestone bedrock) Associations. Both soil associations have very severe limitations for onsite sewage disposal.

  Many of the septic systems in Sugar Ridge are believed to have failed, as evidenced by a severe accumulation of black sludge in the ditch on Sugar Ridge Road. As yet, Sugar Ridge is not under orders to install sewers by either the Wood County Health Department or Ohio EPA.

[53] "BG to Extend Utilities on Newton Road," *Sentinel-Tribune* 12/24/2002

[54] *Comprehensive Plan: A Guide for Growth 1998-2003; Wood County, Ohio.* Wood County Planning Commission, 1998

- **Maurer Mobile Home Park**: this mobile home park, just north of Bowling Green, is served by a package plant that discharges to a drainage tile on US 25. In 2004 this wastewater treatment plant was subject to enforcement action by the Ohio Attorney General.[55] The mobile home park is designated as a Critical Home Sewage Disposal Area. This Plan's policy is that this package plant shall be abandoned and replaced by public sewers at the earliest possible date.

- **Dunbridge** is an unincorporated community, located at Dunbridge Road and Middleton Pike (SR 582). There are four package plants in or near the town. Individual residences are served by septic systems. Dunbridge is not under orders to construct sewers. Dunbridge is identified as a Critical Home Sewage Disposal Area.

- **Dowling** is an unincorporated community, located at Dowling Road and Conrail tracks between Dunbridge and Carter Roads. Residences are served by septic systems. Dowling is not under orders to construct sewers. The community is split between the Bowling Green and Perrysburg FPAs. Dowling is identified as a Critical Home Sewage Disposal Area
- **Mermill:** There is no existing documentation of sewage problems in Mermill, which has about thirty residences. No stream testing data is available, but septic system failures are very common in Wood County with houses of similar age and size on similar soils. It may be feasible to install sewers and connect to Bowling Green through Rudolph via force main.

Ducat

There are approximately a dozen houses near the intersection of SR 281 (Bays Road) and Rudolph Road, an area once called "Ducat." These houses are not as old as most of Rudolph or Mermill, but the soils are poorly suited for leaching fields. Presently no stream or septic system data are available. As the existing systems age, connecting the area to the Rudolph system should be considered

Future Needs

- The force main connecting the SR 582/US 25 area to the Bowling Green system is regarded as temporary. Expansion of service in the Sugar Ridge/Dunbridge areas will require a higher-capacity gravity sewer.

[55] "Mobile Home Park Sewered Over Sewage" Bowling Green *Sentinel-Tribune* 1/6/2004

BRADNER FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Bradner**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.

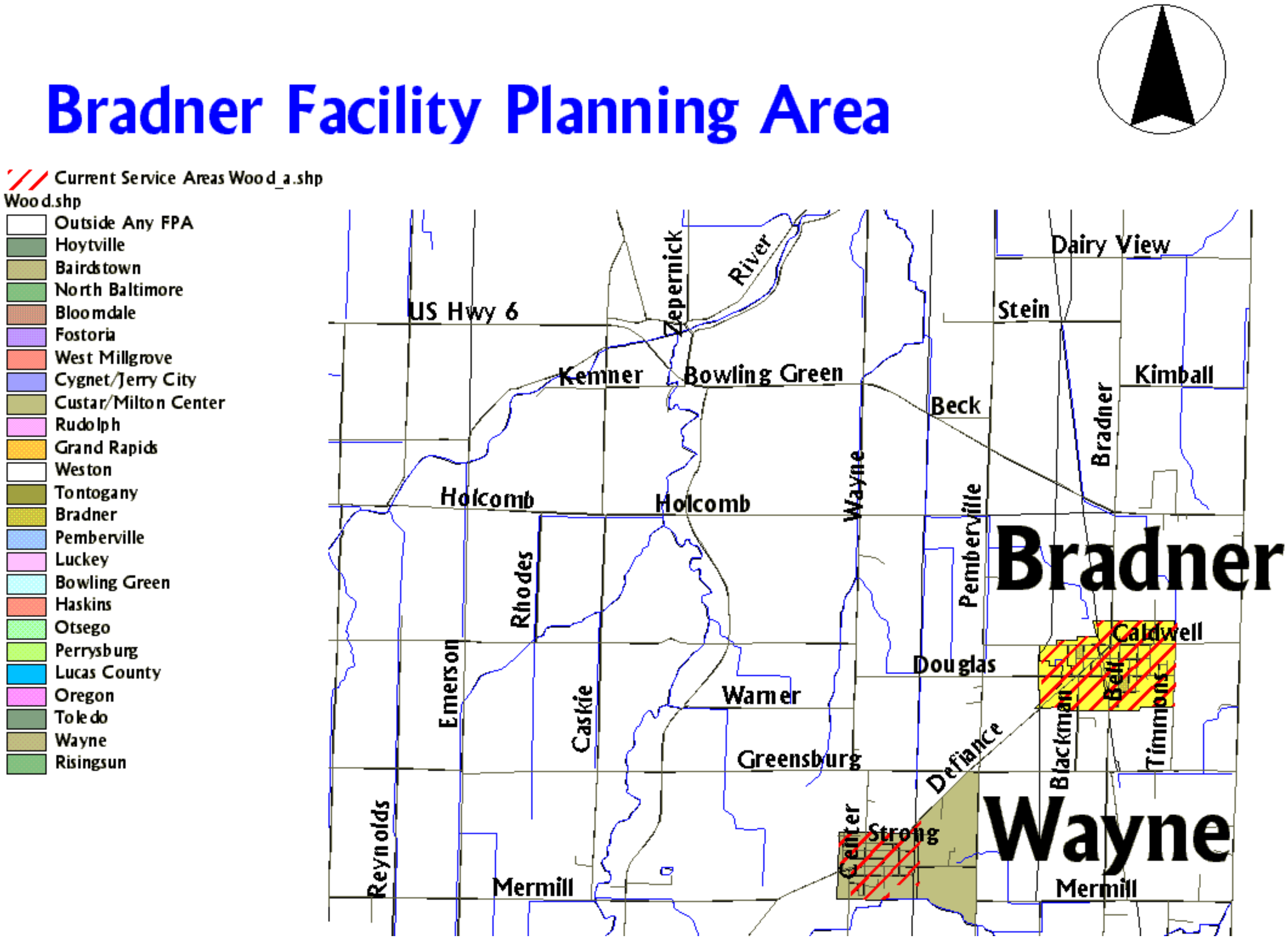


TABLE ONE

	2000	2030
Bradner, entire jurisdiction	1,171	1,366
Montgomery Township, entire jurisdiction	1,872	1,752
Total Population inside the FPA boundary	**1,283**	**1,471**

Present Facilities

The Bradner WWTP is a controlled discharge three-cell lagoon facility, built in 1988. The system uses conventional gravity sewers. The design capacity is 0.13 mgd; in 2004-5 the average flow was 0.063 mgd and peak was 0.108 mgd

CUSTAR/MILTON CENTER FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- Village of Custar: Responsible for sewerage planning within its corporate limits, and will own and be responsible for operation of such a system, if and when it is built. Custar will contract these responsibilities to the Northwestern Water and Sewer District, of which it is a member.
- Village of Milton Center: Responsible for sewerage planning within its corporate limits, and will own and be responsible for the operation of such a system, if and when it is built. Milton Center may contract these responsibilities to the Northwestern Water and Sewer District, of which it is a member.
- Northwestern Water and Sewer District: Responsible for planning, and would own and operate sewers in unincorporated areas.

Custar/Milton Center Facility Planning Area

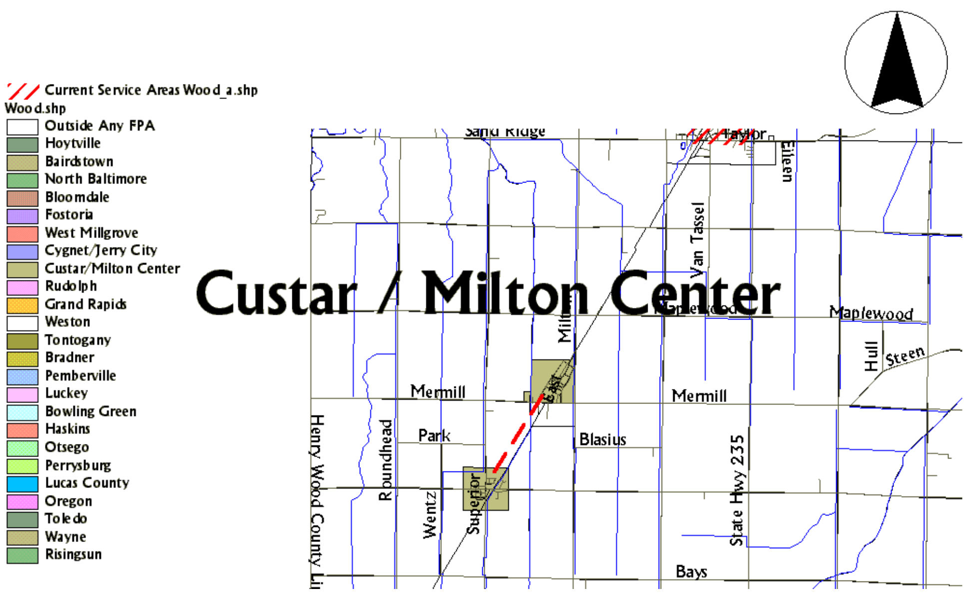


TABLE ONE

	2000	2030
Custar, entire jurisdiction	208	198
Milton Center, entire jurisdiction	195	182
Total Population inside the FPA boundary	**405**	**381**

Present Facilities

There are no public sewerage facilities serving these communities. All sewage treatment is currently handled by on-site systems.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Milton School	Active	1953		1,875

Issues

Ohio EPA sampled in August of 1999; samples shows water quality violations for dissolved oxygen, ammonia, total suspended solids, fecal coliform, and total dissolved solids The Wood County Health Department believes there are a considerable number of septic system failures in this area. Orders to sewer both communities are anticipated.

Future Needs

If Ohio EPA and/or Wood County Health Department data document widespread sewage system failures, a sewerage system should be considered for the area. A joint system serving both villages should be considered: it is most likely to be cost-effective In planning the system, houses in the Township but adjacent to the villages, or along a sewer route between the towns should be considered for service, depending on cost-effectiveness.

Northwestern Water and Sewer District is working with both villages in planning and financing the system. Both villages have income surveys that show qualification for CDBG LMI criteria. Custar's study is complete; Milton Center's still needs additional responses to validate the results.

Funding for the Custar project has been arranged. Northwestern Water and Sewer District and Custar will install sewers and construct the WWTP: probably a controlled discharge lagoon facility. The system is anticipated to be completed in late 2005 at a cost of $1.7 million.

Milton Center plans to connect to the Custar system. The Milton Center sewers are estimated to cost $1.3 million; in 2005, the village had not yet secured funding. Financial assistance is needed to construct their sewers; the Village and Northwestern Water and Sewer District will continue to seek funding.

CYGNET/JERRY CITY FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Cygnet**: Owns and operates wastewater treatment facilities, and collection system within its corporate limits.
- **Village of Jerry City**: Owns the collection system within its corporate limits, and its responsible for its operation either directly or under contract to the Wood County Regional Water and Sewer District.
- **Northwestern Water and Sewer District:** Owns and operates collection system in unincorporated areas, and operates the collection system in Jerry City.

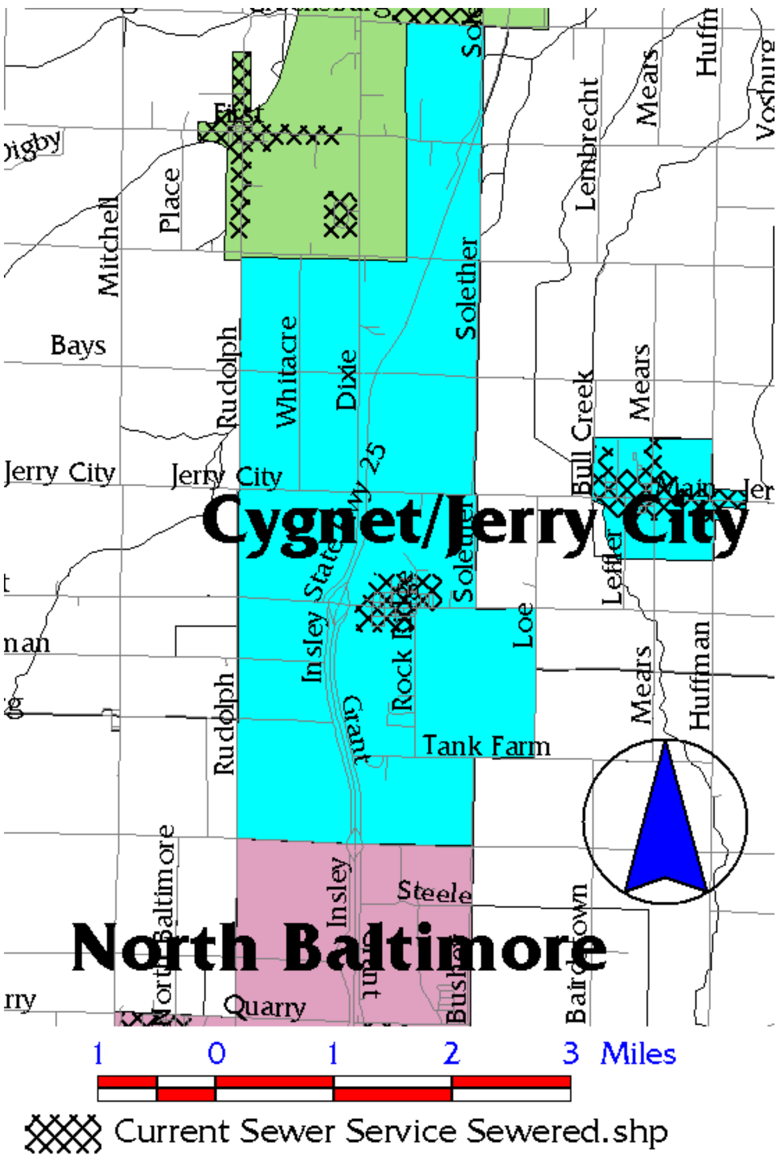


TABLE ONE

	2000	2030
Cygnet, entire jurisdiction	564	581
Jerry City, entire jurisdiction	453	363
Bloom Township, entire jurisdiction	664	716
Henry Township, entire jurisdiction	709	731
Liberty Township, entire jurisdiction	1,862	1,772
Portage Township, entire jurisdiction	1,088	1,163
Total Population inside the FPA boundary	**1,390**	**1,338**

Present Facilities

The Cygnet/Jerry City WWTP is a lagoon facility with an average daily capacity of 0.09 mgd. At the time of construction 1995, there were 220 customers in Cygnet and 172 in Jerry City.[56] The plant was designed to allow 50% growth in both towns. In 2004-5 the average daily flow was 0.03 mgd with a peak of 0.075 mgd. The Cygnet sewer system was completed in 1995, and Jerry City's in 1996. Both are conventional gravity sewer systems.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Ohio State Patrol Weigh Station	Active			1,500

Issues

The FPA covers part of the corridor US 25 / I-75. The Wood County Comprehensive Plan[57] identifies this area for employment opportunities and is therefore included in the FPA with a potential for requiring future service. The area is presently rural with no public sewerage facilities in this area, active package plants, or unsewered developed areas.

[56] "Sewer lagoon to serve Cygnet & Jerry City," Bowling Green *Sentinel Tribune*, 1995

[57] *Comprehensive Plan: A Guide for Growth 1998-2003; Wood County, Ohio.* Wood County Planning Commission, 1998

GRAND RAPIDS FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Grand Rapids**: Owns and operates wastewater treatment facilities, and collection system within its corporate limits.
- **Northwestern Water and Sewer District:** Owns and operates collection system in unincorporated areas.

TABLE ONE

	2000	2030
Grand Rapids, entire jurisdiction	1,002	1,320
Grand Rapids Township, entire jurisdiction	629	649
Total Population inside the FPA boundary	1,138	1,460

Present Facilities

The Grand Rapids WWTP was built in 1978. It is an oxidation ditch with an average capacity of 0.175 mgd and a hydraulic capacity of 0.6 mgd. Plant facilities include aerobic sludge digestion, final chlorination, and sludge drying beds. Dried sludge is applied to agricultural land. The average daily flow in 2004-5 was 0.1 mgd, with a peak daily flow of 0.14 mgd

FOSTORIA FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **City of Fostoria**: Owns and operates wastewater treatment facilities, and collection system within its corporate limits. Owns and operates collection system in Hancock County unincorporated areas, connecting to City system for treatment services.
- **Northwestern Water and Sewer District:** Owns and operates collection system in Wood County unincorporated areas, connecting to City system for treatment services.
- **Seneca County:** Owns and operates collection system in Seneca County unincorporated areas, connecting to City system for treatment services.
- **Village of New Riegel:** Will plan, own and operate the New Riegel collection system, connecting to the Fostoria system for treatment services.

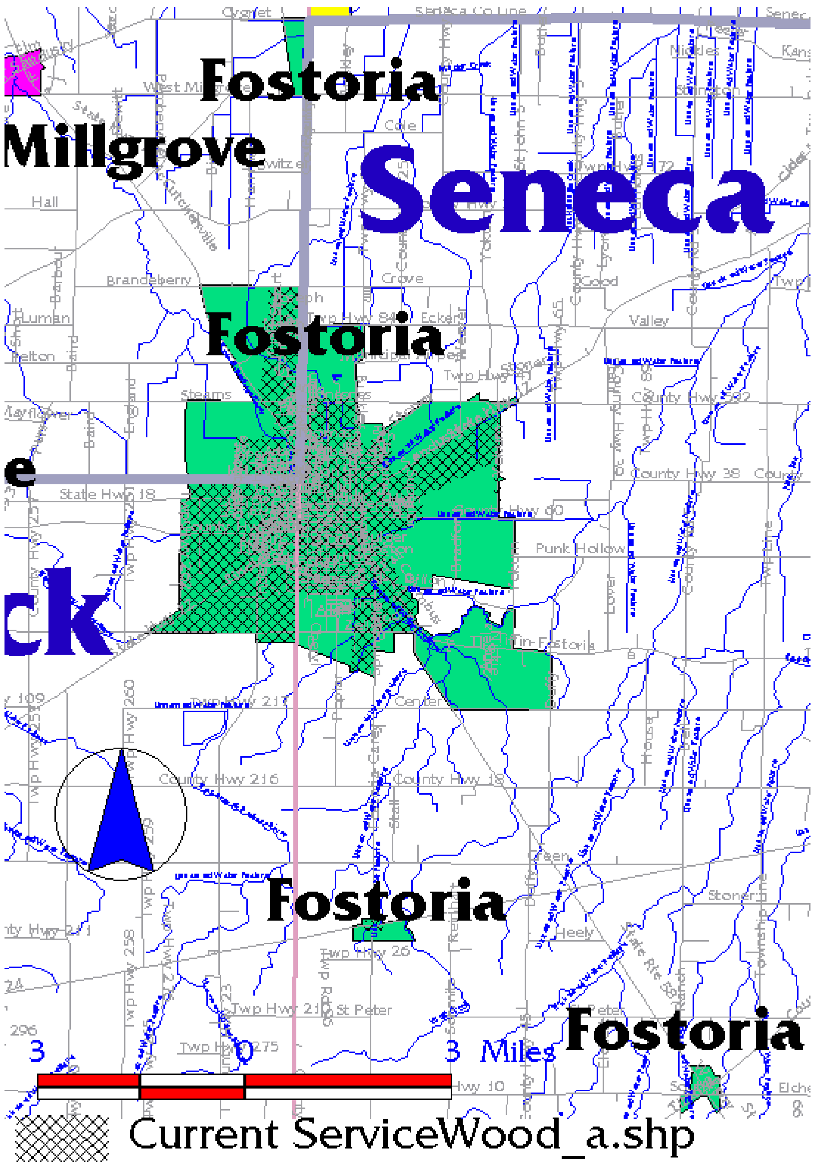


TABLE ONE

	2000	2030
Fostoria, entire jurisdiction	13,931	14,908
Perry Township, entire jurisdiction (Wood County)	1,856	1,872
Washington Township, entire jurisdiction (Hancock County)	1,011	1,121
New Riegel, entire jurisdiction	226	196
Loudon Township, entire jurisdiction (Seneca County)	2,395	2,078
Jackson Township, entire jurisdiction (Seneca County)	1,640	1,423
Total Population inside the FPA boundary	**16,576**	**17,370**

Present Facilities

The Fostoria WWTP is a primary trickling filter and secondary activated sludge facility that treated an average flow of 5.67 mgd in 2003. Primary treatment capacity is 12.5 mgd, and secondary capacity is 8.25 mgd in 1987 at a cost of about $3 million, new primary trickling filters, additional aeration tanks with fine-bubble diffusers, and new clarifiers were built. In 1994 Fostoria completed a major upgrade and expansion that included increased primary treatment capacity, elimination of the plant bypass, CSO abatement, and construction of a 2 MG primary effluent storage lagoon. The lagoon stores primary effluent that the second treatment facilities cannot handle during wet weather. The primary effluent is stored until the plant is able to treat it. The 1994 improvements cost $7 million. Sludge undergoes anaerobic digestion.

Ninety percent of Fostoria's sewer system was combined, as of 2005. New sewers are separate. There are five CSOs, four of which discharge to the Portage East Branch, and one to Wolf Creek.

Besides the FPA contiguous to the city, Fostoria provides treatment services to three non-contiguous areas via force main. They are:

- North of the city, a mile south of Risingsun, in Perry Township of Wood County
- South of the city in south Loudon Township of Seneca County
- The Village of New Riegel

Issues

Combined Sewer Overflows

Fostoria has completed a sewer separation project (partially funded by Issue II, $210,000) which impacts CSO #5 on the east side of the city. Fostoria has also completed a sewer separation project in the northeast portion of the city, costing $800,000, which included an Issue II grant of $500,000. This project will decrease flows at CSO #1.

Fostoria's NPDES permit was renewed in June 2004, giving the city four years to develop a Long-Term Control Plan. That plan requires limits CSO options to separation, storage/treatment of combined sewage, or complete treatment.

Unsewered Areas

Several unsewered portion of the Fostoria FPA are likely to need sewers.

- A subdivision in Loudon Township, Seneca County, southeast of the corporate limits. No stream sampling data is available, but septic systems in the area are believed to have failed and are discharging both into the Portage River East Branch and the Wolf Creek drainage basin.
- SR 18 just west of existing sewers. It is recommended by the Hancock County Health Department as a Critical Home Sewage Disposal Area.
- The triangle between Washington Township Roads 218 and 261. It is recommended by the Hancock County Health Department as a Critical Home Sewage Disposal Area.
- The North Poplar and East Culbertson Street area, bordered by railroad property, is in the City in Seneca County, but does not have access to a sanitary sewer. [58]
- New Riegel plans construction of a separate sewer system in 2005 at an estimated cost of $3.4 million. Anticipated funding includes $200,000 from the Ohio Department of Development, and $800,000 plus $300,000 credit enhancement from the Ohio Public Works Commission (Issue 2). The village has applied for $500,000 from CDBG.[59] The Village has applied for a $1.3 million STAG grant, a loan from OWDA, and is requesting financial assistance to residents for their sewer taps. The Village will own and operate the collection system. It will connect with Fostoria for treatment services.

Future Needs

- The city of Fostoria is facing significant improvements to its sewer system and wastewater treatment plant. The City is negotiating with US EPA, Ohio EPA, and the US Department of Justice.
- Fostoria should continue implementation of its Combined Sewer Overflow Abatement Plan.
- Install sanitary sewers in developed but unserved areas that have documented sewage problems.
- Build sewer extensions to eliminate remaining problems areas and provide service to new development. New package plants and septic systems should not be permitted in areas that may be served by public sewers.
- The Village of New Riegel should proceed with its planned sewer system.

---

58 "City if Given 2 Years to Handle Sewer Woes," *Fostoria Review Times* 11/7/2002

59 "New Riegel Has Lined up 62 Percent of Sewer Project's Funding," *Tiffin Advertiser Tribune* 8/28/2003

HASKINS FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Haskins**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.
- **Northwestern Water and Sewer District:** Owns and operates collection system outside the corporate limits, connecting to Village system for treatment services.

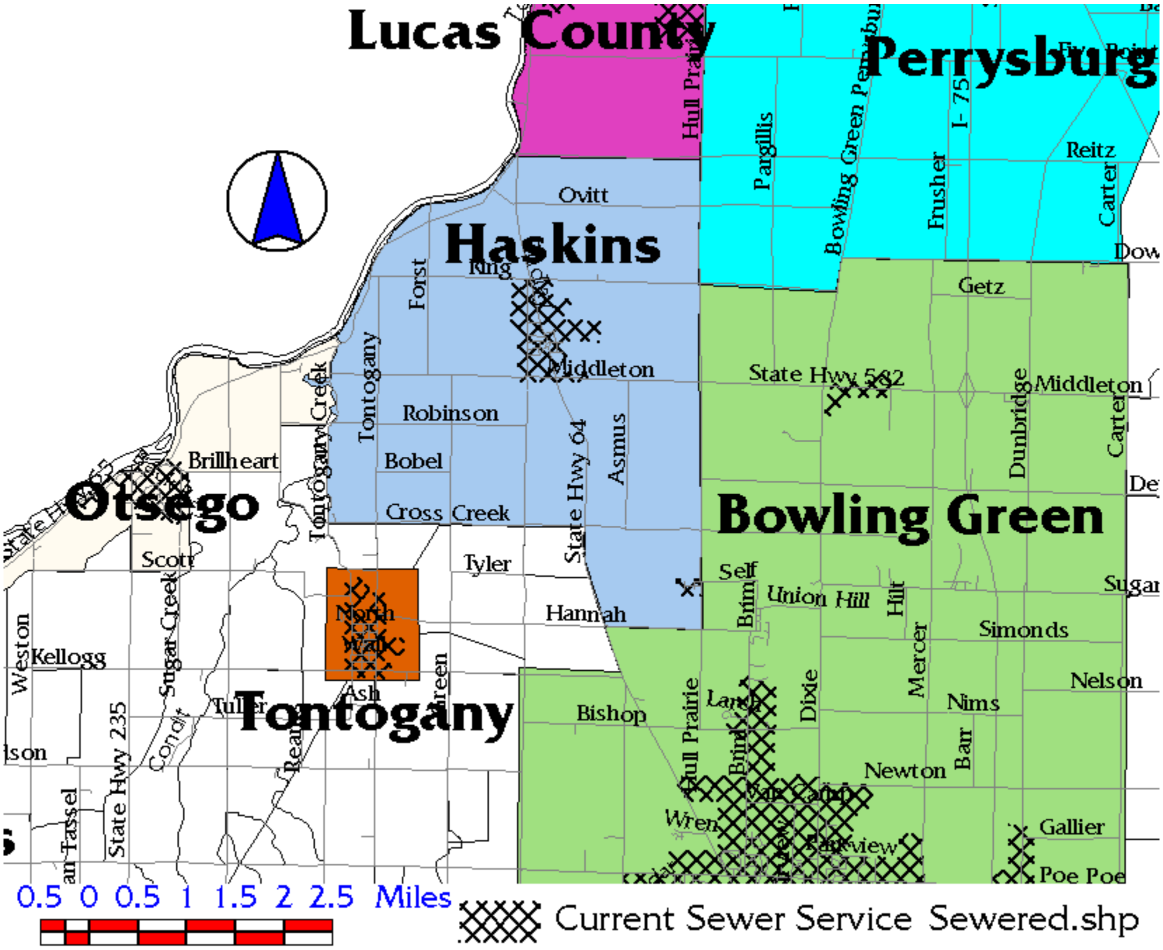


TABLE ONE

	2000	2030
Haskins, entire jurisdiction	638	890
Middleton Township, entire jurisdiction	1,960	2,227
Washington Township, entire jurisdiction	1,324	1,660
Total Population inside the FPA boundary	1,452	1,806

Present Facilities

The existing Haskins WWTP was built in 1970; it is a 0.1 MGD extended aeration plant with filters. Liquid sludge is applied to agricultural land. Average daily flow in 2004-5 was 0.13 mgd and peak daily flow was 0.423 mgd.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
Country Manor Estate, SS #3	Active		2PG00096	20,000
Riverby Hills Golf Club	Active			4,000

Issues

The principle issue for Haskins is capacity of its wastewater plant. The village and neighboring township areas in the FPA have been growing. The plant is running at full capacity. Lack of additional capacity limits tapping in new houses, as well as eliminating failed septic systems in the FPA.

The existing sewer system within the village has serious problems with extraneous flows. In wet weather, the system runs at capacity, and can handle little additional flow. Starting in 1999, the village undertook a sewer system rehabilitation program to eliminate extraneous flows. Under this program, all manholes were inspected for leaks and chimney seals 66. Thirteen basement sump pumps discharging to the sanitary sewer system were identified and eliminated; smoke testing and sewer televising programs were conducted to identify and eliminate other I/I sources.

Three groups of houses unsewered adjacent to the village need sewer service:

- ***State Route 64 north of King Road:*** about 19 houses are in this area north of town. Bypassing sewage from failed septic systems is obvious in the roadside ditch. The septic systems of most of these houses are believed to have failed. The service area should be expanded to eliminate these septic systems. In 2000, the Wood County Health Department conducted a sanitary survey in this area.
- ***Hull Prairie,*** an unincorporated area on the north side of King Road just east of the railroad tracks. There are ten houses in this area; a sanitary survey of this area has not been conducted. Sanitary sewers may be needed here in the future.
- ***Liberty Hi***, an unincorporated area on Liberty Hi Road south of the railroad tracks. Sanitary sewers may be needed to serve the houses in this area; a sanitary survey has not been conducted.

Future Needs

Haskins is in the process of constructing a new WWTP to provide adequate treatment capacity for projected growth, elimination of failed septic systems, and potentially replacement of smaller nearly wastewater treatment plants. Design capacity will provide treatment for:

- Development within the present corporate limits. There are substantial undeveloped areas within the village, and future development is anticipated in these areas.
- Developed but unsewered areas adjacent to the village. Capacity should be planned for the approximately 40 houses in these areas.
- Present and future development for the portions of Middleton Township in the Haskins FPA. In

particular, service will be needed northwest of the Village up to the Maumee River

It is recommended that the Village of Haskins and the Wood County Regional Water and Sewer District study the feasibility of Haskins providing wastewater treatment services for portions of the Otsego FPA:

- Portions of Washington and Middleton Township along the Maumee River from Williamsburg (Brillhart Road) to Ovitt Road. There are many houses on septic systems in this area, which is regarded as very desirable for development. As development proceeds, sanitary sewers will be needed. Part of this area is in the Haskins FPA, and part is in the Otsego FPA.

Sewers in unincorporated areas will be owned and operated by the Wood County Regional Water and Sewer District, with treatment provided under contract by the Village of Haskins. The Village will own and operate sewers within its corporate limits.

The new Haskins WWTP will be a 400,000 gpd activated sludge facility, to be built at an estimated total cost of $2.76 million in 2005. The new WWTP site is 40 acres on the west side of SR 64, just north of the former Village limits (now annexed). The receiving stream will be a ditch along SR 64, flowing north into the Maumee River. Site plans include a future 200,000 to 400,000 gpd expansion. The village is seeking state and federal financial assistance for the new treatment plant. This Plan supports financial assistance for this facility.

HOYTVILLE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Hoytville**: Owns and operates wastewater treatment facilities, and collection system within its corporate limits.
- **Northwestern Water and Sewer District:** Owns and operates collection system in unincorporated areas.

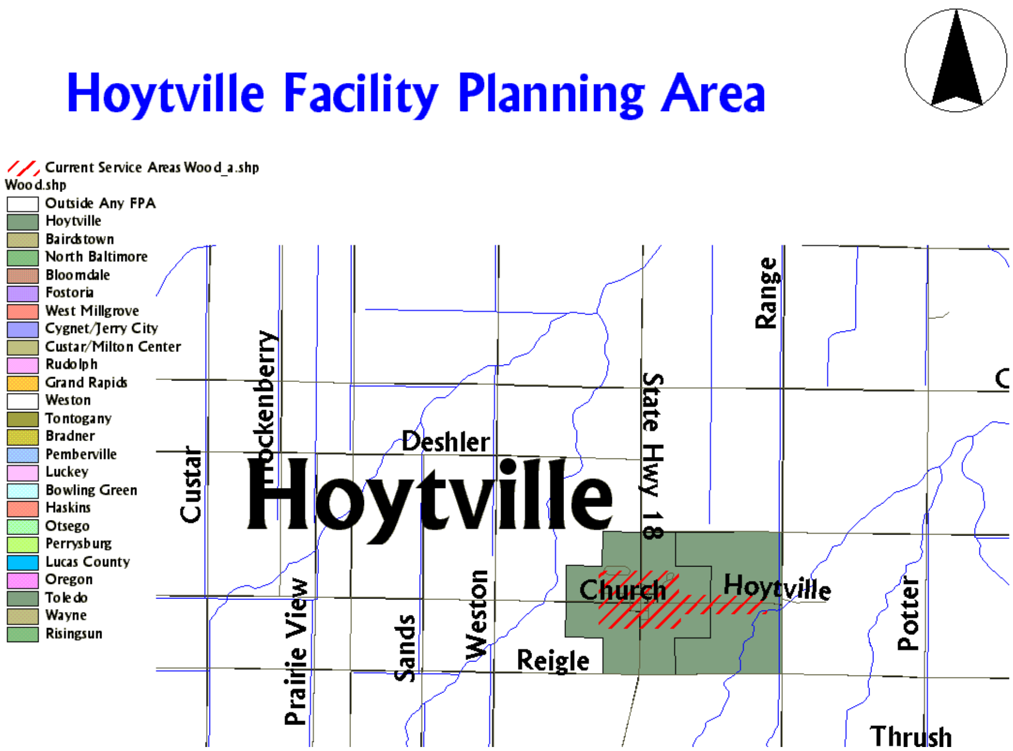


TABLE ONE

	2000	2030
Hoytville, entire jurisdiction	296	292
Jackson Township, entire jurisdiction	455	407
Total Population inside the FPA boundary	308	303

Present Facilities

Hoytville WWTP was built in 1990 with an average daily design flow of 0.036 mgd. Average flow in 2004-5 was 0.021 mgd and peak daily flow was 0.84 mgd. The plant is a three-cell controlled discharge lagoon system that discharges to Needles Creek only during high flow. The sewers are a small diameter gravity design that uses on-lot septic tanks to capture solids. The Village is responsible for pumping the septic tanks and septage handling.

Luckey Facility Planning Area

Designated Management Agency Responsibilities:

- **Village of Luckey**: Owns and operates wastewater treatment facilities, and collection system within its corporate limits.
- **Northwestern Water and Sewer District:** Owns and operates collection system in unincorporated areas. The District operates the Luckey WWTP under contract with the Village.

Luckey Facility Planning Area

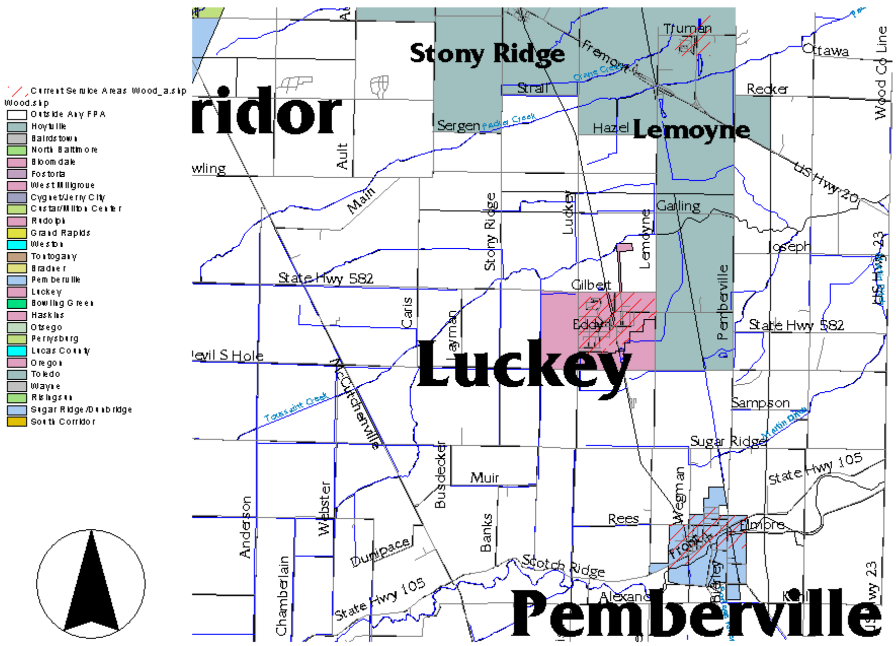


TABLE ONE

	2000	2030
Luckey, entire jurisdiction	998	1,200
Troy Township, entire jurisdiction	3,357	4,107
Webster Township, entire jurisdiction	1,277	1,579
Total Population inside the FPA boundary	1,050	1,264

Present Facilities

The Luckey WWTP, built in 1988, is a 0.12 mgd controlled discharge lagoon facility. Hydraulic capacity of the system is 0.36 mgd. In 2004-5 the average flow was 0.07 mgd and peak daily flow was 1.0 mgd. Effluent is discharged to Toussaint Creek only during high flow.

Prior to construction of the WWTP, failed septic systems discharged to the village storm sewer system. Pump stations were built to convey the septic tank effluent to the treatment plant. Existing septic tanks were left in place. The village is responsible for pumping them out and disposing of the septage.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Uretech	Closed	1976	2IR00008	22,500

Issues

The Luckey sewerage system has advantage of providing the village with dry weather treatment that the residents could afford. The alternative was to do nothing until a separate sewer system could also be built. The next step is to address the Combined Sewer Overflows. The Village has prepared a CSO Long Term Control Plan that calls for sewer separation by construction of a new sanitary sewer system.

Future Needs

- Luckey should continue with its CSO Plan to separate its sewers; the NPDES permit requires separation within three years from 2003. Since most of the town is built on shallow bedrock areas, constructing a separate sewer system will be expensive. The estimated cost is $3.2 million, to be constructed in one phase. Luckey submitted a funding request to USDA/Rural Development in 2001, and received a $750,000 STAG grant in 2002. The project is anticipated to be completed in 2006. This Plan supports financial assistance for Luckey's sewerage improvements.

NORTH BALTIMORE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of North Baltimore**: Owns and operates the wastewater plant and sewers within its corporate limits.
- **Northwestern Water and Sewer District:** Owns and operates sewers in unincorporated areas Wood County with treatment services provided by the North Baltimore WWTP.
- **Hancock County:** Owns and operates sewers in unincorporated areas of Hancock County with treatment services provided by the North Baltimore WWTP.

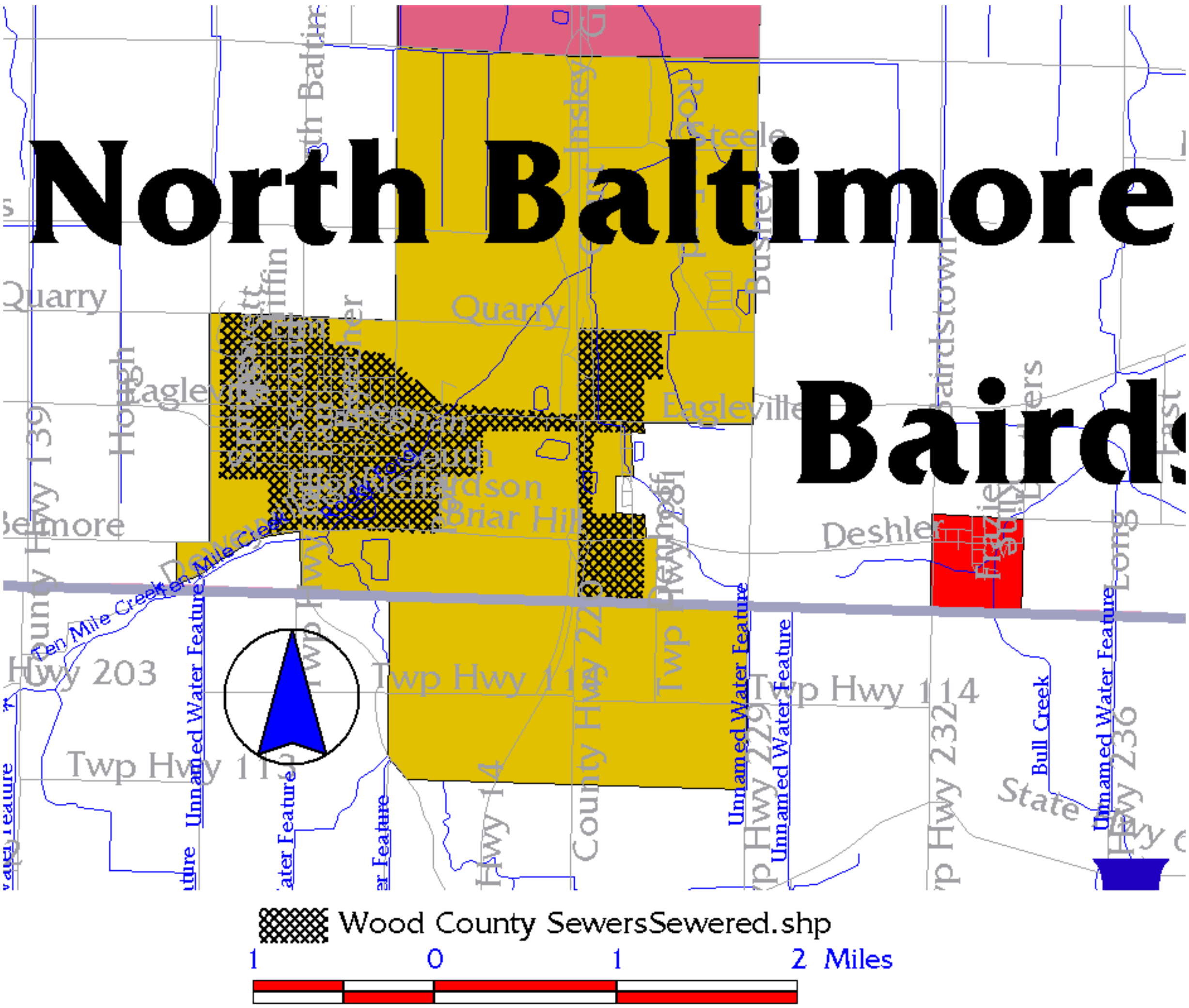


TABLE ONE

	2000	2030
North Baltimore, entire jurisdiction	3,361	4,495
Bloom Township, entire jurisdiction	664	716
Henry Township, entire jurisdiction	709	731
Allen Township, entire jurisdiction	1,797	1,992
Total Population inside the FPA boundary	3,540	4,687

Present Facilities

The North Baltimore WWTP is a 0.8 mgd trickling filter plant. In 2004-5 its average daily flow was 0.85 mgd. I/I was a serious problem, causing bypassing. In 1997, in house improvements to two overflow structures reduced CSO discharges by 60% during a rain event. In 2000, North Baltimore constructed a 200,000 gallon sludge holding tank to provide 180 days' storage capacity at a cost of $300,000.

North Baltimore completed the first phase of its 13 phase CSO abatement program in 2003. The first phase cost about $550,000, and was aided by a $275,000 Ohio Public Works Commission grant.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area
Table Two

Package Plant	Status	Install or Upgrade Date	NPDES Permit	Capacity, gpd
Bernie's Towing Service	Inactive	1968		1,500
Briar Hills Country Club	Active	1965		1,500
Crown Inn Motel	Active			23,400
KOA Kampground (Kampin Korner)	Inactive			40,000
Perry's Pantry, Inc., #3, with Amoco Truck Stop	Inactive			3,000
Sunoco	Inactive			1,500

Issues

North Baltimore's NPDES Permit requires, renewed in 2003, a CSO abatement schedule within 12 months. Ohio EPA has given the village a 15 year deadline from 2002 to complete all phases.

The FPA covers part of the corridor US 25 / I-75. The Wood County Comprehensive Plan[60] identifies this area for employment opportunities and is therefore included in the FPA with a potential for requiring future service. The area is presently rural with no public sewerage facilities in this area, active package plants, or unsewered developed areas

Future Needs

The I-75/SR 18 interchange is an area with development potential. The east side of the interchange has village sanitary sewers serving a truck stop. The west side is unsewered, with older development, and no public sewers. There are three package plants on the west side of the interchange, two of which are not in use. If the west side were to be sewered, the connection would probably be made from the village, along SR 18, about three quarters of a mile from the interchange. Development on the west side of the interchange could be served by:

1. Public sewers connecting the area to the North Baltimore system
2. Repairing, upgrading or replacing the current package plant(s) with a new package plant(s), serving the west side of the interchange, or individual businesses. Package plants are to be considered temporary treatment facilities, until public sewers are available.

It is the policy of this Plan that public sanitary sewers connecting to the North Baltimore sanitary sewerage system are the preferred option for the SR 18 corridor between the present village limits and I-75. Expanding, replacing, or upgrading the existing package plants is an acceptable option for serving the west side of the SR 18/I-75 interchange if North Baltimore sewers are not available. All package

[60] *Comprehensive Plan: A Guide for Growth 1998-2003; Wood County, Ohio.* Wood County Planning Commission, 1998

plants at the interchange shall be abandoned and required to tap into the North Baltimore system when public sewers become available.

North Baltimore has prepared a CSO control program, under which the combined sewer system will be separated. The entire program has a projected cost of $10 to $12 million, in 13 phases to be built by 2017. Three phases are north of the railroads tracks, and ten are south. Ohio EPA noted that they allowed North Baltimore 15 years to construct all phases because the project cost will place a high burden financially on residents.[61] This Plan supports state and federal financial assistance for North Baltimore's CSO control program. The following table lists North Baltimore's completed and proposed CSO abatement projects.

TABLE TWO
North Baltimore North Side
Combined Sewer Abatement Projects

CSO Phase Project	Cost [Estimated]	Completion Date [Projected Date]
1	$582,636	2003
2	$485,544	
3	$548,536	
4	$460,812	
5	$522,171	
6	$472,571	
7	$488,382	
8	$513,083	
9	$527,271	
10	$473,149	
11	$526,183	
12	$515,739	
13	$516,090	

61 "N. Baltimore Continues Sewer Work," *Sentinel-Tribune*, 3/5/2003

OTSEGO FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Northwestern Water and Sewer District:** Responsible for planning public sewerage system; and will own and operate it if and when built.

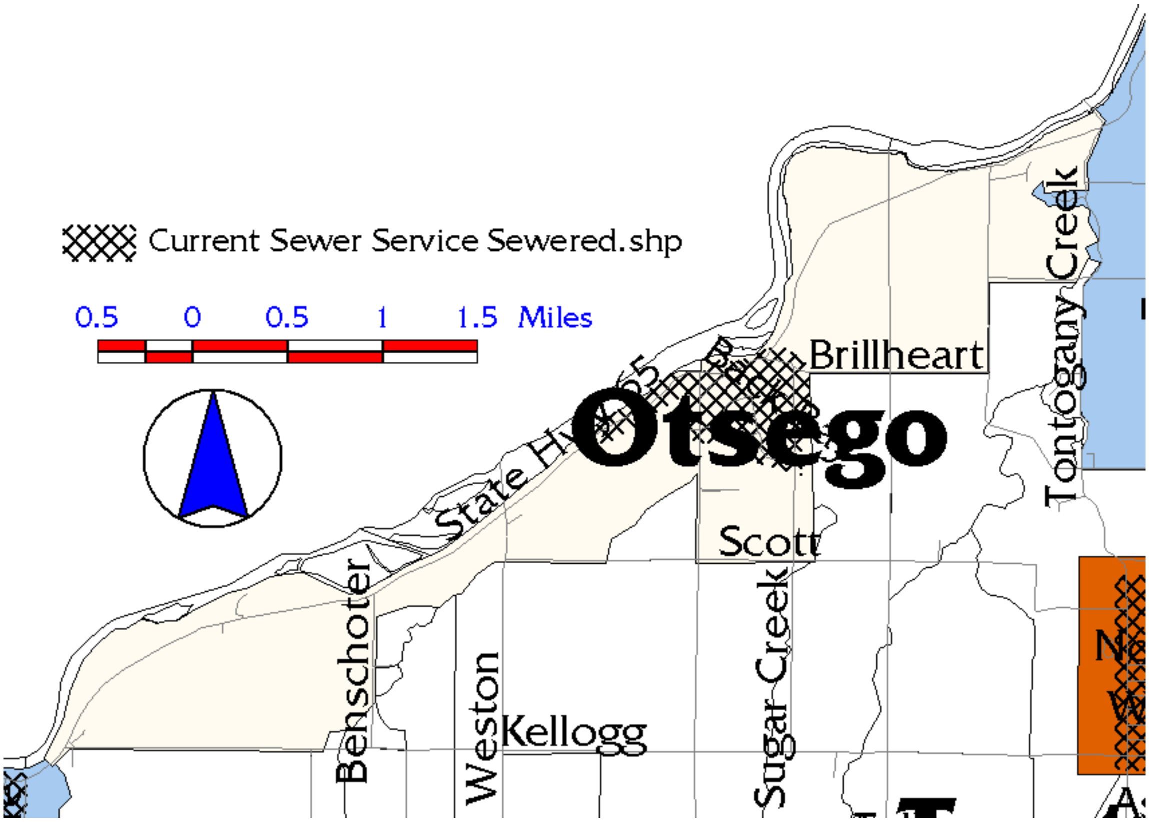


TABLE ONE

	2000	2030
Grand Rapids Township, entire jurisdiction	629	649
Washington Township, entire jurisdiction	1,324	1,660
Total Population inside the FPA boundary	552	659

Present Facilities

Most of the Otsego area is not served by a public sewerage system. The one public facility is a package plant operated by the Wood County Regional Water and Sewer District that serves the Williamsburg-on-the-River subdivision in Washington Township. This facility is a 50,000 gpd extended aeration plant, originally installed to serve just the Williamsburg on the River subdivision, located southeast of SR 65 at the mouth of Sister Creek / Sugar Creek. There have not been as many units built in this subdivision as originally planned, and so the plant has extra capacity (it received 10,000 gpd in 1986). Some houses along SR 65, outside the subdivision, are being added to this WWTP's service area.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Nazareth Hall	Active	1991		6,220
Riverview Trailer Park	Active			3,400
Williamsburg-on-the-River, SS #4	Active	1972	2PG00097	50,000

Issues

Unsewered Areas

The entire riverfront between Grand Rapids and Haskins is a potential growth area. When public water becomes available development is all the more likely to proceed. Many of the houses in this planning area are between River Road (SR 65) and the Maumee River. The bank of the river is steep, the lots are small, and there is no room for an acceptable leaching field. On the other side of River Road, new housing will have to meet present lot size requirements for sewage disposal.

Williamsburg-on-the-River

The Williamsburg WWTP was built in 1972, and is at the end of its useful life. Northwestern Water and Sewer District plans to replace it with a facility which can provide long-term sewerage service to the area and serve more residents.

Future Needs

- Northwestern Water and Sewer District plans on replacing the existing Williamsburg WWTP with a new treatment plant on a different site. Conceptual plans call for a 50,000 gpd plant on a site with room for expansion. The intent of this plant is to provide service to the Otsego FPA, which covers land along the Maumee River from Beaver Creek to Tontogany Creek. As more definite plans are developed over the next several years, adjustments to the FPA boundaries may be needed, especially at the west and east ends.

PEMBERVILLE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Pemberville**: Owns and operates wastewater treatment facilities, and collection system within its corporate limits.
- **Northwestern Water and Sewer District:** Owns and operates collection system in unincorporated areas.

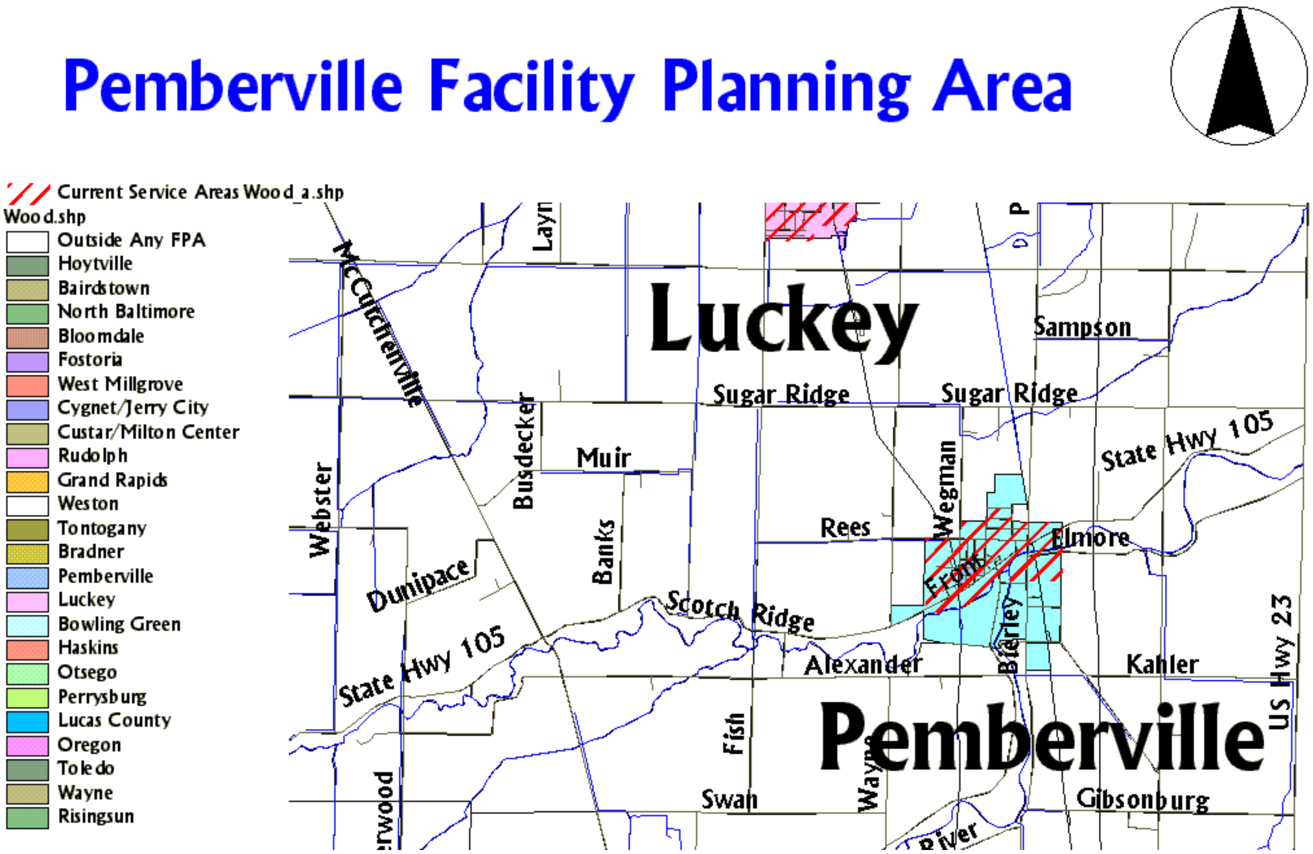


TABLE ONE

	2000	2030
Pemberville, entire jurisdiction	1,355	1,802
Total Population inside the FPA boundary	1,355	1,788

Present Facilities

The Pemberville WWTP has an average design capacity of 0.20 mgd. In 2004-5 its average daily flow was 0.2 mgd and peak daily flow was 0.53 mgd. The plant has a prechlorination, an oxidation ditch, a polishing pond, and aerated sludge digesters. Liquid sludge is applied to agricultural land.

The sewers were originally combined, with four overflow points. Pemberville has completed its CSO Abatement Plan by separating the entire system. The Plan, prepared in 1994, called for a 5 phase $1.846 million separation program. It was completed in 1999.

Issues

Even with completion of sewer separation, the sanitary sewers receive excess infiltration and inflow, especially in the spring. Sewer system overloading can lead to backups and overflows.[62] One manhole continued to be an overflow (SSO) in 2003.

Future Needs

- Pemberville is conducting a study to identify I/I sources that lead to overloading the sewer system. Sewer repairs, rehabilitation, and elimination of roof/yard drains, and sump pumps may be needed. The study, to be completed in 2005, will also evaluate whether wastewater plant expansion or upgrade is needed. This Plan supports financial assistance for these improvements.
- Pemberville's NPDES permit calls for elimination of the one remaining SSO by 2006.

---

[62] "Pemberville Considers Hike in Sewer Rates," *Sentinel Tribune* 9/26/2002

PERRYSBURG FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **City of Perrysburg**: Owns and operates wastewater treatment facilities, and portions of the collection system.
- **Northwestern Water and Sewer District:** Owns and operates portions of the collection system, connecting to Perrysburg system for treatment services.
- **City of Rossford:** Owns and operates portions of the collection system, connecting to Perrysburg system for treatment services.

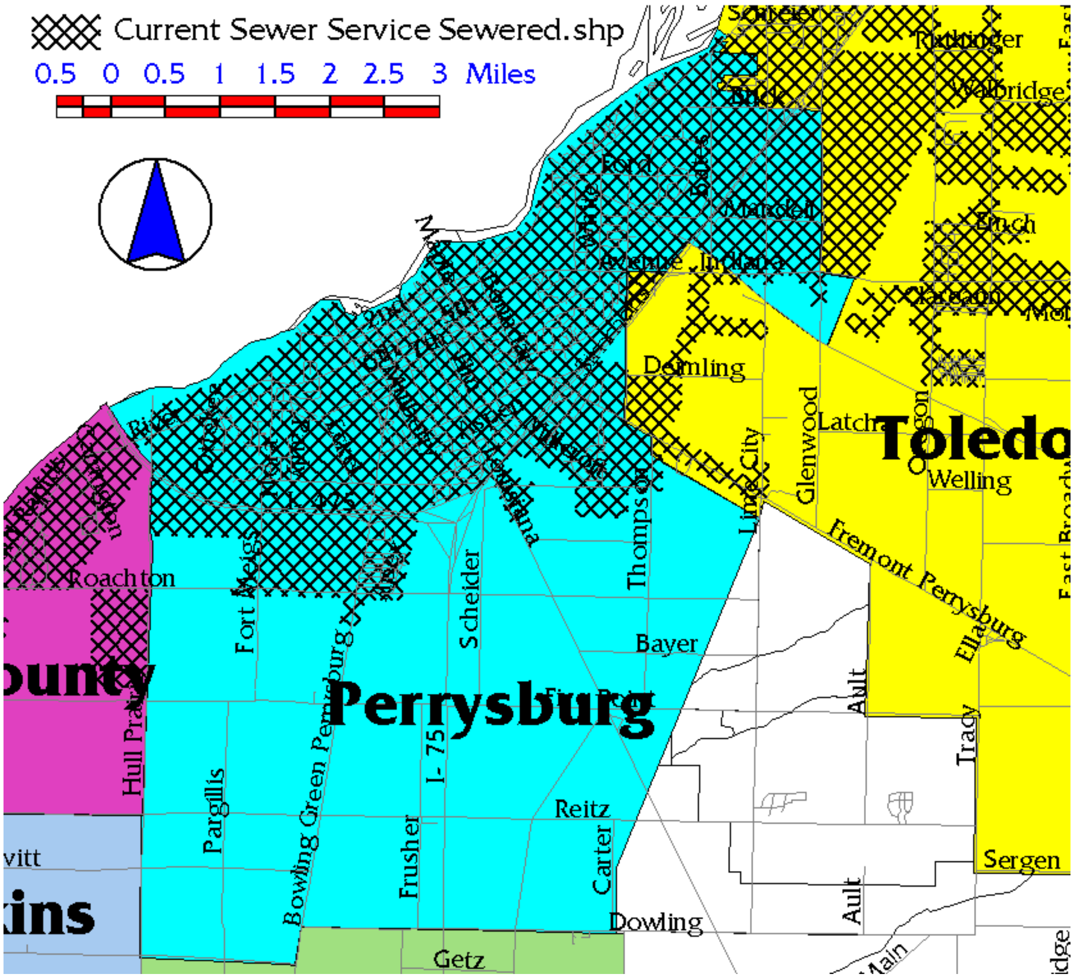


TABLE ONE

	2000	2030
Perrysburg, entire jurisdiction	16,945	21,465
Rossford, entire jurisdiction	6,406	8,903
Middleton Township, entire jurisdiction	1,960	2,227
Perrysburg Twp, entire jurisdiction	13,613	16,501
Total Population inside the FPA boundary	24,273	30,319

Present Facilities

The City of Perrysburg WWTP has an average design capacity of 5.4 mgd, with a peak capacity of 13.4 mgd. In 2004 the average daily flow was 3.924 mgd and peak flow was 17.66 mgd. The plant was originally built in 1958 with expansions in 1972 and 1986; and an expansion to its present capacity in 1991. The capacity upgrade was needed because of growth in the service area. The Perrysburg WWTP is an activated sludge facility with final chlorination and dechlorination, anaerobic sludge digestion, and 2 biosolids belt filter presses. Currently all biosolids are land applied

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Five Points Trailer Park	Active	1975		7,000
Islamic Center of Greater Toledo	Active	1991		8,300
Southview Estates Mobile Home Park	Active		2PY00010	40,000

Issues

Combined Sewers

About 600 acres of the older part of Perrysburg had a combined sewer system, with four wet-weather overflows. Perrysburg completed its CSO Abatement Plan in the early ‘90s which called for annual sewer separation projects of about $500,000 each over a 20 year period. Implementation of this Plan has proceeded at or ahead of schedule.

The CSO area was split into assessment districts for the Cherry and Elm Street regulator areas. The Elm Street area includes most of the half a block west of Louisiana Avenue, extending east to East Boundary Avenue. Separation of sewers in this area was divided into thirteen districts. The remainder of the CSO area, west of Louisiana to West Boundary Avenue is in the Cherry Street district. The schedule of Perrysburg CSO projects is given in Table 2.

TABLE TWO Perrysburg Combined Sewer Abatement Projects		
Project	**Cost ($ Millions) [Estimated]**	**Completion Date [Projected Date]**
Elm Street Assessment District 101	$1.228	1991
Elm Street Assessment District 102	$0.141	1991
Elm Street Assessment District 103	$0.510	1992
Elm Street Assessment District 104	$0.208	1993
Elm Street Assessment District 105	$0.497	1995
Elm Street Assessment District 106	$0.480	1995
Elm Street Assessment District 107	$0.785	1995
Elm Street Assessment District 108	$0.879	1996
Elm Street Assessment District 109	$0.459	1997
Elm Street Assessment District 110	$0.679	1998
Elm Street Assessment District 111	$0.717	2000
Elm Street Assessment District 112	$0.634	2001
Elm Street Assessment District 113	$0.525	2001
Cherry Street Assessment District 201	$0.813	2002

TABLE TWO Perrysburg Combined Sewer Abatement Projects		
Project	**Cost ($ Millions) [Estimated]**	**Completion Date [Projected Date]**
Cherry Street Assessment District 202	$0.486	2004
Cherry Street Assessment District 203	$1.160	2005
Additional Cherry Street Assessment District(s)	[$6.00]	[2006-2011]

Peak flows at the treatment plant headworks have been declining as CSO projects have been completed. In the years 1992 through 1998 peak flows averaged 26.33 mgd. In the years 2000 through 2004 peak flows averaged 21.332 mgd. This decline has occurred even as the City Of Perrysburg has expanded both in population and area.

Unsewered Areas

There are several package plants in this FPA. When public sewers become available, these plants will be abandoned and replaced by tapping in. Package plants include the Five Points Trailer Park, Islamic Center of Greater Toledo, and Southview Estates Mobile Home Park. A public sewer to Perrysburg is expected to replace the Southview Estates plant by the end of 2005 at a cost of approximately $1.8 million.

The Wood County Health Department has ordered sewers for the Bates Road / East River Road area. About 10 houses would be served near the intersection of these two roads; they are in Perrysburg Township and the City of Rossford. These sewers have been designed and installation should be complete by the end of 2005

Dowling is an unincorporated community, located at Dowling Road and Conrail tracks between Dunbridge and Carter Roads. Residences are served by septic systems. Dowling is not under orders to construct sewers. The community is split between the Bowling Green and Perrysburg FPAs. Dowling is identified as a Critical Home Sewage Disposal Area

Future Needs

- Build sewer extensions to eliminate package plants and to provide service to new development. New package plants and septic systems are not to be permitted in areas where public sewers are available.
- Perrysburg should continue implementation of its CSO Abatement Plan. Perrysburg's Combined Sewer System Long-Term Control Plan[63] and the project implementation schedule given above. This Plan supports state and federal financial assistance for these improvements.
- In 2004 Jones & Henry prepared a study recommending a three-phase WWTP expansion, which would increase its capacity to meet the city's needs for the next 15-20 years. The cost of improvements was estimated at $12 million.[64]
- Perrysburg's draft NPDES permit of August 2005 calls for detail plans to attain compliance with final effluent limits without 18 months of the final permit's effective date. The draft permit calls for completion of construction within 34 months of the permit effective date, and attainment of effluent

[63] *City of Perrysburg Ohio Combined Sewer System Long-Term Control Plan,* Jones & Henry Engineers Ltd., September 1996. Also *City of Perrysburg Combined Sewer System Operational Plan;* ibid.

[64] "Perrysburg May Update Sewer Plant," *Sentinel-Tribune* 4/19/2004

limits within 36 months.[65] In 2005 Perrysburg started design of Phase 1 of its WWTP expansion. This phase will include a primary clarifier, primary thickener, and additional biosolids storage area.

65 Perrysburg NPDES Permit 2PD000002*ID draft, August 2005

RISINGSUN FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Risingsun**: A member of the Northwestern Water and Sewer District, which is responsible for planning public sewerage system. Either the Village or the District may own a sewerage system; the District would operate it.

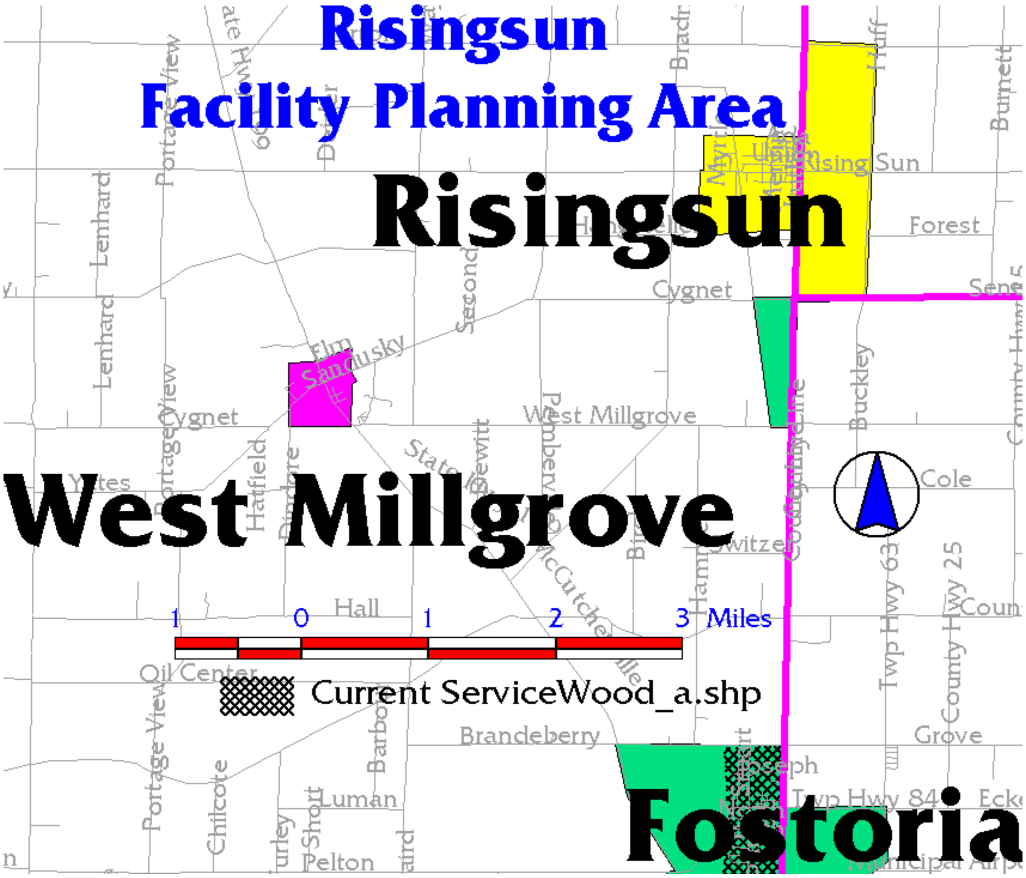


TABLE ONE

	2000	2030
Risingsun, Wood County, entire jurisdiction	620	542
Scott Township, Sandusky Co, entire jurisdiction	1,502	1,288
Total Population inside the FPA boundary	**750**	**653**

Present Facilities

Risingsun does not presently have a public sewerage system; sewage treatment is handled by individual septic systems. Soils in this area belong to the Millsdale-Randolph-Romeo Association, which are silty clays and loams, often over shallow limestone bedrock. The suitability for sewage disposal is poor.

Package plants in the FPA are listed in Table 2.

Package Plants In The Facility Planning Area Table Two				
Package Plant	**Status**	**Install or Upgrade Date**	**NPDES Permit**	**Capacity, gpd**
Lakota Central Elementary School (Risingsun Ele.)	Active			6,600

Issues

Stream and storm sampling indicates that many septic systems have failed and are discharging untreated sewage to Sugar Creek.[66] The concentration of homes using septic systems on small lots, in soils poorly suited for leaching fields, makes a public sewerage system necessary. In 1993 Ohio EPA issued Findings and Orders to the Village to proceed with a sewerage system.

Across US 23 from Risingsun are several dozen additional houses. They are outside of the village, in Scott Twp of Sandusky County. Environmentally, their situation is the same as houses across the road inside the village. Contiguous houses and businesses in Scott Township should be included in the Risingsun service area. A two-county project will be more difficult to get built, but the additional service connections will help make the project affordable.

Future Needs

- Risingsun and the adjacent developed portion of Scott Township should proceed to install its sewerage system.
- The main problem is one of money. Because so much of the town has shallow bedrock, the sewer system will be very expensive. Conventional gravity sewers (serving just the village) and an extended aeration WWTP are estimated at $3.4 Million. The Village has instituted a sewer project fund, initially charging each household $10 per month, later raised to $15, and presently $20. By February 2005 the fund had a balance of over $138,000.[67] The General Plan included the area in Scott Township. The Village has stated its intent to apply for Ohio Public Works Commission funding, and conduct an income survey to determine eligibility for other financial assistance.[68] This Plan supports state and federal financial assistance to install a sewerage system for Risingsun.

[66] *Village of Risingsun, Wood County: Sugar Creek Survey*, Ohio EPA Division of Water Quality Planning and Assessment; March 1992

[67] "Mayor Says Sewers Could Help Business," *Fostoria Review Times*, 2/18/2005

[68] "Sewer Funds Sought for Risingsun," *Fostoria Review Times*, 8/28/2002

TONTOGANY FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Northwestern Water and Sewer District:** Owns and operates wastewater treatment facilities and collection system.

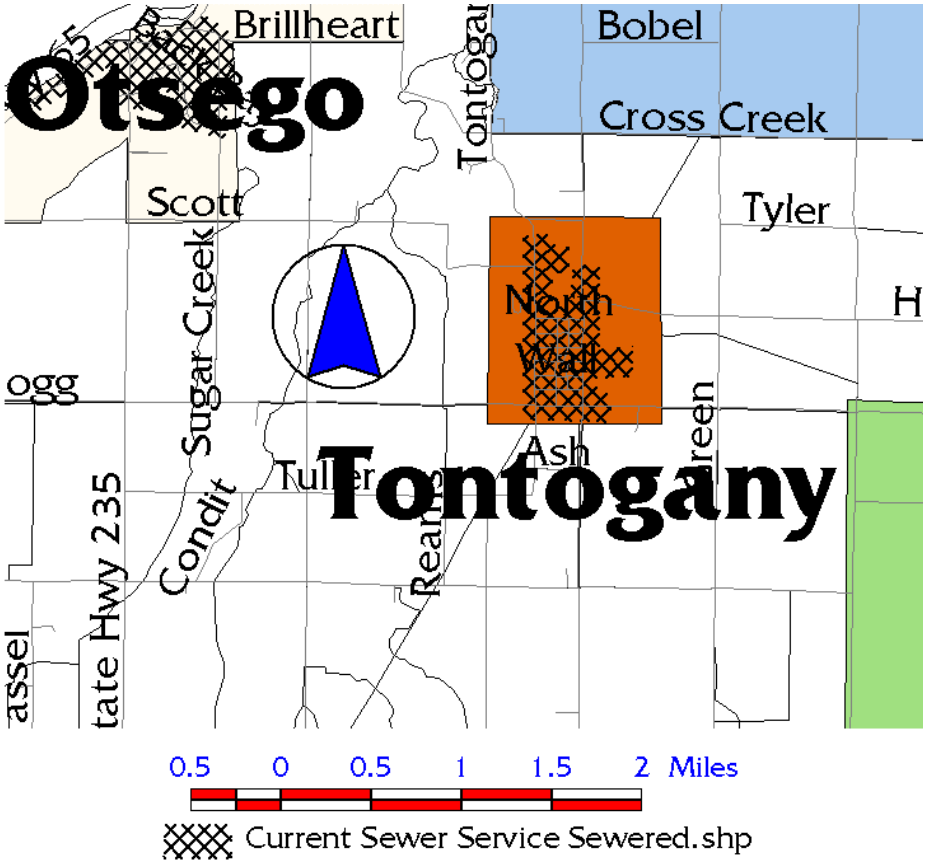


TABLE ONE

	2000	2030
Tontogany, entire jurisdiction	364	358
Washington Township, entire jurisdiction	1,324	1,660
Total Population inside the FPA boundary	**439**	**452**

Present Facilities

The Tontogany WWTP is a four-cell aerated lagoon facility with effluent chlorination. It was built in 1985, and has an average design capacity of 0.10 mgd and a hydraulic capacity of 0.33 mgd. In 2004-5 the average daily flow was 0.06 mgd and a peak daily flow of 0.21 mgd. The conventional gravity sewer system was built at the same time.

Future Needs

No specific needs have been identified.

WAYNE FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Wayne**: Owns and operates wastewater treatment facilities, and collection system within the corporate limits.

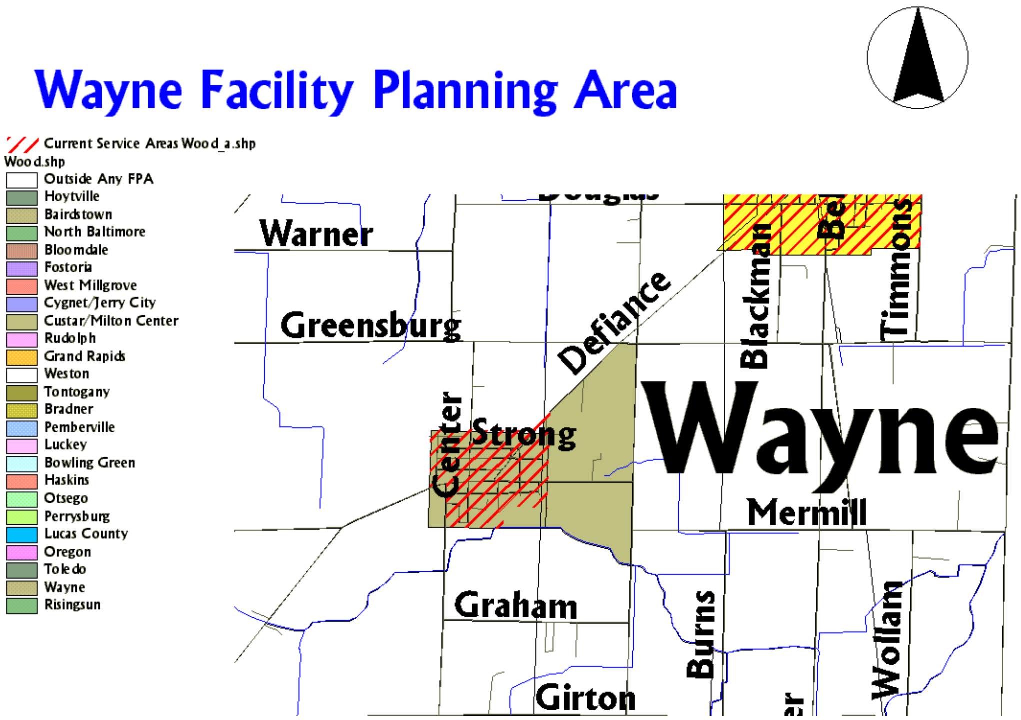


TABLE ONE

	2000	2030
Wayne, entire jurisdiction	842	847
Montgomery Township, entire jurisdiction	1,872	1,752
Total Population inside the FPA boundary	938	937

Present Facilities

The Wayne WWTP is a controlled discharge lagoon facility, built in 1997. The system uses conventional gravity sewers. The design capacity is 0.092 mgd; in 2004-5 the average flow was 0.072 mgd and peak daily flow was 0.65 mgd

Designated Management Agency Responsibilities:

- **Village of West Millgrove**: A member of the Northwestern Water and Sewer District, which is responsible for planning public sewerage system. Either the Village or the District may own a sewerage system; the District would operate it.

TABLE ONE

	1990	2030
West Millgrove, entire jurisdiction	175	—
Total Population inside the FPA boundary	175	—

The 2000 Census shows West Millgrove's population as 78 persons in 25 households. The 1990 census counted 175 residents in the village. TMACOG believes the 2000 figures are erroneous. Therefore, we are using the 1990 count, and not providing a projection from the 2000 Census.

Present Facilities

West Millgrove has no public sewerage system. Sewage treatment is handled by individual septic systems.

Issues

The Village of West Millgrove is identified as a Critical Home Sewage Disposal Area (see chapter 5). The Village presently has no collection or treatment system. A sewerage system is likely to be needed in the future.

Future Needs

- As warranted by water quality and/or septic system test data, West Millgrove should prepare a General Plan to identify the most cost-effective sewerage option. Connecting with the existing Fostoria system, or a joint project with Risingsun should be considered. Implementation should include preparing a financing plan that will make the system affordable to residents. An income survey was completed in 2002 that shows the Village meets HUD Low to Moderate Income criteria.
- Northwestern Water and Sewer District submitted a funding pre-application to USDA/RD in 2002 for conventional gravity sewers and an extended aeration WWTP estimated at $1.4 Million. A regional wastewater system with Risingsun and/or Fostoria may be feasible and beneficial. Feasibility of such a system should be jointly evaluated by all jurisdictions. This Plan supports financial assistance to install sewers and provide treatment for West Millgrove.

WESTON FACILITY PLANNING AREA

Designated Management Agency Responsibilities:

- **Village of Weston**: Owns and operates wastewater treatment facilities, and collection system within its corporate limits.
- **Northwestern Water and Sewer District:** Owns and operates collection system in unincorporated areas.

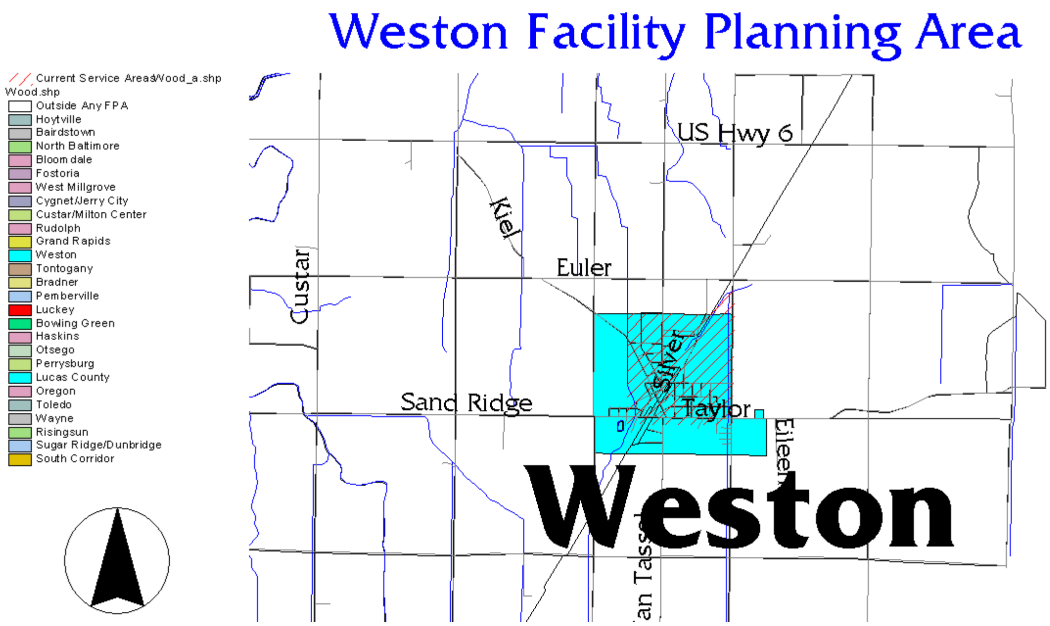


TABLE ONE

	2000	2030
Weston, entire jurisdiction	1,659	1,502
Total Population inside the FPA boundary	**1,629**	**1,477**

Present Facilities

The Weston WWTP is an extended aeration facility with aerobic sludge digestion, effluent chlorination/dechlorination and an aerated flow equalization pond. The plant has sludge drying beds, but current practice is not to use them, and apply liquid sludge to agricultural land. It was built in 1967, with an expansion in 1983. The 1983 improvements included separating the sewer system. Average design capacity is 0.21 mgd and hydraulic capacity is 0.70 mgd. In 2004-5 average flow was 0.28 mgd and peak flow was 0.85 mgd.

Issues

The Weston WWTP is impacted by severe I/I problems. The excess flows upset the treatment process and have caused permit violations for a number of parameters including DO, suspended solids, fecal coliform, $CBOD_5$, and residual chlorine. Treatment issues include capacity, exacerbated by fluctuations caused by I/I, and increased sludge handling capacity. Limited removal of I/I (e.g., elimination of downspouts from the sanitary system) is needed.[69] In 1999, smoke testing was conducted to identify any downspouts hooked into the sanitary sewer; smoke testing did not find significant I/I sources.

Future Needs

- The NPDES Permit, renewed in May 2003, set a compliance schedule that required a General Plan, and compliance with effluent standards by 2007. By 2005 the major treatment issues had been addressed. Whether additional improvements to eliminate I/I are needed will be determined in the next two years.
- The Weston WWTP needed significant improvements to meet current and projected needs. The preferred alternative is under evaluation. Feller & Finch prepared a General Plan of phased improvements.[70]
    - Phase I (completed): Included new blowers and building, raw sewage pumps, new flow metering, added dechlorination, and converted a tertiary lagoon into an aerated flow equalization facility. The cost was about $650,000, with an Issue 2 grant and low loan funds from OWDA.
    - Phase II (completed 2005): Included improvements to treatment plant and sludge handling system, replacing aged equipment increasing capacity by about 25%.
- Phase III (potential future project): Additional I/I elimination from the sewer system and possible plant treatment process modification to SBR. Whether this phase is needed will be determined by performance of improvements built under Phases I and II.

[69] *Report on Wastewater Treatment Plant Improvements for Weston, Ohio*; Feller, Finch & Associates; August, 1998

[70] Communication with Feller & Finch: July 2003, April 2005

CHAPTER 5
ON-SITE SEWAGE TREATMENT

Introduction

On-site sewage treatment includes the treatment and disposal of sewage on the same property as a residence, rather than at a centralized (off-site) treatment plant. The purpose of on-site sewage treatment is the same as that of centralized wastewater treatment. Systems should provide adequate and cost-effective removal of pollutants and pathogens from wastewater before sewage effluent enters ground and surface waters. On-site sewage treatment should do this in a way that avoids odor and other nuisance conditions.

Septic tanks with soil absorption or leaching tile fields are the most common type of on-site sewage treatment system. This type of home sewage treatment has been in existence for several decades in both rural and suburban areas. A typical residential septic tank has a volume of 1,500 gallons. Other types of home sewage treatment systems in use include aerators and septic tanks followed by subsurface sand filters. These two latter types of systems both discharge effluent off-site to a stream or storm sewer.

Besides septic systems, this chapter covers small, privately-owned sewage treatment plants. Most of these systems are extended aeration "package" plants, which treat sewage at a business or development that is too large to be served by a septic system and does not have public sewers available. Generally, plants are rated from 1,500 gpd up to about 100,000 gpd. Private wastewater treatment plants include several types of systems — trickling filters, lagoons, or a settling tank followed by surface filter. Generically we refer to small private sewage treatment systems as "package plants" — the great majority of which are extended aeration.

On-site effluent disposal has been identified as a significant water quality issue in the TMACOG area. Sampling data indicate high bacterial counts in many suburban and rural waterways. The City of Toledo's sampling program, ongoing since 1968, shows bacterial counts in the Ottawa River and Swan Creek flowing into the city commonly exceeding water quality standards. Lake Erie beaches experience high bacterial counts and subsequent closings, usually after storms. Septic systems have been identified as a major source of the contamination.

This chapter includes recommendations from each participating Health District, including:

1. A description of the problems of onsite sewage treatment in the TMACOG region;
2. Areawide policies affecting onsite sewage treatment;
3. Regulatory programs presently in effect or recommended;
4. Recommended improvements for existing programs;
5. Identification and recommendations for Critical Home Sewage Disposal Areas

Water Quality Impacts

Incompletely treated or raw sewage impacts ground and surface water quality in several different ways. The recommendations of this Plan are primarily based on three pollutants in sewage: nitrates, phosphates, and bacteria.

Nitrates

Nitrates are a water quality problem because levels over 10 mg/l make water unsafe for certain individuals to drink. Such concentrations of nitrates interfere with the body's ability to transfer oxygen, with a condition called Methemoglobinemia, or "blue baby syndrome." Infants are the most susceptible to nitrates. Further information on nitrate health impacts is given in the Agricultural Runoff Chapter of this Plan.

Incompletely treated sewage contains high levels of nitrates. Since nitrates are highly soluble, they can contaminate groundwater. A failed septic system can contaminate a well if they are located too close together. In a community that is served by individual septic systems and wells, a large number of failed septic systems can threaten the local aquifer and endanger all the wells. Septic discharges to streams endangers downstream drinking water supplies.

Phosphates

Phosphorus has been identified as the critical nutrient that resulted in eutrophication and algal blooms in Lake Erie in the 1960s and 1970s. High phosphate levels can encourage nuisance algae growths in streams, and hinder some pollution-intolerant species of fish. The main water body of concern for phosphorus impacts, however, is Lake Erie. On-site systems are a significant, but not the largest, source of phosphorus entering Lake Erie from the TMACOG planning area. Water quality impacts of phosphorus on Lake Erie are discussed in more depth in Agricultural Runoff Chapter of this Plan.

Bacteria

Incompletely treated sewage is a potential source of disease-causing organisms, and until the late nineteenth century was a common cause of illness in this country. Sewage contains five categories of parasitic organisms that are infective to humans: bacteria, protozoa, worms, viruses, and fungi. Two bacterial diseases carried by sewage are typhoid fever and cholera. There were outbreaks of cholera in northwest Ohio before public sewerage systems came into use. Other waterborne diseases include dysentery, infectious hepatitis, numerous others.[71]

When testing water for the presence of sewage bacteria, tests are usually run for fecal coliform or Escherichia coli (e. coli). Fecal coliform are “indicator bacteria.” They are generally not disease-causing organisms themselves, but are present in feces in large quantities, and are therefore easy to detect. *E. coli* is a specific species of bacterium that lives in the intestinal tract of mammals. In the past, fecal coliform was the most commonly used standard for detecting sewage bacterial contamination. In recent years *E. coli* has become increasingly accepted as a standard and is widely used.

A recent study evaluated effluent qualify from a variety of on-site sewage treatment systems in seven counties of northeast Ohio.[72] Among its findings were that between 20%-33% of onsite systems installed between 1979-1998 had observably poor (cloudy, black, and/or odorous) effluent. However, two-thirds of effluent collected from on-site systems did not meet minimum regulations for fecal coliform. The study’s conclusion was that even clear sewage effluent is often high in bacteria — clear effluent does not necessarily mean good effluent.

Septic Systems

In the TMACOG region, most on-site systems installed consist of a septic tank and leaching tile field. The septic tank provides primary treatment by settling out heavy solids (sludge) and trapping floating materials (scum). Solids retained in the septic tank have to be periodically removed by pumping. Anaerobic bacterial action takes place in the tank and then the septic tank effluent enters the leaching tile field, where microorganisms in the soil utilize the biodegradable material and destroy pathogens. The leaching tile field is a series of distribution pipes laid in trenches to provide for soil absorption of the effluent from the septic tank.

Common variants on septic tank leaching systems include:

- Alternating dual leaching fields to allow using one while the other rests and recovers its capacity
- Perimeter tiles to lower the water table around the leaching field and prevent its invasion of the tile field

71 Water and Wastewater Engineering, Volume 2, Fair, Geyer, and Okun, John Wiley & sons, 1958; pp 19-4 through 19-9

72 *Northeast Ohio Home Sewage and Semi-Public Sewage Disposal Systems Survey* NOACA, 2001

- Mounded leaching fields for areas where the soil, bedrock, and/or water table do not allow a leaching field to work properly.

Replacement of Septic Systems and Package Plants by Public Sewers

Septic systems and package plants must be abandoned and tapped when public sewers become available. The definition of an "available sewer" depends on the circumstances. Sewers under the County Commissioners[73] are available if within 200 feet of the building foundation. Under a Regional Water and Sewer District the rule is to *"Require the owner of any premises located within the district to connect his premises to a water resource project determined to be accessible to such premises and found to require such connection so as to prevent or abate pollution or protect the health and property of persons in the district. Such connection shall be made in accordance with procedures established by the board of trustees of such district and pursuant to such orders as the board may find necessary to ensure and enforce compliance with such procedures."*[74] In Michigan, State Law authorizes local governments to require connection to a public sewer. Ohio Boards of Health may establish more stringent "availability" rules.

It is the policy of this *Areawide Water Quality Management Plan* that,

1. No private sewage treatment system shall be installed, maintained, or operated on any property accessible to a public sanitary sewerage system.
2. For the purposes of this Plan, "accessible to a public sanitary sewerage system" means
   a. The Designated Management Agency (DMA; see Chapter 3 for definition and list) responsible for public sanitary sewers in the Facility Planning Area will grant permission to connect to their system, and
      i. A connecting point to the public sewer from the foundation wall of any structure with plumbing drains along the shortest direct line distance is within a specified distance. That specified distance is 200 feet unless a **different** figure is given in the table below of individual criteria for each county, or
      ii. Ohio EPA or Michigan DEQ has determined that a public sanitary sewer is available, considering the distance to the sewer, physical barriers, ability of the sewerage system to transport and treat the wastewater, cost effectiveness, overflows from the sewer system, or other environmental or public health issues, or
      iii. The Facility Planning Area has a policy that new subdivisions shall be required to connect to the public sanitary sewerage system, and may not be served by septic systems or package plants. This policy applies only to individual FPAs where the DMAs have requested it. Please see the individual FPA Descriptions in Chapter 4 of this Plan.

Locally Established Criteria for "Available" Public Sewers	
Lucas County, Ohio	Uses policy of jurisdiction responsible for sewers
Monroe County, Michigan	State Law authorizes local governments to require connection to a public sewer.
Ottawa County, Ohio	Existing residences must tie into an available gravity sewer; tying into a pressure sewer is not mandatory until there is a system failure or upgrade. New construction on a vacant lot must tie in if a sewer is available.
Sandusky County, Ohio	Within 200 feet of a gravity sewer
Wood County, Ohio	400 feet

[73] Ohio Revised Code §6117.51(A)-(D)

[74] Ohio Revised Code §6119.06(Z)

Concentration and Extent of On-Site Systems

The 1990 Census shows occupied housing units served by septic systems, and compares region totals with 1970 and 1980 figures.

Area	Residential Units	Units served by septic systems	Percent of Total	Estimated Population
Lucas County	196,259	22,974	47.27%	60,033
Monroe County[75]	15,486	7,321	44.60%	19,718
Ottawa County	25,523	11,384	46.64%	21,575
Sandusky County	25,253	11,778	30.74%	29,563
Wood County	47,468	14,590	21.95%	37,457
Totals, 2000[76]	309,989	68,047	22.0%	168,346

Problem Identification

On-site sewage treatment is a water quality issue of major concern. Extensive use of individual home sewage systems and package plants not only result in water quality problems, but public health and nuisance concerns as well if not properly maintained.

Septic System Constraints and Issues

The causes of septic system failures and problems are site and design constraints, improper installation, and poor management. In general, the performance of septic tank systems is determined by the rate at which the effluent percolates through the soil. Effluent percolates faster in sandy and gravelly soils than in clay soils. When the ground water level is high enough to saturate the drain field, the effluent will not percolate and may contaminate ground and surface water.

In addition to soil permeability and high water tables, other physical factors adversely affect the performance of septic systems. The common thread is that effluent percolates too quickly, too slowly, and/or does not facilitate the soil's natural ability to purify effluent through microbial action.

- Shallow depth to bedrock — a minimum of 4' of native soil is required for a conventional leaching field
- Excessive slopes (more than 12%)
- Periodic or frequent flooding
- Tight silt or clay soils with slow percolation
- A residential lot (especially for older homes) does not have enough room for a leaching field, or a replacement leaching field when the existing one fails.
- Isolation distances need to be adequate to protect wells, streams, wetlands, and other water resources from contamination.
- Leaching fields should not be installed in wet soil conditions. Absorption areas must be installed with a minimum of soil smearing or compaction.

[75] Includes only Bedford, Erie and Whiteford Townships

[76] The 2000 Census does not explicitly list sewage disposal method by housing unit. These figures are calculated from the population and number of housing units not within present sewer service areas.

Statewide Regulation

Many details of system design and location are set by state regulation, in OAC 3701-29 or Michigan Compiled Laws Chapter 324. Generally, however, sewage systems are regulated by the County Sanitary Code rather than state regulations.

In Ohio, the authority to regulate onsite sewage treatment systems lies with Ohio EPA, ODH, and local Boards of Health. While OEPA's authority may in fact pre-empt all other state agencies and political subdivisions in the regulation of such systems (ORC 6111-46), the actual responsibility rests with ODH and local Boards of Health. The Public Health Council, which together with the Director of Health makes up the ODH, is charged by ORC 3701.34 with making and applying sanitary regulations for the State.

That code, OAC 3701-29, sets forth the regulations that govern "household sewage disposal systems." Local Boards of Health are required to enforce "all sanitary rules and regulations adopted by the Department of Health" and are designated by the code as "appropriate units for carrying out the permit, license, inspections, and variance procedures required therein…"[77]. Local Boards of Health may formulate, adopt, and enforce onsite system regulations that are more stringent than the State's.[78] It is important to note the discussion of "semi-public" sewage treatment systems under Ohio Administrative Code below. Policies that apply to residential septic systems under OAC do not apply to semi-public septic systems.

Statewide policies are outlined below. In some cases, discussed later, individual county regulations may be more stringent than these requirements.

Septic System Policies and Criteria

Septic System Policy	Ohio[79]	Michigan[80]
Septic system installers	Registration by Board of Health required; must be renewed annually.	Monroe County requires registration by Board of Health; must be renewed annually. Performance bond from contractor required.
Septic tank cleaners	Registration by Board of Health required; must be renewed annually.	Licensed by MDEQ under Part 117 of Public Act 451 of 1994; County Health Department is required to inspect all septage vehicles before license may be issued. Vehicles are licensed for a three year period. Disposal of septage at POTW requires signature of the plant superintendent. Land application requires signed permission of property owner, and a site inspection.
Minimum lot size	In addition to isolation distances, the lot is required to have room for a complete replacement septic system	In addition to isolation distances between septic system and wells, waterways, and structures the lot is required to have room for a complete replacement septic system
Septic tank design criteria	OAC 3701-29-07 specifies tank size, layout, and plumbing details. 3701-29-10 through 14 set criteria for soil absorption and percolation; leaching tile fields, curtain drains, leaching pits, and subsurface sand filters.	Section 504 of the Monroe County Sanitary Code covers location, accessibility, and size of tank(s), effluent filter, and subsurface disposal system design.
Off-lot effluent discharge	Permitted if on-lot disposal is not possible, with several provisos:[81]	Health Department may block off discharges of untreated sewage following posting of at

77 Peat, Marwick, Mitchell & Co., *Model Onsite Disposal Management Program for the State of Ohio*, 1983.

78 *Darke County Strategic Plan for On-Site Wastewater Treatment and Disposal Systems* Miami Valley Regional Planning Commission, 1985

79 OAC regulations apply only to septic systems under the jurisdiction of Local Health Departments and not to septic systems that are classified as "semi public" because they serve businesses.

80 Monroe County Sanitary Code: Chapter 5, Sewage Disposal, March 2001.

81 OAC3701-29-02

Septic System Policies and Criteria		
Septic System Policy	Ohio[79]	Michigan[80]
	1. Obtain easement if effluent crosses property before reaching discharge point 2. Obtain written permission from persons who control property on which discharge point is located 3. Effluent must meet standard of 20 mg/l BOD and 40 mg/l SS based on two samples, 24 hours apart 4. If effluent standards are not met or the Board of Health determines that a nuisance exists, additional treatment may be required. 5. All reasonable means are used to minimize off-lot discharge	least 5 public notices for at least 30 days.
Home aerators	OAC 3701-29-08 specifies design criteria; 3701-29-09 sets criteria for surface sand filters following home aerators.	Mechanical sewage treatment systems must be approved before installation. Approval requires a current maintenance contract and a performance bond.
Sewage treatment system inspections and maintenance requirements	Approval by Health Commissioner is required before a sewage treatment system may be put into use. The Health Department may inspect any household sewage treatment system during or after construction, sample effluent, or any other steps necessary to insure compliance.	Inspection and approval by health officer before covering distribution tiles is required before a sewage treatment system may be put into use. Minimum (statewide) program requirements include evaluation of existing onsite sewage systems. Each year the County Health Department inspects existing systems equal to 10% of the sewage permits issued the previous year. In 1999 evaluations were conducted at home where the property owner requested other services, such as well inspections, FIA evaluations, proposed swimming pools or additions to the home. Of 56 systems evaluated, 52 were found to be functioning properly at the time of the study.[82] Monroe County Sanitary Code §501.08 requires private sewage disposal systems to be maintained in satisfactory operating condition at all times. Septic tanks are required to have sludge pumped out as necessary to prevent carry-over of solids into the leaching field.
Abandonment	Tank must be emptied and filled to ground surface with suitable material	Tank must be emptied and filled to ground surface with suitable material
Variances	Board of Health may grant variances when 1. Regulations cause a hardship; although variances shall not be granted that defeat the spirit and general intent of the regulations. 2. Experimental systems may be installed if the Health Department approves the	

[82] Monroe County Health Department, Environmental Health Division memo of 10/2/2000 to MDEQ: "Sewage Report 2000"

Septic System Policies and Criteria		
Septic System Policy	Ohio[79]	Michigan[80]
	proposed design	
Septage disposal	No statewide regulations except compliance with US EPA "503" provisions. County Health Departments may issue regulations.	If source of septage is within 15 miles of a public septage waste treatment facility, the septage must go that facility. US EPA "503" regulations apply as well.

NPDES General Permit for Small Sanitary Discharges

Under the Clean Water Act and ORC §6111, all wastewater discharges to the waters of the state require an NPDES permit. In Ohio, the practice has been not to issue individual NPDES permits to onsite sewage treatment systems. Ohio EPA has a general permit for small sanitary discharges to waters of the state. Presently the General Permit applies only to:

- Wastewater discharges under Ohio EPA's regulatory authority: systems serving commercial establishments and systems serving four or more families
- Wastewater treatment systems designed to treat less than 25,000 gpd
- Systems that do not already have individual NPDES permits

The General Permit set effluent limits for total suspended solids, ammonia, $CBOD_5$, fecal coliform, dissolved oxygen, residual chlorine; and effluent turbidity, odor, and color. Monitoring frequency and standards depend on the system type and size. The categories are systems designed to treat more than 5,000 gpd but less than 25,000 gpd; those between 1,500 gpd and 5,000 gpd; those less than 1,.500 gpd; and continuous-discharging lagoon facilities.

Several types of systems would be exempt from the General Permit. Among the exemptions are discharges that existed prior to 10/1/1996, controlled discharge wastewater lagoons.

In Michigan, state law stipulates that the municipality may be required to assume responsibility for managing the system (section 3109 of Part 31 of Michigan Public Act 451 of 1994).[83].

Onsite System Policies set by Local Health Boards

Septic systems serving single, two, or three family residences are regulated by County Boards of Health and are subject to a section of the Ohio Administrative Code (3701-29). Septic treatment systems serving commercial establishments or residences with more than three families are regulated by Ohio EPA as "semi-public" systems, described in the next section.

Most soils in the TMACOG region are not well suited for conventional septic systems. Suitability for sewage treatment is a characteristic given for each soil type in the County Soil Surveys. Mound systems are often permitted in shallow bedrock or high groundwater areas. These systems are considered "experimental" designs, and must be approved by the County Board of Health with ODH concurrence before installation.

Demand for rural home sites encourages use of on-site sewage systems. When a lot is too small for a full system, or a site is not suited for a leaching field, other types of systems may be used. Research and long-term testing of innovative and experimental systems is needed to determine what designs will work best over the long term in our region's soils.

The following table gives policies for each county on system designs that may be used where site constraints do not allow a conventional or mound system.

[83] *Water Quality Management Plan for Southeast Michigan* SEMCOG, October 1999

Home Sewage Disposal Design Policies		
	Policy	
County	Home aerator systems	Septic Tanks with Sub-surface sand filters
Lucas	Allowed for replacement systems only where there is no room for conventional, mound system, or subsurface sand filter	Allowed for replacement systems only where there is no room for conventional or mound system
Monroe	Allowed with engineered plans submitted and approved.	Allowed with engineered plans submitted and approved.
Ottawa	Limit of 10 aerator systems discharging per quarter mile on major streams; 5 per quarter mile on small continuous stream. On non-continuous streams, home aerators must have leaching tile fields, flow equalization and are limited to 5 systems per quarter mile. All home aerator systems must be maintained under a service contract.	Permitted only for existing lots and replacement systems where there is not room for a conventional system.
Sandusky	Not allowed as a new system. May be used as a replacement system under a variance.	Not allowed
Wood	Not allowed as a new system. May be used as a replacement system if a conventional design will not work.	Allowed for new and replacement systems in poor soil conditions.

Policies

- All onsite sewage treatment systems must be properly operated and maintained in order to protect water quality and public health.
- Conduct research and demonstration projects to determine what designs work the best long term in heavy silt/clay, shallow bedrock, and/or high groundwater soils.
- Financial assistance may be available to upgrade onsite systems on either a grant or cost-share basis. Two programs that can help individual homeowners include the USDA/Rural Development “504” program, and the HUD “CHIP” program through the Ohio Department of Development. Both of these programs have financial need criteria. Other programs may be developed on a competitive basis (e.g., US EPA §319 non-point source grants) on a special project basis.

Septic System Management Issues

A primary reason why on-site sewage systems, and specifically, septic tanks and aeration systems, are not working properly is because of existing management practices. Existing agency practices and controls are inadequate for preventing the malfunctions.

Better control over the operation and maintenance of septic systems is needed. Only a small percentage of all of the home sewage systems are monitored to see if they are properly functioning. The property owner is responsible for the maintenance, inspection and replacement of any given sewage treatment device located on his property. As a result, the individual's knowledge of the system and perceived notion of its needs for proper functioning largely determine the effectiveness of the system.

Although the average dwelling unit has a structural life of some eighty years, the useful life of a household sewage system may be twenty to twenty-five years if properly maintained. The primary causes of failure are soil clogging and hydraulic overload. Proper maintenance helps prevent failure by soil clogging. As a broad average, septic tanks should be pumped about every three years. Pumping frequencies depend on the number of people in a house, size of tank, and whether or not there is a garbage disposal. A septic tank is considered full and in need of pumping when it is 1/3 each scum/grease, liquid, and sludge. OSU Extension[84] gives the following recommendations:

Estimate Septic Tank Pumping Frequencies in Years (For Year-Round Residence)										
Tank Size (gal)	Household Size (Number of People)									
	1	2	3	4	5	6	7	8	9	10
500	5.8	2.6	1.5	1.0	0.7	0.4	0.3	0.2	0.1	---
750	9.1	4.2	2.6	1.8	1.3	1.0	0.7	0.6	0.4	0.3
1000	12.4	5.9	3.7	2.6	2.0	1.5	1.2	1.0	0.8	0.7
1250	15.6	7.5	4.8	3.4	2.6	2.0	1.7	1.4	1.2	1.0
1500	18.9	9.1	5.9	4.2	3.3	2.6	2.1	1.8	1.5	1.3
1750	22.1	10.7	6.9	5.0	3.9	3.1	2.6	2.2	1.9	1.6
2000	25.4	12.4	8.0	5.9	4.5	3.7	3.1	2.6	2.2	2.0
2250	28.6	14.0	9.1	6.7	5.2	4.2	3.5	3.0	2.6	2.3
2500	31.9	15.6	10.2	7.5	5.9	4.8	4.0	4.0	3.0	2.6
Note: More frequent pumping needed if garbage disposal is used.										

Septage Disposal

Septage from domestic septic systems is subject to US EPA "Part 503" sludge regulations. Removal and disposal of solids and liquids (septage) from septic tanks poses a final problem of on-site septic systems. Septage disposal options include:

- Discharge to a municipal wastewater treatment plant for treatment and stabilization[85]
- Application to farm ground not used to grow crops which may be eaten raw. Septage should not be applied to agricultural land, which will grow crops for human consumption, nor be used for grazing by livestock for human consumption.
- Application must be done in such a manner as to prevent discharge of any material to area water courses, to prevent development of any nuisance condition, and must be plowed or injected into the soil within 24 hours after application.
- Discharge to approved lagoons or drying beds
- Discharge to a properly designed and operated incinerator device
- Discharge to a properly operated and approved sanitary landfill, which has a permit-to-install authorization to accept such wastes.
- Do not apply septage to ground that is frozen or saturated.
- To stabilize septage before land application, treat with lime to raise pH to 12 for not less than 30 minutes.

US EPA "503" regulations include crop, grazing, and site access restrictions when Domestic septage is land applied without treatment:[86]

- Food crops with harvested parts that touch the domestic septage/soil mixture and are totally above ground shall not be harvested for 14 months after application of domestic septage.
- Food crops with harvested parts below the surface of the land shall not be harvested for either (1) 20 months after application if domestic septage remains on the land surface for 4 months or longer, or

[84] OSU Extension Bulletin AEX-740-98, "Septic Tank Maintenance"

[85] *Environmental Health Code of the Wood County Combined General Health District*, 1982

[86] *Process Design Manual Land Application of Sewage Sludge and Domestic Septage*, US EPA Office of Research and Development EPA/625/K-95/001 September 1995

(2) 38 months after application if domestic septage remains on the land surface for less than 4 months, prior to incorporation into the soil.

- Feed, fiber, and food crops shall not be harvested for 30 days after application of the domestic septage.
- Grazing animals shall not be allowed to graze on the land for 30 days after application of domestic septage.
- Public access to land with a low potential for public exposure shall be restricted for 30 days after application of domestic septage. Examples of restricted access include remoteness of site, posting with no trespassing signs, and/or simple fencing.

Some wastewater plants accept septage, but most do not. Because septage is septic, and a high-strength waste, some treatment plants are not able to accept it. There is a lack of plants with septage handling facilities in Northwest Ohio. Current septage policies are provided in the following table.

County	Health Department's Septage Land Application Policies & Practices[87]	Wastewater plants that accept Septage
Lucas County	Prohibited unless no wastewater plant is available to accept septage	Toledo
Monroe County	Land application acceptable; MDEQ issues permits	None in Bedford, Erie, or Whiteford Townships
Ottawa County	Land application is acceptable, though County Health Department does not regard it as a desirable practice	None
Sandusky County	Prohibited	Fremont
Wood County	Land application acceptable	Bowling Green Fostoria

Recommendations

- More septage receiving capacity is needed at public wastewater treatment plants. POTWs do not have a responsibility to accept septage; therefore, better incentives are needed to encourage them to accept it.

Semi-Public Wastewater Treatment Systems

In Ohio, regulation of package plants and septic systems is divided depending on whether a particular facility meets the criteria of a "semi-public" system.

A privately owned sewage treatment device with a discharge of treated effluent is "semi-public" if it treats less than 25,000 gpd. Regulation is the responsibility of Ohio EPA. Most such systems do not have NPDES Permits. As a "semi-public" system, a County Board of Health may assume monitoring duties under a "House Bill 110" contract with Ohio EPA.

Ohio EPA has historically given priority to issues NPDES to larger package plants: those discharging more than 25,000 gpd. In 2001, 78% (25 of 32 active package plants over 25,000 gpd) had individual NPDES permits in the TMACOG region, while 23% (54 out of 214 active package plants) of any size have NPDES permits.[88]

A sewage treatment device that serves a commercial facility and does not discharge effluent off-lot is a "semi-public" sewage treatment system. The classification also applies to non-discharging sewage

[87] Table needs updating — Monroe, Sandusky Wood, and Ottawa County information is from Appendix C of 208 Report #4 in 1976

[88] From TMACOG Package Plant Inventory updated July 2003.

treatment devices four family or larger residences. Typically a “non-discharging sewage treatment device” would mean a septic system followed by a leaching field. Ohio EPA regulates “Semi-public” septic systems. A County Board of Health may assume monitoring duties for them under contract with Ohio EPA.

Package Plants

Extended aeration is a biological treatment process that grows a culture of aerobic micro-organisms (activated sludge) to digest the organic matter in sewage. An extended aeration plant has an aeration chamber where activated sludge and raw sewage are mixed with air to promote digestion. The plant has a settling chamber as well. Clear, treated water flows over a weir and out of the plant; activated sludge settles to the bottom and is pumped back to the aeration tank.

Extended aeration plants as they have been designed over the last forty years come in numerous variants, depending on design requirements at the time. Common facilities include:

- Trash trap —a septic tank preceding the plant to remove settleable and floatable solids
- Chlorination — disinfects treated wastewater; usually a plastic tube that feeds slow-dissolving chlorine tablets as needed.
- Dechlorination — Removes residual chlorine from effluent after disinfection is done. Mechanically, a dechlorinator is similar to a chlorinator. These devices came into common use in the late 1990s.
- Filter — a sand bed that filters remaining solids out of treated effluent
- Some larger extended aeration plants have an aerobic sludge digestion/sludge holding tank

Ohio EPA and Michigan DEQ are responsible for permitting package plants. For a new package plant to be permitted, the application must go through the anti-degradation review process and demonstrate that there is no other sewage treatment method available. That means a septic system will not be adequate, and that public sewers are not available. Whether a proposed package plant may be built in an unsewered part of a Facility Planning Area is determined in Chapter IV of this Plan. They may be accepted or denied as a policy of each FPA. Presently all FPAs accept temporary package plants where public sewers are not available. Unless stated otherwise, package plants may be permitted in unsewered areas.

The majority of small, privately-operated wastewater plants are extended aeration systems. Some plants, especially those of older design, use other treatment processes. Examples include:

! Settling tank with surface sand filter (Imhoff treatment plant)
! Trickling filter
! Wastewater lagoon

The equipment for these systems is different than extended aeration plants, but the management issues are identical. For that reason, these systems should be considered as “package plants” for the purposes of the *Areawide Water Quality Management Plan’s* policy recommendations.

Package Plant Constraints and Issues

Modern package plants are fundamentally sound sewage treatment equipment; their problems rise almost entirely out of operation, maintenance, and management issues. Because most package plants are not operated and maintained properly, it is crucial that they be abandoned in favor of public sewers whenever feasible.

Package Plant Statistics[89]			
Area	**Total Package Plants**	**Package Plants with NPDES Permits**	**Package Plants in Use**
Lucas County	51	6	45
Monroe County[90]	8	8	8
Ottawa County	69	32	66
Sandusky County	46	14	39
Wood County	50	13	40
Totals	224	73	198

Policies

- Package plants must be required to tap into public sewers when they become available regardless of the age, condition, or design capacity of the package plant..[91] New package plants should be permitted only on this condition.
- Package plants should be available as a sewage treatment option for subdivisions where public sewers are not available. In such cases, a properly operated and maintained package plant may be better environmentally than individual septic systems. Such a package plant should include two provisos:
  - The package plant is owned and operated by the County Sanitary Engineer (Ohio), Drain Commissioner (Michigan), a municipality with qualified staff, or Regional Water and Sewer District. (Ohio).
  - The plant has an NPDES permit and meets its effluent requirements.

Package Plant Management Issues

Ohio House Bill 110

Regulation of package plants is the responsibility of the designated state agencies, Ohio EPA and Michigan DEQ. In Ohio, House Bill 110 (1984) changed ORC §3709.085 to allow local Health Departments to contract with Ohio EPA to monitor systems and cover costs by charging a fee.

House Bill 110 has been applied successfully in some parts of Ohio, notably the northeast part of the state. It has not been successfully implemented in the TMACOG Region. Inspections cover "semi-public" treatment works — package plants and commercial septic systems. Package plants discharging over 25,000 gpd are not considered "semi-public" and are exempt from monitoring and inspection. The statue also prevents the Board of Health from charging a fee when a package plant serves a "manufactured home park, recreational vehicle park, recreation camp, or combined park-camp that is licensed under section 3733.03".

In 1987-1990 the Wood County Board of Health instituted a House Bill 110 program with the following fee schedule:[92]

89 From TMACOG Package Plant Inventory updated September 2005.

90 Includes only Bedford, Erie and Whiteford Townships

91 Most unincorporated areas are covered by ORC §6117 which defines "available" as 200 feet from the foundation of the building to the edge of the sewer right of way. Wood County regulations use 400'. In areas covered by Regional Water and Sewer Districts, *"…require such connection so as to prevent or abate pollution or protect the health and property of persons…"* In Michigan, State Law authorizes local governments to require connection to a public sewer.

Sewage Treatment System Type	Flow, gpd	Inspection Frequency	Fee
Aeration with off-lot discharge	10,000-25,000	Quarterly	$150/year
Aeration with off-lot discharge	5,000-9,999	Quarterly	$100/year
Aeration with off-lot discharge	1,500-4,999	Annually	$50/year
Septic or aeration with off-lot discharge	Below 1,500	Annually	$50/year
Septic or aerobic with no off-lot discharge	Below 1,500	Once every three years	$50/three years

The program was discontinued after three years because it was not financially self-sustaining. Problems the Wood County Board of Health faced included:

- Several package plants were excluded from the program either because they were bigger than 25,000 gpd or because they fell under the ORC §3733.03 exclusion (see above). In some other counties the great majority of package plants fall under this exclusion (Ottawa for example) because most package plants serve a recreational facility.
- While HB 110 allows Boards of Health to inspect semi-public systems, enforcement remains with the State through the Attorney General's office. Enforcement of fee collection also remained with the State. The Board was not able to collect sufficient fees to run the program.

Health Levy Funding

Several County Boards of Health rely on a levy for operating funds. Relying on voted funds places Board of Health in a vulnerable position when they are called upon to enforce regulations or make unpopular decisions. Levies are used to support programs and general operations of Health Departments. These funds may pay for environmental health programs, but they also support other functions and services. A summary of County Health levies for general operating funds is given in the following table.

County Health Levies for General Operating Funds	
County	**Levy Funding?**
Lucas County	No
Monroe County	No
Ottawa County	No
Sandusky County	Yes
Wood County	Yes

Policies

- Institute regular training programs for package plant operators on a regional level, conducted at minimum every three years. Should target operators of package plants regardless of whether they have NPDES permits. Must include not only licensed operators, but also the on-site person who maintains the plant on a day-to-day basis. Programs should be designed to fulfill OEPA Contact Hours and ODH Continuing Education requirements.
- OAC §3745-33-08 (b) and (c) forbid issuance of an NPDES permit to a semi-public facility when a public sewer is available; and require abandonment of the semi-public facility in favor of a tap to the sewer. Because the definition of "semi-public" only includes package plants under 25,000 gpd, larger package plants are exempt from the requirement. Requirements to tap into public sewers must apply to all privately owned sewage treatment systems regardless of their size.

[92] *Semipublic Sewage Regulations of Wood County General Health District*, March 1987

- All package plants should have and be operated under either a general or individual NPDES permit.

Areawide Policies

This section recommends policies and practices to necessary provide on-site sewage treatment that protects water quality and public health.

1. County Boards of Health shall administer local on-site sewage treatment regulations pursuant to the Ohio Administrative Code (OAC) 3701-29-01 to 3701-29-21. The Monroe County Health Department shall administer the Monroe County Sanitary Code.
2. The TMACOG Environmental Council shall compile a list of Best Management Practices. Each management agency shall be responsible for its own list of practices to be included in Plan updates.
3. The County Health Departments should:
    a. Coordinate its regulations and policies with the other agencies, including land use planning, capital improvements programming, and public wastewater treatment to prevent the installation of home sewage systems in unsuitable areas.
    b. Cooperate with the Environmental Council, its subcommittees, and the other Designated Management Agencies for home sewage treatment to update the Plan and keep it current to the needs of the region.
    c. Not allow on-site sewage systems to discharge waste offsite except under the provisions of the applicable state regulations: Ohio Administrative Code or Michigan Act 245/Michigan Criteria for Subsurface Sewage Disposal.
    d. Assure uniform interpretation and enforcement of state regulations as a minimum. Provide for adequate funding to administer effective monitoring program. Augment state regulations to reflect specific on-site sewage treatment problems.
    e. Cooperate with TMACOG and other agencies to institute an educational program for septic tank installation and maintenance targeted at homeowners and developers.
    f. Develop or maintain septic systems regulations that include:
        i. Site inspections before and following construction (prior to backfill).
        ii. Consider the development and issuance of operating permits for on-site sewage treatment systems with specified minimum maintenance requirements.
        iii. Monitor septage disposal, with assistance from appropriate state agencies
    g. Maintain sufficient and well-trained staff.
    h. Prohibit sewage systems in unsuitable areas such as floodplains and marshes.
    i. Ban the installation of new systems in identified Critical Home Sewage Disposal Areas

4. The TMACOG Environmental Council shall:
    a. Work to implement the creation of on-site waste management districts responsible for planning, design, installation, operation and maintenance, and monitoring of on-site systems within sub-county or given problem areas.
    b. Encourage the periodic updating of soil surveys.
    c. Seek new improved legislation from the Ohio Legislature as detailed in the Recommended Implementation Activities section at the end of this chapter.
    d. Support long-term research on effective and practical on-site sewage treatment systems for the soil conditions of our region. System designs must work in real-world applications for untrained residents without professional operators. System selection must take into account what will happen when the system is neglected and fails. Expand the list of Best Management Practices as appropriate to include tested and proven practical systems.
5. The Environmental Council and the management agencies shall work together to improve the programs for home sewage treatment in accordance with the recommendations of this chapter.

6. The Areawide Water Quality Management Plan supports the goals and recommendations of Ohio DNR's *Ohio Coastal Nonpoint Pollution Control Program Plan*, submitted to NOAA in September 2000. It is recommended that its onsite sewage treatment management measures in Sections 5.6.1 and 5.6.2 be incorporated into local, regional and state policy.[93]

Policy Implementation

Regulatory Programs

Existing Programs

The State of Ohio requires that all counties enforce Household Sewage Disposal System Regulations, covered in OAC 3701-29-01 to 3701-29-21. The regulations cover all aspects of home sewage treatment systems including on and off-lot disposal requirements and prohibitions, standards for effluent, system design requirements and prohibitions, subdivision requirements, permit procedures, installation procedures, and requirements for septic tank cleaners and installers. The County Boards of Health administer the regulations and have the power to abate nuisances. The Boards of Health may petition the Court of Common Pleas for injunctive relief against a nuisance and may also abate the nuisance, with cost charged to the owner, or a lien set against the subject property. Provisions are made for a hearing prior to enforcement action.

Monroe County Sanitary Code regulations are of similar scope and design with a few differences. Ohio has detailed design requirements for home aerators, while Monroe does not recognize them.

Sewers and Package Plants

OAC §3701-29-03 requires that a centralized system be given first consideration for sewage treatment in residential subdivisions. Connection to an existing treatment plant is preferred, with construction of a package treatment plant the secondary alternative. If a sewage collection system is not close enough and a package treatment plant is not feasible in the judgment of Ohio EPA, the local Board of Health may allow an on-site treatment system. As indicated below, there are variations among the county subdivision regulations pertaining to sewage treatment requirements. According to each county's subdivision regulations, package treatment plants must be constructed by the developer of a subdivision, and then deeded to the respective county.

Over the past twenty years the practice has been to eliminate package plants wherever possible and resist permitting new ones. Package plants are viewed as maintenance problems by the County Sanitary Engineers, and ineffective sewage treatment facilities by Ohio EPA and the Health Departments because they are generally neglected. New package plants have been installed for rural businesses; they are rarely permitted for suburban or rural subdivisions.

Complaint Procedure for Unsanitary Conditions

Ohio Revised Code and Administrative Code set procedures for reporting cases where untreated sewage is contaminating public waterways. ORC §6111.05 requires Ohio EPA to investigate when it receives a written complaint. ORC §6117.34 describes a more rigorous complaint procedure applicable to unincorporated areas, and is recommended for Health Departments. Such a complaint should be sent to the Ohio EPA District Office, and follow procedures set in OAC 3745-1-04(F), summarized below:

- Detailed documentation of unsanitary conditions, visual (black water or sludge, gassing or grayish white water, toilet paper), odor (sewage smell), and data (fecal coliform or *e. coli*).

---

[93] For more information on the ODNR *Ohio Coastal Nonpoint Pollution Control Program Plan, please see* http://www.dnr.state.oh.us/odnr/soil+water/Coastalnonpointprogram.htm

- Bacterial tests conducted under the supervision of Ohio EPA or a Registered Sanitarian should include at least two sample runs. The samples must be collected at least two hours apart but within 30 days of each other. The samples are to be collected when stream flow is in a steady state dry weather condition. Bacterial standards defining a violation of water quality standards are:
    - More than 5,000 fecal coliform/100 ml in two or more samples when five or fewer samples are collected; or in more than 20% of samples when more than five are collected.
    - More than 576 *e. coli*/100 ml in two or more samples when five or fewer samples are collected; or in more than 20% of samples when more than five are collected.[94]

A complaint filed under ORC §6117.34 must include a resolution adopted by the Township Trustees or Board of Health.

Financial Assistance

This Plan encourages the use of financial assistance programs to upgrade or replace onsite sewage treatment systems. This Plan supports funding for these programs through federal, state, regional, and local agencies.

USDA Rural Development

USDA/RD "Section 504" funds may be used for home repairs to remove health and safety hazards. One such use is to upgrade or replace home sewage systems. Section 504 funding may be available as a loan, or a grant/loan combination. Financial need is a requirement in all cases. Grants may be available to those 62 years of age or more, and unable to repay a Section 504 loan. Funding under this program is available only in rural areas. Applications are made through USDA district offices.

HUD Community Development Block Grant

The CDBG Community Housing Improvement Program (CHIP) may be used to upgrade or repair housing for low and moderate income households. Sewage system upgrades and sewer taps are among the eligible housing improvements. The initial application is made by a local jurisdiction, which then administers grants to residents. Counties are the applicant for unincorporated areas; "non-entitlement" cities and villages under the Block Grant regulations may also apply. Households must qualify as "low to moderate income" under HUD rules.

Ohio EPA Water Pollution Control Loan Fund

Individual residents may qualify for reduced interest loans through the Ohio EPA Linked Deposit Program. Depending on the credit market, the program may lower the resident's interest rate by as much as 5%. The resident uses the loan to upgrade his/her sewage system. The property owner works with the Health District and a participating bank; if the property owner qualifies, the Health District issues a Certificate of Eligibility.

The participating bank evaluates the Certificate of Eligibility; if the applicant is credit worthy, the bank issues the loan. The bank sends an investment request form to Ohio EPA. Upon approval, Ohio EPA and OWDA deposit with the bank through a certificate of deposit, funds equal to the face value of the loan. The period of the CD is the same as the loan to the property owner, but not to exceed 20 years. The interest rate of the loan to the property owner is reduced by the same amount as the discount the bank received from Ohio EPA.. Loans for sewage systems that discharge effluent off-lot are not eligible.

Clean Michigan Initiative: Failing On-Site Septic System Grants

Michigan DEQ administers this grant program to identify failing on-site septic systems and/or implement corrective measures. This funding may replace failed septic systems with sewer extensions or

[94] OAC §3745-1-04

treatment facilities. It does not pay for repairing or replacing failed septic systems. Funding is limited to the amount appropriated to it for any given year. The funding source is the Clean Michigan bond fund.

EPA "§319" Nonpoint Source Grants

US EPA, through Ohio EPA provides grant funds under §319 of the Clean Water Act to reduce nonpoint sources of water pollution. This is the same program described in the Agricultural Runoff Chapter of this Plan. For home sewage treatment systems, fundable activities include:

- Educational programs
- Cost share for upgrading or replacing home systems; systems discharging effluent off lot are not eligible
- Development, testing, and demonstration of alternative home sewage systems.

Recommended Implementation Activities

1. Better coordination of planning, design and installation of on-site sewage treatment systems among governmental agencies.
2. More consideration and use of technical alternatives to traditional on-site sewage treatment systems where physical conditions warrant.
3. More specific enabling legislation at the state level to allow improved enforcement of proper maintenance
4. Better administration at the local health department level of on-site sewage treatment systems.
5. Improved education and information for homeowners on the proper operation and maintenance of on-site sewage systems.

Better Coordination of Planning, Design and Installation

- Health regulations for on-site sewage treatment system should be coordinated with existing county land use policies and controls like zoning and subdivision regulations. Lot splits should be coordinated with health and home sewage regulations, soils information, drainage and capital improvement plans.
- As part of the lot split review procedure, a recommendation on suitability of the site for sewage disposal from the county health department should be required.
- Local health department regulations should prohibit conventional septic tank systems in areas that are unsuited for an effective on-site sewage disposal system.

More Consideration and Use of Technical Alternatives

Septic tank-soil absorption systems are just one type of on-site sewage treatment. Other on-site sewage treatment systems may be used on a site with severe physical constraints do not allow traditional systems. The table below lists on-site system alternatives. These alternatives are recommended as Best Management Practices.

Recommended On-Site System Best Management Practices[95]	
Flow Reduction Techniques	
	Standard plumbing fixtures
	Water conservation shower heads

[95] Detailed in Appendix IV-2 of the 1980 Areawide Water Quality Management Plan.

Recommended On-Site System Best Management Practices[95]	
	Water conservation toilets
On-Site Treatment	
	Septic tanks with standard soil absorption system [alternating leaching fields required for new systems]
	Septic tank with low mound leaching system
	Subsurface sand filter with off lot discharge — used only for replacement systems or where no other alternatives are available
	Aerobic systems — used only for replacement systems or where no other alternatives are available

- Evaluate on-site sewage disposal alternatives based on long-term testing in northwest Ohio/southeast Michigan soil conditions..

More Specific State-Enabling Legislation

- Ohio needs enabling legislation to allow for creation of on-site waste management districts. Such on-site waste management districts could be responsible for the planning, design, installation, operation and maintenance, monitoring and problem correction of on-site sewage treatment systems.
- Basic System Assessments should be mandatory for all onsite systems, regardless of whether they are new or existing, regardless of whether they are legally classified as "semi-public." A basic system assessment is the regular inspection of permitted and installed home sewage treatment systems.
- Basic System Assessments should be paid for by residents through inspection or permit fees. The State of Ohio should provide financial assistance to local health districts for the development and implementation of inspection and maintenance programs. State assistance is especially important for counties whose environmental health programs are supported by voted tax levies.
- Inspection and maintenance of onsite systems should be required annually for mechanical systems, and once every five years for non-mechanical systems. These requirements should be phased in over a three to five year period to allow local Health Districts to develop and implement their programs. State funding should be provided in the development period.
- Clarification is needed between the roles and responsibilities of Ohio OEPA and the Ohio Department of Health in responsibility for on-site systems. These two agencies split their enforcement authority with package plant systems depending upon the size of the plant. The capability of one of these state agencies needs to be expanded to ensure that local boards of health effectively manage all facets of their on-site sewage treatment program.

Better Administration of On-Site Sewage Regulations

- All programs for improving on-site sewage treatment must be adequately financed. Investigate implementation of a fee schedule and charges to make the regulatory system for administering home sewage and package plant programs self-financing.
- Establish stream and septic system monitoring programs to identify failed systems. Areas designated as Critical Home Sewage Disposal Areas should have priority for:
    - Stream monitoring and sanitary surveys
    - Financial assistance to homeowners for upgrading systems using State Water Pollution Control Revolving Loan Fund programs
    - Cost share funds through the US EPA §319 non-point source program
- Adopt uniform regulations for septage haulers, including equipment, disposal sites, and record-keeping.

Additional Public Information to Homeowners and Developers

- Develop and conduct information and education programs and materials with Health Departments individually and jointly through the Maumee RAP, the Portage River Basin Council, the Sandusky River Watershed Coalition, and the Northwest Ohio Sewage Consortium. Educational programs should be geared to take advantage of available funding through grant programs, such as the Ohio Environmental Education Fund, the Lake Erie Protection Fund, and the Coastal Zone Management Assistance program.
- Adopt policies requiring site inspections prior to sale or development of a parcel of property.

Critical Home Sewage Disposal Areas

Local Boards of Health identify Critical Home Sewage Disposal Areas. They are areas with documented or suspected concentrations of failed onsite sewage systems. System failures result in known or suspected cases of:

- Surface water contamination, and/or
- Ground water contamination, and/or
- Public health nuisances.

The County and Local Health Departments have identified these areas as places where onsite sewage problems cannot be solved by conventional system upgrade or replacement. Typically the reasons why system replacement will not solve the problem are one or more of the following:

- There is a significant concentration of onsite systems that are known or suspected to have failed
- Most of the systems are on small lots that do not have room for replacement leaching fields
- Soil conditions for leaching fields are poor due to shallow bedrock, tight silt/clay soils, and/or seasonally high groundwater.

Critical Home Sewage Disposal Areas are recommended as:

- Priority areas for Ohio EPA, Michigan DEQ, and Health Departments to conduct sanitary surveys
- Priority areas for inspection and maintenance of onsite systems.
- Priority areas for public sewers or innovative community onsite sewage treatment system to replace concentrations of individual systems and/or package plants. For critical areas where a public sewerage system is the best alternative, the priority order for construction may be affected by the availability of financial assistance.

Lucas County

1. Unsewered developed portions of Oregon and all of Jerusalem Township
2. Berkey
3. Neapolis
4. Town of Monclova
5. Unsewered portions of Toledo and Washington Township in and near Point Place and Lost Peninsula
6. Swan Creek headwater areas near airport and Swanton
7. Swan Creek – unsewered subdivisions throughout
8. Alexis/Whiteford area and the Northeast corner of King and Brint near Sylvania
9. The Springbrook Farms/Davis Road area, the Berridge Road area, SR 64 (Centerville Street / Waterville-Swanton Road) northwest of the corporate limits, and Camp Courageous; near Whitehouse

10. Swan Creek – areas surrounding Holland, South Hill Park, and Brandywine – may be laundry or old sludge beds. All sewered now but still has high bacterial levels.

Monroe County

1. Morin’s Point, McLeary’s Point, and Lost Peninsula in southern Erie Township
2. The unincorporated hamlet of Erie in Erie Township near Luna Pier

Ottawa County

Ottawa County areas are listed without priority.

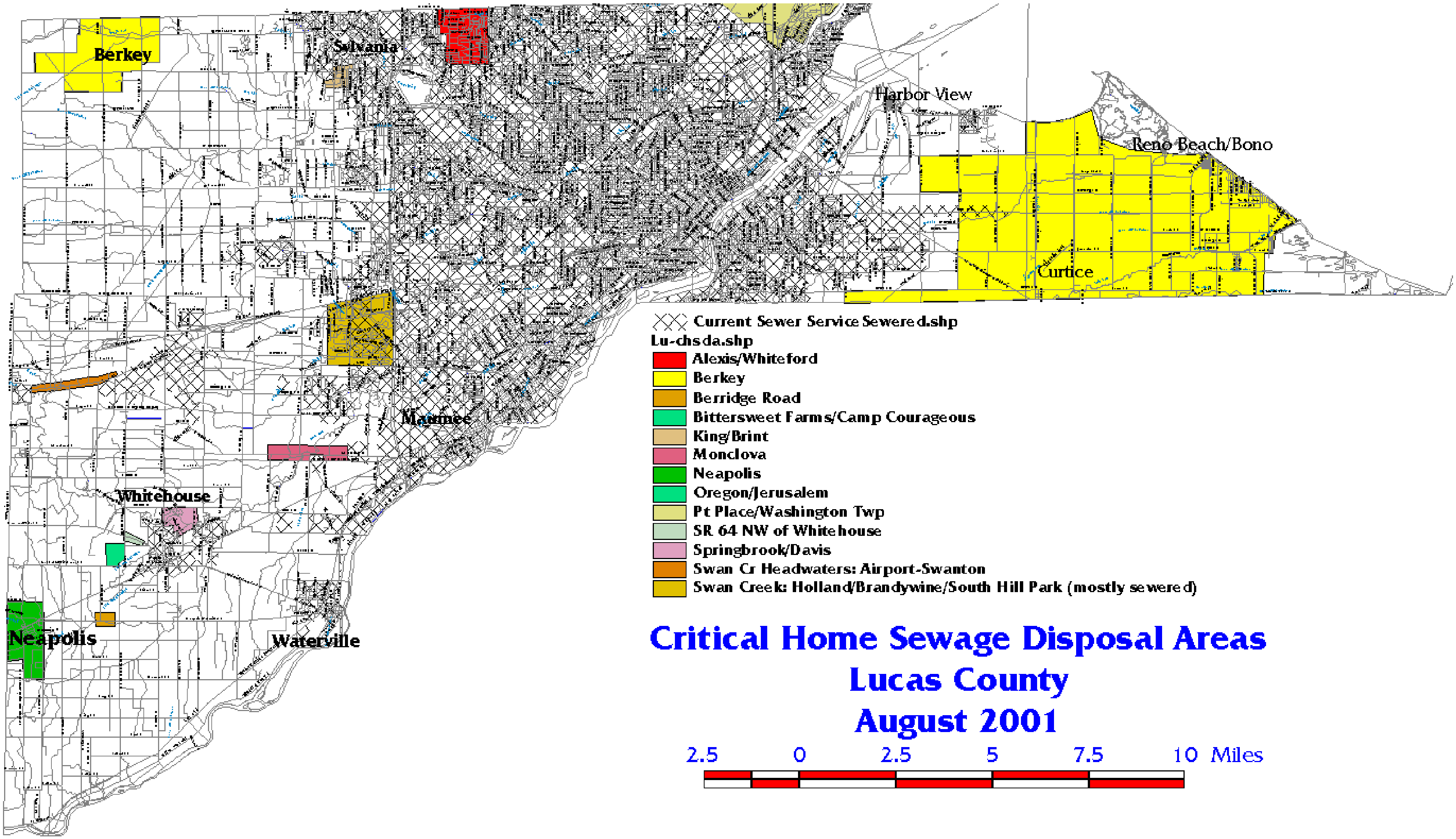
- Curtice and Williston
- Oak Harbor area: SR 19 south of the Portage River, the Waterford Place Subdivision, SR 19 north of Oak Harbor, and the Behlman Road area
- Clay Township near Genoa, especially unsewered portions of Section 20
- The unsewered portions of South Bass Island
- Rocky Ridge
- Clay Center
- Locust Point, Long Beach area in Carroll Township
- Unsewered parts of Johnson's Island, SR 269, and Church, Port Clinton Eastern, and Englebeck Roads in Danbury Township
- Developed unsewered areas in Erie Township, especially along SR 163, the Portage River, and the Richey Road area.
- State Road area and beach-front housing in southern Portage Township, notably south of Lockwood Road in Sections 7, 8, and 9.
- Middle Bass Island

Sandusky County

1. Timpe Road
2. Woodland Heights
3. Rodriguez Street
4. US 6 East
5. Hayes/53
6. Barkshire Hills Subdivision
7. Wightman's Grove
8. Muncie Hollow
9. White's Landing
10. Twp Line 198 @ Cole
11. Green Cr Limerick Rd Area
12. Rambo Road Area
13. Hessville
14. Vickery
15. Helena
16. Burgoon
17. Country Club Estates
18. US 20 @ Erlin 232

Wood County

1. Risingsun
2. West Millgrove
3. Rudolph
4. State Route 64 north of King Road, Hull Prairie, and Liberty Hi areas near Haskins
5. Woodland Court
6. Custar and Milton Center
7. Bates Road / East River Road
8. Stony Ridge
9. Lemoyne
10. Sugar Ridge/Dunbridge
11. Bairdstown
12. Unsewered areas along the Maumee River between Grand Rapids and Haskins
13. Dowling
14. Mercer/Sugar Ridge Rd
15. Kramer/Huffman Rd
16. Hammansburg

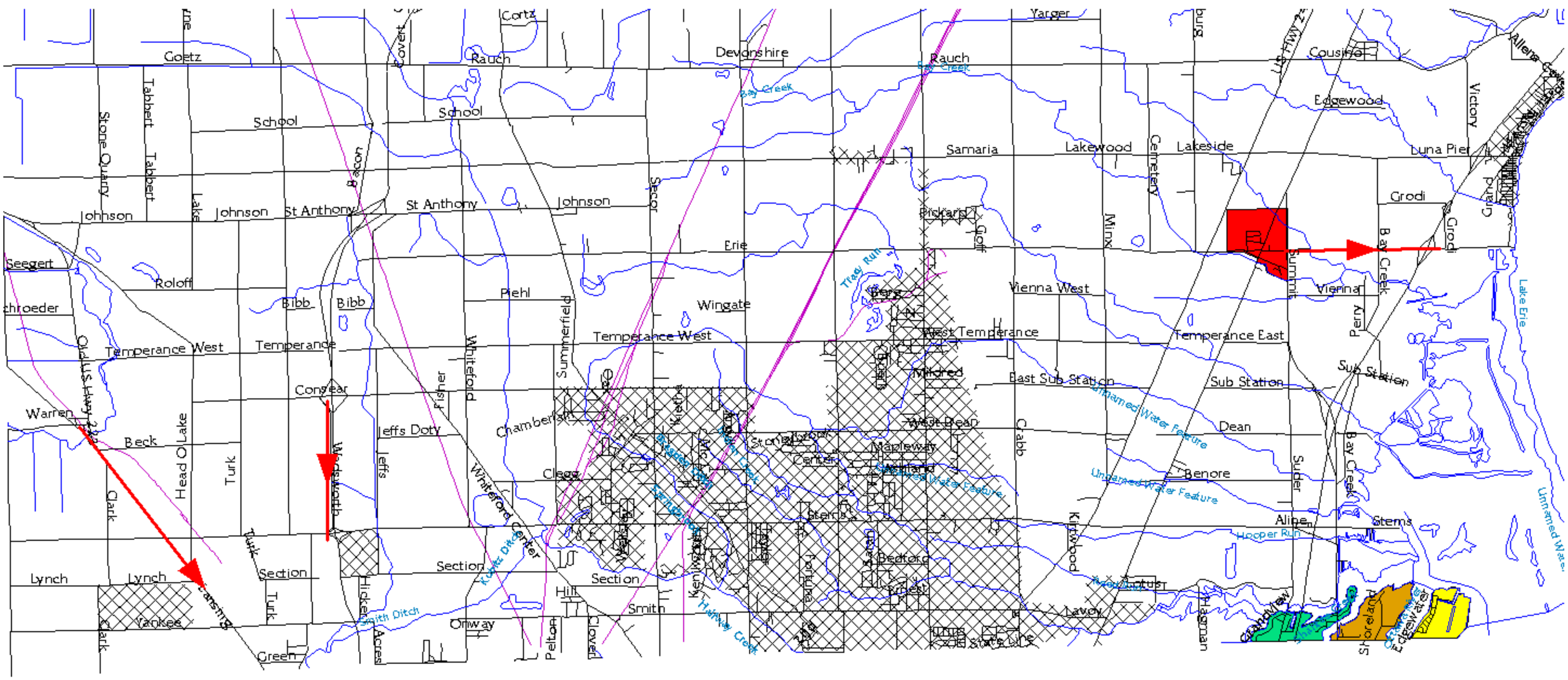


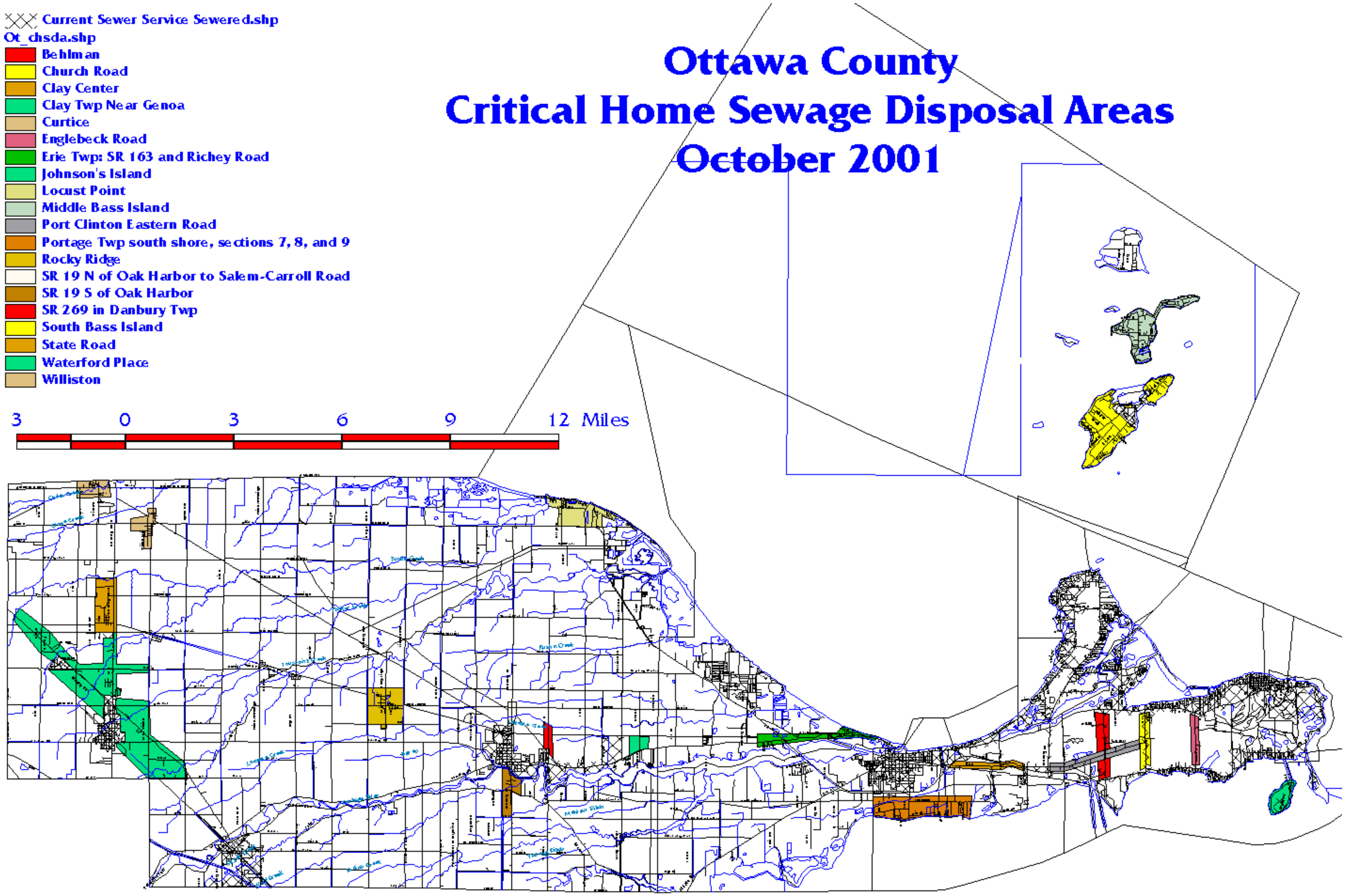
Critical Home Sewage Disposal Areas
Lucas County
August 2001

Monroe County
Critical Home Sewage Disposal Areas
December 2001

Current Sewer Service Sewered.shp
Mo_chsda.shp
Erie
Lost Peninsula
McLeary's Point
Morin Point

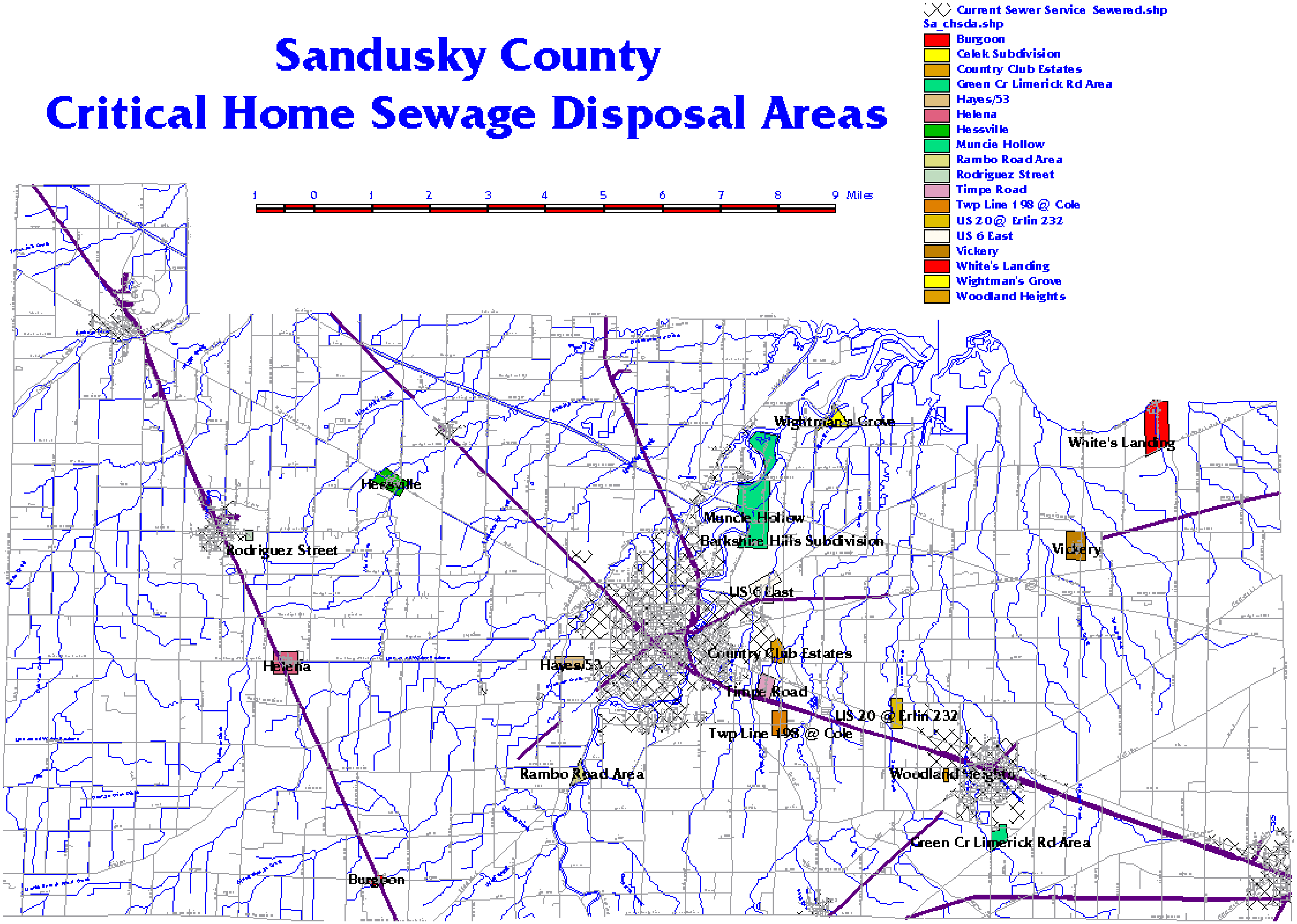
1 0 1 2 3 Miles





Ottawa County
Critical Home Sewage Disposal Areas
October 2001
Current Sewer Service Sewered.shp
Ot_chsda.shp
Behlman
Church Road
Clay Center
Clay Twp Near Genoa
Curtice
Englebeck Road
Erie Twp: SR 163 and Richey Road
Johnson's Island
Locust Point
Middle Bass Island
Port Clinton Eastern Road
Portage Twp south shore, sections 7, 8, and 9
Rocky Ridge
SR 19 N of Oak Harbor to Salem-Carroll Road
SR 19 S of Oak Harbor
SR 269 in Danbury Twp
South Bass Island
State Road
Waterford Place
Williston
3 0 3 6 9 12 Miles

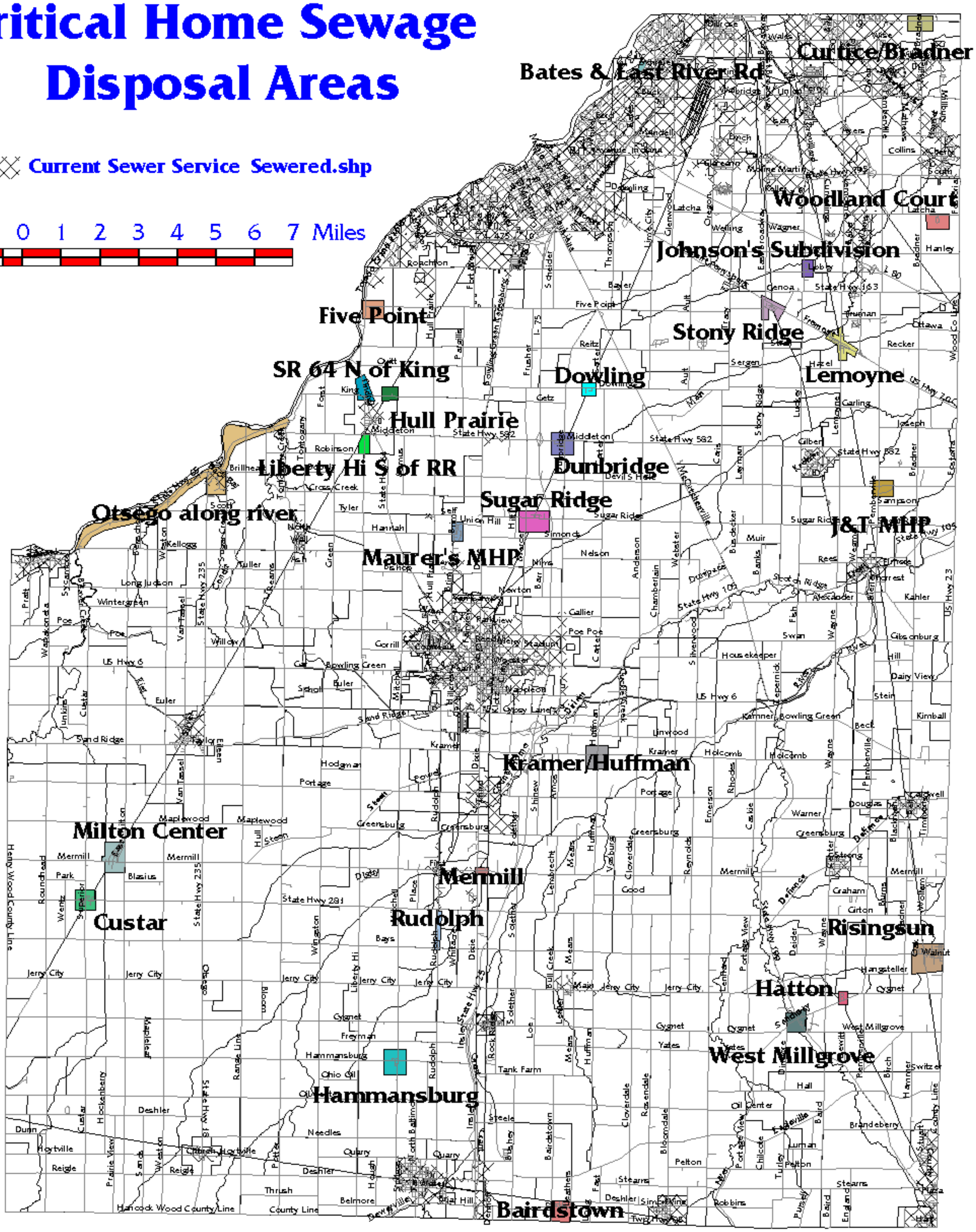
Sandusky County
Critical Home Sewage Disposal Areas



Wood County Critical Home Sewage Disposal Areas

Current Sewer Service Sewered.shp

1 0 1 2 3 4 5 6 7 Miles



CHAPTER 6
AGRICULTURAL RUNOFF

Introduction

Controlling non-point sources of water pollution will be necessary to meet the goals of the Clean Water Act. Sediment and associated nutrients from agricultural cropland have been identified as the greatest non-point source sediment and nutrient loading to Lake Erie from the TMACOG region.

The requirements for agricultural pollution abatement under the Areawide Water Quality Management Plan are addressed in this chapter. They include:

1. The designation of management agencies with responsibilities to implement agricultural Best Management Practices (BMPs).
2. The identification and prioritization of critical agricultural non-point source water quality problem areas.
3. Selection of BMPs best suited to individual watersheds and counties.
4. The development of operational programs including costs and schedules for action.

Chapter III Water Quality Management Framework identifies Designated Management Agencies (DMAs) for agricultural runoff, at the state, federal, and local levels. The Soil and Water Conservation Districts are DMAs for their respective counties. This provision follows the Ohio Agricultural Pollution Abatement Program pursuant to Section 1515 of the Ohio Revised Code and a similar Michigan program.

The priority areas, Best Management Practices, and operational programs are all addressed in this chapter.

Areawide Issues

Phosphorus has been identified as the principal limiting nutrient in the eutrophication of Lake Erie and other area streams. Eutrophication is a natural aging process generally describing the fertility (mainly aquatic plant productivity) of lakes. Over time, a lake will become filled with sediment and organic materials from streams draining its watershed. On a geological time scale, all lakes will presumably cease to exist because of this natural process. However, man’s activities can alter natural processes and accelerate this extinction process to a human, rather than a geological time scale. This phenomenon is “cultural eutrophication” as opposed to the natural aging process.

Cultural eutrophication is caused by an excessive load of nutrients (usually phosphorus). These nutrients can produce nuisance growths of algae and higher aquatic plants. While some lakes are naturally eutrophic, excessive nutrient loads that induce eutrophication usually result from human activity.

The U.S. Army Corp of Engineers Lake Erie Wastewater Management Study (1979) concluded that if point source discharges met a 1.0 mg/1 phosphorus limit, a further reduction of 46.5% of the non-point sources would be necessary to restore Lake Erie from its eutrophic state. Specifically, these estimates were based on improving the Western and Central Basins of Lake Erie to a meso-trophic condition, meaning that lake fertility levels are classified as moderate.

TOTAL PHOSPHORUS MASS TRANSPORT - 1975[96]

	Total Transport Tons Per Year	Point Source Input Total Tons Per Year	Non-Point Transport Tons Per Year
Maumee River Basin above Waterville, Ohio	2,685	432 [97]	2,253
Portage River Basin above Woodville, Ohio	129	49[98]	80
Sandusky River Basin above Fremont, Ohio	405	31[99]	374

The fine-textured silt and clay soils found in northwestern Ohio and southeastern Michigan are easily displaced and washed away by the rain. The soil loss rates are not high at about 1 ton/acres per year. However, the drainage areas are large, especially the Maumee, which is the largest Great Lakes tributary.

River Basin	Drainage Area (Square Miles)[100]
Maumee	6,608
Portage	581
Sandusky	1,420

The increased use of conservation tillage was found to correspond to decreases in suspended- sediment discharge over time at two locations in the Maumee River Basin.[101] A 49.8 percent decrease in suspended-sediment discharge was detected when data from 1970–74 were compared to data from 1996–98 for the Auglaize River near Ft. Jennings, Ohio. A decrease in suspended-sediment discharge of 11.2 percent was detected from 1970–98 for the Maumee River at Waterville, Ohio.

Heidelberg College Water Quality Laboratory has provided long-term gauging and water quality sampling for several Lake Erie tributaries. Since the mid 1970s. Discharges from the rivers of sediment and nutrient can vary widely from year to year, depending on the amount and severity of rainfall. Consistent monitoring over a long period of time is necessary to show whether sediment and nutrient loads are increasing or decreasing. The table below gives a trend summary for four primarily agricultural watersheds. The parameters are TSS: Total Suspended Solids, TP: Total Phosphorus, SRP: Soluble Reactive Phosphorus, NO_3: nitrate, and TKN: Total Kjeldahl Nitrogen. The Maumee River station is at Waterville, and the Sandusky River station is at the Tindall Bridge upstream of Fremont.[102]

96 *Lake Erie Wastewater Management Study* – converted from metric tons

97 *Maumee Level "B" Study*, GLBC, 1976

98 TMACOG 208 Study, 1976

99 Heidelberg College Water Quality Laboratory Data, 1976

100 *Lake Erie Wastewater Management Study, Volume 1L: Main Report;* Table I-1

101 *Status and Trends in Suspended-Sediment Discharges, Soil Erosion, and Conservation Tillage in the Maumee River Basin—Ohio, Michigan, and Indiana* **U.S. Department of the Interior U.S. Geological Survey** Water-Resources Investigations Report 00-4091, 2000

102 *Trends in Water Quality in LEASEQ Rivers and Streams (Northwestern Ohio), 1975-1995*, Heidelberg College Water Quality Laboratory, R. Peter Richards and David B. Baker

River	Flow	TSS	TP	SRP	NO3	TKN
			Parameter			
Maumee R.	9.2	-18.1 *	-41.6 ****	-84.5 ****	21.3	-28.4 ****
Sandusky R.	6.7	-27.2 ****	-46.3 ****	-87.9 ****	12.0	-21.0 ****
Honey Cr.	-16.7	-2.5	-28.7 ****	-78.5 ****	45.9 ****	-14.2 **
Rock Cr.	-30.5 *	-37.2 ****	-41.4 ****	-54.8 ****	-36.9 **	-40.6 ****

Percent change from 1975 to 1995, estimated as described in the text. Negative numbers corresponding to decreasing concentrations, positive numbers to increasing concentrations. Significance levels are based on t-values adjusted for autocorrelation. *: p<.05, **: p<.01, ***: p<.001, ****: p<.0001.

* Percent change during 1983 to 1995 only, reflecting the shorter period of record for Rock Creek

Heidelberg College's data for sediment and nutrients at the four stations from 1975-1995 generally shows decreases in sediment and phosphorus loads, but increases in nitrates. The inference is that farming conservation practice changes over those 20 years reduced sediment loads (and phosphorus as well, because phosphorus tends to attach to fine soil particles). Conservation practice changes, however, have not similarly reduced nitrate loadings; nitrates are soluble, and are carried more by water flow than sediment. Use of tile drainage may increase loadings of soluble nitrates to the rivers. It should be noted, however, that the data, especially for nitrates, is highly variable and dependent on weather. The changes in nitrate concentrations may not be statistically significant.

Phosphorus Reduction Strategies

The Lake Erie Phosphorus Reduction Strategy is based on nutrient reductions needed for the lake's recovery. The strategy[103] notes that phosphorus loading to the lake from municipal sewage treatment plants fell from 11900 metric tons to 4500 metric tons from 1970 to 1980. the Strategy incorporates lake-wide phosphorus reduction targets:[104]

State	1982 Phosphorus Load to Lake Erie in Metric Tons/year	Phosphorus Reduction Target by 1998, Metric Tons/Year
Ohio	5,617	1,365
Michigan	1,525	185
Indiana	600	90
Pennsylvania	135	20
New York	250	40
Total	**8,127**	**1,700**

The Strategy then breaks Ohio phosphorus loadings down by watershed and type of source:

Tributary	Point Source Phosphorus, metric tons/year	Non-Point Source Phosphorus, metric tons/year	Total Phosphorus, metric tons/year
Ottawa	0	74.2	74.20
Maumee (74% of GLNPO estimate)	222.5	2,113.3	2,335.80
Portage & Toussaint	13.7	535.1	548.80
Sandusky	44.1	711.4	755.50

[103] State of Ohio Water Quality Management Plan Phosphorus Reduction Strategy for Lake Erie, Ohio EPA June 1985

[104] US EPA Great Lakes National Program Office, 1984

Huron & Vermilion	40.4	455.4	495.80
Black & Rocky	158.0	206.5	364.50
Cuyahoga	590.2	224.3	814.50
Chagrin	73.7	39.2	112.90
Grand	27.1	71.4	98.50
Ashtabula & Conneaut (54% of GLNPO estimate)	4.2	12.1	16.30
Total	**1,173.90**	**4,442.90**	**5,616.80**

Phosphorus is a major cause of eutrophication, but it is transported by sediment that is a pollutant in its own right. Sediment is the most prevalent non-point source pollutant by volume. Studies show that erosion rate from urban land is about ten times greater than on land in cultivated row crops. Because the great majority of the region's land use is agricultural, erosion from cropland poses a major pollution problem. Farming lays bare great expanses of soil that remain exposed to wind and rain for months, sometimes during periods of heavy rain. The Ohio phosphorus reduction goals set target reductions for each county:[105]

County	Agricultural Phosphorus Reduction Target from 1982 baseline, metric tons/year	Urban Phosphorus Reduction Target	Total Phosphorus Reduction Target
Lucas	17.3	19.2	36.50
Ottawa	21.0	4.2	25.20
Sandusky	38.3	3.3	41.60
Wood	69.6	7.4	77.00
Total	**146.20**	**34.10**	**180.30**

Progress toward achieving these agricultural phosphorus reduction goals has been substantial. NRCS tracked reductions for each Lake Erie county in Ohio through 1997. For the entire Lake Erie basin, 49% of the agricultural phosphorus reduction target had been met by 1997; four of the TMACOG counties reached substantially higher reductions. Agricultural phosphorus reductions through 1997 are given below.[106]

County	Agricultural Phosphorus reduction through 1997 (pounds)	Agricultural Phosphorus reduction target (pounds)	Percent of Goal
Lucas	29,567	38,060	!Zero Divide
Monroe			
Ottawa	27,742	46,200	76.31%
Sandusky	64,296	84,260	71.49%
Wood	109,467	153,120	71.84%
Totals	231,072	321,640	71.84%

The Ohio Lake Erie Buffer Team, a coalition of conservation agencies whose goal is to encourage landowners to put conservation buffers into practice and help meet agricultural phosphorus and sediment

105 *Phosphorus Reduction Goals by County.* USDA Soil Conservation Service 1990?? I think we got this either from Steve Davis or Diana Holt. What is the precise citation??

106 USDA NRCS, 1997

reduction targets. In particular, the team has made a concerted effort to use cost share conservation buffer programs (described later in this chapter). Continued use and expansion of conservation buffers will bring the counties still closer to their agricultural phosphorus reduction targets than they were in 1997. The acres put into conservation buffers since 1997 are given in the following table.[107]

County	Continuous CRP Acres	CREP Acres	319 Watershed Project Acres	Wetland Reserve Acres	Total Agricultural Conservation Buffer Acres
Lucas	119.4	29	0	0	148.40
Ottawa	242.7	93	186.7	636.8	1,159.20
Sandusky	610.0	100	7.55	0	717.55
Wood	2,203.6	649	71.4	56	2,980.00
Total	3,175.70	871.00	584.65	692.80	5,324.15

Water Quality Impact of Suspended Sediment

1. Increased levels of suspended solids (sediment) increase the cost of treating water supplies.
2. Suspended sediment lessens the aesthetic appeal of water. It can affect the appearance of a body of water for recreational purposes along with affecting the odor and taste of public water supplies.
3. It increases wear of various types of machinery, such as pump motors.
4. Excessive quantities of suspended sediment reduce light penetration, reducing photosynthesis.
5. It reduces the visibility for the sight feeding of fish and the fisherman’s ability to catch fish.
6. It is a safety hazard for boaters, swimmers, and water skiers by reducing visibility in the water.

Water Quality Impact of Deposited Sediment

1. When deposited in reservoirs, it depletes the storage capacity.
2. Sediment creates shallow water areas that will support nuisance vegetation and detract from the beauty of a lake.
3. It impairs biological systems by covering bottom spawning and feeding areas of fish. In addition, it reduces the productivity of many macroinvertebrate species that are food for fish.
4. Deposited sediment fills ditches, which impairs drainage. The results include lower crop yields, safety hazards, and possible property damage.
5. When sediment is deposited in streams and channels, it can increase flood damage by reducing drainage capacity.
6. It causes navigation problems in rivers and harbors. Many of the region’s harbors and rivers require periodic, costly dredging. Toledo Harbor requires dredging annually.

   In agricultural runoff, two of the principal pollutants (sediment and phosphorus) may be controlled through the same BMPs because phosphorus tends to attach to silt and clay soil particles.

---

[107] USDA NRCS, 2001 with data through 4/13/2001

Nitrate Impacts on Water Quality

Nitrogen is an essential plant nutrient and is applied to cropland as a fertilizer. Nitrogen is also a nutrient for aquatic plants although it is less of a limiting factor than phosphorus, and therefore, has not received the same level of attention in water quality control strategies. The concentrations of nitrate nitrogen increase during runoff events. However, nitrates are soluble and are carried to streams with runoff rather than adsorbed to sediment as is phosphorus. Tile drains are a pathway for nitrates to reach streams.

The drinking water standard for nitrate is 10 mg/l. Concentrations above that level are common in Lake Erie tributaries, especially following storm events. Nitrate is a concern for drinking water supplies. Water utilities are required to issue health advisories when nitrate levels exceed the standard of 10 ppm. The Nebraska Cooperative Extension summarizes its health effects:

> *"Nitrate is relatively non-toxic substance that occurs naturally as part of the nitrogen cycle. However, nitrate can be converted readily by bacteria into nitrite. This occurs in the environment, in foods, and in the human mouth and gastrointestinal tract. Once nitrogen is converted into nitrate it can have harmful health effects. For example, high nitrates in drinking water can cause methemoglobinemia resulting from the reaction of nitrites with hemoglobin in red blood cells affecting the ability of the blood to carry sufficient oxygen to individual cells of the body".*[108]

Methemoglobinemia is also known as "blue baby syndrome." Infants are the most susceptible to nitrates, and are advised not to drink public water under health advisories.

Heidelberg College Water Quality Laboratory has summarized nutrient trends in Lake Erie watersheds for the period of 1975-1995.

> *"The science of nutrient management has advanced greatly during the study period. An evolution in perspective from fertilizer applications designed to build fertility levels to those aimed at maintenance, proper credits for nutrients applied in manures, precision application of fertilizers, and yield monitoring are all aspects of nutrient management that have matured substantially and come into widespread application during the study period. In addition, heightened awareness of environmental issues has strengthened incentives to use nutrients efficiently. These developments have undoubtedly been major causes of the trends in nutrient use detailed in the following paragraphs.*
>
> *"Sales of fertilizer increased in the early part of the study period, reached a peak about 1980, and have declined since then. This pattern appears to reflect a change in attitude about fertilization. In the 1970s, the prevailing view about fertilizer was "more is better". In the early 1980s, this view began to change, as fertilizer prices increased and as soil tests revealed that many fields already contained as many nutrients as crops could utilize. In the Maumee watershed, sales of fertilizer phosphorus decreased 22% between 1971 and 1995, and 37% relative to their peak level in 1979. Fertilizer nitrogen sales have increased 23% relative to their level in 1971, but decreased 28% relative to their peak in 1981 (Figure 8). In the Sandusky watershed, fertilizer phosphorus sales decreased 17% between 1971 and 1995, and 25% relative to their peak in 1979. Fertilizer nitrogen sales are anomalous: the data document a steady increase during the study period, amounting to 46%. The reason for this continued and substantial increase is not apparent, though we note that the land area planted in corn has increased slightly in the Sandusky watershed while decreasing in the Maumee watershed. In addition, nitrogen from application of manure has decreased more sharply in the Sandusky*

---

108 *Well Water, Nitrates and the "Blue Baby" Syndrome Methemoglobinemia*, Nebraska Cooperative Extension NF91-49

watershed than in the Maumee (see below), perhaps requiring an increase in fertilizer nitrogen to compensate.

"Row-crop agriculture has dominated the area during the period of study, and animal agriculture has been less important. Animal populations declined between 1975 and 1995, particularly those of cattle, dairy cows, and sheep. Consequently, production of animal manures and their associated nutrients also decreased. In the Maumee watershed, phosphorus associated with manure decreased by 17%, and nitrogen by 22%. In the Sandusky watershed, the decreases are larger: 34% and 37% respectively.

"Assuming that all manure produced and all fertilizer sold were applied to crops in the watershed, manure accounted for 24% of the phosphorus and 22% of the nitrogen applied in the Maumee basin, on average during the study period, and 20% of the phosphorus and 18% of the nitrogen applied in the Sandusky watershed. Phosphorus from fertilizer and manure decreased by 30% in the Maumee watershed and by 19% in the Sandusky over the period 1975-1995. Nitrogen from fertilizer and nutrients decreased by 8% in the Maumee watershed but increased by 10% in the Sandusky watershed."[109]

Baseline Studies

Pollution From Land Use Activities (PLUARG)

The Canada-United States Agreement on Great Lakes Water Quality signed in 1972 requested the International Joint Commission (IJC) to conduct a study of pollution of the boundary waters of the Great Lakes system from agricultural, forestry and other land use activities. The International Reference Group on Great Lakes Pollution from Land Use Activities (PLUARG), fulfilled this charge.

Eutrophication, due to elevated nutrient inputs, particularly in the lower lakes (Erie and Ontario), and the increasing contamination of these water bodies by toxic substances, were identified as the major pollution problems in the basin. PLUARG concluded that the eutrophic condition of Lake Erie could not be cause by point sources pollutants. PLUARG findings included:

1. The Great Lakes are being polluted from land drainage sources by phosphorus, sediments, some industrial organic compounds, previously used pesticides and potentially some heavy metals.
2. The lakes most affected by phosphorus and toxic substances are Erie and Ontario.
3. Intensive agricultural is the largest contributor of phosphorus.
4. Erosion from crop production on fine textured soils and from disturbed soil in urbanizing areas was the main sources of sediment.

PLUARG issued recommendations for agricultural non-point sources[110]. More recent studies have added the last two recommendations:

- Development of Management Plans
- Control of Phosphorus
- Control of Sediment
- Agricultural Land Use to help farmers develop and implement water quality plans
- Control of Nitrates
- Animal Waste Management

---

109 *Trends in Agriculture in the LEASEQ Watersheds, 1975-1995,* R. Peter Richards* and David B. Baker Water Quality Laboratory

110 *Environmental Management Strategy for the Great Lakes System* , IJC.

Lake Erie Wastewater Management Study (LEWMS)

The Lake Erie Wastewater Management Study (LEWMS) was conducted by U.S. Army Corps of Engineers in 1979. It studied the water quality conditions of Lake Erie and the development of a wastewater management program to improve and rehabilitate the water quality of Lake Erie. The Study identified non-point sources of pollution as a problem that must be solved in order to achieve water quality improvement in Lake Erie. It devoted special attention to the reduction of agricultural runoff pollution. Its conclusions include:[111]

- The bulk of the phosphorus from non-point and point sources reached Lake Erie in association with suspended sediment transported during storm events.
- The biological availability of sediment bound phosphorus varied considerably with flow and between river basins.
- Reducing gross erosion would reduce phosphorus loads to Lake Erie.
- Non-point source phosphorus is derived principally from agricultural land use, particularly crop production.
- Adoption of conservation tillage and no-till practices appeared to be an economically feasible method of reducing potential erosion in the Lake Erie Basin.
- A maximum rural non-point source phosphorus reduction of 4,100 to 5,100 MT/yr would result if the maximum reduced tillage scenario were achieved and erosion reduction were 90% effective in reducing phosphorus.
- Tillage practices other than conservation tillage and no-till were shown to be unable to achieve significant erosion reductions.
- In addition to conservation tillage and no-till practices, other controls of sediments and phosphorus must be appropriately applied. These controls include animal waste management, gully erosion control via waterways and structures, and farm conservation plans.
- An education and technical assistance program is needed to accelerate the adoption of conservation tillage, no-till, and other cost effective Best Management Practices.
- The environmental benefits of erosion control extend well beyond a reduction in phosphorus.

Other Lake Erie Basin wide benefits resulting from sediment reductions include: reduced sedimentation and reduced dredging costs in Lake Erie harbors, lower water treatment costs for sediment removal from domestic water supplies, less movement and transport of other sediment attached pollutants such as insecticides and herbicides, and reduced in-stream sedimentation which benefits the fishery resources. In addition, BMPs that help prevent sedimentation also improve aquatic habitat, such as riparian buffer zones.

TMACOG 208 Studies

For the 1980 *Areawide Water Quality Management Plan*, TMACOG developed information on the sources of agricultural non-point source pollution to provide target phosphorus reductions to achieve sediment and phosphorus goals.

---

[111] *Lake Erie Wastewater Management Study Methodology Report*, U.S. Army Corps of Engineers, March 1979.

The goal for phosphorus loading to Lake Erie was 11,000 MT/yr. In order to achieve this goal, the Lake Erie Wastewater Management Study calculated that there must be a 46.5% reduction in non-point phosphorus.

TMACOG prepared an evaluation of tillage practices that would be required to achieve this reduction. Phosphorus loading could be reduced if conservation till or no-till were applied to all suitable soils:

- by 31% if conservation tillage practices were 60% effective; or
- by 46.6% if conservation tillage practices were 90% effective.

It is not likely that all suitable soils will be farmed with conservation tillage, but other factors may help assist the region meet phosphorus load reductions.

- Only agricultural runoff was considered, and much sediment and associated nutrients can be reduced through certain runoff controls.
- Only reductions achievable through conservation tillage practices were accounted for and additional reductions can be achieved through other Best Management Practices.
- Reductions in sheet erosion attributed to minimum tillage practices were conservative it was anticipated in 1980 that new conservation tillage equipment would achieve higher rates of sediment reduction.

Areawide Policies

The previous sections have defined the nature of the problems of agricultural pollution and the recommended reductions deemed necessary by various studies of the problem. This section lists the policy statements developed by TMACOG to solve their problems.

<u>*POLICY 1*</u> The Soil and Water Conservation Districts shall be responsible for programs of agricultural pollution abatement pursuant to Chapter 1515 of the Ohio Revised Code.

<u>*POLICY 2*</u> The *Areawide Water Quality Management Plan* shall include a compilation of Best Management Practices for the TMACOG area. Each County Soil and Water Conservation District (SWCD) shall be responsible for its own list of acceptable BMPs. Each County BMP list is herewith incorporated by reference as part of the *Areawide Water Quality Management Plan*.

<u>*POLICY 3*</u> Each County SWCD shall:

1. Assist in implementation of agricultural pollution abatement in the areas of sediment, erosion, and animal waste control by providing technical assistance to landowners, following standards developed by the Ohio DNR Division of Soil and Water, the Michigan Department of Natural Resources (MDNR), and USDA Natural Resources Conservation Service (NRCS).
2. Implement of the *Areawide Water Quality Management Plan* by:
    a. Conducting agricultural education programs to encourage use of BMPs.
    b. Support legislation essential to agricultural pollution abatement.
    c. Work with other SWCDs and local agencies through the Maumee RAP, Portage River Basin Council, and Sandusky River Watershed Coalition to develop BMP demonstration and implementation projects.
    d. Pursue funding from conservation programs including small watershed protection and cost-sharing for BMPs.

POLICY 4 The *Areawide Water Quality Management Plan* recommends the following principles for agricultural pollution control:

1. Water quality problems resulting from erosion of soil particles and agricultural chemicals adsorbed to them should be controlled through implementation of the policies, rules, and BMPs of Federal, State, and local Management Agencies described below and incorporated by reference as part of this Plan.
2. The BMPs recommended in this Chapter are practices that should be considered. Each County SWCD should select practices best suited to each area based on local conditions.
3. Use of BMPs should be encouraged through outreach and educational programs, technical assistance to farmers, and voluntary conservation incentives.

Implementation Programs and Agency Responsibilities

Federal, State, and county agencies have well-established roles and working relationships with agricultural conservation programs. Generally, agencies use a voluntary approach with technical assistance, incentives, and cost-sharing to encourage use of agricultural BMPs. A variety of agencies and organizations have cooperative roles in promoting BMPs at the following levels: federal, state, regional, county, watershed councils, and agricultural university extension programs.

! **USDA, US Department of Agriculture**

USDA provides technical assistance and funding through two agencies: Farm Services Agency (FSA), and the Natural Resources Conservation Service (NRCS)

! **US EPA**

Responsible for regulations to implement the Clean Water Act including NPDES permits where applicable. Provides non-point source grant funding.

! **Ohio EPA, Ohio Department of Agriculture, Michigan DEQ, and Michigan Department of Agriculture**

Ohio EPA, Ohio Department of Agriculture, and MDEQ are responsible for agricultural technical assistance and regulation at the state level from US EPA requirements. Regulatory oversight includes Animal Feeding Operations (AFFs), also known as Animal Feeding Operations (AFOs), and issuing Permits to Install and NPDES permits for point source discharges where applicable. MDEQ and OEPA are responsible for US EPA non-point source grants at the state level, in cooperation with other state agencies. In Ohio, the Department of Agriculture issues Permits to Install and Permits to Operate for all livestock facilities over 1,000 animal units. In Ohio legislation has been passed to move responsibility for NPDES permits for livestock facilities that discharge and NPDES stormwater construction general permits from Ohio EPA to Ohio Department of Agriculture. The transition will be complete upon approval by US EPA, which is pending.

In Ohio, Revised Code requires the Director of Agriculture to deny an application for a NPDES permit if the proposed discharge or source would conflict with an areawide waste treatment management plan adopted in accordance with section 208 of the Federal Water Pollution Control Act.[112] This provision applies only to agricultural facilities that require Permits to Install from ODA:

! Animal Feeding Operations that have a wastewater discharge and have less than 1,000 animal units

[112] Ohio Revised Code §903.08(E)(3)

- Confined Animal Feeding Operations with 1,000 or more animal units regardless of whether they have a discharge.

This Plan recommends no provisions beyond current law and regulation.

The Michigan Department of Agriculture develops and adopts Generally Accepted Agricultural and Management Practices (GAAMPs) for farms and farm operations. These voluntary practices are based on available technology and scientific research to promote sound environmental stewardship and help maintain a farmer's right to farm.[113] The GAAMPs cover five specific areas of production agriculture, including:

- Manure Management/Utilization
- Pesticide Utilization/Pest Control
- Nutrient Utilization
- Care of Farm Animals
- Cranberry Production

GAAMPs are used by USDA in Michigan to target cost share funds. This Plan incorporates the first three categories by reference, related to manure management, pesticide use, and nutrient use.

- **Ohio DNR and Michigan DNR**

The natural resources agencies provide technical assistance and funding to the SWCDs/SCDs and coordinate programs to promote conservation and habitat.

Rules 1501:15-5-01 to 1501:15-5-18 of the Administrative Code establish state standards for a level of management and conservation practices in farming, silvicultural operations and concentrated animal feeding operations on farms in order to abate excessive soil erosion or the pollution of waters of the state by soil sediment including pollutants attached to the sediment and animal waste. These rules further define Ohio's pollution abatement grant program for landowners or operators to voluntarily install conservation practices.[114] The Ohio DNR Division of Soil and Water Conservation is responsible for administering these rules and programs.

Agricultural pollution complaints must be filed with the Chief of the Ohio DNR Division of Soil and Water Conservation in writing.[115] The Chief of the Division may issue abatement orders where a violation exists. Failure to comply with orders is a misdemeanor of the first degree.[116]

Ohio DNR, through its Coast Management Program, submitted its *Ohio Coastal Nonpoint Pollution Control Program Plan* to NOAA in September 2000. The *Areawide Water Quality Management Plan* supports the goals and recommendations of that document; and recommends its Chapter 3 as source of information on agricultural programs, legislation, and agency management responsibilities, as well as incorporation of the agricultural “management measures” into local, regional and state policy.[117]

- **Lucas, Ottawa, Sandusky, and Wood County SWCDs; Monroe County SCD**

---

[113] Michigan Department of Agriculture website, 2001

[114] Ohio Administrative Code, 1501:15-5-01(A)

[115] Ohio Administrative Code, 1501:15-5-15(B)

[116] Ohio Administrative Code, 1501:15-5-16(A)(2)

[117] For more information on the ODNR *Ohio Coastal Nonpoint Pollution Control Program Plan, please see* http://www.dnr.state.oh.us/odnr/soil+water/Coastalnonpointprogram.htm

The Soil and Water Conservation Districts (called Soil Conservation Districts in Michigan) provide technical assistance and conduct educational programs at the local level, working directly with land owners. They are the principle implementing agencies for encouraging farmers to adopt BMPs.

In Ohio, SWCD Boards of Supervisors review and act upon operation and management plans. An operation and management plan" means a written record, developed or approved by the District Board of Supervisors or the Chief of the Division of Soil and Water Conservation, for the owner or operator of agricultural land or concentrated animal feeding operations that contains implementation schedules and operational procedures for a level of management and best management practices which will abate the degradation of the waters of the state by animal waste and by soil sediment including attached pollutants.[118]

! **Ohio State University Extension, Michigan State University Extension**

OSU and MSU conduct research and educational programs, and provide extensive technical recommendations to the agricultural community.

! **TMACOG Environmental Council**

The Environmental Council is responsible for maintaining the *Areawide Water Quality Management Plan*. TMACOG, through the watershed councils, works with other agencies to develop and coordinate BMP programs.

! **Watershed Councils**

The Maumee RAP, Portage River Basin Council, and Sandusky River Watershed Coalition provide mechanisms for public involvement with natural resource and water quality issues for river basin areas. They may lead the development of multi-county BMP projects by coordinating agencies at the watershed level.. Each of these watershed councils has a representative and vote on the Environmental Council.

More detailed agency responsibilities and roles are given below.

! **Soil and Water Conservation Districts**

The Soil and Water Conservation Districts in Ohio and the Soil Conservation District in Monroe County, Michigan are Designated Management Agencies for agricultural pollution abatement. They offer voluntary programs to that promote use of agricultural BMPs. Their responsibilities and the associated responsibilities of Ohio's and Michigan Department of Natural Resources are described below.

! **Ohio —**The main responsibility for agricultural pollution abatement rests with the Ohio Department of Natural Resources and the Soil and Water Conservation Districts at the county level. ODNR programs are administered by the SWCDs that act as staff to the Soil and Water Conservation Commissions (SWCC), per ORC §1515.02. The SWCC is administratively located within ODNR. SWCDs are political subdivisions of the state, and are organized for all 88 counties. Their primary function is to assist the agricultural community with conservation practices.

! **Michigan —** The principal agencies for agricultural runoff and BMPs are the Water Resources Commission (WRC), the MDNR. Office of Land Use, the Michigan Department of Agriculture (MDOA), the Michigan Soil Conservation Committee (MSCC), the county Soil Conservation District, and the county Drain Commissioner. Statewide soil erosion and sedimentation control rules are promulgated by the WRC, with the assistance of MDOA and are to include "provisions

118 Ohio Administrative Code, 1501:15-5-01(B)(26)

for the review and approval of site plans, land use plans or permits relating to erosion control and sedimentation control". (§282.105)

The administration, such as the issuance of permits, and enforcement of the Act is carried out at the local level. Each county board of commissioners is to designate a county agency from among the Drain Commissions, Road Commissions or Building Inspectors, to perform this function in unincorporated areas (§282.106), while the governing body of a city, village or charter township may designate a local agency to perform this function within its boundaries (§282.197). The issuance of permits is governed by §282.109.

For the most part exceptions remove agriculture from the Act's regulatory scheme. Normal tilling, planting and harvesting of agricultural crops of five acres or less is excepted. Agricultural practices conducted on land five acres or greater is also excepted from the Act when they are carried out in accordance with a current conservation plan. A formal conservation plan may be waived if the board of the local SCD determines that current agricultural practices are being effectively controlled to meet the requirements of the Act.

The MSCC is made up of seven members: the Director of the Department of Agriculture, the Dean of Agriculture at Michigan State University, the Director of Natural Resources, and four "practical farmers appointed by the governor from among directors of several districts (§284.4). The MSCC may employ an administrative officer and other required experts, agents, and other employees. Among MSCC's powers are the following: 1) to offer assistance to local SWCDs in carrying out their powers and programs; 2) to keep such directors informed of experiences and activities of other districts and to facilitate the interchange of advice, experience and cooperation; 3) to approve and coordinate programs of the SWCDs; and 4) to secure cooperation and assistance of U.S. and state agencies in the work of SWCDs and to formulate policies and procedures relative to extending aid in any form from federal or state agencies to such SWCDs.

Policy Implementation: Best Management Practices

Agriculture is a vital part of our region's economy, lifestyle, and tradition. Much of the area is highly productive, classified as prime agricultural land. Productive farming in many areas requires drainage via field tiles and ditches. Protecting the environment while allowing a prosperous farm community requires stewardship and careful management.

Agricultural runoff is caused by precipitation which erodes soils and carries nutrients, pesticides, and herbicides away from their point of origin and throughout the watershed. During large storms, the runoff to surface water and infiltration to ground water increases and so does the rate of pollutant movement. Agricultural environmental programs recommend a series of "Best Management Practices" (BMPs) designed to meet Clean Water Act goals. BMPs are implemented through technical assistance, educational outreach, and voluntary incentives.

Water management practices include ditch maintenance, outlet protection structures, subsurface tile drainage, contour farming, diversions, and grassed waterways to collect and dispose of excessive runoff water at non-erosive velocities. These practices have been and continue to be an important part of erosion control in Northwest Ohio, where drainage is necessary for productive farming.

Best Management Practices for Agricultural Pollution Abatement, are summarized below. Not all of these practices will be useful in all areas of the TMACOG region. Selection of specific BMPs should be based on site and local conditions for each watershed.

Michigan Department of Agriculture, as discussed earlier, has established Generally Accepted Agricultural and Management Practices (GAAMPs) for farms and farm operations. This Plan incorporates by reference the three categories GAAMPs related to manure management, pesticide use, and nutrient use.

Conservation Tillage

Leaving crop residue on the surface before and during planting protects topsoil and reduces erosion. Pieces of crop residue shield soil particles from rain and wind. No-till and conservation tillage techniques that leave at least 30% residue cover are recommended practices. Where soil erosion by wind is a primary concern, the goal is top maintain at least 1,000 pounds of flat small grain residue on the surface (approximately 30% residue cover) during the critical erosion period. In our region conservation tillage is important because phosphorus attaches to fine silt and clay particles. Techniques that control erosion are therefore also effective in reducing phosphorus loading that ultimately reaches Lake Erie. Use of conservation tillage is recommended at the top priority for agricultural BMPs.

Nutrient Management

Managing the times, forms and rates of application can reduce nutrient runoff. This Plan recommends following nutrient application rates given in the *Ohio State University Extension Agronomy Guides, Bulletin 472* and *Extension Bulletin E-2567* (July 1995). Following the Ohio State University recommendations will ensure realistic yield goals and minimize nutrient transport concerns. Bray P-1 and Bray P-2 are common testing methods used to measure the amount of phosphorus in the soil. Bray P-1 determines the amount of readily available phosphorus that can be found in the soil. Bray P-2 measures the water soluble phosphates and other phosphates that become available later. Bray P-1 is the most accepted measure for agricultural phosphorus use recommendations.

To control nitrate levels, apply nitrogen as close as possible to the time the crop will utilize the nitrogen, using split applications as necessary. Fall application of nitrogen is discouraged. Plant grass cover crops to tie up excess nitrogen and other nutrients for recycling of nutrients to the next crop. Nutrient management techniques include soil testing fields to determine amount of nutrients needed, and variable rate application equipment (e.g., “Soil Doctor”) to apply just the amount of nutrients crops require. Fall application of nitrogen fertilizer should be discouraged.

Comprehensive Nutrient Management Plans (CNMP) plans are highly recommended for livestock operations. A CNMP is a detailed, specific plan designed for a particular farm with guidelines set by NRCS, and may be prepared through County SWCDs. Manure and Nutrient Management is managing the sources, rates, forms, timings, placements and utilization of manure, other organic by-products, bio-solids, and other nutrients in the soil and residues. The goal is to apply manure to agricultural land at an agronomic rate, efficiently using its nutrients to supply soils and plants to produce food, forage, fiber, and cover while minimizing the transport of nutrients to ground and surface water and environmental degradation. The CNMP is a component of a farm’s Conservation Plan. It is used in conjunction with crop rotations, residue management, pest management, conservation buffer practices, and/or other practices needed on a site-specific basis to address natural resource concerns and landowner objectives. A CNMP controls manure runoff applied to cropland, feedlot runoff from a livestock feeding operation, maximizes nutrients from manure, minimizes fertilizer purchase required, and address aesthetics and odor concerns.

Filter Strips

Vegetative strips along waterways trap a portion of sediment and other pollutants in runoff water that would otherwise flow into neighboring streams, carrying nutrients with it. The term “filter strip” usually refers to a grassed area between the field and stream. Its purpose is to remove pollutants from field runoff water but not necessarily provide riparian habitat. Grassed filter strips should be at least 20 feet wide. They are recommended wherever possible on both sides of streams and ditches in agricultural areas.

Grassed Waterways

Grassed waterways are a BMP that reduce gully erosion by transporting concentrated runoff to a single outlet. They are used to provide surface drainage from fields. The drainageway is graded and shaped to form a smooth, bowl-shaped channel. The area is seeded to grasses. Runoff water draining from the field flows over the grass, rather than eroding soil. This technique minimizes sediment and nutrients in the runoff, and prevents gully erosion.[119]

Riparian Buffer Areas

A riparian buffer filters sediment, nutrients, pesticides, and pathogens out of field runoff like a filter strip, but also provides habitat. Forested riparian areas especially absorb nutrients from field runoff water. Even narrow riparian forest strips on flat land are effective filters. A strip as narrow as 50 feet can remove a significant amount of nitrogen and phosphorus from surface and subsurface runoff. However, wider buffer zones are desirable for other benefits, such as wildlife habitat.

Riparian buffers play an important role in aquatic habitat as well. Forested banks help make streams suitable for fish and other aquatic creatures. Tree roots help stabilize stream banks and provide cover for fish and the macroinvertebrates that form the base of the food chain. Leaves that fall into the stream are the primary food source for small aquatic animals such as insect larvae. Branches overhanging streams also helps maintain proper water temperature to support aquatic life. In the summer, the shade keeps water temperature cool; cold water holds more dissolved oxygen, supporting more aquatic life.[120]

Grade Control Structures

Grade control structures are earthen, wooden or concrete, or other outlet controls built across a drainageway to prevent gully erosion. They include low head dams, pipe drops, and rock chutes. They lower runoff from a higher grade to a lower grade over a short distance without gullying.

Windbreaks

Rows of trees and shrubs protect fields from wind erosion and provide wildlife habitat. Multiple rows of coniferous trees or a combination of coniferous and deciduous trees are planted to protect a farmstead, field, or feedlot from wind and snow. One or two rows of shrubs are also beneficial. The established windbreak slows wind on the downwind side for a distance of 10 times the height of the trees. The tree rows also act like a snow fence. Field windbreaks can be planted to reduce wind speed in open fields. They should be planted on at least the north and west sides of the area to be protected.

Wetland Restoration/Enhancement

Wetlands filter out nutrients, chemicals, and sediment from runoff water, and help keep them out of ground and surface water. Restoration of former wetlands and oxbows and enhancement of existing wetlands are encouraged, especially along streams and in floodplains. Wetlands control and reduce pollutants from agricultural runoff, provide aquatic and riparian habitat, and can serve as flood plains to reduce flooding problems.

Stream Protection

Stream banks should be stabilized and protected against scour and erosion by vegetative or structural means to reduce sediment loads and pollution. Vegetative means are preferred over structural means because vegetation provides habitat and some nutrient uptake in addition to protecting stream banks.

---

119 *Conservation Choices: Your Guide to 30 Conservation and Environmental Farming Practices;* USDA Soil Conservation Service [now NRCS], 1994

120 *Ohio's Streamside Forests*, Ohio DNR Division of Natural Areas and Preserves, 1991

Livestock should be excluded from streams and stream banks to prevent soil compaction and loss of vegetation. In addition, livestock exclusion will prevent manure deposition in the stream.[121]

Pest Management

- Agricultural pest infestation should be managed to reduce adverse effect on plant growth but be environmentally acceptable. The principles of an Integrated Pest Management (IPM) program should be applied.
- Use crop rotations, crop varieties resistant to target pests, and adjustment of planting dates to help control weed, insect, and disease problems.
- Minimize pesticide use; encourage point application rather than applying pesticide to an entire field.
- Agricultural pesticides are common in area streams. Among the most widely used chemicals are the herbicides Atrazine, Metolachlor and Alachlor. For the Maumee River, Atrazine exceeds the lifetime drinking water exposure level about 13% of the time[122] (mostly in the spring) and Alachlor 7%. For Metolachlor, exceedence rates are under 1%. These concentrations, which are likely to apply to other streams as well, are well within safety limits. To make sure that water supplies continue to be safe, efforts should be made to control and reduce pesticide use.[123]
- Consideration of pesticide characteristics such as solubility, toxicity, persistence and adsorption is desirable. The relations to site characteristics such as soil and leaching potential, geology, depth to water table, proximity to surface water, and topography should be considered.
- Pesticides listed with a “groundwater advisory” on the label have been identified as having a significant impact on surface and groundwater. Application on soils with a high leaching potential or require additional management. Pesticides with groundwater advisories include Alachlor, Metolachlor, Atrazine, Cyanazine, Simazine, Metribuzin, and Clopyralid. [124]

Cover Crops

A crop of close-growing grasses, legumes, or small grain is recommended for seasonal protection and soil improvement. This practice reduces erosion and nutrient runoff during periods when the major crops or their residue do not furnish adequate protection for the topsoil. Recommended crops include oats, cereal rye, winter wheat, alfalfa, sweet clover, red clover, crown vetch, sudan grass, and hairy vetch.[125]

ODNR Cost Share Eligible Practices

Ohio Administrative Code 1501:15-5-13 enables ODNR Division of Soil and Water Conservation to provide cost share funding for eligible practices. The Division may offer to share the cost of establishing eligible best management practices up to fifteen thousand dollars per person per year. If other public funds are involved in cost sharing to establish an eligible best management practice or practices, state funds can be used only to the extent that the combined public funds amount to no more than seventy-five per cent of the cost of establishing the best management practice or practices, or not more than fifteen thousand dollars per person per year, whichever is smaller. The maximum of fifteen thousand dollars of

---

121 Maumee RAP Recommendations for Implementation, 1991

122 Data from Heidelberg College Water Quality Laboratory

123 *Portage River: A Resource Worth Protecting,* TMACOG/Portage River Basin Council 1997

124 Maumee RAP Recommendations for Implementation, 1991

125 *Conservation Choices: Your Guide to 30 Conservation and Environmental Farming Practices;* USDA Soil Conservation Service [now NRCS], 1994

public funds per person per year limit may be waived by majority vote of the Ohio Soil and Water Conservation Commission.[126]

Eligible practices include but are not limited to:

1. Animal waste storage structures;
2. Settling basins and filter strips;
3. Critical area seeding and fencing;
4. Off stream watering and stream crossing stabilization;
5. Roofing and gutters;
6. Water diversions;
7. Grass waterways;
8. Water and sediment control basins;
9. Erosion control structures;
10. Wetland treatment facilities;
11. Composting facilities; and
12. Other practices as approved by the Ohio Soil and Water Conservation Commission.

Further details should be requested from ODNR: there are qualifying requirements. For example, cost share funds will be available only to owners and operators with a current operation and management plan.

- ### Cost Sharing and Technical Assistance Programs

The SWCDs, USDA, Ohio DNR, Ohio EPA, and Ohio Department of Agriculture cooperate and jointly provide conservation assistance to farmers through a number of programs. Each focuses on a specific aspect of non-point pollution control or habitat restoration. These programs use two techniques to implement their goals. One is providing technical expertise from professional staff who advise farmers on what BMPs to use, and how to use conservation that will help make farming profitable while protecting the environment. The second is providing financial incentives for participating in voluntary use of BMPs, known as cost sharing.[127]

- ### Conservation Reserve Program (CRP)

The Conservation Reserve Program is a voluntary program for agricultural landowners. Through CRP, farmers can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland. CRP provides land rental payments to farmers who are willing to sign long-term contracts converting cropland to filter strips, riparian forest buffers, wetland restorations, or windbreaks. CRP and CREP (see below) contracts are administered by USDA Farm Services Agency (FSA) in close cooperation with USDA NRCS, Ohio DNR, and the county SWCDs. CRP is available in Monroe County as well.

CRP is administered by FSA, and program support is provided by NRCS, the OSU Extension, state forestry agencies, and local Soil and Water Conservation Districts.

- ### Conservation Reserve Enhancement Program (CREP)

In all five Ohio counties in the TMACOG planning area, the State of Ohio offers an enhanced CRP program which provides increased incentives to install conservation buffer practices. CREP is a special program in Ohio available only in the Lake Erie basin. Practices include filter strips along watercourses, wildlife habitat along watercourses, wetland restoration, field windbreaks, and riparian buffers and tree planting. CREP enhances CRP by providing additional incentives and extending the reserve period.

---

126 Ohio Administrative Code 1501:15-5-13(A)

127 *Ohio Lake Erie Buffer Program Strategic Plan 2000-2004*; Lake Erie Buffer Team, a coalition of 21 cooperating organizations and agencies

o Northwest Ohio Windbreak Program

The NW Ohio Windbreak program is an interagency effort of USDA, ODNR, and county SWCDs to assist land owners in establishing field windbreaks in the area, including the entire TMACOG region. Applications may be made through the County SWCDs or Ohio DNR Divisions of Forestry or Wildlife. The program provides cost share funds to landowners for establishing windbreak vegetation. It covers a total of 15 counties on a rotating basis. The program is available in Ottawa, and Sandusky, Counties in even years, and in Lucas and Wood every year.

o Wetlands Reserve Program (WRP)

The Wetlands Reserve Program (WRP) is a voluntary program to restore and protect wetlands on private property. It is an opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal agricultural land. Land owners can establish conservation easements or can enter into restoration cost=-share agreements where no easement is involved. In exchange for establishing a permanent easement, the landowner receives payment up to the agricultural value of the land and 100% of the wetland restoration cost. The program is administered by USDA FSA with technical support from NRCS through partnerships with state agencies (OEPA, ODNR, MDEQ, MDNR), the Fish and Wildlife Service (FWS), and Ducks Unlimited.

o Clean Water Act §319 Non-Point Source Grants

These non-point source grants are often called “319” because they provide cost share and funding and technical assistance through §319 of the Clean Water Act. Priorities and BMP policies were jointly developed by Ohio EPA and Ohio DNR through the Nonpoint Source Assessment and Nonpoint Source Management Program. Ohio developed its program through Ohio EPA *State of Ohio Nonpoint Source Assessment* (1990) and the ODNR/OEPA, *Ohio Nonpoint Source Management Program (1992*, revised 1993). This Plan support the goals and programs of the statewide Plan.

The program is a significant resource for the TMACOG region because it funds many educational, planning, and cost share projects. 319 is important to agricultural runoff by providing funding to prepare watershed plans, conduct nonpoint source educational programs, providing watershed coordinators, and cost share incentives to implement BMPs. §319 grants are available in Monroe County as well.

o Environmental Quality Incentive Program (EQIP)

EQIP is a voluntary USDA conservation program for farmers and ranchers who face serious threats to soil, water, and related natural resources. It provides technical, financial, and educational assistance primarily in designated priority areas. Nationally, half of the funding for EQIP is targeted to livestock-related natural resource concerns and the remainder to other significant conservation priorities. The EQUIP program provides technical, educations, and financial assistance to eligible farmers improve their property to protect the environment and conserve soil and water resources. Participants can take advantage of education in new conservation management practices, technical support, and cost-share assistance and incentive payments.

EQIP is available in both Ohio and Michigan, with an emphasis on either state-identified priority areas or significant statewide concerns. In general, priority areas are defined as watersheds, regions, or areas of special environmental sensitivity or having significant soil, water, or related natural resource concerns. . No priority areas have been established in the TMACOG planning area. Priority areas are determined by a process that begins with local work groups. These local work groups-convened by local conservation districts-do a conservation needs assessment and, based on that assessment, develop proposals for priority areas. These proposals are submitted to the Natural Resources Conservation Service (NRCS) State Conservationist, who selects those areas within the State based on the recommendations from the State Technical Committee.

Cost-sharing may pay up to 75 percent of the costs of certain conservation practices, such as grassed waterways, filter strips, manure management facilities, capping abandoned wells, and other practices important to improving and maintaining the health of natural resources in the area. Incentives may be made to encourage a producer to perform land management practices such as nutrient management, manure management, integrated pest management, irrigation water management, and wildlife habitat management. Incentives may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without the program incentive.

EQIP focuses on designated priority areas, but can be used on other areas as well. In the program's first year of the program, 65% of the funds were used in priority areas. EQUIP contract applications are available at USDA Service Centers. The applications are accepted throughout the year.

Alternative Techniques and Technologies

Since 1980, when the first version of this chapter was completed, conservation tillage and many other techniques that are now standard BMPs have been developed and come into wide practice. New techniques and technologies could further improve soil and water conservation. It is this Plan's policy to encourage development and demonstration of new practices that may be effective in reducing nonpoint source pollution impacts or improving habitat. The examples below are given as examples, and are not intended to exclude other alternative techniques.

Wetland Reservoir Sub-Irrigation

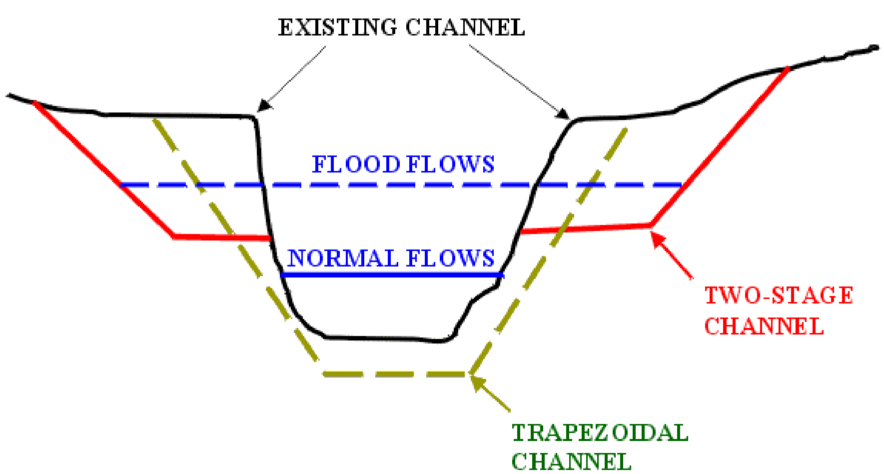
Productive agriculture in northwest Ohio and southwest Michigan requires drainage to remove excess water, often using a tile system. Conventional practice is to drain the water to a river and ultimately Lake Erie. Tile drainage water can be a significant source of nitrates.

Sub-irrigation is an alternative practice that stores runoff water in wetland and reservoirs near the fields. During dry periods, water is pumped back through the tile system. The agricultural benefits are to aid crop production by reducing drought stress, and serving as a source of nitrate. The wetland and reservoir system can reduce the amount of sediment and nitrates that reach streams, and provide wetland habitat. Testing data from Iowa indicates a reduction of nitrates from drainage water from 40 to 98%.[128]

Test data indicates sub-irrigation may be effective in reducing nitrate loadings. In 1997 Ohio tests, average nitrate-N concentrations in water sampled at subsurface drain outlets during February through May were roughly 50% lower when sub-irrigation had been used during the previous growing season than when it had not been applied.[129]

Natural Channel Design

Streams naturally tend to form channels based on the amount of flow, the grade, and how much energy the water has. A stream whose channel is straightened may erode its banks as it dissipates energy and seeks to restore a stable flow regime. The



Two-Stage Channel

128 *Reducing Nitrate in Water Resources with Moderr*

129 *Agricultural Drainage Bulletin 871*, OSU Extensior

result can be sedimentation, requiring future sediment removal.

Research and demonstration projects are being conducted in Northwest Ohio on alternative stream channel designs that may be more stable and do not cause future sedimentation.

One such technique is the "two-stage ditch design." Conventional ditch design is a trapezoidal cross-section with the stream at the bottom of the channel and straight sloping banks. The two stage design uses a wider bottom. The normal flow channel takes up only part of it; the rest is a floodplain "bench." The stream may meander across this bench area, but during normal flow, the bench itself is dry. During high flow, the stream overflows onto the bench and may reach bank full flow.[130]

The goal of research and demonstration of alternative channel designs is to identify designs that will provide drainage required for productive agriculture, but need less maintenance, and cause less erosion and sedimentation.

Implementation Activities

Program activities vary from one district to another follow similar approaches; specifics differ according to local need. Projects may be undertaken by the SWCD, by a group of SWCDs for a multi-county watershed. Where requested and feasible, TMACOG will work with the SWCDs to develop and help administer the project.

- Develop Watersheds Plans
    a. Inventory BMPs used for each watershed, particularly conservation tillage, filter strips, riparian buffers, wetlands, and wetlands.
    b. Inventory present water quality and use attainment status data from the current 305(b) report, and collect additional water quality data as necessary to adequately assess the chemical, biological, and physical integrity of the water. Note particularly whether water quality is impaired due to nonpoint source pollution (including hydromodfication).
    c. Develop a plan for each watershed recommending specific BMPs and land use decisions designed to address nonpoint sources of impairment (including hydromodification).
    d. Prioritize watersheds based on water quality use attainment status and TMDL schedule.
- Educational and Informational Activities
    a. Demonstration plots & projects
    b. Field days, tours, or farm visits
    c. Information packages for local media
    d. Educational meetings
    e. Technical seminars
    f. Pamphlets or publications on use of BMPs
- Technical Assistance and Equipment Availability
    a. SWCDs help farmers implementing conservation tillage, buffer strips and other BMPs by providing technical assistance.
    b. Provide new or innovative conservation tillage equipment for lease or demonstration so that farmers can gain experience with them before committing to purchase.

---

130 Graphic courtesy of Finkbeiner, Pettis, & Strout, Ltd. Used by permission.

- ### Develop and Implement Conservation Cost Share Projects

  a. Use the watershed plan and its selected BMPs to develop cost share programs.
  b. Work with other SWCDs, river basin councils, and TMACOG as appropriate to implement projects on the watershed level.

- ### Adopted Watershed Plans

The following watershed plans have been developed and adopted by the SWCDs and are incorporated into this Plan by reference:

[None at this time]

CHAPTER 7
URBAN RUNOFF

Introduction

The problem with urban stormwater runoff is that the pollution sources are diffuse and not easily identified. Historically, water pollution control has focused on the more obvious point sources: municipal wastewater treatment plants and industrial discharges. The water pollution potential for stormwater runoff was not fully appreciated until repeated studies revealed that urban non-point sources seriously threaten water quality and can exceed the impact of municipal sewage discharges.

Non-point problems are both water quality and quantity based. In urban areas a variety of created surfaces now cover much of the landscape. Many of these surfaces are impervious and therefore prevent rainwater and snowmelt from following their natural course into the soil. Roofs and pavement prevent infiltration completely, while even suburban lawns absorb far less than natural areas. Impervious surfaces therefore increase the rate and volume of stormwater runoff, resulting in higher flows and more frequent floods. In Swan Creek (Lucas Co.) for Example, flood flows have increased 17 to 85 percent from pre-settlement times. The elevated flows increase the erosion of waterway beds and banks[131]. Other negative impacts include increasing the receiving waters temperature, changing habitat, and decreasing stream flow stability.

Most land use activities deposit detrimental and sometimes hazardous materials on the impervious surfaces: sediments such as dust and sand, toxic metal particles, pesticides and fertilizers, petroleum products, harmful bacteria, salt, pet waste, and trash. As rainfall and snowmelt move rapidly across this transformed landscape, these pollutants are carried to surface and underground collection systems. Eventually these polluted flows reach waters that we use for drinking, swimming, fishing, and recreation.

In most communities, the majority of impervious cover is related to the transportation infrastructure-roads and parking lots. Automobiles contribute a number of different types of pollutants to urban runoff. High levels of metals are found in tire wear, used motor oil and grease, diesel fuel, and vehicle rust. Engine coolants and antifreeze containing glycols are toxic and can contribute to high BOD in the receiving waters. Generally, fossil fuel combustion is the largest contributor of nitrogen to the waters in urbanized areas of the United States. Salts are used to keep facilities free of ice, but in large volumes can be toxic to fish and other wildlife. These pollutants accumulate on impervious surfaces during dry weather conditions, only to form a highly concentrated first flush during storm events.

Landscaping practices and poor housekeeping practices are other potential sources of pollutants in urban runoff. Chemicals that are used in fertilizers and pesticides can lead to water quality impacts. Over and improper application at homes, golf courses, public parks, etc. is very common and the excess eventually makes its way to ditches and streams. Rain and melting snow erodes piles of stored materials such as sand, loose topsoil, or road salt that is left uncovered. Similarly, precipitation can flush contaminants off “dirty” equipment that is stored outside. These common pollutants can degrade the quality of receiving waters, almost to the same degree as if they were introduced by direct discharge.

---

[131] *Flooding and Erosion Related to Urbanization: Swan Creek Watershed, Lucas County, Ohio.* Earthview Inc., April 1973.

Erosion rates from construction sites are significantly greater than from almost any other land use. Field studies and erosion models have shown that erosion rates from construction sites are typically an order of magnitude larger that row crops and several orders of magnitude greater that rates from well-vegetated areas such as forest or pastures[132]. Excess sediment causes a number of problems for waterbodies. Suspended sediments increase turbidity and reduce light penetration in the water column, which directly impacts aquatic organisms. Long-term effects of sedimentation include habitat destruction and increased difficulty in filtering drinking water.

Illicit or illegal connections to the storm sewers from homes and businesses introduce pollutants and pathogens to the storm sewers that are released without appropriate treatment. Sources of illicit discharges include, but are not limited to: sanitary wastewater, effluent from septic tanks, car wash, laundry, household waste, and other miscellaneous waste products. Industrial facilities often negligently discharge wastewater that should be directed to the sanitary sewers into floor drains, dry wells and cesspools, which feed into their stormwater system. The result is untreated discharges that contribute high levels of pollutants into receiving waterbodies.

Table VII-1. Categories of Primary Stormwater Contaminants

Category	Examples
Metals	Zinc, Cadmium, Copper, Chromium, Arsenic, Lead
Organic Chemicals	Pesticides, Oil, Gasoline, Grease
Pathogens	Bacteria, Viruses, Protozoa
Nutrients	Phosphorous, Nitrogen
Biochemical Oxygen Demand (BOD)	Grass clippings, Hydrocarbons, Animal waste, Fallen leaves
Sediment	Sand, Soil, Silt
Salts	Sodium Chloride, Calcium Chloride

Source: Bannerman, R.T., D.W. Owens, R.B. Dodds, and N.J. Hornewer, *Sources of Pollution in Wisconsin Stormwater,* Water, Science and Technology vol. 28, no. 3-5, 1993.

Growth trends have resulted in significant shifts in population from the urban to the suburban areas and accelerated stormwater problems. Urban development increases the amount of impervious surface in a watershed, as farmland, forests, and meadowlands with natural infiltration characteristics are converted into roads, parking lots, buildings, driveways, and sidewalks with virtually no ability to absorb stormwater. The effect of impervious surfaces on the volume of stormwater runoff is dramatic. For example, a one-inch rainstorm on a 1-acre natural meadow produces approximately 218 cubic feet of runoff. The same storm over a 1-acre paved parking lot would produce almost 16 times that volume, 3,450 cubic feet of runoff. The proliferation of hard surfaces not only changes the volume of stormwater flows, but also the distribution of flows over time. The stormwater is forced off the land immediately, causing much sharper peaks in runoff. These “flashy” flows can lead to problematic changes in the hydraulics of the system.

[132] 64 Federal Register 235 (December 1999).

Table VII-2. Impacts from Increases in Impervious Surfaces					
Increased Imperviousness Leads to:	**Resulting Impacts**				
	Flooding	**Habitat Loss**	**Erosion**	**Channel Widening**	**Streambed Alterations**
Increased volume	●	●	●	●	●
Increased peak flow	●	●	●	●	●
Increased peak flow duration	●	●	●	●	●
Increased stream temperature		●			
Decreased base flow		●			
Increased sediment loadings	●	●	●	●	●
Source: *Urbanization of Streams: Studies of Hydrologic Impacts,* EPA 841-R-97-009, 1997					

Some of the older urbanized areas in the region have combined sewers, where stormwater and sanitary sewage flow in the same system. The stormwater problems associated with urban areas can be intensified by occasional overflows from these combined systems. Overflow points and treatment plant bypasses are provided, by design, to prevent damage to the wastewater treatment plant and reduce local flooding during periods of high flow. While combined sewers are no longer permitted and most communities have developed plans to reduce the number of combined sewers, upgrading existing systems requires complex engineering and extremely expensive capital improvement outlays.

According to the 1996 National Water Quality Inventory, a biennial summary of State surveys of water quality, approximately 40 percent of surveyed U.S. waterbodies are still impaired by pollution and do not meet water quality standards. A leading source of this impairment is polluted runoff. In fact, according to the Inventory, 13 percent of impaired rivers, 21 percent of impaired lake acres and 45 percent of impaired estuaries are affected by urban/suburban stormwater runoff and 6 percent of impaired rivers, 11 percent of impaired lake acres and 11 percent of impaired estuaries are affected by construction site discharges. In addition, population and development trends indicate that by 2010 more than half of the nation will live in coastal towns and cities. Runoff from these rapidly growing urban areas will continue to degrade coastal waters. Urban and suburban development, with the expansion of impervious surface area and proliferation of pollutants, produce increased runoff volumes loaded with pollutants that damage our waterways.

A majority of the point sources have been addressed through the early focus of the Clean Water Act. Now, the more difficult non-point sources must be dealt with in order to continue to improve our water resources. In Northwest Ohio’s and Southeast Michigan’s urbanized areas, stormwater runoff continues to be a significant cause of water pollution. The purpose of this chapter is to revise and update the urban stormwater runoff information found in the Area Wide Water Quality Management Plan and to provide current recommendations suitable for implementation by local management agencies. The chapter includes a discussion of urban runoff issues in the region, applicable policy statements, stormwater management alternatives, and a recommended program for policy implementation.

Problem Identification

Under the Federal Clean Water Act, every state must adopt water quality standards to protect, maintain and improve the quality of the nation's surface waters. These standards represent a level of water quality that will support the goal of "swimmable/fishable" waters. Ohio EPA and Michigan DEQ have assigned specific set of water quality standards to most major streams and rivers throughout the States. Ohio EPA divides each stream into segments and assigns each segment a specific use designation. Then, using multiple chemical, physical and biological measures, Ohio EPA determines if the stream segments are in attainment of their use designation. The biological parameters are emphasized because resident organisms are good indicators of water pollution. A healthy fish or invertebrate community is also associated with high quality recreational opportunities. Statistics for the most recent two year reporting cycle (representing data collected in 1997-98) showed only 52.3% of the streams meeting their aquatic life use designation.

Waterbodies in the TMACOG Region Impaired by Urban Sources of Water Pollution			
Lower Sandusky River Watershed [Source: 1996 Ohio EPA 305b Report]			
Segment	**Miles Assessed**	**Urban Sources of Impairment**	**Urban Causes of Impairment**
Sandusky River (Wolf Creek to Lake Erie)	22.73	Flow regulation /modification, Dam construction, Industrial point sources, Municipal point sources	Flow alteration, Other habitat alterations, Siltation, Organic enrichment /DO
Muddy Creek (Gries Ditch to Sandusky Bay)	20.06	Municipal point sources, Channelization	Organic enrichment /DO, Unionized Ammonia, Other habitat alterations, Siltation
Muddy Creek (Headwaters to Gries Ditch)	9.24	Channelization, Removal of riparian vegetation, Urban Runoff/Storm Sewers (NPS)	Habitat alterations, Organic enrichment /DO
Portage River Watershed [Source: 1996 Ohio EPA 305b Report]			
Segment	**Miles Assessed**	**Urban Sources of Impairment**	**Urban Causes of Impairment**
Portage River (Sugar Creek to Lake Erie)	17.5	Industrial point sources, Combined sewer overflow	Organic enrichment /DO, Siltation, Priority organics, Metals
Portage River (M. Br. Portage River to Sugar Creek)	17.71	Major municipal point source, Combined sewer overflow, Municipal point sources	Nutrients, Organic enrichment /DO, Nutrients
Rocky Ford	15.4	Combined sewer overflow, Minor municipal point source, Onsite wastewater systems (septic tanks)	Organic enrichment /DO, Flow alteration, Metals
Air Products Trib.	1.97	Industrial Point Sources	Metals, Organic enrichment /DO
East Branch Portage River	24.37	Major municipal point source, Combined sewer overflow, Onsite wastewater systems (septic tanks), Channelization	Priority organics, Metals, Non-priority organics, Organic enrichment /DO, Other habitat alterations
North Branch Portage River	25.8	Channelization, Municipal point sources	Other habitat alterations, Nutrients
Lake Erie Tributaries (Maumee R. to Portage R.) [Source: 1996 Ohio EPA 305b Report]			
Segment	**Miles Assessed**	**Urban Sources of Impairment**	**Urban Causes of Impairment**
Toussaint Creek (Headwaters to trib. E. of Genoa)	3.2	Urban runoff/Storm sewers (NPS), Channelization, Dredging, Removal of riparian vegetation, Streambank modification /destabilization	Siltation, Other habitat alterations
Crane Creek	7.57	Land development /suburbanization, Removal of riparian vegetation	Pesticides, Priority organics, Metals, Siltation, Flow alteration, Other habitat alterations

Cedar Creek	16.15	Minor municipal point Source, Channelization, Flow regulation /modification, Removal of riparian vegetation, Streambank modification /destabilization	Pesticides, Priority organics, Metals, Siltation, Flow alteration, Other habitat alterations
Dry Creek	7.5	Urban runoff/Storm sewers (NPS), Channelization, Dredging, Removal of riparian vegetation, Streambank modification /destabilization, Land development Suburbanization, Onsite wastewater systems (septic tanks)	Pesticides, Priority organics, Metals, Siltation, Flow alteration, Other habitat alterations, Organic enrichment /DO
Driftmeyer Ditch	2.43	Land development /Suburbanization, Onsite wastewater systems (septic tanks), Channelization, Removal of riparian vegetation, Streambank modification /destabilization	Nutrients, Siltation, Organic enrichment /DO, Other habitat alterations
Wolf Creek	2.45	Highway/road/bridge/sewer line, Land development /Suburbanization, Removal of riparian vegetation, Streambank modification /destabilization, Channelization, Dredging	Siltation, Flow alteration, Other habitat alterations, Nutrients
Otter Creek	10.23	Major industrial point source, Minor industrial point source, Urban runoff/Storm sewers (NPS), Landfills, Hazardous waste, Channelization, Removal of riparian vegetation, Streambank modification /destabilization	Unknown toxicity, Siltation, Flow alteration, Other habitat alterations, Total toxics, Oil and grease
Lower Maumee River Watershed [Source: 1996 Ohio EPA 305b Report]			
Segment	**Miles Assessed**	**Urban Sources of Impairment**	**Urban Causes of Impairment**
West Branch Tontogany Creek	0.5	Municipal point sources	Organic enrichment/DO
Maumee River (Bad Creek to Beaver Creek)	4.98	Dam construction, municipal point sources	Siltation, Other habitat alterations, Organic enrichment /DO
Maumee River (Swan Creek to Lake Erie)	5.22	Major municipal point source, Combined sewer overflow, Other urban runoff, Removal of riparian vegetation, Streambank modification /destabilization, Drainage/filling of wetlands, Spills	Pesticides, Priority organics, Metals, Nutrients, Siltation, Total toxics
Maumee River (Waterville to Swan Creek)	10.46	Combined sewer overflow, Other urban runoff, Hydromodification	Pesticides, Priority organics, Metals, Siltation, Nutrients, Other habitat alterations, Total toxics

Duck Creek	3.56	Other urban runoff, Sludge, Channelization, Removal of riparian vegetation, Streambank modification /destabilization, Spills, Contaminated sediments	Pesticides, Priority organics, Metals, Siltation, Salinity /TDS /chlorides, Flow alteration, Other habitat alterations, Oil and grease
Swan Creek (Blue Creek to Maumee River)	10.8	Other urban runoff, Hydromodification, Land development /Suburbanization	Pesticides, Priority organics, Metals, Siltation, Other habitat alterations
Heilman Ditch	0.5	Other urban runoff, Highway maintenance and runoff	Unknown toxicity, Flow alteration, Other habitat alterations
Wolf Creek	2.5	Highway/road/bridge/sewer line, Land development /Suburbanization, Other urban runoff, Streambank modification /destabilization	Siltation, Flow alteration, Other habitat alterations, Total toxics
Blue Creek	1.7	Land development /Suburbanization, Other urban runoff, Removal of riparian vegetation, Streambank modification /destabilization, Hydromodification	Pesticides, Metals, Priority organics, Siltation, Flow alteration, Other habitat alterations, Other habitat alterations
Grassy Creek	5.0	Onsite wastewater systems (septic tanks), Land development /Suburbanization, Other urban runoff, Hydromodification	Pesticides, Priority organics, Metals, Siltation, Other habitat alterations, Organic enrichment /DO, Nutrients
Ottawa River	19.75	Major industrial point source, Combined sewer overflow, Land development /Suburbanization, Other urban runoff, Landfills, Channelization, Removal of riparian vegetation, Streambank modification /destabilization	Pesticides, Priority organics, Siltation, Other habitat alterations
Flieg Ditch	1	Highway/road/bridge/sewer line, Land development /Suburbanization, Other urban runoff, Dredging, Removal of riparian vegetation, Streambank modification/destabilization, Highway maintenance and runoff	Flow alteration, Other habitat alterations, Siltation, Unknown toxicity
Heldman Ditch	5.5	Highway/road/bridge/sewer line, Land development/ Suburbanization, Other urban runoff, Channelization, Removal of riparian vegetation, Streambank modification/destabilization, Highway maintenance and runoff	Nutrients, Siltation, Flow alteration, Other habitat alterations

Haefner Ditch	4.4	Land development /Suburbanization, Other urban Runoff, Hydromodification, Removal of riparian vegetation, Streambank modification /destabilization, Highway maintenance and runoff	Unknown toxicity, Other habitat alterations, Siltation
Hill Ditch	2.6	Other Urban Runoff, Highway/road/bridge/sewer line, Land development /Suburbanization, Removal of riparian vegetation, Streambank modification /destabilization, Channelization	Flow alteration, Other habitat alterations, Siltation, Nutrients
Sibley Creek	2	Other urban runoff, Channelization, Dredging, Streambank modification /destabilization, Spills	Unknown toxicity, Siltation, Flow alteration, Other habitat alterations
Ten Mile Creek	10	Land development /Suburbanization, Removal of riparian vegetation, Dam construction	Pesticides, Priority organics, Siltation, Other habitat alterations, Metals
N. Branch Ten Mile Creek	1	Highway/road/bridge/sewer line, Land development /Suburbanization, Other urban runoff, Flow regulation /modification	Pesticides, Priority organics, Metals, Flow alteration, Other habitat alterations
Shantee Creek	6	Minor industrial point source, Other urban runoff, Onsite wastewater systems (septic tanks), Channelization, Removal of riparian vegetation, Streambank modification /destabilization, Contaminated sediments	Unknown toxicity, Pesticides, Priority organics, Metals, Organic enrichment /DO, Flow alteration, Other habitat alterations, Oil and grease
Tifft Ditch	2	Land development /Suburbanization, Other urban runoff, Channelization, Removal of riparian vegetation, Streambank modification /destabilization	Siltation, Flow alteration, Other habitat alterations
Silver Creek	7.3	Land development /Suburbanization, Channelization, Removal of riparian vegetation, Streambank modification /destabilization, Contaminated sediments	Pesticides, Priority organics, Metals, Nutrients, Organic enrichment /DO, Flow alteration, Other habitat alterations, Oil and grease
Ketcham Ditch	1.4	Land development /Suburbanization, Other urban runoff, Channelization, Removal of riparian vegetation, Streambank modification /destabilization	Siltation, Flow alteration, Other habitat alterations

Water Quality Standards Non-Attainment Sites: Southern Monroe County, Michigan [Source: 2000 MDEQ 305b Report]		
Watershed	**Miles Assessed**	**PROBLEM**

Ottawa River	1	FCA-PCBs; WQS exceedences for the pesticides lindane (a-BHC) and aldrin

Developed Areas

Older, developed areas face expensive infrastructure challenges related to sewer system capacity, maintenance, replacement, and surface runoff. The construction of storage facilities to retain and treat water from combined sewer systems and the separation of sewer systems to address pollution from wet weather events eliminate only one class of the water quality impairments. These programs need to be augmented by new initiatives to limit pollution from non-point sources such as street dirt and residential sources. At the same time some of these areas are faced with declining tax bases and aging infrastructure, decreasing available revenue to support water quality programs.

Aging Infrastructure

Drainage in the TMACOG planning area has historically been poor, due primarily to lack of relief and a low density of natural streams to drain the land. Except for extreme western Lucas County, the region was largely characterized by swamp forest and marshland. The area was historically referred to as “The Great Black Swamp”. These poor drainage conditions severely retarded agriculture and urbanization. Ditch laws passed in the 1860s gave county commissioners in Ohio and Michigan the authority to construct, enlarge, and deepen natural streams and man-made ditches. An extensive ditch system was installed, providing and integrated drainage system for the area that permitted agricultural land uses and settlement. In the urban centers the drainage efforts were more intense.

In the late nineteenth century the need for wastewater treatment had become increasingly apparent. Storm sewer ordinances were amended to allow disposal of sanitary wastes via the storm sewers and construction of these combined sewer systems became an accepted practice. The serious pollution and health risks were not realized until populations grew and treatment of the wastewater became essential. More recently constructed stormwater and wastewater collection systems have been separate systems. Nevertheless, many combined sewers are still in use in older urban areas.

During wet weather, the capacities of combined sewer systems are often exceeded and the combined sanitary wastes and stormwater runoff overflow without treatment. Overflow points and treatment plant bypasses are provided, by design to prevent damage to the wastewater treatment plant and to reduce local flooding during periods of high flow. Combined sewer discharge can be a major source of pollution during the period of overflow.

Combined sewer overflow (CSO) can also be a source of long-term pollution in the receiving water, since the solids that are discharged settle to the bottom and form sludge deposits. These deposits create a continuing oxygen demand and bacterial contamination that persist during periods of dry weather. While most communities are aware of their CSO problems, separation of storm and sanitary sewers requires extensive capital improvements that create significant financial challenges. By either proactive actions or consent decree, communities have developed plans to reduce this source of pollution. Table VII-4 lists the facility planning areas that have identified CSO problems and summarizes abatement plans. More detailed information is available in the Facility Planning area Chapter (Chapter IV) of this document.

Table VII-4. Communities in the TMACOG Region with Combined Sewer Overflows (CSOs)
Bowling Green
Clyde
Elmore
Fostoria
Fremont
Genoa
Gibsonburg
Green Springs
Luckey
North Baltimore
Oak Harbor
Perrysburg
Port Clinton
Swanton
Toledo
Woodville

Illicit Discharges

Discharges from storm sewers often include wastes and wastewater from non-stormwater sources. Significant portions of these dry weather flows are from illicit and/or inappropriate discharges and connections to the storm sewer system. Illicit discharges enter the system through either direct connections (e.g., wastewater piping either mistakenly or deliberately connected to the storm drains) or indirect connections (e.g., infiltration into the storm sewer system from cracked sanitary systems, spills collected by drain outlets, or paint or used oil dumped directly into a drain). The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies. Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health.

Since connections to storm sewers are most often obscured or underground, tracking and identifying illicit connections is not easy. Sometimes the connections were made a long time ago and the property owner is unaware of their existence. Individuals and business may intentionally dump waste oil, excess pesticides and other chemicals, or simply trash and yard waste into storm drains as an inexpensive way to dispose of the materials. In other cases, wastewater lines that should be connected to the sanitary sewer system are inadvertently or negligently connected to the storm sewer system.

Uncontrolled Runoff

Typically there are limited urban runoff control practices in use in the older, developed urban areas. New site drainage design regulations most often only apply to new development. Implementing stormwater controls on existing sites is more expensive and challenging from an engineering standpoint. Expanding urbanization has produced higher rates and larger volumes that overwhelm the existing drainage systems. The higher flows cause changes in urban stream morphology and increased streambank erosion. Eroded banks in turn have created damage to adjacent property as well as a potential safety hazard.

Lack of Space or Easements for System Maintenance and Improvement

Most urban sites are surrounded by existing development that limits or prohibits structural water quality control practices. These sites may not be able to or have difficulty installing structural controls. Design engineers must be creative in order to gain needed flood control and deal with water quality concerns. Alternatives to traditional detention ponds or large infiltration structures must be identified. Improving or dredging drainage ditches and streams can be nearly impossible when confined to a narrow right-of – way with few access points. Obtaining additional space through easements or purchase can be politically and financially problematic.

Runoff from Sites Constructed Prior to Stormwater Management Requirements

Many existing sites were developed prior to stormwater management regulations and have been grandfathered into the system. There are few options through the regulatory process to enforce new stormwater detention or quality requirements on these sites. Therefore the system must be capable of accepting this runoff volume and potential pollutants must be eliminated at their source.

In many older industrial sites, storm drainage systems are undocumented, undersized, or damaged. Often the present staff is unaware of the systems location or condition. Drainage areas, pipe capacities, and runoff flow that exceed the systems' capacities can all cause water quality problems. Significant discharges at locations where flow is not expected can lead to flooding, erosion and sedimentation, and release of harmful toxins.

Street Runoff With No Controls

From the standpoint of stormwater quality, streets have been identified as the single most important source of stormwater pollutants. Not only do streets produce some of the highest concentrations of phosphorous, suspended solids (sediment) and bacteria, but they also generate a disproportionate amount of runoff volume from the watershed.[133] Of particular concern for water quality, are soluble metals, which are much more likely to exert a toxic effect on aquatic life and are not easily removed by natural processes. Table VII-5 identifies common metals associated with the transportation.

[133] Bannnerman, R., D. Owens, R. Dodds, N. Hornewer. 1993. *Sources of pollutants in Wisconsin Stormwater*. Water Science and Technology. 28:3-5pp. 241-259.

Table VII-5. Sources of Heavy Metals from Transportation								
Source	**Cd** cadmium	**Co** cobalt	**Cu** copper	**Fe** iron	**Mn** manganese	**Ni** nickel	**Pb** lead	**Zn** zinc
Gasoline	●		●				●	●
Exhaust						●	●	
Motor Oil & Grease		●		●		●	●	●
Antifreeze				●				●
Undercoating							●	●
Brake Linings			●	●		●	●	●
Tire Wear	●		●				●	●
Asphalt			●			●		●
Concrete			●			●		●
Diesel Oil	●							
Engine Wear					●	●	●	●
Source: *Local Ordinances: A Users Guide*, Terrene Institute and EPA, Region 5, 1995								

Funding

Traditional government funding sources do not address the unique nature and growing problem of stormwater runoff. Unlike water supply and sanitary sewers, typically there is no dedicated funding source for drainage systems. Unless they are affected by flooding, residents do not recognize the benefits that drainage provides. Grants for water pollution from the federal government have shrunk and become more competitive. Low interest loans from federal and state revolving loan funds are designed to fund capital projects and are not applicable for many of the non-capital aspects of a stormwater pollution program. Diversions from a general revenue fund are unreliable and unpopular. Community leaders are reluctant to allocate adequate funds for stormwater pollution control, because the money comes from the same pool as more politically popular programs.

Many of the jurisdictions covered under expanding federal and state stormwater rules do not have the funding sources, organization, or expertise to administer a comprehensive program. Seed money is needed to develop the local institutions required to meet new permit requirements. Increases in funding to existing federal and state grant are needed to provide for development or expansion of local stormwater management plans and organizations.

Due to this lack of dedicated funding sources, local officials are forced into developing alternative solutions. One option that is gaining widespread acceptance is forming a stormwater utility. Stormwater utilities operate similarly to water or sewer, and are funded through service fees or assessments. However, stormwater rate payers are being asked to pay to prevent flooding and water pollution problems, which is not always perceived as necessary. The City of Toledo established a stormwater utility in 2000 to fund long neglected planning, maintenance and capital improvement of their system. This is not an option for the unincorporated areas, which are constrained by state law. For small cities and villages, forming a utility can be too expensive because they can't spread the costs over a large population.

Developing Areas

With the development of open lands have come abrupt changes in the relationships between vegetation, soils, and waterways. The existing surface cover is replaced with roads, rooftops, driveways, parking lots, and other impervious surfaces. Since the new land cover is less permeable than the existing cover, this change results in a greater percentage of the precipitation becoming runoff. The increased runoff causes larger and more frequent floods and increases erosion of stream banks and beds. The higher flows can lead to increases in stream temperature, changes in habitat, and decreases in stream flow stability.

Expansion of Urbanized Area

Research has show that when impervious cover reaches between 10 and 20 percent of the area of a watershed, hydrological and ecological stresses become apparent.[134] A second threshold appears to exist at around 25 to 30% impervious cover, where most indicators of stream quality consistently shift to a poor condition (e.g., diminished aquatic diversity, water quality, and habitat scores).

Table VII-6. NW Ohio Watershed Impervious Area Changes

River Basin	1994 Impervious Area	Impervious Area Increase 1974-1994
Lower Maumee	6.1%	10.4%
Ottawa	**30.8%**	9.6%
Portage	3.1%	17.4%
Sandusky	3.1%	7.3%

Source: *Ohio Coastal Nonpoint Pollution Control Program Plan*, September 2000

Suburban Sprawl

Stormwater pollution has two main components: the increased volume and velocity of surface runoff and the concentration of pollutants in the runoff. Both of these components are directly related to development in urbanizing areas.[135] As the greatest growth continues to occur on the fringes of the metropolitan areas, the impervious areas within our watersheds expands at ever increasing rates.

An overall population increase of 0.5 % for the region between the 1990 and 2000 censuses does not reflect the significant shifts in population from the urban to the suburban and rural areas. For example, the City of Toledo lost over 19,000 (-5.8%) people but communities such as Monclova (+48.8%), Springfield (+20.3%) and Sylvania (+10.7%) Townships had large increases during the 1990s. Similar patterns can be seen throughout Northwest Ohio and Southeast Michigan.

---

134 Schueler, T.R. *The Importance of Imperviousness*. Watershed Protection Techniques, vol. 1, no. 3, Fall 1994, pp.100-111.

135 Lehner, P.H., G.P.A. Clarke, D.M. Cameron, A.G. Frank. 1999. *Stormwater Strategies: Community Responses to Runoff Pollution*. Natural Resources Defense Council. 269 pp.

Construction Site Runoff

During the construction process, soil is the most vulnerable to erosion by wind and water. Studies indicate that poorly managed construction sites can release 7 to 1,000 tons of sediment per acre during a year, compared to 1 ton or less from undeveloped land.[136] Suspended sediment lowers the quality of water for municipal and industrial uses as well as for boating, fishing, swimming, and other water based recreation. Deposited sediment clogs storm sewers, culverts and drains, reduces the storage capacity of stream channels and reservoirs, fills ponds and lakes, and buries aquatic life habitat.

While sediment is the major pollutant generated on construction sites, other pollutants may be present. Potential secondary pollutants include petrochemicals (oil, gasoline, and asphalts), solid wastes (paper, wood, metals, plastics, etc.), construction related chemicals (acids, soil additives, concrete curing compounds, paints, etc.), wastewater (aggregate wash water, concrete cooling water, clean-up water, etc.), sanitary wastes, and fertilizers. Sediment can serve as a transport mechanism for a chemicals such as phosphorous and nitrogen, which in excess amounts lead to water quality impairments.

Lack of Comprehensive Planning

Effective runoff control should not be haphazard, but this is the common method of operation. Comprehensive planning is often overlooked, but is an essential element of any stormwater management program. The planning process is complicated by the fact that responsibility for stormwater management is fragmented between several levels of government and is organized around political boundaries. Stormwater does not obey political boundaries, requiring a watershed based management philosophy.

Lack of Watershed Based Stormwater Management

To adequately control current and future stormwater runoff, the problem needs to be looked at from a watershed prospective. Much of the control of stormwater currently occurs within each community through a variety of subdivision regulations and other ordinances. Without some type of mechanism to jointly take care of common drainage systems, there is no guarantee that the natural watershed system will work to provide adequate drainage and water quality.

Watershed management is a growing concern in the TMACOG region as local efforts to control pollution expand. However, local watershed organizations, especially non-governmental groups, typically lack the financial support and regulatory capabilities required to implement and sustain their projects.[137] Sustainable, funded watershed partnerships are needed to provide long-term support, focus, and consistency to watershed efforts.

Lack of Stormwater Considerations in Zoning

Many existing zoning ordinances and subdivision codes work in opposition to the goals of reducing stormwater volumes and pollutant loads. Communities have written in rules for minimum street widths, minimum number of parking spaces, sidewalk requirements, curb and gutter requirements, etc. with convenience and esthetics in mind, but with little thought to the environmental consequences.

---

136 US Environmental Protection Agency. 1993. Guidance specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, EPA 840/B-92/002.

137 Ohio Coastal Nonpoint Pollution Control Program. September 2000. Ohio Department of Natural Resources.

Zoning that does not consider environmental consequences can lead to impromptu growth and negative water quality impacts. Zoning is ideally suited to growth management, as it provides a framework to direct growth to areas that have the needed infrastructure to support it. However, local officials have been slow to implement changes in zoning ordinances and subdivision codes due to the complexity of rewriting the bewildering mix of regulations, misinformation, and reluctance to change long-standing practices.

Inconsistent or Inadequate Standards

Currently, stormwater management requirements vary considerably from one jurisdiction to another, leading to confusion among developers and ineffective control of stormwater. Drainage systems receive stormwater runoff from a watershed that may extend through several communities. To effectively manage stormwater runoff on a watershed basis, each community within a watershed should use complimentary requirements for stormwater management standards.

Within the TMACOG region several jurisdictions utilize design standards for stormwater management. The cities of Toledo, Oregon, Maumee, and Sylvania have and enforce their own standards. The Lucas and Wood County Engineers' offices have developed and enforce design standards for development that occurs in the unincorporated areas of their respective counties. Nothing, however, ensures that once the drainage leaves their jurisdiction, there is adequate drainage to carry the flow downstream or that the water quality meets the neighbor's use requirements.

All of the stakeholders- local governments, developers, construction contractors, industry, and citizens- need a clear definition of what is expected and what level of performance they need to attain.[138] Local governments can facilitate this by implementing clear and consistent standards and strongly enforcing the regulations.

Limited Inspection and Maintenance

Effective runoff management using structural practices and facilities requires successful execution of all phases of development. This includes proper construction as well as proper operation and maintenance after construction. Despite the importance of construction inspection and post-construction maintenance programs, several factors complicate and hinder their execution. Most often the costs and manpower requirements of these programs exceed local government's ability to meet them.

Most areas of the TMACOG region have some level of site plan review and require a permit or other type of approval prior to construction. At this point reviewers ensure that stormwater runoff has been taken into account in the development. Depending on the jurisdiction and their current workload, this is often the only assurance that the development will have proper stormwater controls. Correcting this weakness requires comprehensive and aggressive inspection programs concentrated on the proper installation and maintenance of stormwater management structures and facilities.

Destruction of Wetlands and Floodplains

Wetlands provide a natural way to manage and store water and maintain water quality. A healthy wetland provide a variety of benefits that can help reduce the impacts of urban stormwater runoff- such

---

138 Lehner, P.H., G.P.A. Clarke, D.M. Cameron, A.G. Frank. 1999. *Stormwater Strategies: Community Responses to Runoff Pollution*. Natural Resources Defense Council. 269 pp.

as cleaning the water to maintain water quality and storing and dampening floodwaters. Unfortunately, many wetlands have been drained or altered to make way for development and no longer provide these benefits.

The TMACOG region has a rich heritage of extensive wetland areas. Historically, the Great Black Swamp and the closely connected Oak Openings Region were part of a vast wetland complex that reached from Fort Wayne, Indiana to Sandusky, Ohio. Today over 95% of these vast wetlands are gone, primarily as a result of drainage efforts in the late 19th Century and subsequent conversions to other land uses. This major shift in land use was made possible by thousands of miles of drainage ditches and countless miles of drainage tile. This extensive drainage system encourages high runoff peaks, increased erosion, and can produce intense flooding in some areas.

Floodplains form naturally as rivers and streams periodically exceed their normal levels during periods of high precipitation. They function as nature's safety valve by providing a place for flood storage and reducing floodwater velocities. But when development encroaches upon floodplains, problems begin to occur. Development in floodplains usually reduces, modifies, or eliminates their storage capacity and causes increased flooding and erosion.

Most jurisdictions in the TMACOG region have programs that meet the minimal requirements of the Corps of Engineers and the Federal Emergency Management Agency regarding development in wetlands and floodplains. These requirements, while prohibiting the filling of large wetlands and mainstream channels, allow the filling of isolated wetlands and portions of the floodplain. Additional filling occurs outside of the knowledge of the regulatory agencies, through ignorance of the rules and simple negligence. Without the wetlands and floodplains to provide natural retention and with ever-increasing amount of impervious surface area, flooding and water quality problems will grow.

Areawide Policies

Develop Reliable Stormwater Funding Source

Implementing effective stormwater management programs costs money. A dedicated source of revenue should be developed to provide adequate programming and maintain continuity. Most communities in the TMACOG region do not have a specific funding source devoted to operation, maintenance, or capital costs of their stormwater system. Therefore many communities are forced to divert funds from their general funds or other programs and departments. This can prove problematic by disrupting budgets and forcing unpopular decisions.

There are several approaches a community can take to establish a reliable funding source for stormwater management. Local governments have funded stormwater management measures through charging inspection and permit fees, taxing new development at an increased rate, forming regional stormwater management districts, and creating stormwater utilities. Research has shown that the most effective programs have been the stormwater management districts and stormwater utilities that operate similarly to water and sewer programs, and are funded through service fees that are administered separately from the general tax fund. An EPA study identified three major advantages of stormwater district or utilities over funds generated through property tax revenues: 1.) Increased stability and predictability, 2.) Greater equity, and 3.) The opportunity for incorporating incentives for implementation of on-site stormwater management.[139] For more information on potential structure of a regional stormwater management

[139] Doll, A., G. Lindsey, and R. Albani. *Stormwater Utilities: Key Components and Issues*. Prepared for Advances in Urban Wet Weather Pollution Reduction Conference, sponsored by Water Environment Federation, June 28 – July 1, 1998, Cleveland Ohio, 10pp.

district, see Appendix B "Plan of Operation for a Regional Stormwater Management District in the Lower Maumee River Watershed".

Maintain and Upgrade Infrastructure

The expense of maintaining most stormwater infrastructure is relatively small compared to original construction costs. However, maintenance is often not completed, particularly when facilities are privately owned. Improper maintenance decreases the efficiency of the stormwater management facilities, and may also detract from the aesthetic qualities of some practices. Proper operation and maintenance language within a stormwater ordinance can ensure that initial designs facilitate easy maintenance and that regular maintenance activities are completed.

Update Zoning to Improve Stormwater Management

Zoning is a powerful tool in the land use planning process and is available to most communities. In order to reach water quality goals, watershed boundaries and conditions must be considered in land use decisions. Watershed based zoning involves defining watershed conditions, measuring current and potential future development, identifying and classifying subwatersheds based on the amount of future development, and most importantly-- modifying master plans and zoning to shift the location and density of future development to the appropriate subwatershed management categories.

Watershed based zoning can employ a mixture of land use and zoning options to achieve desired results. A watershed based zoning approach should include the following steps[140]:

- Conduct a comprehensive drainage system inventory.
- Measure current levels of development.
- Verify development/stream water quality relationships.
- Project future levels of development.
- Classify subwatersheds based on stream management goals and current levels of development.
- Modify master plans/zoning to correspond to subwatershed development targets and other management strategies.
- Incorporate management priorities from larger watershed management units such as river basins or larger watersheds.
- Adopt specific watershed protection strategies for each subwatershed.

Use of Urban Stormwater Best Management Practices

Conservation Site Design

Conservation site design or cluster development is a design technique that concentrates buildings in a compact area in one portion of a development site in exchange for providing open space and natural areas elsewhere on the site. Minimum lot sizes, setbacks and frontage distances are relaxed in order to create additional open space at the site. Open space designs have many benefits in comparison to the conventional developments that they replace: they can reduce impervious cover, stormwater pollutants, construction costs, grading, and the loss of natural areas. However, many communities lack zoning

[140] Center for Watershed Protection. *The Stormwater Managers Resource Center*. http://stormwatercenter.net/.

ordinances to permit open space development, and even those that have enacted ordinances may need to revise them to achieve greater water quality and environmental benefits.

It should also be noted that the benefits of open space design can be amplified when it is combined with other site design techniques such as narrow streets and alternative turnarounds. This policy involves promoting the use of narrower streets to reduce the amount of impervious cover created by new development, and in turn, reduce the stormwater runoff and associated pollutant loads. Currently, many communities require wide residential streets that are 32, 36 and even 40 feet wide. In most residential settings, streets can be as narrow as 22 to 26 feet wide without sacrificing emergency access, on-street parking or vehicular and pedestrian safety. Even narrower access streets or shared driveways can be used when only a handful of homes need to be served.

Developers, however, often have little flexibility to design narrower streets, as most communities require wide residential streets as a standard element of their local road and zoning standards. Revisions to current local road standards are often needed to promote more widespread use of narrower residential streets. Residential street design requires a careful balancing of many competing objectives: design, speed, traffic volume, emergency access, parking, and safety, to name a few. Communities that want to change their road standards to permit narrower streets need to involve all the stakeholders who influence street design in the revision process.

Source Controls

The primary goal of source controls is to reduce the amount of pollutants entering stormwater runoff. Although the accumulation of certain contaminants is inevitable, some of pollutants can be controlled at their source. Measures that can improve runoff quality at the source include litter control, street sweeping, roadway deicing alternatives and good housekeeping. These measures need to be implemented by the communities as well as private citizens.

Since most storm sewer discharge directly into our waterways, runoff most often does not even receive simple filtering or screening of larger objects. As a result all types of litter that people toss onto sidewalks or streets are carried to ditches, streams, and lakes. Local governments need to do their part by providing an adequate number and variety of litter containers and by setting a good example. Cleanliness guidelines should be followed by city waste collection forces and other city departments that generate litter and other potential water contaminants. Recycling programs should be initiated or maintained for appropriate products, including glass, plastics, aluminum, paper, etc.

Landscaping practices can be a significant source of pollutants to urban runoff. Turf management chemicals including fertilizers and pesticides used on private lawns as well as golf courses and public parks can add high levels of nutrients or dangerous pesticides to the runoff. While each location is unique and the effects on water quality vary, it is clear that the type, quantity, and timing of materials can make a big difference in the runoff. In order to gain public support and cooperation in reducing these pollutants, an effective education program is necessary to inform the public of the potential water quality ramifications.

Poor housekeeping at commercial, industrial, and municipal sites can lead to contaminated runoff. Rain or melting snow can erode piles of bulk material such as loose topsoil or salt if it is left uncovered. Similarly, precipitation can wash contaminants off of equipment or dirty objects left exposed to the weather. Improperly maintained landfills can allow toxic contaminants to reach the surface of a landfill, allowing stormwater to carry these pollutants to nearby waterbodies. Communities need to develop

Most highway and street departments use salts and abrasives to keep roads, parking lots, and sidewalks free from ice during the winter. In excess, the salts can be toxic and abrasives can increase sediment loads. While a certain amount of de-icing is necessary to ensure safety, the easiest way to minimize adverse affects is by using less. The following steps can be useful in curbing application rates: 1.) Decrease application rates on straight, flat sections, 2.) Training for operators of application equipment, and 3.) Keeping accurate records of applications.

Street surfaces receive a large portion of the litter, chemicals, dust fall, and other contaminants that affect urban water resources. The contaminants that remain after source control measures have been implemented can be partially removed by street sweeping. Increasing the frequency of street sweeping operations can minimize the accumulation and runoff of street surface contaminants. Specially designed street sweepers should be used on a regular basis to remove litter and other debris. Vacuum-assisted type sweepers have achieved high removal effectiveness, including the small particle size range of contaminant material.

Illicit or illegal discharges to the storm sewers from homes and businesses can add harmful contaminants to storm sewer systems. The illicit discharges can be the result ignorance, simple negligence or intentional connection of discharge pipes that should be directed to the sanitary sewer. People who don't understand that storm sewers directly discharge to waterbodies have been known to dump oil, old paint, or household chemicals into storm sewer inlets. Floor drains, dry wells, and cesspools are frequent sources of commercial or industrial discharges and connections. Communities need to conduct programs that actively identify and eliminate these illicit discharges. The program should include monitoring and inspection components such a dry weather surveys of stormwater outfalls. An enforcement mechanism is necessary to ensure that once the problem is identified, it can be dealt with successfully. Communities should also coordinate collection drives or manage collection centers for hazardous household wastes such as motor oil, old paint, and caustic chemicals.

Erosion and Sediment Control

Some of the highest stormwater pollutant loads occur when development is in the initial construction phase. This is when land is cleared of vegetation and graded to create a proper surface for construction. The removal of natural vegetation and topsoil renders the exposed area susceptible to erosion, causing transformation of existing drainage areas and disturbance of sensitive areas. Erosion control is the practice of minimizing the amount of soil that runs off during the construction process, and sediment control is the practice of retaining eroded soil on site, preventing damage to watercourses and infrastructure. For additional guidance on Erosion and Sediment Control refer to Appendix A "Regional Stormwater Management Standards Manual".

Riparian Buffers

Riparian Buffers serve as boundaries between local waterways and existing development that help protect water resources by filtering pollutants, providing flood control, reducing streambank erosion, preventing stream warming, and providing room for natural movement of the stream channel. While there is often overlap between the role of buffers and conservation areas, buffers differ in that they are a specific planning tool to protect stream quality and riparian habitat. For more details on the design and applications, see Appendix A "Regional Stormwater Management Standards Manual".

Runoff Conveyance

The management of stormwater runoff from sites after construction is vital in controlling the impacts of development on urban water quality. The increase in impervious surfaces such as rooftops, roads, parking lots, and sidewalks due to land development has a number of effects on aquatic systems. First, increases in imperviousness create a corresponding increase in the total volume of stormwater runoff from a site. Without proper conveyance, this increase in runoff volume can lead to erosion, degradation of stream channel habitat, and increases in the occurrence of flooding.

Urban runoff is most commonly directed as quickly as possible to the storm sewer system via curbs and gutters. However, sewers do not provide for energy dissipation, volume control, or pollutant removal. Each of these controls is necessary to protect water quality. To achieve these goals, stormwater engineers have more recently employed open grass channels to convey stormwater runoff. The grass channels are designed to meet runoff velocity targets for large storms and provide water quality treatment for smaller storms. Grass channels are generally not an option in ultra-urban areas and runoff may still need to be directed to detention or retention facility for further treatment. For further guidance on runoff conveyance, see Appendix A "Regional Stormwater Management Standards Manual".

Runoff Detention/Retention and Treatment

Best management practices or BMPs can be used to achieve four broad resource protection goals. These include: Flood Control, Channel Protection, Groundwater Recharge, and Pollutant Removal. The BMPs should be designed to function together as a system to ensure that the volume, rate, timing and pollutant load of runoff remains similar to that, which occurred under natural conditions. This can be achieved through a coordinated network of structural and nonstructural methods, designed to provide both source and site control. In such a system, each BMP by itself may not provide major benefits, but when combined with others becomes very effective.

To manage both water quantity and quality, stormwater facilities must be designed to capture and treat two different storm events:

1. Large storm events: Flood attenuation and erosion control
2. The first flush (first ½ to 1-inch of runoff from the watershed): Water quality

Controlling both extremely large events, to prevent flooding and erosion, and more frequent events, to mitigate water quality impacts, can be achieved through the proper design of detention/retention facilities. Among the alternatives, wet ponds and constructed marsh systems are the most effective for achieving control of both stormwater volume and quality. Alternative Best Management Practices (BMPs) providing flood attenuation and treatment of the "first flush" and are also acceptable. For more details on the design and applications, see Appendix A "Regional Stormwater Management Standards Manual".

Public Involvement and Education

For proper stormwater management techniques to be implemented in the study area, people need to know about them. The general public and the business community need to understand the importance of good stormwater management and how it can benefit them. This won't happen however, if there isn't a significant public involvement and education program about the subject.

The public needs to be educated to accept responsibility for the operation of the stormwater management system. Even though they may not have any direct problems, everyone should understand that stormwater does flow into the drainage system from their yard, roof, driveway, patio, and sidewalk. Further, they should develop and understanding of how each piece of real estate contributes to water pollution and flooding problems.

An informed and knowledgeable community is crucial to the success of a stormwater management program since it helps to ensure greater support and greater compliance. Public support is particularly beneficial when communities attempt to institute new funding initiatives for the program or seek participation and buy-in to help implement the program.

Complete Watershed Based Planning & Coordination

To adequately control current and future stormwater runoff, the problem needs to be looked at from a watershed perspective. A management plan is needed to control both the quantity and quality of stormwater. Much of the control of stormwater currently occurs within each community through a variety of subdivision regulations and other ordinances. Maintenance of ditches, storm sewers, and drainage systems is largely the responsibility of a county engineer, drain commissioner, or individual municipality. However, stormwater runoff does not obey political boundaries, and several drainage systems within the region flow through more than one community.

Without some type of agreement and coordination between communities to jointly take care of their common drainage systems, there is no guarantee that the natural watershed system will work to provide adequate drainage and water quality. Solving problems cannot be accomplished by constructing isolated, individual and non-related projects. A master plan for stormwater drainage is necessary to establish the guidelines for maintaining and improving the existing facilities, as well as providing for future development.

A watershed level master stormwater plan will aid in the orderly development of new drainage facilities, water quality practices, and capital improvements. The improvements outlined in a master plan should be based on ultimate development of the watersheds. Ultimate development is a projection based on existing land use, proposed land use and current land use trends.

The most equitable of funding master planning and capital improvements would be for political subdivisions to participate in their share of the costs according to how much runoff they generate. For those regional streams and ditch systems that serve two or more political subdivisions, multi-jurisdictional or regional funding mechanisms would be needed.

A regional stormwater management organization would have the ability to address stormwater management on a watershed basis, develop and implement activities of a regional stormwater master plan, provide a funding mechanism for stormwater projects, and formalize the commitment of local governments to regional stormwater management. A watershed level organization could address those stormwater management issues of regional concern, leaving the normal operation of local stormwater systems to the individual jurisdictions. For details on how a regional stormwater management organization could operate, see Appendix B: “Plan of Operation for a Region Stormwater Management District in the Lower Maumee River Watershed”.

Augment Protection of Wetlands and Floodplain

Existing federal and state laws currently protect larger, identified wetlands and floodplain areas. However, wetlands are regularly destroyed and floodplains are filled because of a lack of enforcement and inadequacy of records. Wetlands and floodplains are also negatively impacted by adjacent development on unprotected uplands.

A variety of options are available to protect wetlands and floodplain areas. Fee acquisition is the most recognized and permanent strategy for protection, although it is also the most expensive. Conservation easements are another option and can be effective in situations where private landowners desire to retain ownership. Easements can be purchased from landowners to protect special resource areas and an adjacent buffer, allowing for the use of the remaining land.

Options for donating and conserving special resource areas should be made available to any landowner with wetlands or floodplain areas on their property. Donating special resource areas or placing them into a conservancy easement with a land trust can realize significant tax benefits. Local governments can become involved with conservation efforts by informing property owners about donation and conservation easement options, or by offering development density bonuses for site designs or impact fees that preserve special resource areas. In addition, the standards local governments use to review site plans should include provisions for reviewing projects for wetland and floodplain impacts. For an example of standards that include these provisions, see *Stormwater Management Standards Manual*.[141]

Improve Inspection and Enforcement

All stakeholders- local governments, developers, construction contractors, industries, and citizens- need clear statements of what is expected of them and need to be held by all the others to an acceptable performance level. Local governments should facilitate this by setting clear standards, creating incentives, conducting routine monitoring and strongly enforcing laws and regulations. Stormwater control measures, when properly implemented, have proven to enhance water quality and alleviate flooding problems. However, left in disrepair these measures are ineffective and do not achieve the desired benefits.

Policy Implementation

Regulatory Programs

There are two different types of laws that help control urban runoff: one focusing on urban point sources and the other focusing on urban nonpoint sources. The National Pollution Discharge Elimination System permit program of the Clean Water Act, which regulates stormwater discharges, addresses urban point source pollution. Nonpoint source management programs under Section 319 of the Clean Water Act cover urban nonpoint source pollution. The Total Maximum Daily Load (TMDL) program deals with both point and nonpoint sources of pollution in watersheds with degraded water quality. In the Lake Erie coastal zones, programs to protect coastal waters from nonpoint source pollution also are required by section 6217 of the Coastal Zone Act Reauthorization Amendments.

National Pollution Discharge Elimination System Stormwater Program

The Federal Clean Water Act (CWA) prohibit the discharge of any pollutant to waters of the United States from a point source unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permitting program is designed to track point sources, monitor the discharge of pollutants from specific sources to surface waters, and require the implementation of the controls necessary to minimize the discharge of pollutants. Initial efforts to improve water quality under the NPDES program primarily focused on reducing pollutants in industrial process wastewater and discharges from municipal sewage treatment plants.

[141] Stormwater Management Standards Manual, TMACOG, Maumee RAP Urban Runoff Action Group, 2002

As pollution control measures for point sources were implemented and refined, studies showed that more diffuse sources of water pollution were also significant causes of water quality impairment. Specifically, stormwater runoff draining large surface areas, such as urbanized land. In 1987, the CWA was again amended by Congress to require implementation of a comprehensive national program for addressing problematic non-agricultural sources of stormwater discharges. As required by the amended CWA, the NPDES Stormwater Program is being implemented in two phases.

Phase I

In response to the 1987 Amendments to the CWA, US Environmental Protection Agency (EPA) developed Phase I of the NPDES Stormwater Program. Phase I requires NPDES permits for stormwater discharges from:

- “Medium” and “large” municipal separate storm sewer systems (MS4s) serving populations of 100,000 or greater,
- Construction activity disturbing 5 acres of land or greater, and
- Ten categories of industrial activity.

The regulated entities must obtain coverage under an NPDES stormwater permit and implement stormwater pollution prevention plans (SWPPPs) or stormwater management programs (both using Best Management Practices or BMPs) that effectively reduce or prevent the discharge of pollutants into receiving waters.

USEPA identified eleven categories of industrial activities that are required to obtain permit coverage under the NPDES Stormwater Program. All categories are guided by a common set of rules and requirements (except Category (x) – Construction Activities). Any construction activity, including grading, clearing, excavation, or other earth moving process that disturbs greater than five acres requires a separate NPDES stormwater permit for construction under the NPDES Stormwater Program.

Phase II

The Phase II program expands the NPDES program by requiring permits for small sized MS4s in urbanized areas as well as operators of small construction sites. This is designed to implement programs and practices to control polluted stormwater runoff. The rule automatically regulates two classes of stormwater dischargers on a nationwide basis:

- Operators of small MS4s located in “urbanized areas” as defined by the Bureau of the Census (termed a “regulated small MS4”). Waivers from coverage are available.

- Operators of construction activities that disturb 1-5 acres of land. Waivers from coverage are available.

Additional small MS4s (outside of urbanized areas) and construction sites (disturbing less than 1 acre of land), along with other sources which are a significant contributor of pollutants to waters of the U.S., may be brought into the NPDES Stormwater Program by the state NPDES Permitting Authority (Ohio EPA or Michigan Department of Environmental Quality). Permit applications will be required by March 2003, or an earlier date set by the state Permitting Authority.

Operators of Phase II regulated small MS4s are required to apply for NPDES permit coverage (most under a general rather than an individual permit) and implement “Six Minimum Control Measures” that effectively reduce or prevent the discharge of pollutants into receiving waters:

- Public Education and Outreach

- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

Operators of small construction activities are required to implement Best Management Practices (BMPs) as outlined in a general or individual permit. The goal of the BMPs is to prevent discharge of pollutants into receiving waters.

In 2004 the 125th Ohio General Assembly passed HB 411, adopting changes to ORC §307.79, to abate soil erosion and water pollution caused by land development. The statute allows Boards of County Commissioners to adopt rules establishing standards for conservation practices to soil erosion from development.

This legislation provided counties with enforcement powers for Phase II of the Stormwater Permits. The Phase II rules cannot be inconsistent with Ohio EPA rules. The rules may require sediment control plans before developing a site by disturbing one or more acre of land, and impose a filing fee for plan review. If a county requires filing an erosion control plan, it must:

- Designate an official to review plans
- Establish procedures and criteria for approval of plans
- Issue permits for approved site development plans
- Establish procedures for the issuance of permits
- Establish appeal procedures following denial of a permit

Where rule violations occur, a county may impose stop work order and fines, subject to notification procedures. Fines may be assessed of not less than $100, nor more than $500 for each day of a rule or stop work order violation.

Total Maximum Daily Load Program

If analyses indicate an impairment of water quality standards and technology-based controls are inadequate, Section 303(d) of the Clean Water Act establishes the Total Maximum Daily Load (TMDL) process to achieve state water quality standards. A TMDL is a written, quantitative assessment of water quality problems and contributing sources. It specifies the amount a pollutant needs to be reduced to meet water quality standards, allocates pollutant load reductions in a watershed, and provides the basis for taking actions needed to restore a waterbody. It is a watershed approach to quantifying and reducing both point and nonpoint sources of pollution to impaired waterbodies.

TMDLs establish allowable loadings (both point and nonpoint source) necessary to meet water quality standards in a given watershed. Specifically, allowable loadings are equal to the sum of individual wasteload allocations for point sources and the load allocations for both natural inputs and nonpoint sources. In urbanized watersheds, reductions in urban runoff non-point pollution will be a significant part of meeting the TMDL allowable loadings.

Non-Point Source Management Program

Congress amended the Clean Water Act (CWA) in 1987 to establish the Section 319 Nonpoint Source (NPS) Management Program because it recognized the need for greater federal leadership to help focus

State and local NPS efforts. Under section 319, Ohio and Michigan receive grant money which support a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of specific nonpoint source implementation projects.

Both States manage significant nonpoint source grant programs designed to provide financial assistance to local watershed groups. The grant programs emphasize education, technical assistance, financial incentives and voluntary actions as opposed to regulatory mandates or permits. The programs rely heavily on watershed management plans to address water quality problems. These plans emphasize: identification of the nature, extent, and cause of water quality problems; development of an implementation plan; implementation of Best Management Practices (BMPs); education and evaluation.

Wetlands Protection Programs

Permits are required for the discharge of dredged or fill material into waters of the United States, **except** as provided in 33 CFR Section 323.4. Requirements that irreversible impacts to jurisdictional wetlands be mitigated are imposed through various legislation and regulations:

a. Section 404 of the Federal Clean Water Act (CWA) administered by the Corps of Engineers (COE)

b. Council of Environmental Quality (CEQ) regulations and guidelines implemented through the National Environmental Policy Act (NEPA)

c. Executive Order 11990, “Protection of Wetlands”

d. EPA guidelines at Section 404(b)(1) and their regulations and

e. State Water Quality Certification through Section 401(a) of the CWA

f. Ohio Administrative Code Chapter 3745-32

g. Michigan's wetland statute, Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451

A federal Section 404 permit cannot be issued by the COE unless the State of Ohio Environmental Protection Agency (OEPA) or Michigan Department of Environmental Quality (MDEQ) issues a Section 401 Water Quality Certification. If OEPA or MDEQ issues a Section 401 Certification for the project, the conditions become requirements of the federal permit. If OEPA or MDEQ denies the Section 401 Certification, the COE must deny the Section 404 permit without prejudice.

Floodplain/Floodway Protection Programs

In 1968, Congress created the National Flood Insurance Program (NFIP) in response to the rising cost of taxpayer funded disaster relief for flood victims and the increasing amount of damage caused by floods. The NFIP makes Federally backed flood insurance available in communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage.

The Federal Emergency Management Agency’s (FEMA) Federal Insurance Administration and Mitigation Directorate manage the NFIP. The Federal Insurance Administration manages the insurance component of the NFIP, and works closely with FEMA's Mitigation Directorate, which oversees the floodplain management aspect of the program. Projecting the Base Flood Elevation (BFE) onto the site topography delineates the Regulatory Floodplain. The BFE is delineated by the 100 year flood profiles, as indicated on the floodplain studies noted below:

a. Regulatory Floodplain profiles, approved by the community for regulatory use and subjected to a 60-day public review and comment period, or

b. FEMA Flood Insurance Study and profiles, or

c. In the case of FEMA delineated "AH Zones" the elevation noted on the map shall be the BFE. In the case of FEMA delineated "AO Zones" (Areas of shallow flooding) the BFE shall be the depth number shown on the map added to the highest adjacent grade, or at least two feet above the highest adjacent grade if no depth number is provided, or

d. When no base flood elevation information exists, a Registered Professional Engineer using an appropriate model or technique can determine the BFE.

e. For a non-riverine Regulatory Floodplain, the historic flood of record plus three feet may be used for the BFE instead of performing a detailed hydrologic and hydraulic study.

The regulatory floodway is the channel and that portion of the Regulatory Floodplain adjacent to a stream or channel which is needed to store and convey the existing and anticipated future 100 year frequency flood discharge with no more than 0.1 foot increase in stage due to loss of flood conveyance or storage, and no more than a 10% increase in velocities.

Coastal Nonpoint Pollution Control Program

In 1990, Congress passed the Coastal Zone Act Reauthorization Amendments (CZARA) to tackle the nonpoint source pollution problem in coastal waters. Section 6217 of CZARA required Ohio and Michigan to develop a Coastal Nonpoint Pollution Control Program Plan. The States' plans must conform with the 56 management measures in six categories described in USEPA's *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. Urban Runoff is one of the six categories that must be addressed.

If these original management measures fail to produce the necessary coastal water quality improvements, the States then must implement additional management measures to address remaining water quality problems.

Designated Management Agencies

US Environmental Protection Agency

The US Environmental Protection Agency (EPA) has the primary responsibility for urban Stormwater runoff management at the federal level. The agency has undertaken or sponsored various studies relative to stormwater problems, and has provided grants for the control and treatment of urban stormwater pollution.

<u>NPDES- Phase I</u>

To implement the NPDES program U.S. EPA published initial permit application requirements in the *Federal Register* on November 16, 1990. As NPDES delegated states, Ohio EPA and Michigan Department of Environmental Quality (DEQ) are currently implementing the federal stormwater program. USEPA needs to continue to provide technical and financial support to the state agencies responsible for implementing the program. Additionally, financial assistance to the local permit holders is needed to assist in meeting the services and infrastructure requirements of the permits. USEPA should increase funding to existing loan and grant assistance programs targeted at upgrading municipal stormwater operations and infrastructure.

<u>NPDES– Phase II</u>
On December 8, 1999, USEPA promulgated the expansion of the existing NPDES Stormwater Program by designating additional sources of stormwater for regulation to protect water quality. The expansion regulates small Municipal Separate Storm Sewer Systems (MS4s) located in "urbanized areas" (UA) as defined by the Bureau of the Census, and those small MS4s located outside of a UA that are brought into the program, on a case-by-case basis, by the state NPDES permitting authorities. NPDES Phase II also regulates small construction activities that disturb between 1 and 5 acres.

<u>TMDL</u>
The Final TMDL Rule was published in the *Federal Register* on July 13, 2000 but a Congressional rider prohibited USEPA from implementing this rule until FY 2002.
By law, each State is required to submit a prioritized list of impaired waters to USEPA for approval (the “303(d) list”). A TMDL must be developed for each of the impaired waters. USEPA Regions should have a specific written agreement with each State in the Region about establishing TMDLs expeditiously and a plan for implementation.

<u>NPS Management</u>
States and the U.S. Environmental Protection Agency (EPA) have joined together to form a new State/EPA Nonpoint Source (NPS) Partnership. The Partnership provides a framework for States and EPA to work cooperatively to identify, prioritize, and solve NPS problems.

<u>CZARA</u>
In its program, each State describes how it will implement nonpoint source pollution controls, known as management measures, that conform with those described in Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. This program is administered jointly with the National Oceanic and Atmospheric Administration (NOAA).

Ohio Environmental Protection Agency

Ohio EPA’s Division of Surface Water is responsible for restoring and maintaining the quality of Ohio's rivers and streams. The Division of Surface Water accomplishes this mission by monitoring the aquatic environment, permitting, enforcing environmental laws, using and refining scientifically sound methods and regulations, planning, coordinating, educating, providing technical assistance and encouraging pollution prevention practices. As a delegated State, Ohio EPA is responsible for implementing the NPDES federal stormwater, TMDL and Section 401 Water Quality Certifications programs.

<u>NPDES- Phase I</u>
The City of Toledo was the only entity in the TMACOG planning area that was affected by the MS4 portion of the Phase I rule. Toledo was issued an NPDES permit for its municipal separate storm sewer systems (MS4) discharges, first effective on September 1, 1997. The permit will need to be renewed

every five years. Ohio EPA must work cooperatively with the City of Toledo to implement the requirements of the City's NPDES stormwater permit.

All stormwater discharges associated with industrial activity that discharge to waters of the State or through a MS4 are required to obtain NPDES permit coverage, including those which discharge through systems serving populations less than 100,000. Ohio EPA needs to aggressively work through education, partnerships, and inspections to identify and permit industrial discharges in the region.

NPDES– Phase II

About 280 jurisdictions located in urbanized areas and that operate a MS4 will be included in the program in the State of Ohio. Table VII-7 identifies communities in the Ohio portion of TMACOG planning area that are identified in the rules as automatically or potentially designated based on the 2000 Census. Ohio EPA may use their discretion in bringing additional jurisdiction into the program.

Table VII-7. Designated Stormwater NPDES Communities

Cities	Villages	Townships
	Lucas County	
Oregon	Harbor View	Jerusalem
Sylvania	Holland	Monclova
Maumee	Ottawa Hills	Spencer
Toledo (under Phase I)	Waterville	Springfield
		Sylvania
		Washington
		Waterville
	Wood County	
Bowling Green	Millbury	Lake
Fostoria	Walbridge	Perrysburg
Northwood		Middleton
Perrysburg		
Rossford		
	Monroe	
		Bedford
		Erie
		Whiteford
	Ottawa County	
		Allen
		Clay
Sandusky County		
(none)		

TMDL

The Division of Surface Water has developed a 12-step project-management-based TMDL process to accomplish TMDLs. The process contains four broad, overlapping phases:

- *Assess* waterbody health: biological, chemical, habitat
- *Develop* a restoration target and a viable scenario
- *Implement* the solution: inside/outside Ohio EPA
- *Validate* to monitor progress: delist or relist.

Each phase of the process will require public input and participation. Ohio EPA needs to work with local watershed groups, other state and local agencies, local elected officials, and the public to ensure a program is practicable and implementable.

NPS Management

Ohio EPA is the designated state water quality management agency responsible for administering the CWA Section 319 program in Ohio. In a broad context, NPS pollution control is a part of the Ohio EPA surface water quality program. However, NPS pollution control is administered as a distinct program because of the manner in which the federal CWA addresses the issue. Under CWA Section 319, the Ohio NPS Program emphasizes education, technical assistance, financial incentives and voluntary actions as opposed to regulatory mandates or permits.

Wetlands Protection Programs

Anyone who wishes to discharge dredged or fill material into the waters of the U.S., regardless of whether on private or public property, must obtain a Section 404 permit from the U.S. Army Corps of Engineers (Corps) and a Section 401 Water Quality Certification (WQC) from Ohio EPA. This program's primary impact is in the area of Wetlands Protection. Ohio EPA also has power to protect wetlands established through Ohio Revised Code Chapter 3745.

Ohio Department of Natural Resources

The Department of Natural Resources (DNR) was granted the legal authority to coordinate urban water pollution abatement efforts through Ohio Revised Code Chapters (ORC) 1501, 1511 and 1515. Ohio DNR is also the lead agency for development of the Ohio Coastal Nonpoint Pollution Control Program Plan.

ORC Chapter 1501

Authorizes the Director, through the soil and water conservation districts, to coordinate the efforts of state and local governmental agencies to meet the minimum water quality standards relating to urban sedimentary pollutants.

ORC Chapter 1511

Defines the duties and powers of the Division of Soil and Water Conservation (DSWC). The chapter clarifies the duties and powers of the Division relating to urban stormwater pollution abatement as follows:

> The chief of the DSWC shall establish standards to …. abate the degradation of the waters of the state by soil sediment in conjunction with land grading, excavating, filling, or other soil-disturbing activities on land used or being developed for nonfarm commercial, industrial, residential, or other nonfarm purposes, and establish criteria for determination of the acceptability of such management and conservation practices.

ORC Chapter 1515

Establishes individual county Soil and Water Conservation Districts (SWCDs). The SWCDs are assigned the task of working with landowners and other groups to implement conservation practices including- soil erosion control and flood prevention measures.

Ohio Coastal Nonpoint Pollution Control Program Plan

Ohio's plan is based upon and expands the existing statewide Ohio Nonpoint Source Management Program. The responsibility for management of the Nonpoint source control program is networked between the Ohio Department of Natural Resources (ODNR) and the Ohio Environmental Protection Agency (OEPA). The Division of Real Estate and Land Management (RELM), ODNR, has the lead for implementing the Ohio Coastal Management Plan (OCMP).

The plan was submitted to the National Oceanic and Atmospheric Administration and the U.S. Environmental Protection Agency for comment in September 2000. The plan recommends management measures for Lake Erie non-point issues including urban development.

Michigan Department of Environmental Quality

Two Divisions within the Michigan Department of Environmental Quality (MDEQ) are directly involved with urban stormwater issues: the Surface Water Quality Division and the Land and Water Management Division. Michigan Public Act 451 of 1994, Natural Resources and Environmental Protection Act, establishes most of the authority of the MDEQ.

NPDES Phase II
The Surface Water Quality Division administers Michigan's National Pollution Discharge Elimination System (NPDES) stormwater permit program. All three Michigan Townships in the TMACOG planning area are located fully or partially within and Urbanized Area and are subject to the permitting regulations. Table VII-8 identifies the three communities. Michigan DEQ may use their discretion in bringing additional jurisdiction into the program.

Table VII-8. Michigan Automatically or Potentially Designated Phase II Communities

Cities	Villages	Townships
	Monroe County	
		Bedford
		Erie
		Whiteford

TMDL
MDEQ will prepare a TMDL for all waterbodies not meeting Water Quality Standards (WQS). WQS are state rules established to protect the Great Lakes, the connecting waters, and all other surface waters of the state. These rules define the water quality goals for a lake or stream. The goals are in three areas:

1. Uses of the lake or stream;
2. Safe levels to protect the uses;
3. Procedures to protect high quality waters.

NPS Management
MDEQ Surface Water Quality Division administers their Nonpoint Source (NPS) program. The NPS Program offers grants and technical assistance and develops information and education materials to help protect and improve Michigan's lakes and streams.

Michigan Coastal Nonpoint Pollution Control Program Plan
In Michigan, the Great Lakes Shorelands Section in the Land and Water Management Division (LWMD) of the Department of Environmental Quality (MDEQ) administers the program. The program includes local pass through grants, administration of coastal related sections of the Natural Resource and Environmental Protection Act, 1994 PA 451, and review of federal agency activities for consistency with Michigan's approved program.

Wetlands Protection

The Geomare-Anderson Wetlands Protection Act, 1979 PA 203, which is now Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended provides the basis for MDEQ's wetland protection authority. MDEQ has adopted administrative rules that provide clarification and guidance on interpreting Part 303. Some wetlands in coastal areas are given further protection under Part 323, Shorelands Protection and Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

In 1984, Michigan received authorization from the federal government to administer Section 404 of the federal Clean Water Act in most areas of the state. The Michigan 404 program must be consistent with the requirements of the federal Clean Water Act and associated regulations set forth in the Section 404(b)(1) guidelines. Whereas in Ohio, where an applicant must apply to the U.S. Corps of Engineers and a state agency for wetland permits, applicants in Michigan generally submit only one wetland permit application to the DEQ.

Area Wide Water Quality Management Planning

The Areawide Water Quality Management Plan (AWQMP) is a regional document mandated by Congress under Section 208 of the Clean Water Act. Overall, the "208 Plan" is a statement of how Northwest Ohio and Southeast Michigan will restore our waterways to fishable and swimmable conditions. TMACOG is responsible for updating and maintaining this plan for four Counties in Ohio (Lucas, Wood, Ottawa, and Sandusky) and the southern three Townships in Monroe County, Michigan (Whiteford, Bedford, and Erie). Ohio EPA and Michigan DEQ use this plan in reviewing and approving permit applications.

County Governments (Ohio)

County governments in Ohio are responsible for implementation of the Ohio drainage laws. Counties may construct and maintain stormwater collection, treatment, and disposal facilities, and may enter into inter-local agreements to perform such functions for any municipal corporation or special district. Counties may also adopt ordinances or rules for urban sediment control pursuant to the Urban Sediment Pollution Abatement Act.

Four of the five County governments in the TMACOG region are identified by the NPDES Phase II Rules as operators of regulated small Municipal Separate Storm Sewer Systems (MS4s). Operators of small MS4s within urbanized areas are required to implement programs and practices to control polluted stormwater runoff. The program must design its stormwater management program to satisfy applicable Clean Water Act water quality requirements and technology standards (See Part A, *Regulatory Programs*).

Boards of County Commissioners in Ohio are authorized to construct and maintain storm sewer systems through the establishment of sewer districts, as outlined in ORC Chapter 6117. House Bill 549, signed on December 8, 2000, modified the Sewer Districts and County Sewers Law (ORC Chapter 6117)--relative to the procedures for the acquisition, construction, maintenance, and operation of various facilities and other improvements and the procedures for financing the various improvements. The definitions pertaining to sewers were clarified to explicitly include stormwater and drainage facilities.

Currently stormwater management requirements vary considerably from one county to another, enforced through a combination of subdivision regulations and ordinances. The major focus of the County Engineer continues to be on drainage rather than overall stormwater management. County governments need to include water quality considerations in their stormwater management programs.

County Government (Michigan)

Monroe County is identified by the NPDES Phase II Rules as an operator of a regulated small Municipal Separate Storm Sewer System (MS4). Operators of small MS4s within urbanized areas are required to implement programs and practices to control polluted stormwater runoff. The program must design its stormwater management program to satisfy applicable Clean Water Act water quality requirements and technology standards (See Part A, *Regulatory Programs*).

In Monroe County, the Board of Commissioners assigned the Drain Commissioner the responsibility to enforce the Soil Erosion and Sedimentation Control Act. This authority does not extend to cities, villages, or charter townships that have erosion and sediment control ordinances in effect. Under provisions of the Subdivision Control Act, the County Drain Commissioner is required to review subdivision plats involving five or more parcels, to ensure that adequate stormwater facilities are included.

The County Drain Commissioner, through the Michigan Drain Code, carries out the majority of stormwater drainage improvements in Monroe County. The Drain Commissioner has responsibility for all aspects of the construction and maintenance of drainage facilities in the County and has the assessment authority to fund these projects.

Municipal and Township Governments (Ohio)

Municipal corporations in Ohio are granted the statutory authority to construct, own, and operate sewers, drains, and ditches for the collection and conveyance of urban stormwater runoff. They are authorized to establish drainage districts for the purpose of constructing, maintaining, repairing, cleaning, and enclosing ditches. Also, the Ohio constitution enables municipalities to adopt ordinances or rules for urban sediment control.

Municipalities possess more extensive land use powers than counties, such as zoning and subdivision control. These powers, together with their power of eminent domain, extend to the regulation of construction site runoff and other non-point source pollution. Municipalities are not bound by the Ohio Drainage Laws, and may construct and expand drainage facilities without being constrained by the petition process. In these ways, municipalities hold advantages over unincorporated areas in the control of urban runoff.

Funding mechanisms for municipal funding of urban stormwater runoff are similar to those of counties with a notable addition. Municipalities have the authority to acquire, construct, own, lease and operate within or without its corporate limits, any public utility the product or service of which is or is to be supplied to the municipality or its inhabitants. Stormwater utilities are an innovative approach to finance and manage stormwater. A stormwater utility operates similarly to water and sewer utilities, which are financed through user fees and administered separately from the general tax fund. Generally a municipality enacts two ordinances to create a stormwater utility, one to establish the various components of the utility and the other to determine the rate structure. Forming the utility through two separate ordinances allows the municipality to alter the rate structure without having to modify the ordinance governing the utility structure.

Several Townships are identified by the NPDES Phase II Regulations as operators of regulated small Municipal Separate Storm Sewer Systems (MS4s). Operators of small MS4s within urbanized areas are required to implement programs and practices to control polluted stormwater runoff. The program must design its stormwater management program to satisfy applicable Clean Water Act water quality requirements and technology standards (See Part A, *Regulatory Programs*).

Municipal and Township Governments (Michigan)

Municipalities in Michigan are authorized to provide public services and make necessary improvements, including storm sewers to drain urban runoff. These entities may also administer and enforce ordinances to control erosion and sedimentation, wetlands, subdivision activity and land use. Municipalities may elect to administer and enforce erosion and sediment control ordinances pursuant to the Soil Erosion and Sediment Control Act. The county drain commissioner governs all general law townships and all municipalities who choose not to administer such ordinances. Local governments are also authorized to adopt wetland protection ordinances.

Michigan municipalities may adopt subdivision control ordinances that require subdivision plats to be reviewed and approved in accordance with a stormwater management. While a drainage review is not specifically required, local governments can consider stormwater management when they review subdivision plats. Similar to Ohio, municipalities in Michigan also have broad authority to adopt zoning ordinances to regulate land use within their jurisdictions, and may require land owners to submit a site plan as part of a rezoning approval. Site plan review requirements provide a legal basis for stormwater management review of proposed developments other than subdivisions.

All three Townships in the Michigan portion of the TMACOG planning area are identified by the NPDES Phase II Regulations as operators of regulated small Municipal Separate Storm Sewer Systems (MS4s). Operators of small MS4s within urbanized areas are required to implement programs and practices to control polluted stormwater runoff. The program must design its stormwater management program to satisfy applicable Clean Water Act water quality requirements and technology standards (See Part A, *Regulatory Programs*).

Recommended Implementation Activities

Develop Reliable Stormwater Funding Source

- Municipal, Township and County governments should identify and document stormwater management and drainage needs. An annual budget should be developed that addresses documented needs and provides for planning and study of future needs.
- Municipal, Township and County governments should choose and implement an appropriate stormwater financing mechanism(s) based on sound financial planning, input from their constituents and consultation with adjacent or overlapping governmental entities.
- USEPA, Ohio EPA, and Michigan DEQ should provide technical assistance and guidance to local governments on stormwater regulatory requirements. Grant assistance should be provided to local governments and planning agencies to develop stormwater management plans and financing mechanisms.

Maintain and Upgrade Infrastructure

- Based on stormwater management needs assessment, Municipal, Township, and County governments should develop a list of both short-term and long-term maintenance and upgrade needs of their stormwater systems. A maintenance and capital improvement schedule should be developed that outlines specific projects, responsible parties, and a priority ranking.

- Regular maintenance issues for existing and proposed stormwater facilities should be identified and incorporated into a stormwater facility maintenance plan for each community.
- Municipal, Township and County governments should pass or update ordinances that establish design guidelines for new facilities and require regular maintenance activities for existing facilities.
- A regional planning entity should identify those stormwater systems that service more than one community. Maintenance and facility upgrades should be conducted in a coordinated fashion, so that improvements compliment the efforts in neighboring communities.
- Regular inspections of both public and private facilities should be conducted to ensure compliance with the stormwater ordinances. The inspection requirements should be set forth in the stormwater facility maintenance plan and recommendations should be enforceable through the stormwater ordinances.
- USEPA, Ohio EPA, Michigan DEQ, and the State Water Pollution Control Load Funds should increase grant funding and low cost loans for the upgrade of sewer system and continued separation of combined sewers.

Increase Utilization of Urban Stormwater Best Management Practices

- USEPA, Ohio EPA, and Michigan DEQ should work through the NPDES and TMDL programs to encourage the adoption of stormwater Best Management Practices (BMPs).
- Ohio DNR and Michigan DEQ should work through the Coastal Nonpoint Pollution Control Program to further encourage the adoption of stormwater BMPs in sensitive coastal areas.
- Local, Regional and State management agencies should work toward full implementation of the urban areas management measures outlined in Chapter 5 of the Ohio Coastal Nonpoint Pollution Control Program Plan and the Michigan Coastal Nonpoint Pollution Control Program Plan.
- A regional planning entity should develop and maintain a uniform set of design standards for stormwater management. A committee representing those jurisdictions who will be governed by the standards should review the requirements to ensure equitability, reasonable administrative burden, and public acceptability.
- Each community should pass ordinances governing new development and significant improvements that require the utilization of stormwater Best Management Practices BMPs. The requirements should incorporate in whole or in part the principals and practices set forth in the regional standards.

- The County Soil and Water Conservation Districts (SWCD) should develop and conduct information and education programs and materials individually and jointly through the Maumee RAP, the Portage River Basin Council, and the Sandusky River Watershed Coalition. Educational programs should be geared to take advantage of available funding through grant programs, such as the Ohio Environmental Education Fund, the Lake Erie Protection Fund, and the Coastal Zone Management Assistance program.

Watershed Based Planning and Coordination

- Each community should bring stormwater management issues into the land use planning process at the local and county planning commission level. The protection of wetlands, floodplains, and sensitive riparian corridors should be addressed in order to ensure the stormwater impacts of development are considered.
- Master stormwater drainage plans should be completed at the watershed level to aid in the orderly development of new stormwater facilities and capital improvements.

- A regional organization should be formed to build master plans and capital improvements that cover regional streams and ditch systems that serve two or more communities. A region-wide master plan should be developed based on existing jurisdictional or watershed master plans.

Augment Protection of Wetlands and Floodplain

- The local floodplain administration agencies should work the local and county planning commissions, township and municipal governments and developers to strictly enforce the Federal Emergency Management Agency's floodplain regulations.
- County, Township, and Municipal governments should adopt ordinances that advocate no net loss in floodplain storage volumes.
- Ohio EPA and Michigan DEQ should work to expand the current protections provided wetlands through Section 404 of the Clean Water, which is administered by the Corps of Engineers. Efforts should focus on fully implementing existing state and federal wetlands protection laws.
- Local governments, Soil and Water Conservation Districts, and planning agencies should work to identify, describe, and document wetlands in their jurisdictions. This information should be used to develop wetland inventories and update the Corps of Engineers wetland maps.

Improve Inspection and Enforcement

- Ohio EPA, Michigan DEQ, and local governments should increase emphasis on the execution of stormwater BMPs and their continued maintenance. This should be accomplished by a combination of state and local inspectors that ensure that stormwater facilities are properly constructed and ordinance rules are followed.

Funding Programs

Use of state and federal grant programs to accomplish these goals is encouraged. Under this Plan it is TMACOG's policy to support funding of these grants programs through local, state, and federal agencies, and support funding for participating agencies to administer them. Programs that may be available to provide planning and implementation funds include:

- Ohio Public Works Commission (OPWC): Issue 2 Local Public Infrastructure Financing Program
- Ohio Department of Development (ODOD): Ohio Water and Sewer Commission Rotary Loan Program, Community Development Block Grant Program
- Ohio EPA Division of Environmental and Financial Assistance (DEFA): Water Pollution Control Loan Fund
- US EPA / Ohio EPA / Michigan DEQ: Clean Water Act §319 Non-Point Source Grants
- Ohio DNR / Michigan DEQ: Coastal Management Program

Critical Urbanizing Watersheds

This Plan recommends priority areas, identified as Critical Urbanizing Watersheds. This designation is intended to prioritize watersheds that are undergoing urbanization. Watershed designations are based on three criteria:

- Ohio EPA or Michigan DEQ classify streams as non-point source “impacted” or “impaired.” Urban runoff and other urban sources such as construction sites are identified as being known or suspected sources for the nonpoint source impact/impairment.
- The watershed is undergoing rapid urban development and/or is under pressure for development
- Sensitive or unique habitat or natural resources in the watershed are threatened because of urban development

Streams Impaired by Urban Runoff

Streams may be considered “impacted” by nonpoint sources; or more severely, “impaired.” Impacts or impairments refer to nonpoint pollution sources that contribute to or cause a stream not to meet water quality standards. Additionally, known or suspected nonpoint sources of impacts and impairments are identified. Streams impaired by urban nonpoint sources are highlighted. Streams with no identified urban impacts or impairments are not listed.

Table VII-9 Nonpoint Source Status of Urban Streams[142]		
County	**Stream**	**Nonpoint Urban Source Status**
Lucas	Blue Creek	Impaired
Lucas	Cairl Creek	Impacted
Lucas	Delaware Creek	Impacted
Lucas	Driftmeyer Ditch	Impaired
Lucas	Duck Creek	Impaired
Lucas	Haefner Ditch	Impaired
Lucas	Heilman Ditch	Impaired
Lucas	Heldman Ditch	Impaired
Lucas	Hill Ditch	Impaired
Lucas	Ketcham Ditch	Impaired
Lucas	Maumee River	Impaired
Lucas	North Branch Ottawa River	Impaired
Lucas	Ottawa River	Impaired
Lucas	Otter Creek	Impaired
Lucas	Shantee Creek	Impaired
Lucas	Sibley Creek	Impaired
Lucas	Silver Ditch	Impaired
Lucas	Swan Creek	Impaired
Lucas	Swan Creek[143]	Impacted
Lucas	Tenmile Creek	Impaired
Lucas	Tifft Ditch	Impaired
Lucas	Williams (Flieg) Ditch	Impaired
Lucas	Wolf Creek[144]	Impaired
Lucas	Zink Ditch	Impacted
Monroe	Ottawa River	Impaired
Ottawa	Crane Creek	Impaired
Ottawa	Dry Creek	Impaired
Ottawa	North Branch Crane Creek	Impaired
Sandusky	Muddy Creek	Impaired
Sandusky	Toussaint Creek	Impaired
Wood	Crane Creek	Impaired
Wood	Dry Creek	Impaired
Wood	Grassy Creek	Impaired
Wood	Maumee R Tontogany-Waterville	Impaired
Wood	Needles Creek	Impacted
Wood	Otter Creek	Impaired
Wood	Yellow Creek	Impacted

High Growth Jurisdictions

The following table compares US Census Bureau figures for populations in 1990 versus 2000, and identifies jurisdictions with relatively high growth rates. This table lists all townships, and municipalities with population increases of 5% or more.

142 *Clean Water Act - Section 303(d) List* Ohio Environmental Protection Agency Division of Surface Water FY 1999-2000

143 Some segments are impacted, others are impaired.

144 There are two Wolf Creeks in Lucas County: one a tributary of the Ottawa River, and the other a tributary of Maumee Bay. Both are listed as nonpoint source impaired with urban sources known or suspected.

Table VII-10 Jurisdiction Population Changes 1990-2000 [145]				
County	Jurisdiction	1990 Population	2000 Population	Percent 2000/1990
Lucas	Harding Township	593	724	122%
Lucas	Holland Village	1,210	1,306	108%
Lucas	Jerusalem Township	3,253	3,181	98%
Lucas	Monclova Township	4,547	6,767	149%
Lucas	Oregon City	18,334	19,355	106%
Lucas	Providence Township	3,016	3,454	115%
Lucas	Richfield Township	1,178	1,308	111%
Lucas	Spencer Township	1,665	1,708	103%
Lucas	Springfield Township	18,835	22,817	121%
Lucas	Swanton Township	3,329	3,330	100%
Lucas	Sylvania City	17,301	18,670	108%
Lucas	Sylvania Township	22,682	25,583	113%
Lucas	Washington Township	3,803	3,574	94%
Lucas	Waterville Township	1,958	1,908	97%
Lucas	Waterville Village	4,517	4,828	107%
Lucas	Whitehouse Village	2,528	2,733	108%
Monroe	Bedford Township	23,748	28,606	120%
Monroe	Erie Township	4,492	4,850	108%
Monroe	Whiteford Township	4,433	4,420	100%
Ottawa	Allen Township	2,888	3,297	114%
Ottawa	Bay Township	1,276	1,294	101%
Ottawa	Benton Township	2,046	2,232	109%
Ottawa	Carroll Township	1,735	1,931	111%
Ottawa	Catawba Island Township	3,148	3,157	100%
Ottawa	Clay Township	3,005	2,888	96%
Ottawa	Danbury Township	3,665	3,869	106%
Ottawa	Elmore Village	1,334	1,426	107%
Ottawa	Erie Township	1,454	1,328	91%
Ottawa	Harris Township	1,431	1,583	111%
Ottawa	Oak Harbor Village	2,637	2,841	108
Ottawa	Portage Township	1,600	1,634	102%
Ottawa	Put-in-Bay Township	556	635	114%
Ottawa	Salem Township	2,427	2,676	110%
Sandusky	Ballville Township	6,049	6,395	106%
Sandusky	Clyde City	5,778	6,064	105%
Sandusky	Green Creek Township	4,014	3,463	86%
Sandusky	Jackson Township	1,248	1,174	94%
Sandusky	Madison Township	1,108	1,215	110%
Sandusky	Rice Township	1,467	1,437	98%
Sandusky	Riley Township	1,449	1,302	90%
Sandusky	Sandusky Township	4,441	4,087	92%
Sandusky	Scott Township	1,540	1,502	98%
Sandusky	Townsend Township	1,528	1,670	109%
Sandusky	Washington Township	1,654	1,892	114%
Sandusky	Woodville Township	1,135	1,327	117%
Sandusky	York Township	2,401	2,512	105%
Wood	Bloom Township	814	664	82%
Wood	Bowling Green City	28,151	29,636	105%
Wood	Bradner Village	1,093	1,171	107%

[145] Townships with growth rates of 13% or more are highlighted. Township populations are unincorporated areas only. In some cases population changes may not fully reflect urbanization during the period because newly developed areas were annexed. Similarly, growth in some municipalities was due to annexation.

Table VII-10 Jurisdiction Population Changes 1990-2000 [145]				
County	Jurisdiction	1990 Population	2000 Population	Percent 2000/1990
Wood	Center Township	1,158	1,246	108%
Wood	Freedom Township	1,241	1,330	107%
Wood	Grand Rapids Township	585	629	108%
Wood	Grand Rapids Village	955	1,002	105%
Wood	Haskins Village	549	638	116%
Wood	Henry Township	681	709	104%
Wood	Jackson Township	464	455	98%
Wood	Lake Township	6,632	6,643	100%
Wood	Liberty Township	1,737	1,862	107%
Wood	Luckey Village	848	998	118%
Wood	Middleton Township	1,911	1,960	103%
Wood	Millbury Village	1,082	1,161	107%
Wood	Milton Township	767	756	99%
Wood	Montgomery Township	1,895	1,872	99%
Wood	North Baltimore Village	3,139	3,361	107%
Wood	Pemberville Village	1,279	1,365	107%
Wood	Perry Township	1,651	1,856	112%
Wood	Perrysburg Township[146]	13,176	13,613	103%
Wood	Perrysburg City	12,551	16,945	135%
Wood	Plain Township	2,021	1,706	84%
Wood	Portage Township	966	1,088	113%
Wood	Rossford City	5,861	6,406	109%
Wood	Troy Township	3,000	3,357	112%
Wood	Washington Township	1,195	1,324	111%
Wood	Wayne Village	803	842	105
Wood	Webster Township	1,111	1,277	115%
Wood	Weston Township	718	615	86%

The next table compares the two previous tables by identifying high growth areas with streams that are known or suspected to be impaired by urban nonpoint pollutants.

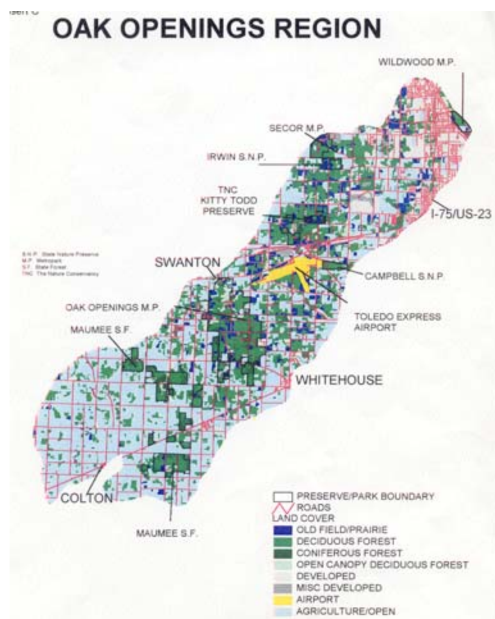
[146] During the decade, Perrysburg City's population increased 35%, and Rossford's by 9%, while Perrysburg Township's increased 3%. The city population increases were due largely to annexation from Perrysburg Township. Perrysburg Township is therefore considered a high growth jurisdiction.

Table VII-11 High-Growth Jurisdictions with Streams Impaired by Urban Non-point Sources		
County	**Jurisdiction**	**Urban Impaired Stream(s)**
Lucas	Holland Village	Wolf Creek
Lucas	Monclova Township	Swan Creek, Maumee River
Lucas	Oregon City	Driftmeyer Ditch, Otter Creek, Duck Creek, Wolf Creek
Lucas	Providence Township	Blue Creek
Lucas	Springfield Township	Wolf Creek, Heldman Ditch
Lucas	Sylvania City	Ottawa River, Tenmile Creek, North Tenmile Creek
Lucas	Sylvania Township	Ottawa River, Tenmile Creek
Lucas	Waterville Village	Swan Creek
Lucas	Whitehouse Village	Swan Creek, Blue Creek
Ottawa	Allen Township	Crane Creek, Dry Creek
Sandusky	Washington Township	Muddy Creek
Sandusky	Woodville Township	Toussaint River
Wood	Millbury Village	Crane Creek
Wood	Perrysburg City	Grassy Creek
Wood	Perrysburg Township	Grassy Creek, Dry Creek, Crane Creek
Wood	Rossford City	Grassy Creek, Dry Creek

Sensitive or Unique Natural Resource Areas

Oak Openings Region

The region's single most important natural habitat area is the Oak Openings region. The Maumee RAP[147] calls for preservation and acquisition of fish and wildlife habitats, specifically recommending wet prairies and oak savannahs of western Lucas County, in the Oak Openings area. The *Swan Creek Plan of Action*[148] gives its highest priority to preserving floodplains and wetlands as natural habitats.



The Oak Openings Region, located within portions of the Swan Creek and Ottawa River watersheds, is a 130 square mile area supporting globally rare oak savanna and wet prairie habitats. It is home to more rare species of plants and animals than any other area of Ohio. Its trees, plants, sandy soils, wet prairies, and floodplains benefit the region by acting as natural filters for our air and water.

Natural floodplain corridors occur between the Oak Openings Region and Lake Erie along the Maumee River, Swan Creek, and Ottawa River. Preserved natural floodplains in these areas help to balance the effects of development and the resulting downstream effects of increased urban runoff. Floodwater is slowed within the broad forested areas of the floodplain allowing for groundwater replacement, and evaporation to take place.

147 TMACOG, Maumee RAP Advisory Committee: *Recommendations for Implementation* July 1991 §§2.3.3, 2.3.4

148 TMACOG, Maumee RAP: *Swan Creek Plan of Action*, April 2001

The Oak Openings Region with its wet prairies and savannas, together with the connecting corridors along the Maumee River, Swan Creek, and Ottawa River should be given the highest priority for preservation. By maintaining the natural character of these areas, they will continue to benefit humans, and wildlife, long into the future.

For these reasons, this Plan recognizes the Oak Openings region as a sensitive and unique habitat area, and recommends it as a priority area for protection and restoration of habitat. Additional areas may be recognized by this Plan upon based on recommendation of the affected watershed council.

Maumee Bay South Coastline

This plan recognizes coastal natural areas as important habitat. They may include wetlands, but also provide shoreline habitat and natural beauty for both recreation users and residents. This plan identifies the south coast of Maumee Bay from the east side of the mouth of the Maumee River to Little Cedar Point within the boundaries of Ohio's Critical Coastal Area[149].

Priorities for Critical Urbanizing Resource Watersheds

1. **Watersheds designated as sensitive or unique natural habitat areas, impaired by urban nonpoint sources, and include high growth jurisdictions:**
- Ottawa River and tributaries Watershed, Lucas County
- Swan Creek and tributaries Watershed, Lucas County

2. **All other watersheds designated as sensitive or unique natural habitat areas**

3. **Watersheds impaired by urban nonpoint sources in high growth jurisdictions:**
- Crane Creek, Wood, Lucas, and Ottawa Counties,
- Dry Creek, Wood and Ottawa Counties
- Muddy Creek, Sandusky County
- Toussaint River, Sandusky County
- Grassy Creek, Wood County
- Otter Creek, Lucas County
- Duck Creek, Lucas County
- Driftmeyer Ditch, Lucas County

4. **High growth jurisdictions**
- Remaining jurisdictions, listed in Table VII-10

Uses of Critical Urbanizing Watershed Designations

- Priority areas for projects to implement BMPs identified earlier in this plan. In particular projects expand, enhance, and/or preserve wetland, habitat, and floodwater storage are recommended. These areas should be the top priority for cost share, demonstration, and Supplemental Environmental Projects (SEP)
- Recommended as priority areas for TMDLs to identify sources and BMPs addressing urban nonpoint sources.

149 Ohio Coastal Nonpoint Pollution Control Program Plan, Figure 2-19, ODNR, September 2000.

- Recommended as priority areas for local and county ordinances/regulations to protect wetlands and floodplains
- This Plan supports funding proposals to buy natural habitat properties or conservation easements in these areas for the purposes of natural habitat and floodwater storage.

Priorities for Already Urbanized Watersheds

There are also opportunities in already urbanized watersheds for implementing BMPs and restoring habitat and water quality. Urban areas in the region are estimated to have 30-35% impervious surface area[150]; Schueler [151] classifies urban streams with more than 26% impervious cover as degraded. This Plan makes the following recommendations:

- Generally, urbanized watersheds are covered by either Phase I or Phase II NPDES Stormwater permits. It is recommended that local governments and businesses meet the requirements of Phase I and II, and construction site permits. BMPs are encouraged throughout urbanized areas.
- Political jurisdictions in urbanized areas are recommended to adopt and implement the *Regional Stormwater Management Standards*
- Redevelopment of older city areas may offer opportunities for improving urban habitat. Besides compliance with NPDES permits, wetland, floodplain, and habitat restoration are recommended as part of the redevelopment. Priority should be given to redevelopment with a potential for restoring riparian habitat and natural floodplains.

Implementation Plans

The following documents are implementation plans specific to issues and conditions in portions of the region. They are hereby incorporated by reference as part of this chapter of the *Areawide Water Quality Management Plan.*

- Proposed Regional Stormwater Management Standards
- Plan of Operation for a Region Stormwater Management District in the Lower Maumee River Watershed.

---

[1] Quoted from US EPA National Water Quality Strategy stated in "Conservation Districts and Nonpoint Source Pollution Control," NACD October 1975

[2] Adapted from *Draft Guidelines for State and Areawide Water Quality Management Program Development*, US EPA February 1976

[3] *State of Ohio Nonpoint Source Assessment* Ohio EPA 1990

[4] *Ohio Nonpoint Source Management Program* Ohio DNR and Ohio EPA 1993; and the 1999 *Ohio Nonpoint Source Management Program Upgrade*

[5] *Ohio Coastal Nonpoint Pollution Control Program Plan* Ohio DNR September 2000 http://www.dnr.state.oh.us/soilandwater/coastalnonpointprogram.htm

[6] *Ecoregions of Indiana and Ohio* US EPA Western Ecology Division, Corvallis, OR http://www.epa.gov/wed/pages/ecoregions/ohin_eco.htm

[7] Ecoregions and Subregions of the United States (Lower 48), US Geological Survey, R.G. Bailey, 1995

---

[150] The Toledo Stormwater Utility in 2001 estimates 13,219 impervious acres, plus about 1,000 miles of streets. Assuming 24' average pavement and sidewalk width, the total is 16,128 acres, not counting highways. The impervious area is 31% of the city's 80.6 square miles. Toledo, the only jurisdiction with impervious area data at present, is probably typical of urban areas in the region.

[151] Schueler, T.R. *The Importance of Imperviousness.* Watershed Protection Techniques, vol. 1, no. 3, Fall 1994, pp. 107-8.

http://www.fs.fed.us/institute/ftp/maps/lower48.htm
[8] US EPA Ecoregions Level IV: http://www.epa.gov/wed/pages/ecoregions/level_iv.htm
[9] Dr. Jane Forsyth, Bowling Green State University, Professor Emeritus, Geology
[10] TMACOG, Maumee RAP Advisory Committee: *Recommendations for Implementation* July 1991 §§2.3.3, 2.3.4
[11] TMACOG, Maumee RAP: *Swan Creek Plan of Action*, 2002
[12] *Lake Erie and Lake St. Clair Handbook*, Stanley J. Bolsenda and Charles E. Herdendorf, Wayne State University Press, 1993
[13] *A Study of Physical Features for the Toledo Regional Area*, the Toledo Regional Area Plan for Action (TRAPA); Bowling Green State University Geology Department, Dr. Jane Forsyth; March 1968, pages 37-8
[14] *Lake Erie and Lake St. Clair Handbook*, Stanley J. Bolsenda and Charles E. Herdendorf, Wayne State University Press, 1993 page 221
[15] *A Study of Physical Features for the Toledo Regional Area*, the Toledo Regional Area Plan for Action (TRAPA); Bowling Green State University Geology Department, Dr. Jane Forsyth; March 1968, pages 23-24
[16] *Portage River Watershed and Fishery* Ohio Department of Natural Resources Division of Wildlife, 1965
[17] Sandusky River Watershed Resource Inventory, Sandusky River Watershed Coalition, 2002, Chapter 3
[18] *A Study of Physical Features for the Toledo Regional Area*, the Toledo Regional Area Plan for Action (TRAPA); Bowling Green State University Geology Department, Dr. Jane Forsyth; March 1968, pages 23-24
[19] *Watershed Initiative Inter-State Nomination for the Ottawa River*, Ohio EPA and Maumee RAP November 2002
[20] "Davis-Besse Nuclear Power Station," brochure Toledo Edison/Centerior Energy Corporation, page 13, no date.
[21] "Beryllium Cleanup Planned," *Sentinel-Tribune*, June 14 2003
[22] *A Study of Physical Features for the Toledo Regional Area*, the Toledo Regional Area Plan for Action (TRAPA); Bowling Green State University Geology Department, Dr. Jane Forsyth; March 1968, page 40
[23] Maumee River Basin Area of Concern Remediation Action Plan Recommendations for Implementation TMACOG and Maumee RAP, July 1991, citing Pinsak & Meyer, 1976 page 31
[24] *Lake Erie and Lake St. Clair Handbook*, Stanley J. Bolsenda and Charles E. Herdendorf, Wayne State University Press, 1993 page 71
[25] Based on population with available sanitary sewers in the FPA GIS system. This should be taken as an "order of magnitude" figure, since there are areas with sewers but not water, and areas with water but no sewer. Water user figures are not readily available.
[26] *A Study of Physical Features for the Toledo Regional Area*, the Toledo Regional Area Plan for Action (TRAPA); Bowling Green State University Geology Department, Dr. Jane Forsyth; March 1968, chapter IV
[27] *Karst Unified Source Water Protection Plan*, WSOS Community Action Commission, March 2001
[28] *Geology for Environmental Planning in Monroe County, Michigan*, Andrew J. Mozola, Wayne State University; Michigan Department of Natural Resources, Geological Survey Division, 1970
[29] *Geohydrology and Quality of Water in Aquifers in Lucas, Sandusky, and Wood Counties, Northwestern Ohio* US Geological Survey Water-Resources investigations Representative 91-4024, 1991. Pages 2, 74-5, and Table 9
[30] Heidelberg College Water Quality Laboratory website: http://www.heidelberg.edu/WQL/welltest.html
[31] *Nitrate and Pesticides in Private Wells of Ohio: a State Atlas*, Heidelberg College Water Quality Laboratory, 1989
[32] *Port Clinton Ohio Facilities Plan Addendum for Catawba Island Portage Townships*, Finkbeiner Pettis & Strout July 1987
[33] *Study of the Effects of Domestic Sewage on Ground Water Quality in Stearns Crest Subdivision Wood County Ohio* Ohio Dept of Health, 1982
[34] US EPA hosts an extensive website on Pollutants/Toxics with many links: http://www.epa.gov/ebtpages/pollutants.html.
[35] US EPA's website on pesticides provides many references and links: http://www.epa.gov/ebtpages/pesticides.html
[36] "Ohio EPA Pesticide Special Study: May 1995 Through August 1998 Summary," Ohio EPA 1998; posted of OEPA website: http://www.epa.state.oh.us/ddagw/pestspst.html
[37] Use Attainment designations and biological testing criteria are defined in Ohio Administrative Code §3745-1-07
[38] More information on Ohio EPA aquatic life indexes is available at http://www.epa.state.oh.us/dsw/wqs/wqs.html
[39] *Ohio 2002 Integrated Water Quality Monitoring and Assessment Report prepared to fulfill the requirements of Sections 305(b) and 303(d) of the Clean Water Act* Ohio EPA Division of Surface Water, October 2002; Table 1 and Appendix C. This report is updated semi-annually, and the 2004 version is presently available in draft.
[40] Updated data for the Sandusky River is from the draft *2004 Integrated Water Quality Monitoring and Assessment Report*, http://www.epa.state.oh.us/dsw/tmdl/2004IntReport/2004OhioIntegratedReport.html Appendix D-3
[41] *Ohio 2002 Integrated Water Quality Monitoring and Assessment Report prepared to fulfill the requirements of Sections 305(b) and 303(d) of the Clean Water Act* Ohio EPA Division of Surface Water, October 2002; the maps presented here were clipped from statewide watershed maps without modification. http://www.epa.state.oh.us/dsw/tmdl/2002IntReport/2002OhioIntegratedReport.html

[42] An index to Ohio advisories is available at http://www.epa.state.oh.us/dsw/fishadvisory/index.html with links to fish consumption and swimming advisories, fact sheets, advisory information for sensitive populations, and fish trimming and cooking tips.

[43] *2003 Ohio Sport Fish Consumption Advisory,* Ohio EPA Division of Surface Water and the Ohio Department of Health, February 2003

[44] Ohio Department of Health Beach Monitoring Sample Results, http://www.odh.state.oh.us/odhprograms/beach/sample.htm

[45] "Bathing Beach Monitoring Program Guidelines," Ohio Department of Health Bureau of Local Services, 1996

[46] Personal communication: Dr. Thomas B Bridgeman, PhD., University of Toledo Lake Erie Center, February 2004

[47] *Ohio Phosphorus Reduction Strategy for Lake Erie | Ohio Water Quality Management Plan* Ohio EPA Office of The Planning Coordinator, June 1985, page 1

[48] *Ohio Phosphorus Reduction Strategy for Lake Erie | Ohio Water Quality Management Plan* Ohio EPA Office of The Planning Coordinator, June 1985, page 5

[49] *Eleventh Biennial Report on Great Lakes Water Quality* International Joint Commission September 2002, pp 50-51

[50] *Association Between Nutrients, Habitat, and the Aquatic Biota in Ohio Rivers and Streams* Ohio EPA Technical Bulletin MAS/1999-1-1, 1999

[51] "Trends in water quality in LEASEQ Rivers and Streams (Northwest Ohio), 1975-1995". *Journal of Environmental Quality* 31(1): 90-96 Richards and Baker. 2003. See also http://www.heidelberg.edu/WQL/publish.html

[52] Public Notice: Operation and Maintenance Dredging and Dredge Material Discharge, Toledo Harbor, US Army Corps of Engineers, September 2003

[53] *The Results of a Sediment Trend Analysis in Maumee Bay, Lake Erie*, GeoSea Consulting, 2003

[54] *Water and Wastewater Engineering, Volume 2*, Fair, Geyer, and Okun, John Wiley & Sons, 1958; pp 19-4 through 19-9

[55] One such outbreak is discussed in *An Historical Gazetteer of Wood County Ohio*, Lyle Rexford Fletcher, Emeritus Professor of Geography, Bowling Green State University, 1988, page 116

[56] *Wolf Creek Bacterial Impact on Maumee Bay State Park Beach*, University of Toledo and TMACOG, June 2003

[57] Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.) Title I Sec. 101. (a)

[58] *The Clean Water Act with Amendments*, Water Pollution Control Federation, 1982, page 1

[59] OAC §3745-1-04

[60] *Great Lakes Water Quality Agreement of 1978 as Amended by Protocol Signed November 18 1987*, Article III. International Joint Commission, 1989.

[61] *Great Lakes Water Quality Agreement of 1978 as Amended by Protocol Signed November 18 1987*, Article II. International Joint Commission, 1989.

[62] *Great Lakes Water Quality Agreement of 1978 as Amended by Protocol Signed November 18 1987*, Annex 3. International Joint Commission, 1989.

[63] *State of Ohio Phosphorus Reduction Strategy for Lake Erie* Ohio EPA, 1985

[64] *Great Lakes Water Quality Agreement of 1978 as Amended by Protocol Signed November 18 1987*, Annex 2. International Joint Commission, 1989.

[65] TMACOG, Maumee RAP Advisory Committee: *Recommendations for Implementation* July 1991

[66] *Maumee Area of Concern Stage II Watershed Restoration Plan*, Maumee RAP, publication anticipated 2005