CITY OF WOOSTER
WAYNE COUNTY, OHIO

COMBINED SEWER COLLECTION SYSTEM

LONG-TERM CONTROL PLAN

January, 2004

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1 INTRODUCTION

The City of Wooster is one of the approximately 772 communities in the United States that are serviced either partly or entirely by a Combined Sewer System (CSS). A CSS is defined as a wastewater collection system that is designed to carry domestic and industrial sewage, as well as storm water within the same system. This type of system is a reflection of earlier American infrastructure. **Figure 1** illustrates this point, as most of the Combined Sewer Systems are located in older communities in the Great Lakes and Northeast regions. The current accepted practice in wastewater management is for the development of two separate sewer systems; a wastewater system that conveys the sanitary sewage to the Publicly Owned Treatment Works (POTW) and a storm water system that is utilized in wet weather conditions to accept surface drainage. The City of Wooster's wastewater collection system contains areas that are serviced as CSSs and also portions of the City are operated as separate sewer areas.

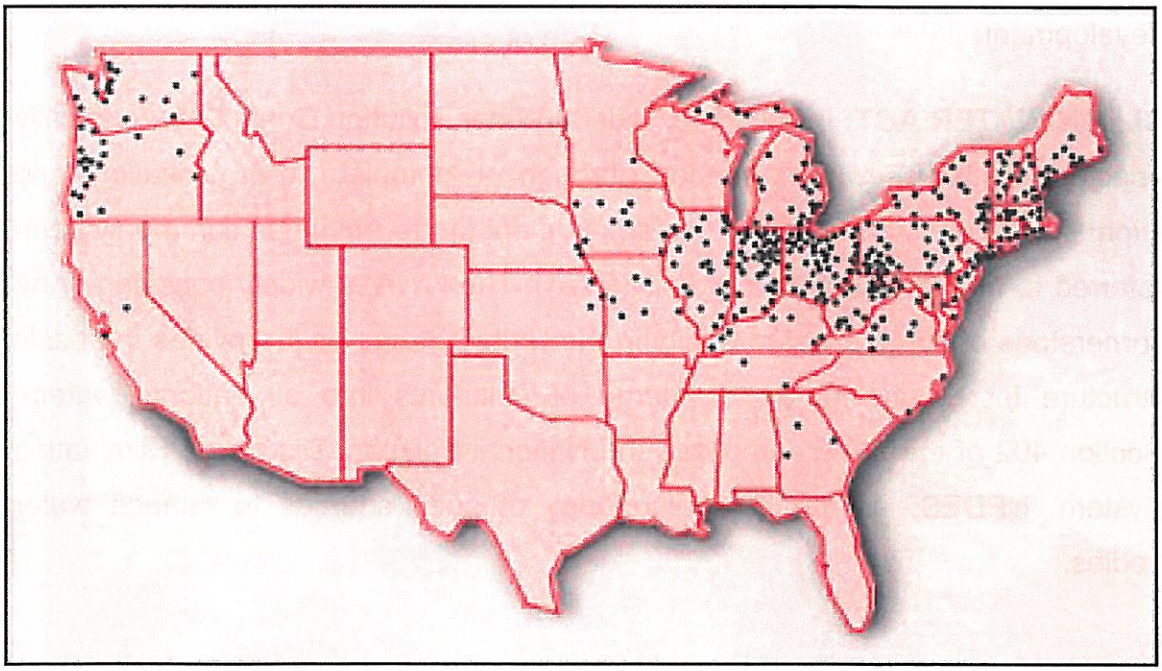

Figure 1: CSS Communities (Source USEPA website)

In "Dry Weather" a CSS transports strictly sanitary sewage through the system to the POTW for treatment before it is eventually discharged into a receiving water, i.e. a river, stream, or lake. In properly designed systems, a CSS should have adequate capacity to process all sanitary flows and also the ability to convey wet weather flows developed from light to medium rain events. In periods of more intense rain events, the incoming flows can become greater than the sewer's flow capacity. In such instances the CSS will begin to surcharge and backup, potentially causing basement flooding, overflowing of manholes and overloading of the POTW. In an effort to avoid such damaging situations, a properly designed CSS will relieve itself by discharging the excessive flows to surface water bodies. The term for this occurrence is called a Combined Sewer Overflow (CSO).

The goal of a Long-Term Control Plan (LTCP) is to develop and implement improvements to a CSS that will allow for the CSOs receiving water body to meet water quality requirements as documented in the Clean Water Act (CWA). To understand fully the objective of this plan, it is necessary to review the following statute, strategies, policy, permit and settlement that have outlined its development.

CLEAN WATER ACT: In 1972 the Federal Water Pollution Control Act (originally enacted in 1948) was amended through a complete reorganization and expansion of the statute. Since this amendment to the Act it has commonly been referred to as the "Clean Water Act" (CWA). The CWA is widely considered the cornerstone of surface water quality in the United States as it provides the basic structure for regulating the discharge of pollutants into all national waters. Section 402 of the CWA authorizes the National Pollutant Discharge Elimination System (NPDES) as the governing body of point sources to surface water bodies.

NATIONAL COMBINED SEWER OVERFLOW CONTROL STRATEGY (Appendix A:): This document issued in 1989 by the EPA's Office of Water was developed in accordance with three objectives. These objectives, as listed in the control strategy, are as follows:

1) To ensure that if CSO discharges occur, they are only as a result of wet weather

2) To bring all wet weather CSO discharge points into compliance with the technology-based requirements of the CWA and applicable State water quality standards, and

3) To minimize water quality, aquatic biota, and human health impacts from wet weather overflows.

To ensure its implementation and consistency, the strategy also required State-wide permit strategies to be developed by the states or by the regions to be approved by March 31,1990.

COMBINED SEWER OVERFLOW (CSO) CONTROL POLICY (Appendix B): The impetus for the creation of the "Control Policy" is twofold:

1) To elaborate on the aforesaid "National Combined Sewer Overflow Control Strategy"

2) To expedite compliance with the requirements of the CWA

In an effort to elaborate on the 1989 CSO Control Strategy the policy provides guidance to both Permitees with CSOs and also NPDES permitting and enforcement authorities. The Policy coordinates the planning, selection, design and implementation of CSO management practices and controls to meet the requirements of the CWA. From the planning to the implementation of these practices and controls, the policy requires the Permitee to involve the public through the process.

The Policy understands that neither time nor money are unlimited resources for any municipality. With this knowledge the document provides the outline and basis for the development of a Long-Term Control Plan to develop cost effective control methods that will eventually meet the requirements of the CWA. The Policy lists four key principles to ensure CSO controls meet the objective of cost effectiveness. They are as follows:

1) Providing clear levels of control that would be presumed to meet appropriate health and environmental objectives;

2) Providing sufficient flexibility to municipalities, especially financially disadvantaged communities, to consider the site-specific nature of CSOs and to determine the most cost effective means of reducing pollutants and meeting CWA objectives and requirements;

3) Allowing a phased approach to implementation of CSO controls considering a community's financial capability; and

4) Review and revision, as appropriate, of water quality standards and their implementation procedures when developing CSO control plans to reflect the site-specific wet weather impacts of CSOs

STATE OF OHIO COMBINED SEWER OVERFLOW STRATEGY (Appendix C): The creation of the "Ohio Strategy" was a requirement of the State to comply with the "National Combined Sewer Overflow Control Strategy" and it's objectives. The Ohio Strategy dated March, 1995 (modeled after the Control Policy) provides guidance for the Ohio EPA and CSO communities to achieve three goals (see Figure 2 for Ohio CSO Communities);

1) Discharges from CSOs shall not cause or significantly contribute to violations of water quality standards or impairment of designated uses.

2) During wet weather, the total loading of pollutants discharged from the entire wastewater treatment system shall be minimized; and the discharge of pollutants from CSOs should not increase above current levels.

3) CSOs shall be eliminated when this is a cost effective, economically achievable control option, and when it does not cause new or significantly increased overflows elsewhere in the system.

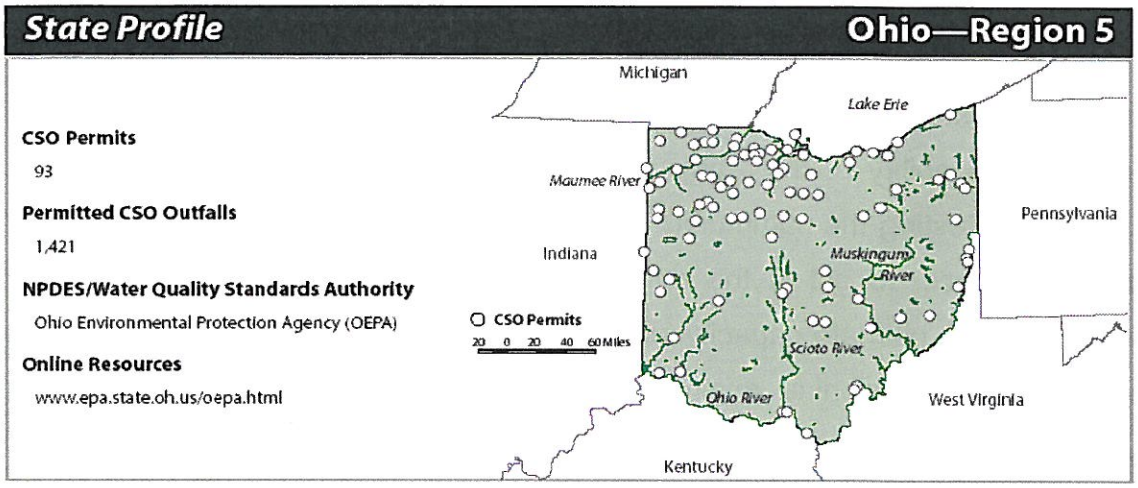

Figure 2: CSO Communities (Source USEPA report to Congress 1/29/02)

The Ohio Strategy also outlines a three-step process the state requires applicable CSO communities to take in their effort to control CSOs. The first course of action that is to be taken is the development of an "Operational Plan". The objective of the Operational Plan is to outline how the community has and/or will implement the Nine Minimum Controls (NMC) as listed below;

1) Proper Operation and maintenance programs for the sewer system and CSO points

2) Maximum use of the collection system

3) Review and modification of pretreatment programs or other local programs to minimize the impact of non-domestic discharges from CSOs

4) Maximization of flow to POTW for treatment

5) Prohibition of Dry Weather Overflows (DWOs)

6) Control of solid and floatable materials in CSO discharges

7) Required inspection, monitoring and reporting of CSOs

8) Pollution Prevention to reduce CSO impacts

9) Public notification for any areas affected by CSOs, especially beach areas and areas where contact recreation occurs.

The second step in this process is to conduct wet weather stress testing to maximize the ability of the wastewater plant to treat wet weather flows. As a result of this testing the community may be able to discover a cost effective tool, already in place, to aid in the reduction of events and intensity of CSOs. In determining the ultimate capacity of the POTW, a community may begin to meet requirements of the nine minimum controls and a Long-Term Control Plan (LTCP).

The development of a Long-Term Control Plan is the third and final phase for the Community to perform under the Ohio Strategy. The Long-Term Control Plan expands on the Nine Minimum Controls and as implied by the name directs the community to outline the implementation of future controls that will ultimately allow for receiving water bodies to meet the water quality requirements of the CWA. The Ohio Strategy also outlines how the Long-Term Control Plan as well as the first two steps listed above (Operational Plan and Wet Weather Stress Testing) will be incorporated into NPDES permits which are under the governing of the Ohio EPA for all communities within the state.

OHIO EPA NPDES PERMIT NO. 3PD00013*KD (Appendix D): The City of Wooster's NPDES permit provides an outline of topics that are to be incorporated within this document. The objective of the City's Long-Term Control Plan is to, at a minimum, address all requirements listed within NPDES permit No. 3PD00013*KD and as follows:

1. Public Participation
2. Combined Sewer System (CSS) Characterization
    a. Rainfall Records Review
    b. CSS Records Review
    c. CSO and Water Quality Monitoring
    d. Identification of Sensitive Areas
    e. CSS and Receiving Water Modeling, if necessary
3. Antidegradation Plan
4. CSO Control Alternatives
    a. Development of CSO Control Alternatives
    b. Evaluation of CSO Control Alternatives
    c. Cost/Performance Considerations
5. Selected CSO Controls
    a. Implementation Schedule
    b. Operational Plan
    c. Post-Construction Compliance Monitoring Program

PROPOSED SETTLEMENT, CASE NO. ERAC 855100: The proposed settlement amends the appealed portions of NPDES permit No. 3PD00013*KD. The effect of the settlement with regards to the goals of the LTCP is stated in the following (Exhibit A, No. 2, Part I, C – Schedule of Compliance, A. Municipal Construction Schedule, 1.);

This entity shall make improvements necessary to eliminate overflows from the Apple Creek interceptor sewer (005) up to an estimated five-year precipitation event. These improvements shall be made as expeditiously as practicable, but not later than the end of the current NPDES permit Term (April 30, 2007)

The City of Wooster is dedicated to maintaining quality standards within the waters of the community and those that flow out of the City's limits. An aggressive approach has been taken as a number of the permit-listed tasks have been performed independently and under the authority of the Ohio EPA. The City takes pride in the fact that the compilation of the work that has already been performed meets many of the requirements listed within NPDES permit 3PD00013*KD. The following is a written narrative, augmented with direction from the Ohio EPA and from the public, of those actions the City has, will, and are currently providing to meet the requirements of the CWA.

2 SYSTEM CHARACTERIZATION

2.1 Public Participation

The City of Wooster has submitted a Public Participation Plan to the Ohio EPA on September 27, 2002 as shown in Appendix E. The plan has since been modified in order to meet the objectives of this document. Therefore the new Public Participation Plan has been incorporated within Sections 2.1 (this Section), 3.1, and 4.1 of this document.

The following had been submitted in the September 2002 Public Participation Plan and will be considered part of this document;

"Several public meetings have been held during the past five years that pertain to the overall development of the City's LTCP. Notifications for all public meetings are posted in the local newspaper and several public locations at least 24 hours in advance. Each meeting posting will describe the items to be discussed, so that interested parties can attend as appropriate.

On February 18 and again on March 3, 1997, Wooster City Council held hearings on an appropriations ordinance that authorized the City to enter into a contract with the consulting firm of Finkbeiner, Pettis, and Strout (FPS). This contract started the development of the City's LTCP by conducting a study which would ultimately produce a report entitled "Master Plan for Sewer Separation". The goal of the study was to identify combined sewer areas that could feasibly be separated in an effort to reduce the number and duration of overflow events from the City's three (3) CSOs. The report was delivered to the City on September 10, 1999 and was made available to the public for viewing in the City Engineer's offices."

2.2 System Characterization

The City of Wooster's collection system consists of nearly 70% separate sewer and 30% combined sewer system. The combined sewers are located in the downtown portion of the City and the areas that closely surround it (The downtown area is one of the oldest and most developed sections of the City). In regards to the entire system, combined sewers are located within three of the four drainage areas within the City; Christmas Run, Elm Street and Bever Street (see Figure 3).

Two main interceptors, the Christmas Run Interceptor and the Apple Creek Interceptor convey the flows from the four drainage areas to the plant. The Christmas Run Interceptor directs flow exclusively from the Christmas Run drainage area (covering the western portion of the City). This drainage area is mostly made up of separate sewers, however, a portion of the area that is located nearest to downtown consists of combined sewers. In 1979, the City performed an Infiltration/Inflow (I/I) Analysis (Jones & Henry Engineers, Limited see Appendix F) on the collection system. At the time of the study, the Christmas Run Interceptor had a working overflow due to excessive I/I and the combined sewer tributary to it. The analysis focused on eliminating I/I problems and in turn minimizing the impact of the overflow. The overflow was eliminated in 1987 but still presents a concern to the POTW as clean water still impacts the system during storm events.

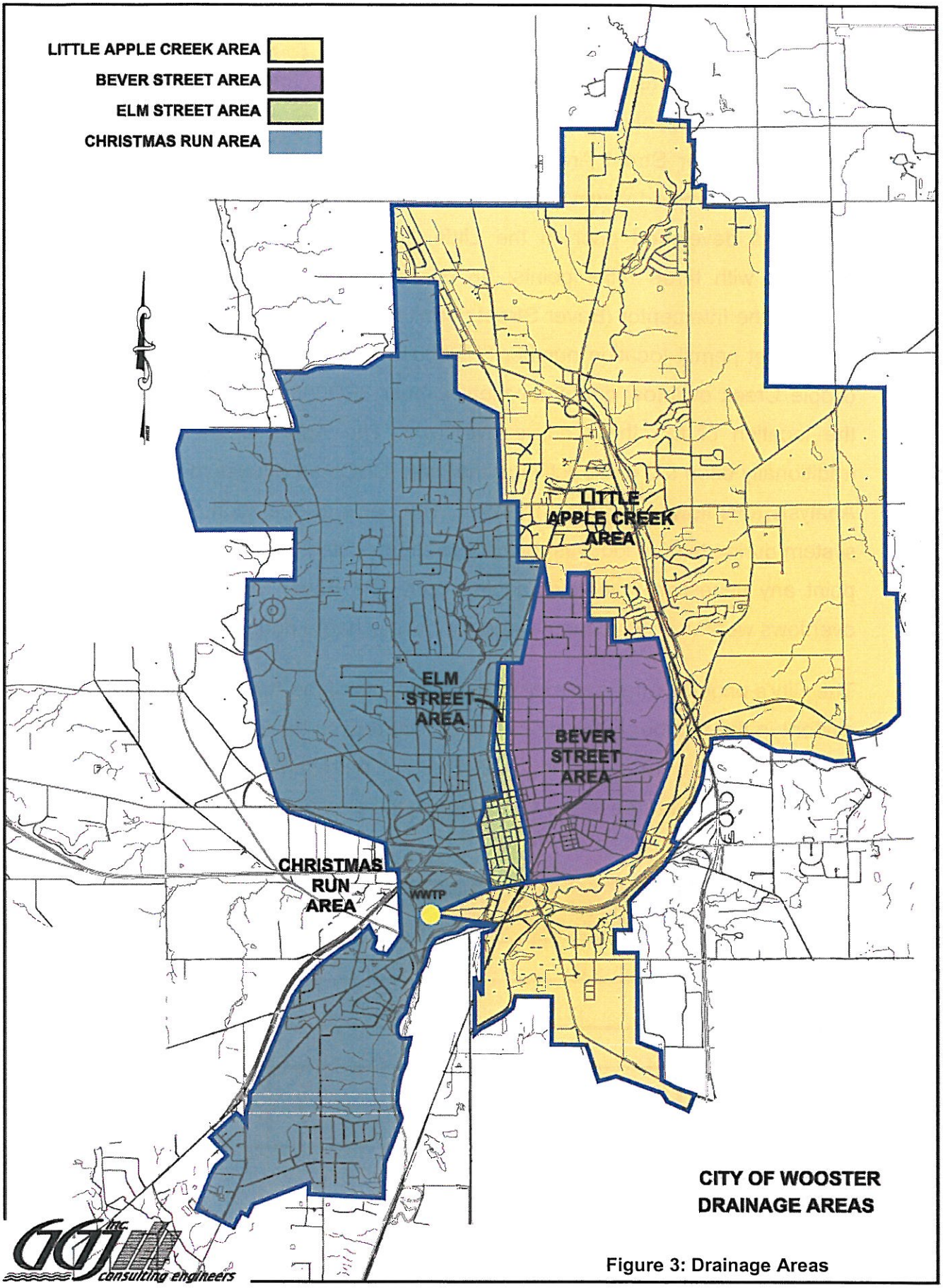

Figure 3: Drainage Areas

The Apple Creek Interceptor processes the flows from three drainage areas; the Elm Street Area, Bever Street Area, and the Little Apple Creek Area. The Elm Street and Bever Street Areas are located in and around downtown and are considered combined sewer areas with partial storm sewer development. These two areas developed prior to the Little Apple Creek have historically been operated with three relief points; an overflow located at each area prior to entering the Interceptor (Bever Street permit location number 3PD00013003 and Elm Street permit location number 3PD00013004) and an overflow at the plant (Apple Creek overflow permit location number 3PD00013005). See Figure 5for the location of the three active overflows. The Apple Creek Overflow had traditionally been the most active of the three CSOs as witnessed in the 1979 I/I Analysis (overflowed 99 times in 1975). The basis of operation of the collection system during this period was to process all possible flow to the POTW at which point any necessary overflows could occur. The Bever Street and Elm Street overflows were used infrequently and did not discharge during most events.

The City's ongoing efforts to minimize the impacts of the Apple Creek Overflow is evident in the number of yearly overflow occurrences having decreased from 99 events in 1975 to 19 events in 2002. Figure 4 represents the number of yearly occurrences of the three active CSOs during the previous five years.

YEAR	APPLE CREEK OVERFLOW	ELM STREET OVERFLOW	BEVER STREET OVERFLOW
1998	25	17	13
1999	17	10	9
2000	24	16	16
2001	15	7	11
2002	19	6	7

FIGURE 4: YEARLY CSO OCCURRENCES

During the development of the LTCP it was discovered that another two (2) CSOs exist within the system. The first CSO discharges into the Christmas Run via a diversion located at the intersection of Foster Path and Poplar Street. The second CSO also discharges into the Christmas Run by means of three diversions located on Henry Street at the intersections of Buckeye Street, Market Street, and Walnut Street. See Figure 5 for the location of the two additional overflows as well as the locations of the Henry Street diversions.

The City is currently in the design phase of projects that will either completely or effectively eliminate the newly discovered CSOs. The long-term controls that have been selected to deal with these CSOs are further discussed within this LTCP in Chapter 4. The City has made it a top priority to address the Foster Path and the Henry Street CSOs.

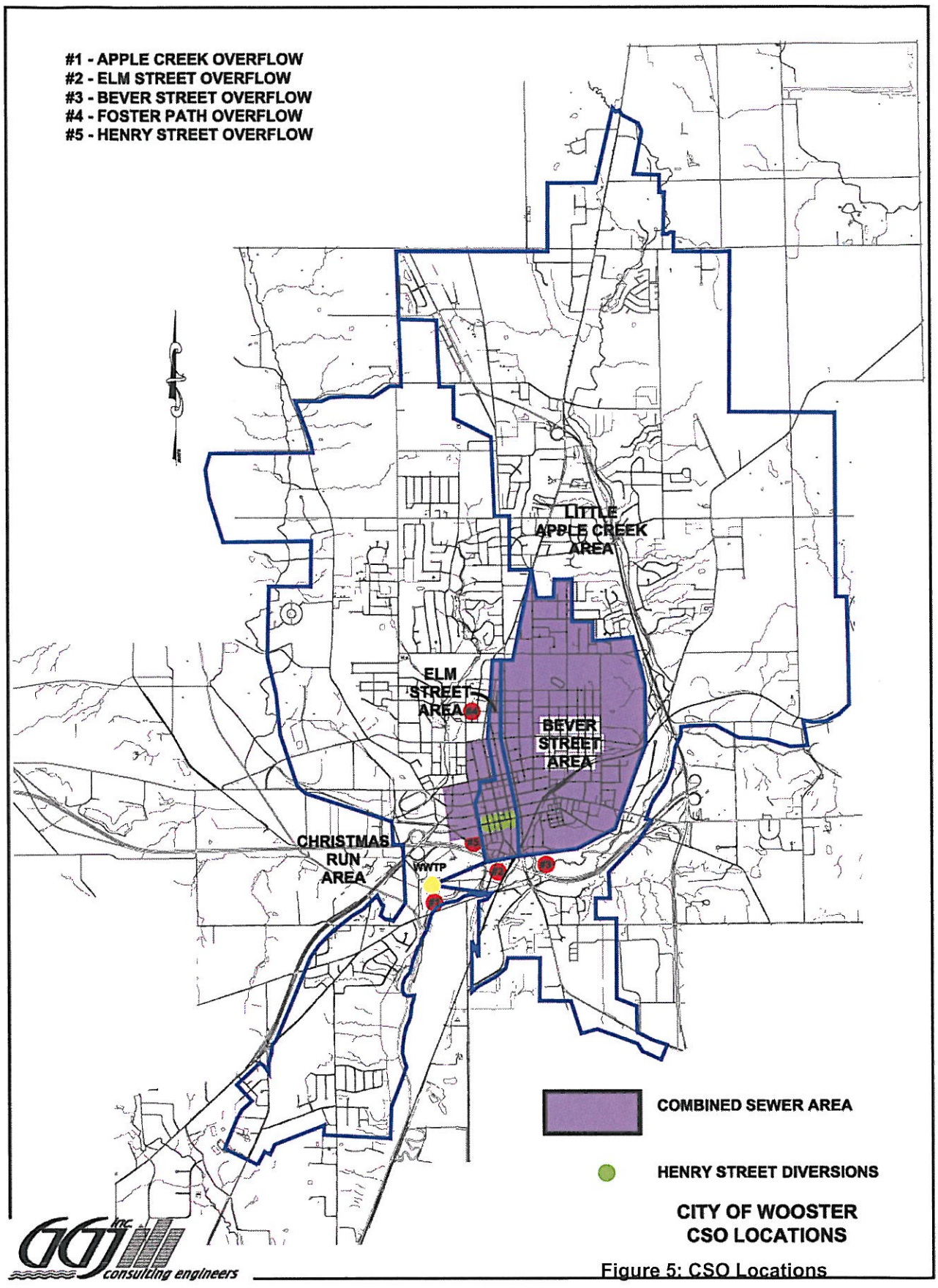

Figure 5: CSO Locations

2.3 Implementation of the Nine Minimum Controls

The City of Wooster has an established Combined Sewer System Operational Plan (CSSO Plan, Jones & Henry, Limited 1995) as approved by Ohio EPA in a letter dated January 23, 1996. The plan has since been implemented and is available to view by the "operator in responsible charge" and also to all employees on day-to-day operations. The City is obligated to continue the implementation of the nine minimum controls under the authority of NPDES permit number 3PD00013*KD as detailed in the CSSO Plan or as it may be updated. The permit requires the following to be done to remain in compliance:

- Provide proper operation and maintenance for the collection system and the combined sewer overflow points
- Provide the maximum use of the collection system for storage of wet weather flow prior to allowing overflows
- Review and modify the pretreatment program to minimize the impact of non-domestic discharges from combined sewer overflows; or if there is no pretreatment program review and modify local programs to minimize the impact of non-domestic discharges from combined sewer overflows
- Maximize the capabilities of the POTW to treat wet weather flows, and maximize the wet weather flow to the wastewater treatment plant within the limits of the plant's capabilities
- Prohibit dry weather overflows
- Control solid and floatable materials in the combined sewer overflow discharge
- Conduct required inspection, monitoring and reporting of CSOs

- Implement pollution prevention programs that focus on reducing the level of contaminants in CSOs

- Implement a public notification program for areas affected by CSOs especially beaches and recreation areas

2.4 Compilation and Analysis of Existing Data

The compilation and analysis of existing data is essential to the development of this and any other long-term control plan (see Figure 6 for data types involved with CSO planning). The objective of properly processing this existing data is to obtain a detailed understanding of the CSS and the receiving stream/streams that may be impacted by the CSOs. By identifying the baseline conditions a community can build the foundation of knowledge that will support future endeavors such as; monitoring, modeling, problem assessment, development of controls and implementation of controls. Through observing the existing data that is available to the community, a more specific focus can be developed by targeting information gaps as they are exposed during this process.

Watershed Data	Source Input/Receiving Water Data
Environmental	**Source Inputs (Flow and Quality)**
Land use	CSO
Recreational and open areas	Storm water
Soil and surface/bedrock geology	Other point source and nonpoint source
Natural resources	**Receiving Water**
Temperature	Physiographic and bathymetric data
Precipitation	Flow characteristics
Hydrology	Sediment data
Infrastructure	Water quality data
Roads and highways	Fisheries data
Storm drainage system	Benthos data
Sanitary sewer (and combined sewer) system	Biomonitoring results
Treatment facilities	Federal standards and criteria
Municipal	State standards and criteria
Population	
Zoning	
Land ownership	
Regulations and ordinances	
Potential Sources/BMPs	
Municipal source controls	
Direct (NPDES) and indirect dischargers	
Pollution control facilities	
Storm water control structures	

Figure 6: Data Types for CSO Planning (source EPA, LTCP Guidance)

2.4.1 Watershed Characterization

ENVIRONMENTAL

Watershed Area: The City of Wooster is located in the Upper Killbuck Creek Watershed (see Figure 7). The City is situated near the confluence of Killbuck Creek, Apple Creek and Christmas Run, nearly 30 miles downstream from the headwaters of the Killbuck. The watershed covers 609 square miles of drainage area that eventually discharges to the Walhonding River by means of the entire 82 miles of the Killbuck Creek and its tributaries.

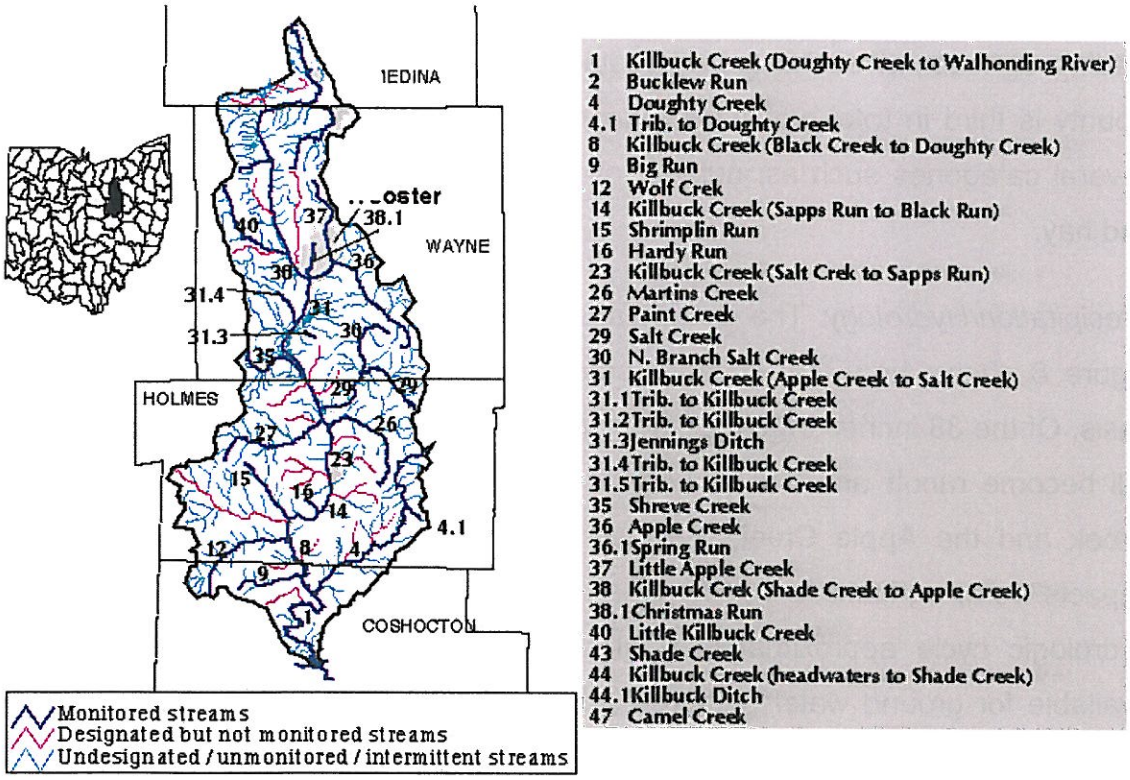

Figure 7: Drainage Area of the Killbuck Creek (source Ohio EPA, Div. of Surface Water)

Land use: For purposes of the LTCP, the northern half of the watershed is the City's concern as all upstream contributing factors can be examined and all areas for which the City would have the greatest impact would be taken into account. Therefore land use characteristics of Wayne County would present a reasonable representation of the area of concern (50% of the county is located within the watershed and the northern half of the watershed consists mostly of Wayne County). Wayne County is comprised of the Erie/Ontario Lake Plain ecoregion that is characterized by irregular shaped agricultural plains scattered with areas of woodlands and urbanization. The County contains 358,912 land acres of which approximately 75% is considered rural. According to information from the Ohio State University (OSU), College of Food, Agriculture and Environmental Sciences, the County has used their extensive rural area to become one of the leading agricultural counties in the state. According to the University, Wayne County is third in total agricultural income in the state and is the top county in several categories such as; number of total cattle, number of dairy cattle, oats, and hay.

Precipitation/Hydrology: The County averages nearly 38 inches of rain per year, Figure 8 shows how that is represented on an average monthly precipitation basis. Of the 38 inches of rainfall each year it is estimated that 10 inches of such will become runoff and find its way into surface water bodies like the Killbuck Creek and the Apple Creek. This surface runoff is capable of water quality impacts from; agricultural runoff, urban runoff, and sedimentation. Through the hydrologic cycle approximately 6 of the 38 inches of rain per year will be available for ground water recharge (the remaining 22 inches will return to the atmosphere through evapotranspiration). Ground water is an important resource within the area; as 98% of local households rely on ground water and nearly half the county's households have private wells.

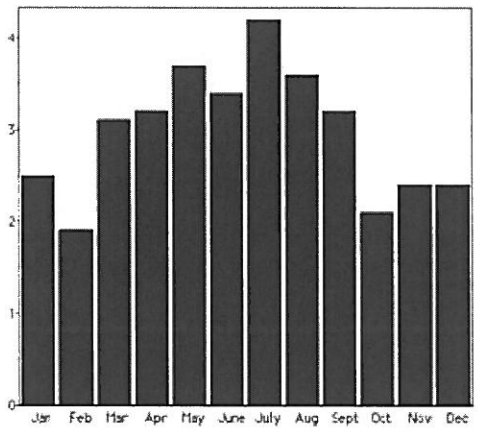

Figure 8: Average Monthly Precipitation, Wayne County (source OSU AEX 480.85)

Soil and Surface/Bedrock Geology: Irregular shaped agricultural plains scattered with areas of woodlands and urbanization characterizes Wayne County. The irregular shaped plains are the product of glacial activity that created the hilly areas, the wetlands and the lake beds that outline those regions. The flat plains are prime farmland locations that consist of poorly drained soils. The soils within this area perform better in terms of agricultural yield when artificially drained.

The County is susceptible to erosion due to sloping in certain sections of the region and also the poor drainage in the plains. The overall soil composition located within the County is considered loamy to silty. The erosion of such soil is detrimental to surface water quality as it begins to fill in the waterways. According to OSU document AEX-480.85, "About 7,000 tons of sediment per day are carried by Wayne County streams, amounting to about 550,000 tons per year". Surface runoff and sediment are a source of pollution as nutrients from agriculture, lawn fertilizer and golf courses may be carried to the stream. Other pollution sources from surface runoff may be from oil and gas spills, industrial wastes and septage.

Aquatic Life Use Designation: The water quality standards in the State of Ohio uses chemical, physical and most importantly biological criteria that is representative of measurable properties of the environment. The state uses these measurable properties to determine attainment status of the designated aquatic life use, which in turn determines water quality standards.

The State has a tiered system of aquatic life uses. These use designations are assigned to each water body segment. In receiving a use designation, that portion of the stream is offered the protection of the particular biocriteria requirements of that designation. The following is a list of the current aquatic life use designations in the State. This information has been provided by The Ohio State University, Bulletin No. 873.98.

- *Warmwater Habitat (WWH)*: Capable of supporting and maintaining a balanced community of warmwater aquatic organisms. This is the most widely applied use designation assigned to warmwater rivers and streams in Ohio.

- *Limited Warmwater Habitat (LWH)*: "Temporary" aquatic life habitat use designation created in the 1978 Ohio Water Quality Standards for streams not meeting specific warmwater habitat criteria. This aquatic life use designation is being phased out.

- *Exceptional Warmwater Habitat (EWH)*: Capable of supporting and maintaining an exceptional or unusual community of warmwater aquatic organisms with the general characteristics of being highly intolerant of adverse water quality conditions and/or being rare, threatened, endangered, or of special status. This is the most protective use designation assigned to warmwater rivers and streams in Ohio.

- *Modified Warmwater Habitat (MWH)*: Incapable of supporting and maintaining a balanced community of warmwater aquatic organisms because of extensive and irretrievable modifications to the physical habitat. Examples include extensive cases of: stream channel modification; stream sedimentation from abandoned mine land runoff; and permanent impoundment of free-flowing water bodies.

- *Seasonal Salmonid Habitat (SSH)*: Capable of supporting the passage of salmonids from October to May and large enough to support recreational fishing. This aquatic life habitat use designation is in effect from only October to May each year. Another aquatic life habitat use designation will be in effect the remainder of the year (June to September).

- *Coldwater Habitat (CW):* Capable of supporting populations of coldwater aquatic organisms on an annual basis and/or put-and-take salmonid fishing. These water bodies are not necessarily capable of supporting the successful reproduction of salmonids and may be periodically stocked with these species.

- *Limited Resource Water (LRW)*: Incapable of supporting and maintaining a balanced community of aquatic organisms because of natural background conditions or irretrievable human-induced conditions.

Each of the aquatic life use designations has index thresholds for the numerical biocriteria to determine attainment status. The biocriteria is established by indices determined through a fish community assessment (Index of Biotic Integrity, IBI, and the Modified Index of Well-Being, MIwb), a macroinvertibrate assessment (Invertebrate Community Index, ICI), and a habitat assessment (Qualitative Habitat Evaluation Index, QHEI). Aquatic life use designation requirements for each of the indices have been further defined by the type of site (headwater, wading or boat) and the ecoregion in which the stream segment is located (Ohio consists of 5 ecoregions: Huron-Lake Erie Plain, Eastern-Ontario

Lake Plain, Eastern Corn Belt Plain, Western Allegheny Plateau, and Interior Plateau).

The water body segments that are located in and around the City of Wooster have been designated as Warmwater Habitats (WWH). This designation is also true of the downstream portions of the Killbuck Creek that may be affected by the CSOs. The defined site and ecoregion descriptions are also common to all of these stream segments, and are respectively listed as, boat and Eastern-Ontario Lake Plain.

Sensitive Areas: The CSO Control Policy (EPA 1994) guides municipalities to give their highest priority to CSOs that may affect surface waters that are considered sensitive. The proper development of a Long Term Control Plan requires an inventory of all surface waters that receive discharge from CSOs and are deemed sensitive in accordance with the Control Policy. The following is a list of possible sensitive waters:

Outstanding National Resource Waters: The Ohio Administrative Code Section 3745-1-05, Table 5-7 "Outstanding national resource waters" (effective 7/01/2003) lists all waters of the State of Ohio with such designation. The list does not show any state water body meeting such criteria.

National Marine Sanctuaries: From the National Marine Sanctuary Program web site (www.sanctuaries.noaa.gov), sponsored by the National Oceanic and Atmospheric Administration (NOAA) it was determined that no sanctuaries are located in the City of Wooster or in neighboring communities.

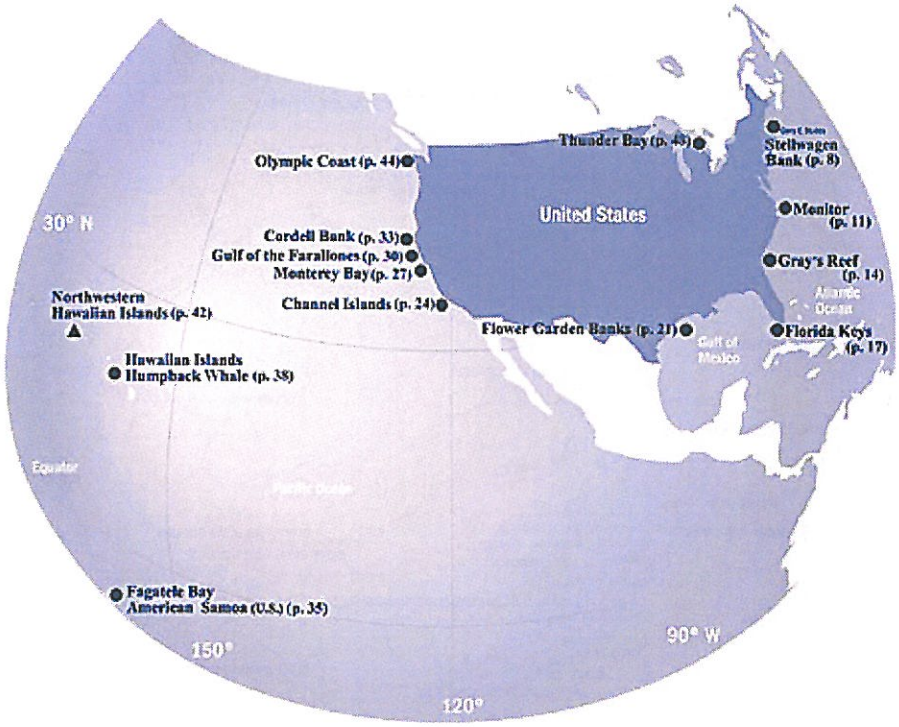

Figure 9: National Marine Sanctuaries (source NOAA)

Waters with threatened or endangered species or their designated critical habitat: The information that was gathered for this topic was provided by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves (DNAP). The DNAP has developed the "Heritage Database" as a readily accessible comprehensive list that contains information on all natural areas and preserves as well as rare species including both plant and animal. Figure 10 graphically depicts the information that has been received from the DNAP.

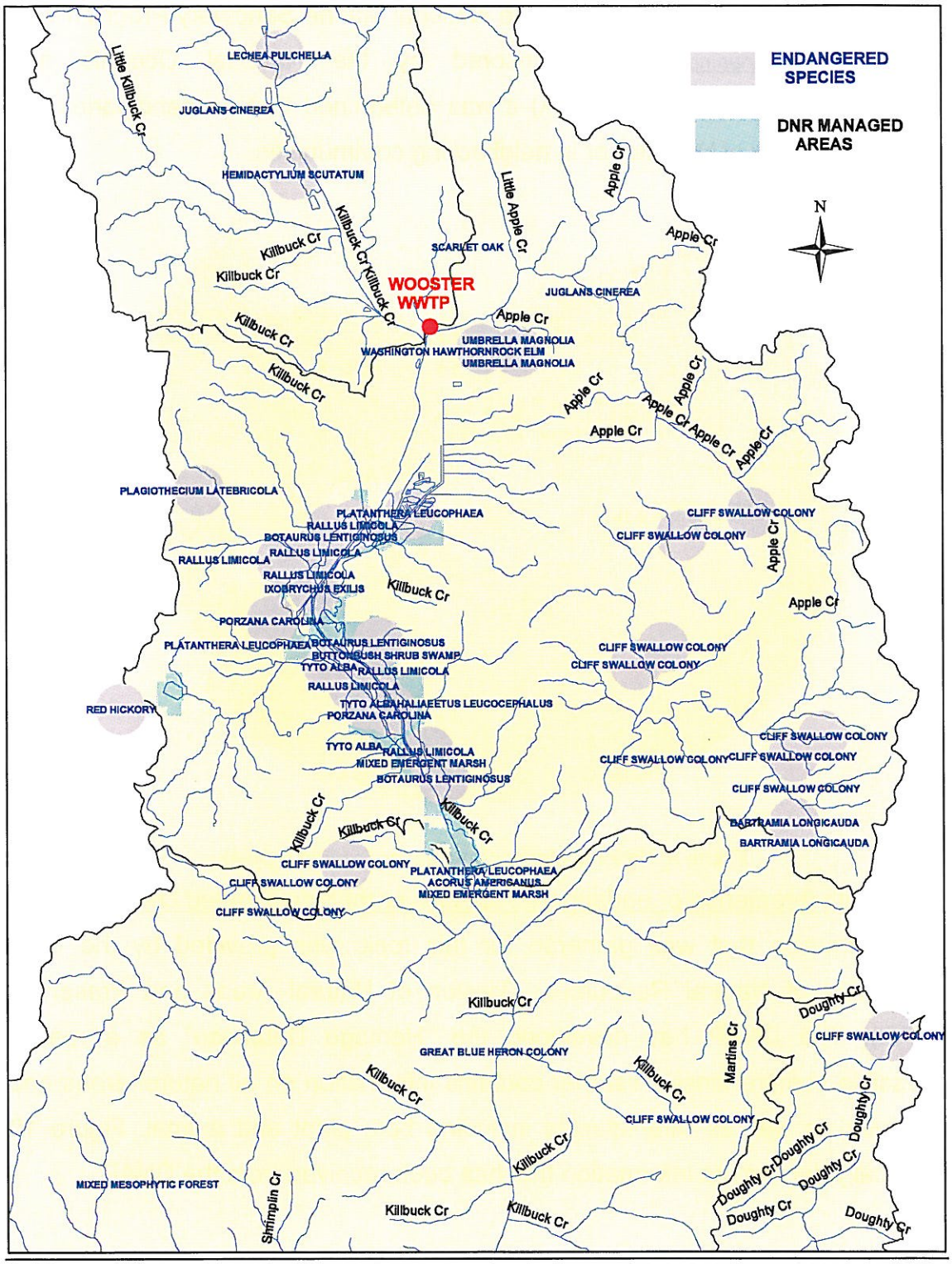

Figure 10: Endangered Species (SOURCE: Ohio Department of Natural Resources, Division of Natural Areas and Preserves (DNAP)

Primary contact recreation waters, such as bathing beaches: The State of Ohio currently has three recreation use designations for water bodies and are in effect from May 1st through October 15th each year. The following is the three designations with there descriptions;

- Bathing Waters- Areas that are suitable for swimming and in areas of Ohio EPA approved water quality

- Primary Contact Recreation- Areas that are suitable for full body contact recreational activities (swimming, canoeing, etc...) with minimal public health risk.

- Secondary Contact Recreation- Areas that are suitable for partial body contact recreational activities (wading, etc...) with minimal public health risk.

According to the Ohio Administrative Code Section 3745-1-24 "Muskingum River Drainage Basin", Table 24-1 the Killbuck Creek is a Primary Contact Recreation water and the Apple Creek is listed as a Secondary Contact Recreation water. The Killbuck Marsh Wildlife Area located nearly three miles south of the Wooster WWTP and as previously mentioned as a critical habitat, is categorized as a state resource water that experiences primary contact. The use of this land area that is owned by the Ohio Department of Natural Resources is shown in Figure 11 (This information is from a pamphlet produced by the Department's Division of Wildlife).

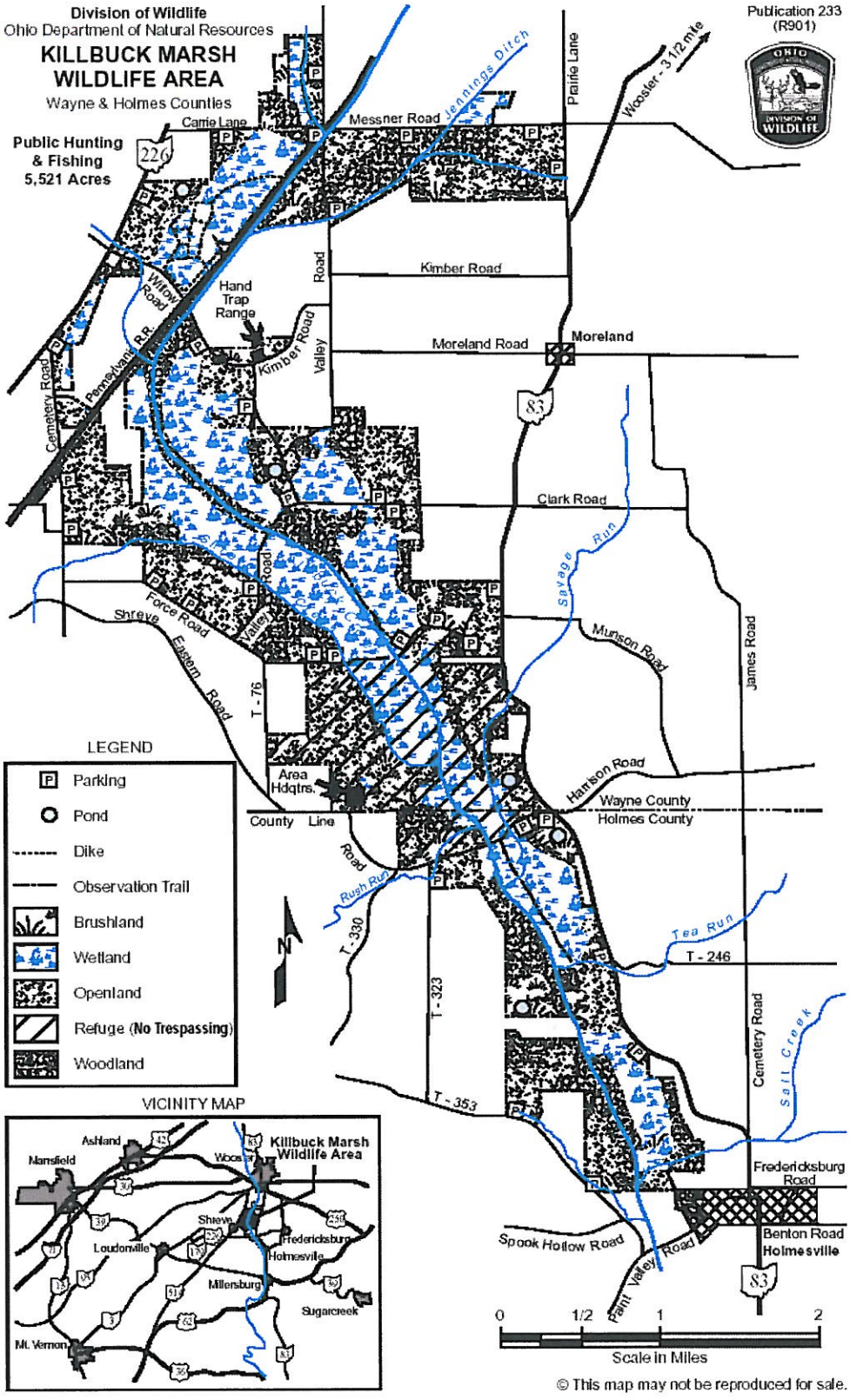

Figure 11: Killbuck Marsh Wildlife Area Map (source ODNR, Division of Wildlife)

KILLBUCK MARSH WILDLIFE AREA

Wayne & Holmes Counties

DISTANCE FROM MAJOR POPULATION CENTERS

80 miles from Columbus
55 miles from Cleveland
35 miles from Akron
35 miles from Mansfield

LOCATION AND DESCRIPTION

This 5,521-acre wildlife area is situated in northeastern Ohio in portions of Wayne and Holmes counties. The area extends north from Holmesville to three miles south of Wooster, and lies between State Route 83 on the east and State Route 226 on the west.

The area is in a shallow, U-shaped glacial outwash valley. The elevation varies from 840 feet at the floor of Killbuck Creek near Holmesville to nearly 1,000 feet on hillsides parallel to the valley floor. About 56 percent of the acquisition unit consists of marsh and swamp that is flooded during some portion of the year. This complex is Ohio's largest remaining marshland outside of the Lake Erie region.

HISTORY AND PURPOSE

Purchase of land for Killbuck Marsh Wildlife Area began in 1969. Additional land is being acquired as funds become available. The wildlife management plan provides for maintenance and protection of the existing woodlands, establishment of regular crop rotations, improvement of open fields for wildlife nesting by controlled burning and selective spraying, and establishment of food patches for general wildlife use. Permanent wildlife cover has been provided by planting thousands of trees and shrubs. Wright's Marsh, a 350-acre diked wetland off SR 226, was restored in partnership with Ducks Unlimited. Dikes and water control structures are being developed to increase and improve the wetland habitat on the area.

FISH AND WILDLIFE

Killbuck Creek, which flows through the area, supports good populations of northern pike, carp, suckers, and bullheads. Most panfish species are found in abundance in area ponds.

Wood duck, muskrat, cottontail rabbit, and raccoon are the principal game and furbearer species. Deer, bobwhite quail, ring-necked pheasant, woodchuck, fox squirrel, and most of Ohio's other furbearers are common. Beaver have become fairly numerous; they have created excellent habitat for many furbearers, waterfowl, fish, frogs, and turtles. The river otter, a state endangered species, was released on the wildlife area in January 1991 and the trumpeter swan, a state and federal endangered species, was released here in August 1997.

A great variety of nesting and migrant birds utilize the area. Of particular interest is the spring migration of waterfowl and songbirds. Prothonotary warblers and barn owls use artificial nesting structures, as do the wood ducks, Canada geese, screech-owls, kestrels, and bluebirds. Among the rare and unusual birds which have been observed are the peregrine falcon, black rail, cattle egret, and Eurasian wigeon. Killbuck Marsh Wildlife Area is one of the few locations in Ohio where the sandhill crane nests and rears its young as does the bald eagle.

The eastern massasauga, a small wetland rattlesnake, is occasionally found on the area.

HUNTING, TRAPPING, AND FISHING

Waterfowl hunting is very popular at this site. The most common species on the area are the wood duck and Canada goose, followed by the blue-winged teal and mallard. Upland game species are well distributed throughout the wildlife area because of the uniform distribution of crop fields, shrubby coverts, grasslands, and woods. Raccoon hunting is productive throughout the area, especially along swamp edges. Furbearers, especially muskrats, provide many hours of recreational opportunity for trappers.

Killbuck Creek offers good fishing for northern pike, carp, suckers, and bullheads. Several ponds offer fair to good fishing for most panfish species. Frog and turtle hunting are popular activities in the marshy portions of the area.

PUBLIC USE FACILITIES

County and township roads provide good access to most of the wildlife area. Small parking lots are scattered throughout. Sportsmen can use shot shells on clay and paper targets at a shotgun hand trap range located on Kimber Road.

ADDITIONAL INFORMATION

Further information may be obtained from the Area Manager, Killbuck Marsh Wildlife Area, 1691 Centerville Road, Shreve, Ohio 44676, telephone (330)567-3390; or from Wildlife District Three Office, 912 Portage Lakes Drive, Akron, Ohio 44319, telephone (330)644-2293.

TURN IN A POACHER

Ohio's TIP, "Turn In a Poacher," program is helping to curtail poaching throughout the state. TIP is designed to involve the public in reporting wildlife violations. Citizens who observe wildlife violations should call the TIP toll-free hotline, 1-800-POACHER.

WILDLIFE OBSERVATION TRAIL

A walking-only trail for wildlife observation follows the abandoned B&O Railroad, through the center of the area. The trail is four miles long, and passes through a large variety of habitats. Funding for the trail comes from Ohio's Endangered Species and Wildlife Diversity income tax checkoff.

Figure 11: **Killbuck Marsh Wildlife Area Information (source ODNR, Division of Wildlife**

Public drinking water intakes or their designated protection areas: The State of Ohio currently has three water supply use designations for water bodies. The following is the three designations with there descriptions;

- Public Water Supply (PWS)- Suitable for human consumption and meets federal regulations for drinking water with conventional treatment.
- Agricultural Water Supply (AWS)- Suitable for irrigation and livestock watering without treatment.
- Industrial Water Supply (IWS)- Suitable for commercial and industrial uses. Required treatment is dependent on particular use.

According to the Ohio Administrative Code Section 3745-1-24 "Muskingum River Drainage Basin", Table 24-1 both the Killbuck Creek and the Apple Creek have the water use designations AWS and IWS.

The City along with 98% of households in the county relies on ground water for their water supply. The City draws water from two well fields, neither being impacted by CSOs. Figure 12 represents ground water resources in the county.

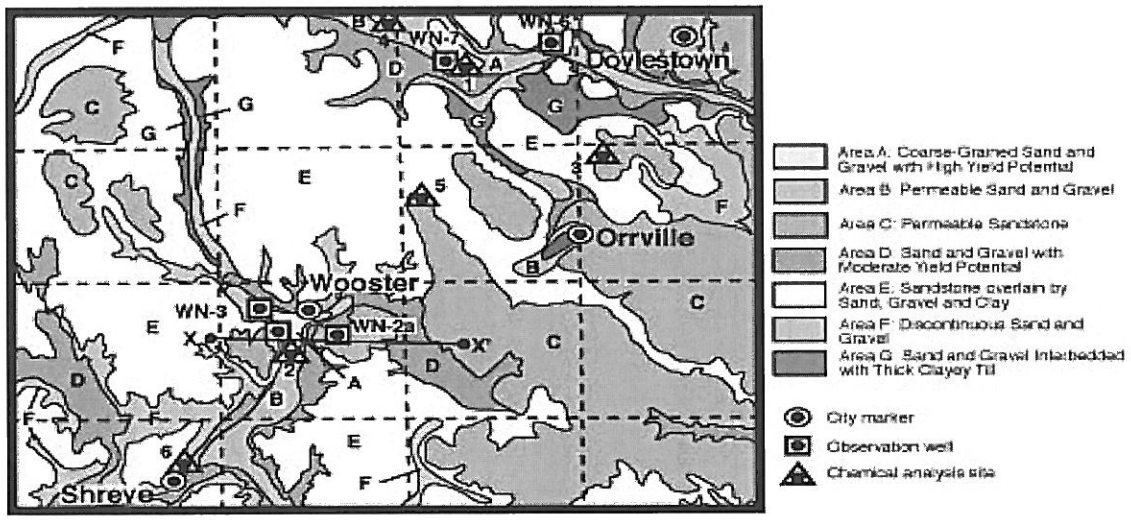

Figure 12: Wayne County Ground Water Resources (source OSU, AEX-490.85)

2.4.2 Collection System Understanding

The City of Wooster's collection system is a mixture of separate sewers and combined sewers. The separated locations account for the majority of the system, covering nearly 70% of the service area. The remaining 30% of the collection system are considered combined sewers. The combined sewer areas are typical to downtown Wooster and the locations surrounding this portion of the City. The Downtown area is situated centrally within the City and had been one of the earliest developed locations. As the infrastructure and development expanded from this region it began to include separate sewers.

Currently the City of Wooster has three Combined Sewer Overflows that are permitted discharges. The first of these CSOs is the Bever Street Swirl Concentrator. The Bever Street Overflow is located within the main trunk line of the Bever Street Drainage Area prior to entering the Apple Creek Interceptor. The Bever Street Drainage Area is almost entirely combined sewer. The second CSO is the Elm Street Swirl Concentrator through which flows from the combined sewers of the Elm Street drainage area may flow. Like the Bever street overflow, the Elm Street CSO discharges into the Apple Creek Interceptor. The last of the three overflows is the Apple Creek Overflow, which is located near the WWTP on the Apple Creek Interceptor. The Apple Creek Interceptor conveys flows from the Elm Street Area (combined sewer area located in the Central portion of the City), Bever Street Area (combined sewer area located in the Central portion of the City), and the Apple Creek Area (separate sewer area located in the Eastern and Northern portions of the City) into the WWTP.

The City's WWTP receives flow from another Interceptor named the Christmas Run Interceptor. This interceptor transports the flows from the Christmas Run Area (western portion of the City) to the WWTP. The flow into the plant from this interceptor consists almost entirely of typical sanitary flows, with the exception of a portion of the Christmas run that contains combined sewers. This section of CSS is located near the Elm Street Drainage Area.

There are two additional CSOs that have been discovered during the development of the LTCP. The first CSO was found at the intersection of Foster Path and Poplar Street. The other CSO is located along Henry Street in the Elm Mini-System. A storm sewer, running to the south of Henry Street, collects diverted flows from three locations (at the intersections of Buckeye Street, Market Street, and Walnut Street) into Christmas Run. (The City plans to eliminate either completely or effectively each of these CSOs). The Christmas Run area is a combined sewer system that is impacted by roof drain connections (house connections) and scattered areas with catch basin connections. The area of the most concentration of catch basins is near the newly discovered CSOs. Sewer Separation projects that are located within this area are designed to eliminate the CSOs as well as prevent overland flow during a 10-year 1-hour storm.

The "Master Plan for Sewer Separation" as dated April 2000 was based on the simulation of the impact of a ten-year one-hour storm event on the combined sewer system of the City of Wooster. The results of this model was summarized in correspondence dated November 15, 2001 from FPS (Thomas E. Hall, P.E.) to the City of Wooster (Eric P. Oswald, P.E., P.S.). The following is the summary of the model as stated in the aforementioned correspondence.

Elm Swirl Concentrator Underflow	-	4.8	MGD
Bever Swirl Concentrator Underflow	-	11.6	MGD
Apple Creek Separated Area	-	1.4	MGD
Christmas Run Combined Sewers	-	11.8	MGD
TOTAL		30	MGD**

The sum equals 29.6 MGD

2.4.3 CSO and Non-CSO Source Characterization

The importance of characterizing the watershed and the sub-watersheds that are affected by CSOs is to aid in determining cost effective, site-specific controls that will benefit water quality. The idea is to identify the relative impact of a CSO and non-CSO sources on stream pollution. With adequate knowledge of a CSO's role in regards to non-attainment the community can avoid a large expenditure on a CSO control that would result in minimal improvement to water quality.

CSO Impacts

The City of Wooster is located in the Killbuck Creek watershed (see Figure 7) for which the Ohio EPA has issued the "BIOLOGICAL AND WATER QUALITY STUDY OF THE UPPER KILLBUCK CREEK WATERSHED" (WQ Study, Ohio EPA, January 31, 1996). This document as will be further discussed in section 2.4.5 has provided guidance for the creation of this LTCP. The WQ Study determined attainment status of the two creeks that are impacted by the City's three permitted CSOs.

The two CSOs that discharge into Apple Creek are the Bever Street and Elm Street overflows. According to the WQ Study, Apple Creek was determined to be in full attainment in all areas of the study limits including the segment from the CSOs to its confluence with Killbuck Creek. The WQ Study further states that, "No significant biological or water quality impacts could be attributed to **point sources** or nonpoint agricultural sources". In 1988 the City installed swirl concentrators at each of these two discharge points.

The two CSOs that are not currently on the NPDES Permit discharge into the Christmas Run. The WQ Study of the Killbuck Creek watershed did not include testing in this stream. Therefore, the impact that these CSOs have on the Christmas Run has not been established.

Wooster WWTP

The WQ Study states that, "The Wooster wastewater treatment plant (WWTP) is the largest point source discharge to the upper mainstem, but it did not significantly impact biological and chemical water quality other than effects of nutrient enrichment". It was further noted that moderate to significant impacts to the improvement of biological and chemical water quality from the early 1980s to the time of the study were primarily attributed to the upgrades and reductions in ammonia loadings from the WWTP. However, the current potential of downstream impairment due to existing nutrients could not be separated from habitat and wetland influences.

The City of Wooster hired ATS Engineering to conduct a preliminary engineering report (January, 2002) to present improvements that would increase the plant performance and effluent quality, while improving its efficiency and lowering operating cost. The proposed upgrades will:

- Reduce sludge yield
- Provide for future nutrient control of phosphorous and total nitrogen
- Reduce energy consumption
- Provide for greater reserve treatment capacity
- Automate monitoring and control to enable greater process control with reduced staffing

The report also details a second phase of the project that would improve the peak handling capability from 15 MGD to 27 MGD.

Agricultural runoff and Point Sources

The City of Wooster is located in Wayne County as is much of the watershed located to the upstream to the Wooster CSOs. According to information from the Ohio State University (OSU), College of Food, Agriculture and Environmental Sciences, the County is one of the leading agricultural counties in the state. According to the University, Wayne County is third in total agricultural income in the state and is the top county in several categories such as; number of total cattle, number of dairy cattle, oats, and hay.

The WQ Study conducted by the Ohio EPA listed agriculture and livestock as a significant nonpoint pollution source throughout much of the watershed. The WQ study also suggests that nutrient loading due to nonpoint sources such as these is moderate, yet pervasive throughout the Upper Killbuck Creek Watershed. The recommendations in the study called for reductions in sedimentation, nutrients, and bacteria in the upper watershed by restricting livestock access to streams and the implementation of livestock waste management practices, conservation tillage, and other agricultural best management practices.

Channelization and wetlands drainage

The WQ Study stated that full attainment of Warm Water Habitat in the Killbuck Creek was realized in all areas that either the natural habitat or recovery from previous stream modifications occurred. The 20 miles of creak upstream from the Wooster WWTP was documented to be in full attainment with the exception of a localized impact before reaching the plant. The impact was due to the destruction of the physical habitat occurring in a portion of the stream that was bulldozed in an attempt to protect an adjacent levy. Thus, causing a non-attainment status in this part of the stream.

The stream does meet full attainment again downstream from Wooster only to begin a decline in status as the stream flows to the Killbuck Marsh near river mile 47.0. The major cause of aquatic life use impairment in this area is due to the combined influences of wetland drainage and past channelization.

Industrial Pretreatment Program

Ordinance 923.05 in the Codified Ordinances of the City of Wooster gives the City the Authority to permit industrial users of the system. Ordinance 923.06 presents the monitoring and reporting requirements. The City has a total of 9 significant industrial users of which 5 are categorical industrial users and 4 are significant non-categorical industrial users. Figure 13 represents the locations of the Industrial users within the city with respect to the 4 main drainage areas in the City. Refer to Appendix G for the following information on the City's pretreatment program; 2002 Pretreatment Performance summary, limits for industrial sludges, and sample industrial discharge permit for both categorical and non-categorical.

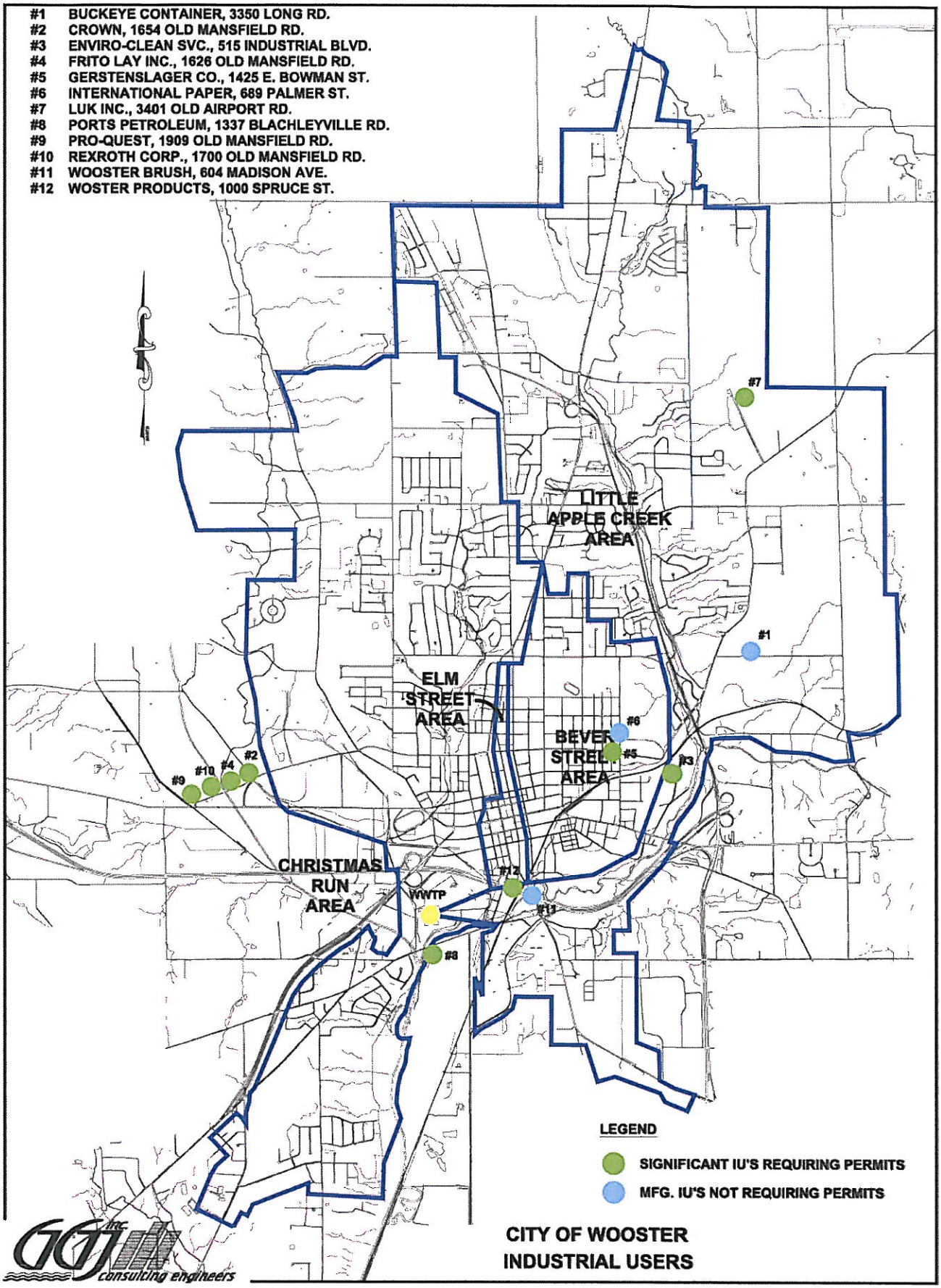

Figure 13: Industrial Users

2.4.4 Receiving Water

The principle objective of the LTCP is the attainment of WQS, including designated uses. Therefore it is a necessity to identify and classify areas that may be potentially affected by CSOs during this initial receiving water investigation. In developing this LTCP a "use attainability" approach has been an effective method for determining those areas that may or may not have the water quality to meet designated uses.

This section is an overview of the existing information that had been readily accessible to the City. This information that has been gathered has aided in the determination of existing baseline conditions of the receiving waters. The review of this data made it possible to determine data gaps, if any, that should be addressed with a monitoring program. The gathering of this information has shortened the LTCP schedule as well as aided in the reduction of cost, more specifically, sampling and analysis cost.

The City of Wooster is located in the Killbuck Creek watershed for which the Ohio EPA has issued the "BIOLOGICAL AND WATER QUALITY STUDY OF THE UPPER KILLBUCK CREEK WATERSHED" (WQ Study, Ohio EPA, January 31, 1996). This is the most important source of existing information regarding the receiving streams of the CSOs.

The specific objectives of this evaluation, as stated in its introduction was to:

- Monitor and assess chemical/physical water quality and biological communities in the Killbuck Creek study area to determine the degree to which the streams are impacted by point and nonpoint sources of pollution and by habitat alterations;
- Evaluate impacts from municipal and industrial discharges on their respective receiving streams;

- Determine the attainment status of current aquatic life use designations and recommend changes in use where appropriate; and,

- Compile baseline data for future monitoring comparisons.

This is a comprehensive document that gives a broad scope of the upper portion of the watershed. The study determined the aquatic life use attainment status of the Killbuck Creek from its headwaters to river mile 24. The study was also conducted on a number of tributary streams to the Killbuck Creek, including Apple Creek (which receives the discharge from the Bever and the Elm Street CSOs). Figure 14 lists the aquatic life use status as determined in the WQ Study.

The Aquatic life attainment use (Warmwater Habitat WWH) status for the Killbuck Creek is documented to be in full attainment upstream and downstream of the Wooster WWTP and the Apple Creek Overflow. The one exception is the segment of the creek upstream of the discharges, at River Miles (RMs) 51.6 through 50.3. The stream received a partial attainment status at this location. The reason, as documented in the WQ Study, was due to damage of that stream segment's physical habitat. The cause of this destruction was that the area had been bulldozed in an attempt to protect an adjacent levy. The effects are evident as the Qualitative Habitat Evaluation Index (QHEI) dropped to 58.5 from 74.5 within the upstream segment of the stream.

Table 1. Aquatic life use attainment status for the existing or recommended aquatic life use in the upper Killbuck Creek watershed based on data collected during June to October, 1993.

River Mile Fish/Invert.	IBI	Modified Iwb	ICI[a]	QHEI[b]	Attainment Status	Comment
Killbuck Creek						
	Erie Ontario Lake Plain-WWH Use Designation (Recommended)					
73.0H/72.8	28*	NA	40	61.5	PARTIAL	Upstream Creston
69.6W/69.6	28*	5.5*	46	50.5	**NON**	Friendsville Rd.
	Erie Ontario Lake Plain-WWH Use Designation (Existing)					
60.6W/69.5	44	9.1	42	77.0	FULL	Ewing Rd.
59.8W/59.6	39	9.0	32ns	74.5	FULL	Home Rd.
50.3B/51.6	33*	8.1	MG	58.5	PARTIAL	Ust. Wooster
49.85B/49.85	*30*	*8.2*	*28*	*NA*	*NA*	*Wooster Mix Zone*
49.5B/49.6	43	9.3	34	56.5	FULL	Dst WWTP & Apple Cr.
47.5B/47.8	29*	7.9*	40	52.5	PARTIAL	Dst Wooster
45.8B/45.9	30*	7.2*	46	50.0	PARTIAL	Mesner Rd.
44.3B/44.5	28*	6.9*	28*	42.0	**NON**	Willow Rd.
41.6B/41.5	33*	6.8*	F*	35.5	**NON**	Force Rd.
39.6B/40.0	29*	6.9*	24*	46.5	**NON**	@ Hard
35.7B/35.6	48	9.2	42	77.5	FULL	@ Holmesville
	Western Allegheny Plateau -WWH Use Designation (Existing)					
24.9B/24.9	39ns	7.9*	44	42.0	PARTIAL	@ Killbuck
Camel Creek	*Erie Ontario Lake Plain- WWH Use Designation (Existing)*					
3.8H/3.8	47	NA	14*	73.0	PARTIAL	Greenwhich Rd.
Shade Creek	*Erie Ontario Lake Plain -WWH Use Designation (Existing)*					
0.2H/0.4	44	NA	E	47.5	FULL	Nr. mouth
Little Killbuck Creek						
	Erie Ontario Lake Plain -WWH Use Designation (Existing)					
6.8H/6.5	34*	NA	34	56.0	PARTIAL	SR 302
0.6W/0.5	39	8.6	F*	69.5	PARTIAL	Nr. mouth (periodically intermittent @ 0.5)
Apple Creek	*Erie Ontario Lake Plain -WWH Use Designation (Existing)*					
6.4W/6.3	44	8.8	50	76.5	FULL	Ely Rd.
2.0W/1.6	46	8.9	52	74.5	FULL	Nr. Pittsburgh Ave.
0.2W/0.1	41	8.4	46	61.0	FULL	Dst CSOs
Shreve Creek	*Erie Ontario Lake Plain -WWH Use Designation (Existing)*					
3.8H/3.8	41	NA	50	62.5	FULL	Ust WWTP
– /0.5	NA	NA	6*	NA	(**NON**)	Wetland
Paint Creek	*Erie Ontario Lake Plain-EWH Use Designation (Recommended)*					
1.6H/1.8	50	NA	56	84.0	FULL	Ambient

Figure 14: Aquatic Life Use Attainment Status

In looking further downstream at RM 47.5 (about two miles downstream of the WWTP and Apple Creek Overflow) the stream begins a decline in attainment status from partial at this location to non-attainment through most of the Killbuck Marsh. The WQ Study noted that Ohio EPA personnel observed remnants of many mature live trees that had been cut down indiscriminately at this location. The removal of such trees may eventually result in destabilization of the stream bank, increased siltation, loss of riparian canopy, reduced capacity to assimilate excessive nutrients, and increase potential for algal growths.

In the wetland region located between RMs 47-38 of the Killbuck Creek, the combined influences of wetland drainage and past channelization were considered to be the main causes of impairment to achieving attainment. The low gradient, sluggish flow of the wetland area, inhibit stream reaeration. The slow movement of the flow in this area compounded by the fact that wetland drainage is low in D.O. has impacted the water quality. There is documented sag in the D.O. level in this portion of the stream as shown in the WQ Study.

As previously noted that the WQ Study stated that, "The Wooster wastewater treatment plant (WWTP) is the largest point source discharge to the upper mainstem, but it did not significantly impact biological and chemical water quality other than effects of nutrient enrichment". The study also made the inference that CSOs, similar to the WWTP, were possible sources of nutrients (i.e., phosphorous and nitrates). However, the nutrient enrichment from these sources were only listed as a partial factor in water quality declines observed well down stream from Wooster.

2.5 Combined Sewer System and Receiving Water Monitoring

2.5.1 Monitoring Plan Development

The next step after the collection of available data is to develop a monitoring plan that will assist in the characterization of the system and the receiving stream. The monitoring plan will aid in the establishment of baseline conditions that in turn will support the development of controls, the creation of a LTCP, and allow for post-construction monitoring. The data collection objectives of a monitoring plan should include the following:

- Define the CSS's hydraulic response to rainfall
- Determine CSO flows and pollutant concentrations/loadings
- Evaluate the impacts of CSOs on receiving water quality
- Support the review and revisions of WQS
- Support the evaluation and selection of long-term controls

The amount of quality data that is obtained through the collection of existing data or observed during monitoring may limit the scope of modeling that may be necessary (thus saving time and costs).

2.5.2 Combined Sewer System Monitoring

Flow Monitoring

In early 1997 the City of Wooster entered into a contract with the consulting firm of Finkbeiner, Pettis, and Strout (FPS) to conduct a study to identify combined sewer areas that could feasibly be separated. The first phase of this project was to perform flow monitoring on the collection system while concurrently collecting rainfall data. The flow-monitoring period was conducted from April 20, 1997 until June 28, 1997 by Savannah Environmental, Inc. Consulting Group. The monitoring locations chosen for this study were situated on sewer interceptors in all four drainage areas (the Little Apple Creek, the Bever Street, the Elm Street, and the Christmas Run). These stations were strategically located in areas that enabled analysis of the; drainage areas, WWTP Influent, and the City's CSOs.

The flow data along with the rainfall data proved to be valuable to determine dry weather flows and the reaction of the system to various storm events. The raw data also aided FPS to create a report for the City of Wooster entitled "Master Plan for Sewer Separation" (April 2000). The basis of the report was to develop a model of the system that was developed and calibrated using the raw flow monitoring data. For more information refer to Section 2.6.1 of this report

CSO Monitoring

The City of Wooster is required to monitor the three permitted CSOs (Bever, Elm, Apple Creek) as part of the NPDES Permit. When the CSOs are discharging, the City is required to report daily, the duration and the flow rate at each location. The City is also required to take one grab sample each month for Total Suspended Solids and CBOD at each CSO while discharging. The City has collected a number of years worth of reported information in satisfying this requirement. The collection of data provides baseline data that may be referred to in implementing a post-construction monitoring period. Appendix H has a summary of CSO monitoring from 1997 through 2002.

2.5.3 Receiving Water Monitoring

According to the LTCP Guidance Manual (EPA) the objectives of receiving water monitoring generally include the following:

- Assess the attainment of WQS, including designated uses
- Establish the baseline conditions in the receiving water
- Evaluate the impacts of CSOs
- Gain sufficient understanding of the receiving water to support evaluation of proposed CSO control alternatives, including any receiving water modeling that may be needed
- Support the review and revision of WQS

The "BIOLOGICAL AND WATER QUALITY STUDY OF THE UPPER KILLBUCK CREEK WATERSHED" (WQ Study, Ohio EPA, January 31, 1996) has been an important source of available existing data that has met the above listed objectives. However, monitoring has still been conducted on the creek in the form of two separate studies; the 1999 Fecal Coliform Study and the City of Wooster's ongoing monthly evaluation of the Killbuck Creek (D.O., Suspended Solids and B.O.D.).

The 1999 Fecal Coliform Study was performed in the summer of 1999 during the months of May through August. The report as submitted to the EPA may be viewed in its entirety in Appendix I.

As discussed in Section 2.4.1, the Killbuck Creek is a Primary Contact Recreation (PCR) water and Apple Creek is listed as a Secondary Contact Recreation (SCR) water. The statewide numerical and narrative criteria for recreational use designations such as those found in the watershed are located in the OAC Section 3745-1-07, Table 7-13. The fecal coliform criteria for these designated uses are also found below;

Primary Contact- geometric mean fecal coliform content (either MPN or MF), based on not less than five samples within a thirty-day period, shall not exceed 1,000 per 100 ml and fecal coliform content (either MPN or MF) shall not exceed 2,000 per 100 ml in more than ten percent of samples taken during any thirty-day period.

Secondary Contact- shall not exceed 5,000 per 100 ml (either MPN or MF), in more than ten percent of samples taken during any thirty-day period.

Figure 15 graphically represents the data collected during the 1999 fecal coliform study. The data is not truly representative of the typical data needed to establish whether designated use requirements are met or not. The reason is that the data was collected on 25 different days, of which, 16 were considered "wet" days (as required). However, the analysis of the collected data showed that the total geometric mean at each testing location was below the required limits (typical testing data would have a lower geometric mean and include less "wet" days). Also, a trend that was apparent in the study was that the "no more than ten percent of the samples" limit was only exceeding during times of heavy rainfalls. The information further demonstrated that it was just as common for data upstream of CSOs to be higher than those sites sampled downstream as it was vice versa (no matter whether it was wet or dry).

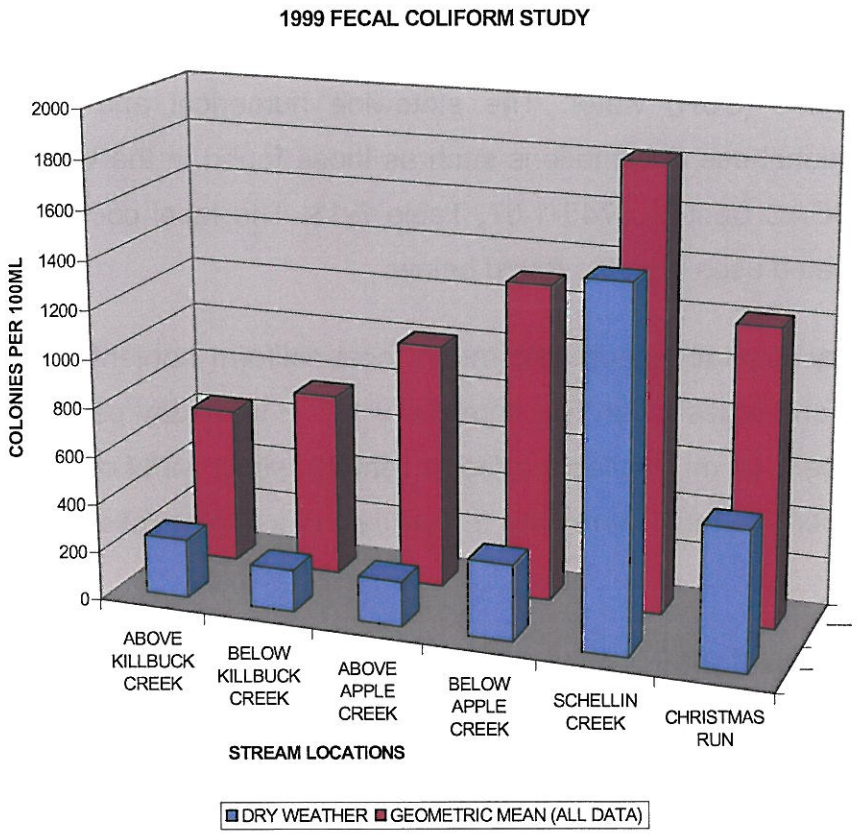

Figure 15: 1999 Fecal Coliform Study

The City of Wooster conducts analysis on the stream almost every month. This monthly analysis is typically done at three locations upstream of the WWTP and nine locations downstream of the plant, the last location being South of Millersburg. Information that is gathered or sampled for during this monthly analysis are items such as D.O., B.O.D., suspended solids, temperature, pH, and stream and weather condition (description). Included in Appendix J is a map depicting the sampling locations that are evaluated, charts summarizing the past year's collected information and a representative worksheet of a recent analysis. Information gathered in the evaluations have not indicated the WWTP or the CSOs as an impact source of the tested parameters.

2.6 Combined Sewer System and Receiving Water Modeling

2.6.1 Combined Sewer System Modeling

The objective in conducting the CSS modeling is to understand the hydraulic response of the CSS to a variety of precipitation events. As discussed in Section 2.5.2, the City entered into a contract with the consulting firm of Finkbeiner, Pettis and Strout (FPS) to conduct a study to identify combined sewer areas that could feasibly be separated. The basis of this study was the development of combined sewer system models for the "mini-systems", i.e., the drainage areas that are impacted by wet weather events. The models were designed and calibrated using the flow data and rain data collected during the flow monitoring of the system.

FPS created the models of the Bever Street, Elm Street, and Christmas Run Areas using the USEPA Storm Water Management Model, Version 4.4. See Appendix K for a detailed description of the methodology used to develop the model as described by FPS in Chapter III of the report, "Master Plan for Sewer Separation" April, 2000.

A working model of the system allows the City to predict the present systems reaction to various precipitation events. Even more significant, is the fact that the City has the ability to evaluate proposed sewer separation projects. It is possible to predict the extent of which proposed projects can lessen the impacts of future wet weather events.

The "Master Plan for Sewer Separation" as dated April 2000 was based on the simulation of the impact of a ten-year one-hour storm event on the combined sewer system of the City of Wooster. The results of this model was summarized in correspondence dated November 15, 2001 from FPS (Thomas E. Hall, P.E.) to the City of Wooster (Eric P. Oswald, P.E., P.S.). The following is the summary of the model as stated in the aforementioned correspondence.

Elm Swirl Concentrator Underflow	-	4.8	MGD
Bever Swirl Concentrator Underflow	-	11.6	MGD
Apple Creek Separated Area	-	1.4	MGD
Christmas Run Combined Sewers	-	11.8	MGD
TOTAL		30	MGD**

The sum equals 29.6 MGD

To support the objectives of this report the model has been updated during August, 2003 to include the simulation of a five-year one-hour storm event. The results of this modeling were recorded and delivered to the City by means of correspondence dated August 12, 2003. This information is included within Appendix K.

2.6.2 Receiving Water Modeling

The objective of conducting modeling on the receiving stream is to evaluate CSO impacts on receiving water quality and to predict possible improvements developed by new controls. The preliminary steps that are to be performed prior to conducting receiving water modeling is the collection of existing data and receiving water modeling. By conducting the preliminary steps, focus can be obtained by addressing the parameters that may be documented as causing impairment.

The collection of existing data pointed towards the Wooster WWTP as being the largest point source discharge to the upper mainstem. It should be noted that this did not correspond to it being the largest source of impairment to the stream. In fact it was determined that it did not significantly impact biological or chemical water quality other than being a source for nutrient impairment. The CSOs, similar to the WWTP, have been questioned as a possible source of nutrients. There is no other documentation or evidence that the CSOs have had any other impact to biological or chemical water quality.

The nutrient enrichment (i.e., phosphorous and nitrates) produced by the WWTP and possibly the CSOs have only been considered a partial factor to the non-attainment of water quality observed well down stream from these sources. In the wetland region located between RMs 47-38 of the Killbuck Creek, the combined influences of wetland drainage and past channelization were considered to be the main causes of impairment to achieving attainment. The low gradient, sluggish flow of the wetland area, inhibit stream reaeration. The slow movement of the flow in this area compounded by the fact that wetland drainage is low in D.O. has impacted the water quality. The WQ Study stated that the "potential contribution to the downstream impairment (from nutrients) could not be clearly separated from the overlying habitat and wetland influences."

Receiving water modeling is not a cost effective exercise at the present stage of development of the Wooster LTCP. The City has already begun the development of the LTCP prior to the issuance of the latest NPDES Permit. Improvements to the wastewater system and the wastewater treatment plant have been constructed or are in the planning/design phase. The selection of the proposed controls, have been based on minimizing the impacts of CSOs by expanding the capacity of the WWTP and directing more flows for treatment. Furthermore, the plant expansion will also allow for nutrient removal (among other objectives), thus meeting future permitting requirements and presently, allowing for better stream conditions.

2.7 Antidegradation (Future Considerations)

Under the Ohio Control Strategy communities are required to evaluate the impacts of future sanitary expansion on CSOs. The City's current NPDES Permit No. 3PD00013*KD listed a number of topics that should be included in this evaluation. Section 2.7.1.1. thru 2.7.1.8. reflect the topics as requested by the Ohio EPA.

Before proceeding, it is necessary to summarize the direction of what areas had been considered in this evaluation and what information sources were used.

The City of Wooster currently has three overflows listed on their NPDES Permit (the Bever Street, the Elm Street, and the Apple Creek) and two others that have been located during the development of the LTCP (Foster Path and the Henry Street overflows). The recently discovered CSOs have not been included within this evaluation as they are considered a high priority for elimination (either completely or effectively). Also not evaluated in the Antidegradation Plan are the Bever Street CSO and the Elm Street CSO. The areas tributary to these CSOs are near developmental capacity and the addition of future sewer extensions to these areas is highly improbable (there are no foreseeable significant impacts to these CSOs). Conversely, the Little Apple Creek drainage area (Figure 3) is a region that future sewer extensions are being planned, which will require an antidegradation evaluation. Therefore, the proceeding evaluation is focused on the Little Apple Creek drainage area and the Apple Creek Overflow.

Existing information gathered to aid in the Antidegradation evaluation has come from two reports. The first report developed for the City is the, "City of Wooster, Comprehensive Plan" (October 2002) prepared by Woolpert LLP. This plan projected the future growth of the City in terms of population increases and non-residential expansion in terms of employees in retail, office, and industrial (until the year 2010). The second report is the "201 Facilities Plan Update and Map" that graphically depicts the locations to which sewer extensions are projected to be constructed in the next twenty years.

The following information has been focused specifically on the Little Apple Creek drainage area;

Identify specific geographic areas tributary to CSOs to which the community plans to extend Sanitary ServiceFigure 16 is the 201 Facilities Plan Map that depicts the locations projected to receive sanitary sewer extensions in the next 20 years by the areas that are shaded in red. To further detail these specific areas that are being proposed, **Figure 17** has been developed for this plan. This figure uses information gathered from the Comprehensive Plan to show what type of development is expected to occur in the projected sewer extension areas (the figure only shows the areas tributary to the Apple Creek Overflow).

2.7.1.1 Determine the dry weather flow capacities of the sewer and interceptor that will receive the increased flow

The interceptor/sewer that is the focus of this evaluation is the Apple Creek Interceptor. It has been assumed for this plan that all other sewers have enough capacity to handle increased flows (Caution: In proposing any new sewers, the hydraulic capacity of downstream lines need to be considered). It should be noted that this plan has been conducted to evaluate possible degradation of the stream as a result of CSOs and is focused on how the interceptor and the overflow interact in response to increased flows.

In the Combined Sewer System Operational and Maintenance Plan (Jones & Henry, 1995) it was determined that the Apple Creek Interceptor from downstream of the Bever and Elm Street overflows to the Apple Creek Overflow has a design capacity of 20.0 MGD.

2.7.1.2 Determine the existing dry weather flow of the sewer and interceptor that will receive the increased flow

In correspondence dated November 15, 2001 from Finkbeiner, Pettis & Strout to the City of Wooster it was documented that the average dry weather flow in the Apple Creek Interceptor from downstream of the Bever and Elm Street overflows to the Apple Creek Overflow was 3.7 MGD.

City of Wooster Facilities Planning Area

Clean Water Plan Update for the Ohio River Basin

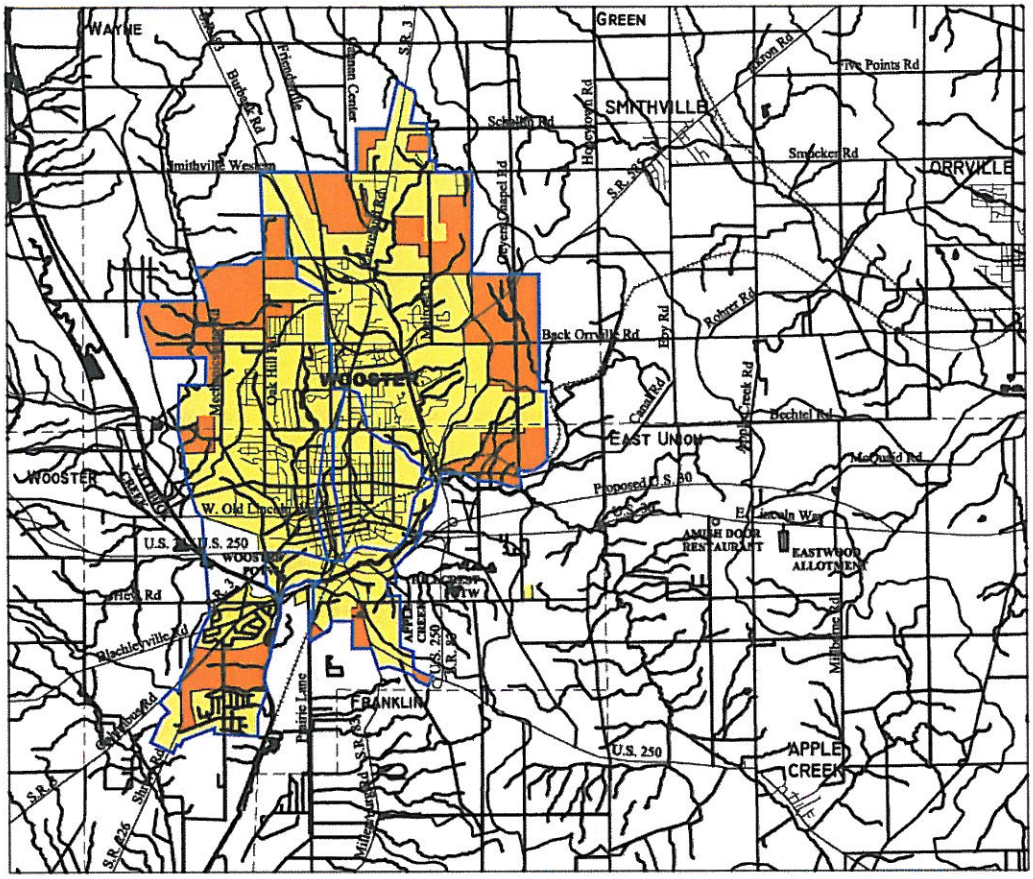

Figure 16: 201 Facilities Map

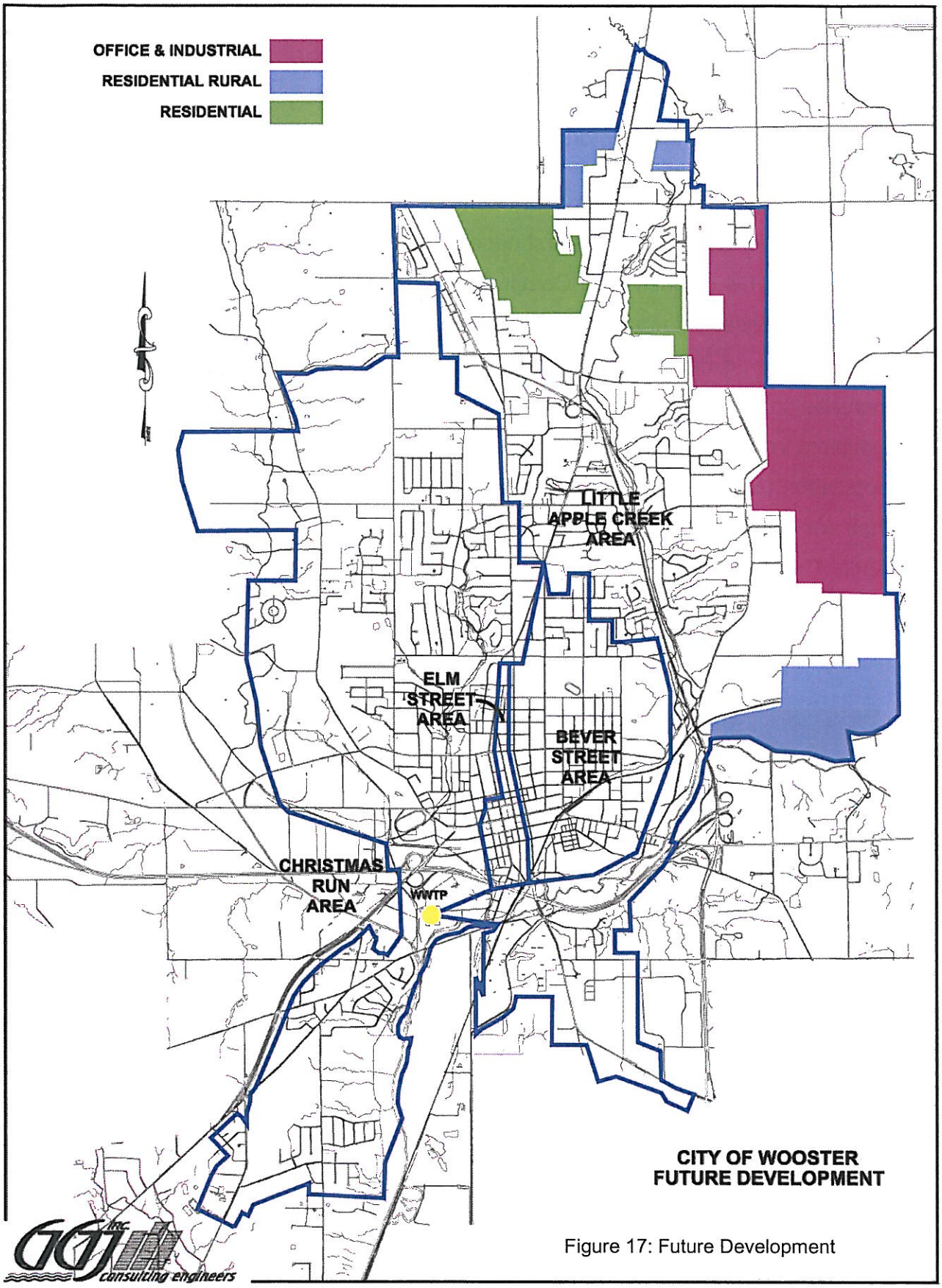

Figure 17: Future Development

2.7.1.3 Define how much additional dry weather, sanitary flow is planned in the sewers and interceptors

To estimate how much additional dry weather flow will be created due to possible sanitary sewer extensions, it is first necessary to determine what future growth is expected and is planned. The Comprehensive Plan that has been developed for the City provides information on projected population increases up to the year 2010. Figure 18 has been taken from the Comprehensive Plan and projects an increase to the population of 2,841 people. Also determined in that plan and exhibited in Figure 19 is the projected increase in the non-residential employment population (categorized into retail, office, and industrial). The projected numbers that are presented in the aforementioned figures are not specific to the Little Apple Creek drainage Area but to the whole City. Therefore, the use of these numbers to calculate for the probable increase of flow through the Apple Creek Interceptor is a likely overestimation.

	1990	2000 (Actual)	2005 (Projected)	2010 (Projected)
Population in Households	20,638	22,844	24,318	25,685
Number of Households	8,671	10,040	10,782	11,728
Number of Vacant Units	399	634	676	724
Total Units	**9,070**	**10,674**	**11,458**	**12,267**
New Unit Demand	—	—	784	809
Source: U.S. Census Bureau; City of Wooster, 2002				

Figure 18: Projected Population (Source: Comprehensive Plan)

		Number of New Employees	Floor Area	Land Requirement In Square Footage	Land Requirement In Acres	Land Requirement With Multiplier
2001-2005	Retail	394	197,000	788,000	18.1	36.2
	Office	632	189,600	758,400	17.4	34.8
	Industrial	873	1,309,500	3,741,429	85.9	171.8
	Total	**1,899**	**1,696,100**	**5,287,829**	**121.4**	**242.8**
2006-2010	Retail	328	164,000	656,000	15.1	30.2
	Office	248	74,400	297,600	6.8	13.6
	Industrial	397	595,500	1,701,429	39.1	78.2
	Total	**973**	**833,900**	**2,655,029**	**61.0**	**122.0**
10-Year Total	Retail	811	405,500	1,622,000	37.2	74.4
	Office	977	293,100	1,172,400	26.9	53.8
	Industrial	1514	2,271,000	6,488,571	149.0	298.0
	10-Year Total	**3,302**	**2,969,600**	**9,282,971**	**213.1**	**426.2**
Source: City of Wooster, 2002						

Figure 19: Non-Residential Population Projections (Source: Comprehensive Plan)

The Chart in Figure 20 uses the projected population data from Figures 18 and 19 to translate those numbers into estimated flows. The total that has been calculated is likely an overestimation and may extend beyond the year 2010.

RESIDENTIAL FLOW INCREASES

	POPULATION INCREASE	ESTIMATED FLOW (PER PERSON)	INCREASED FLOW (GPD)
POPULATION	2,841	100	284,100

NON-RESIDENTIAL FLOW INCREASES

	NUMBER OF NEW EMPLOYEES	ESTIMATED FLOW (PER UNIT)	INCREASED FLOW (GPD)
RETAIL	811	20	16,220
OFFICE	977	20	19,540
INDUSTRIAL	1,514	25	37,850
		SUB TOTAL	73,610
		TOTAL	**357,710 GPD**

Figure 20: Proposed Flows

2.7.1.4 Predict increases in frequency, duration, volume and pollutant loads from wet weather combined sewer overflows that will result from increasing the dry weather flow

The frequency, duration and volume of CSOs will significantly decrease at the Apple Creek Overflow with the implementation of the LTCP (this includes the increase of dry weather flows). The controls that are proposed within the LTCP will enable more flows to be treated at the WWTP. In doing such, pollutant loading of the receiving water from CSOs will decrease. It is difficult to quantify the impacts of the future flows to the system since the increased flow (400,000 GPD) is within the margin of error in the prediction of total flows.

2.7.1.5 If there is a bypass at the treatment plant, predict increases in frequency, duration, volume and pollutant loads from bypasses that will result from the increased base dry weather flow

N/A. There is no bypass at the WWTP.

2.7.1.6 Predict water quality impacts to the receiving stream that will result from increased CSOs and treatment plant bypasses

The CSOs will decrease with the implementation of the LTCP. From 1998 to 2002, the Apple Creek Overflow averaged 20 CSO events per year. After the proposed controls of the LTCP are constructed, it is anticipated that the Apple Creek Overflow will have only a 20% chance of being active each year. The current rate is 100 times more likely to be activated (20% chance of being activated every 3.65 DAYS).

2.7.1.7 Evaluate alternatives and proposed control measures that would eliminate increases in combined sewer overflows, treatment plant bypasses, and water quality impacts.

Refer to the Long-Term Control Plan Chapter 4

3 DEVELOPMENT AND EVALUATION OF ALTERNATIVES FOR CSO CONTROL

3.1 Public Participation and Agency Interaction

The following information has been gathered from the September 2002 Public Participation Plan and will be considered part of this document;

Several public meetings have been held during the past five years that pertain to the overall developement of the City's LTCP. Notifications for all public meetings are posted in the local newspaper and several public locations at least 24 hours in advance. Each meeting posting will describe the items discussed, so that interested parties can attend as appropriate.

In early 1997 the City entered into contract with the firm, Finkbeiner, Pettis, and Strout (FPS) to start on the initial development stage of a Long-Term Control Plan. FPS's involvement ultimately led to the report entitled "Master Plan for Sewer Separation" that was presented to the City on September 10, 1999 and made available to the public for their viewing in the City Engineer's Office. The goal of the study was to identify combined sewer areas that could feasibly be separated in an effort to reduce the number and duration of overflow events from the City's three CSOs.

Operating under the above plan, City Council had hearings on numerous appropriation ordinances pertaining to sewer separation projects to be carried out under the plan. At each hearing the public had the opportunity to address the Mayor, Director of Administration, City Engineer, Utilities Manager or Council Members on the need for these separation projects; however, no comments were received on any of the above hearings or on the "Master Plan for Sewer Separation".

On April 30, 2002, the City Council Public Utilities Committee held a meeting to discuss the long-term implications of the, at the time, proposed NPDES permit.

As part of this meeting, the Utilities Committee heard a presentation that outlined the necessary improvements to comply with this proposed permit as well as potential future requirements. The proposed plant improvements involve expanding the peak flow capacity of the wastewater plant to 27 MGD sustained peak (this proposed control is further discussed in this plan). This flow rate, in conjunction with some targeted separation would allow the City to avoid the use of the 005 CSO up to a five-year storm event.

On May 6 and 20, 2002 City Council heard abbreviated versions of the report given to the Public Utilities Committee in order to consider the expenditure of $1.2 million for engineering related to the upgrading of the WWTP. These hearings also included a presentation on how the City intended to comply with the Ohio EPA's requirements of CSOs, particularly the 005 CSO. Several members of the community were present and all questions and concerns voiced by Council Members or their constituents were addressed on the Council Floor.

3.2 Long-Term Control Plan Approach

The City has already implemented controls and is currently in the design phase of a WWTP Improvements project that will increase the plants capacity for combined sewer peak flows up to 27 MGD (project will also provide for future nutrient control of phosphorous and total nitrogen.) According to Section IX of the Ohio CSO Control Strategy the Ohio EPA will give consideration to the following: (2) "*Any Community that has substantially developed or is implementing a CSO control program either voluntarily or under an existing NPDES permit…*" The current control program is expected to achieve water quality standards and use designations (since the receiving waters downstream of the CSO discharges have been documented to be in full attainment). This Chapter will be limited to the evaluation of the controls that have already been implemented and those that have been selected by the City for implementation. The evaluation of the controls is based upon the control goals determined by one of the following approaches;

3.2.1 Demonstration versus Presumption Approach

The municipality is required to adopt either the Demonstration Approach or the Presumption Approach to determine the control goals for each receiving water segment. The establishment of the control goals allows for the evaluation and selection of Controls that allow the municipality to comply with the selected requirements.

The following is a description of the two approaches as documented in the Control Policy;

3.2.1.1 Demonstration Approach

The City will be required to demonstrate compliance with each of the following:

- The planned control program is adequate to meet WQS and protect designated uses, unless WQS or uses cannot be met as a result of natural background conditions or pollution sources other than CSOs;
- The CSO discharges remaining after implementation of the planned control program will not preclude the attainment of WQS or the receiving waters' designated uses or contribute to their impairment. Where WQS and designated uses are not met in part because of natural background conditions or pollution sources other than CSOs, a total maximum daily load, including a wasteload allocation, a load allocation or other means should be used to apportion pollutant loads;
- The planned control program will provide the maximum pollution reduction benefits reasonably attainable; and
- The planned control program is designed to allow cost-effective expansion or cost-effective retrofitting if additional controls are subsequently determined to be necessary to meet WQS or designated uses.

3.2.1.2 Presumption Approach

Under the presumption approach, controls adopted in the LTCP should be required to meet one of the following criteria

i. No more than an average of four overflow events per year, provided that the permitting authority may allow up to two additional overflow events per year. For the purpose of this criterion, an overflow event is one or more overflows from a CSS as a result of a precipitation event that does not receive the minimum treatment specified.

ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis

iii. The elimination or removal of no less than the mass of the pollutants identified as causing water quality impairment through the sewer system characterization, monitoring, and modeling effort for the volumes that would be eliminated or captured for treatment under paragraph ii above

The minimum level of treatment applicable to criteria I and ii is defined in the CSO Control Policy as follows (II.C.4.a)

- Primary clarification; removal of floatable and settleable solids may be achieved by any combination of treatment technologies or methods that are shown to be equivalent to primary clarification
- Solids and floatables disposal and
- Disinfection of effluent, if necessary, to meet WQS, protect designated uses and protect human health, including removal of harmful disinfection chemical residuals

3.3 Development of Alternatives for CSO Control

The City has already completed controls, has begun the implementation of a number of other controls, and is currently in the design stage of the most significant control of the LTCP. The development of further alternative controls would only be required if the goals established for the LTCP will not be fulfilled after all planned CSO projects are completed. It is projected that the controls that have already been planned will achieve the standards of the Presumptive Approach. Therefore, this Section does not present control alternatives but does present the considerations that are taken into account when determining such controls. Also discussed are the evaluations of those controls that the City has committed to do.

3.3.1 General Considerations

There are two areas in which general considerations should be given when considering CSO controls. The first of which is the interaction with the nine minimum controls (NMC). The implementation of the NMC during the CSS characterization may have affected flows and loads. In developing future controls, consideration should be given to how the NMC will continue to affect the system. Also, Items that may have been included with the NMC regarding solids and floatables control may be considered adequate in scope to be considered as part of a LTCP.

The second area in which consideration should be given is with other collection and treatment system objectives. Determination of how LTCP controls positively or negatively impact other areas of the wastewater collection and treatment system is necessary. Controls of the LTCP can be done in conjunction with other objectives of the system saving time and cost, and increasing overall efficiency. The LTCP is an opportunity to investigate system modifications that may optimize the operation of new and existing components of the treatment system.

3.3.2 Definition of Water Quality and CSO Control Goals

In an effort determine and evaluate new controls it is imperative to define the water quality and the CSO control goals to which the LTCP strives for. By establishing expected achievements, it is possible to generate the focus on the development of alternative CSO controls and provides the basis for which they can be evaluated.

The water quality goals to which the LTCP should aid in obtaining, is to meet the requirements of water use designations for each segment of the stream. The first criterion is the aquatic life use designation of each creek. The Killbuck Creek and the Apple Creek have both been designated as warmwater habitats (WWH). Therefore, the biological data of each stream shall be sufficient to maintain the intended habitat. The second criterion is the recreational use designation. The state has numerical and narrative criteria for recreational use designations based on e. coli and/or fecal coliform. The state has designated the Killbuck Creek as a Primary Contact Recreation Water and the Apple Creek as a Secondary Contact Recreation Water. The third criterion is the water supply use designation. The Killbuck and the Apple Creeks are both designated as an Agricultural Water Supply (AWS) and an Industrial Water Supply (IWS).

The waters that do not meet their respective Aquatic Life Use designation are considered impaired and are subject to the Total Maximum Daily Load (TMDL) program. This program was established under Section 303(d) of the Clean Water Act (33 U.S.C. 1313) and focuses on identifying and restoring polluted rivers, streams, lakes and other surface waterbodies. The following is a brief description of a TMDL obtained from the Ohio EPA website, "*A TMDL is a written, quantitative assessment of water quality problems in a waterbody and contributing sources of pollution. It specifies the amount a pollutant needs to be reduced to meet water quality standards (WQS), allocates pollutant load reductions, and provides the basis for taking actions needed to restore a waterbody.*" A TMDL has not been conducted in the Killbuck Area to date.

However, the potential of a future TMDL being conducted and the restrictions that will be included is apparent. It is necessary to consider these future water restrictions in the development of a LTCP.

The CSO control goals are based on the approach that is chosen; either the Demonstration Approach or the Presumptive Approach. The selection of an approach is the acceptance of using the established criteria of that approach as the CSO control goals for the LTCP. For a complete description of each approach refer to Section 3.2.1 of this report.

After establishing the regulated parameters of water quality and CSO control objectives it is necessary to establish the goals of the specific LTCP that will facilitate attainment of those water quality and CSO control requirements. The following is the determined goals of this LTCP;

Through the collection of information that has been reviewed, analyzed and incorporated into this document, water quality objectives for this LTCP have been identified. The Apple Creek is already documented to be in full attainment of its aquatic life use designation and existing data shows that the recreational use designation can also be met. The water quality objective in regards to Apple Creek is to maintain the present attainment status of the stream.

The City of Wooster lies along a section of the Killbuck Creek that is in full attainment of its aquatic life use designation, with the exception of an isolated location upstream of the plant (caused by a reported stream channelization project to protect an adjacent levy). The information gathered in the 1999 Fecal Study represents that the recreational use designation requirements can be met. However, impairment to the Killbuck Creek is found well downstream in the wetland region located a couple miles downstream from the Wooster WWTP. The main causes of impairment are channelization of the stream and wetland drainage (the impact of excessive nutrients were considered a partial factor to non-attainment and could not easily be separated from the other factors). This

determined the goal of minimizing the loads of nitrogen and phosphorous caused by the CSO.

The CSO control goals are results of the Presumption Approach (which, has been chosen for this LTCP) and also the water quality goals that have been established (minimizing the impact of nutrients to stream impairment). The goals are to eliminate the number of overflow events not receiving pretreatment to under four events per year; maximize the flow that is treated by the WWTP, enable nutrient control, and minimize the Apple Creek Overflow.

3.3.3 Approaches to Structuring CSO Control Alternates

There are a number of different approaches to consider in structuring CSO control alternatives. These approaches are to take into consideration that all the CSOs are to be included in this plan. Determining alternatives for CSOs may take a broader approach than developing controls on a CSO by CSO basis. The following are a few different approaches to take when developing controls;

3.3.3.1 Projects Common to All Alternatives

The controls that would fall into this category are items that would be included regardless of which of the alternatives are chosen. Projects that are associated with the Nine Minimum Controls (Street Sweeping, Catch Basin Cleaning etc...), or projects that have been defined, possibly in other reports, as having an expected benefit (such as a sewer separation project that is being conducted to relieve surcharging or basement flooding or a sewer rehabilitation project to repair a sewer that is deteriorated and is a source of infiltration) are typical projects that would fall into this category.

3.3.3.2 Outfall-Specific Solutions

Projects that typify this approach are such that target individual CSOs. The projects would include the end of pipe treatment at a CSO or a separation project that would only affect the tributary area of one CSO.

3.3.3.3 Localized Consolidation of Outfalls

Consolidation of localized outfalls may be a cost effective method to provide storage and or treatment to a variety of different CSOs at one location instead of many. The consolidation of the outfalls would minimize the number of CSO locations that would need to be addressed and also reduce the number of permitted outfalls.

3.3.3.4 Regional Consolidation

Regional Consolidation is broader in scope than the localized consolidation of outfalls.

3.3.3.5 Utilization of POTW Capacity

The utilization of POTW capacity may be looked at according to the plant's existing flow capacity or by the future capacity due to plant improvements or expansion. Future plant expansion or improvements may be a more cost effective option than developing capital improvement controls within the system. These projects may also be more cost effective in terms of operation and maintenance.

3.3.3.6 Consideration of Sensitive Areas

An approach that will eliminate or control overflows to sensitive areas is to be considered a high priority.

3.3.4 Goals of Initial Alternatives Development

This Section lists the specific control alternatives that are intended to achieve the determined control goals that have been established. The following steps should be taken during the initial development of alternatives:

1. Identification of control alternatives
2. Preliminary sizing of control alternatives
3. Preliminary development of cost/performance relationships
4. Identification of preliminary site options and issues
5. Identification of preliminary operating strategies

3.3.5 Identification of Control Alternatives

The following controls are not alternatives but the selected controls that will also be found in Chapter 4 as being part of the LTCP.

3.3.5.1 Source Controls

Source control measures are efforts that are conducted to prevent pollutants from entering the system (including control of entering flows). This may include projects such as onsite detention, street sweeping, and fertilizer and pesticide control.

3.3.5.2 Collection System Controls

These are controls that are conducted on the system once the storm runoff and pollutants enter the system. The controls under this heading may reduce CSO volume and frequency by removing or diverting runoff, maximizing the inflow storage and increasing the flow that is convey to the WWTP. Controls that would typify this would include sewer separation, I&I control, and flow diversion.

3.3.5.3 Storage Technologies

The controls that utilize storage technologies attempt to store the excessive flow to minimize the impacts of CSOs and to allow for more flow to be treated. Projects that would fall into this category are in-line storage, flow equalization, and tunnel storage.

3.3.5.4 Treatment Technologies

Treatment technologies are intended to lessen the pollutant load (solids, floatables, bacteria, or other) in the CSO receiving water. The controls can be performed at the plant through expansions, improvements or the determination of increased capacity during the wet weather stress testing. In addition to the aforementioned controls, projects may include end of pipe treatment at the CSOs by means of solids removal, disinfection, and dechlorination.

3.4 Evaluation of Alternatives for CSO Control

3.4.1 Project Costs

Project costs are typically the most deciding of all the evaluation factors in choosing CSO controls. A community must consider all the costs associated with a control to determine the true price of the project. Cost consideration should include the initial capital cost (construction, engineering, legal and administrative, and project overruns), the annual operation and maintenance cost, and the life-cycle cost. Once the costs are estimated a "cost curve" or a "Present Worth Analysis" may be developed to evaluate project costs of the different controls to each other.

3.4.2 Performance

Assessing the expected performance of a proposed CSO Control should involve consideration of a number of factors.

- Selection of parameter or parameters to evaluate
- Quantifying the parameter (before and after control)
- Prioritizing control goals (water quality and treatment goals)

3.4.3 Cost/Performance Evaluations

Cost/Performance evaluations are typically done in the form of cost/performance curves. The curves take into consideration the present worth of controls versus their expected performance. In this type of graphical representation, the optimum point is typically the "knee of the curve", that is the rate at which performance versus cost begins to decrease.

3.4.4 Non-Monetary Factors

The evaluation of factors other than cost or performance may also influence the selection of one alternative over another. These other factors would likely fall into one of three general categories: environmental issues and impacts, technical issues, and implementation issues. These factors, along with cost and performance, provide and overall evaluation of an alternative to determine feasibility and/or efficacy.

3.4.4.1 Environmental Issues and Impacts

General categories of impacts that should be covered are: land use, traffic and site access, utilities relocation, noise and vibration, historic and archaeological resources, soils/rock, wetlands, floodplains, water quality, air quality, threatened or endangered species, and hazardous materials.

3.4.4.2 Technical Issues

General categories of technical issues that may be used to evaluate alternatives include the following: constructibility, reliability, and operability.

3.4.4.3 Implementation Issues

Issues that relate to the ability of implementation may alter the decision making on selecting control alternatives. Political and institutional forces can affect a CSO control program as well as the ability to phase construction of controls and providing available sites to locate such controls. Another consideration that should be looked at in determining implementation issues is the development of controls that may serve more than one function.

3.5 Financial Capability

See Chapter 4 and Appendix O

4 SELECTION AND IMPLEMENTATION OF THE LONG-TERM PLAN

4.1 Public Participation and Agency Interaction

The City of Wooster realizes that public opinion is critical in the development of the LTCP. Therefore a public commenting period was established during the month of December 2003. To alert and instruct the public on the procedure for the commenting period, a notice was included in the local paper ("The Daily Record") on Friday, December 5th, 2003 and then again on Friday, December 12th, 2003. The notice informed the public that a draft of the Long-Term Control Plan would be available for review and comment during the assigned commenting period. The LTCP was then held at City Hall for that time frame along with a comment form that could be turned in during the public commenting period and incorporated into the LTCP. All information for this program is located in Appendix L.

4.2 *Final Selection and Development of Recommended Plan*

4.2.1 Source Controls

Source control measures are efforts that are conducted to prevent pollutants from entering the system (including control of entering flows). This may include projects such as onsite detention, street sweeping, and fertilizer and pesticide control.

The following are the selected Source Controls for the City of Wooster LTCP;

- **The City of Wooster Codified Ordinance 923.04 "PROHIBITED DISCHARGES; PRETREATMENT":** Ordinance 923.04 has a number of effects on source control. This ordinance prohibits storm water from entering the separated sewer system, thus eliminating unnecessary flows. The Ordinance prohibits users to discharge certain pollutants into any of the sewer systems. The Ordinance also goes one step further and

establishes the authority to require pretreatment to the users that are releasing prohibited discharges.

- **The City of Wooster Codified Ordinance 923.05 "INDUSTRIAL DISCHARGE PERMITS":** Ordinance 923.05 gives the City the Authority to permit industrial users of the system. The City has a total of 9 significant industrial users of which 5 are categorical industrial users and 4 are significant non-categorical industrial users. Figure 13 represents the locations of the Industrial users within the city with respect to the 4 main drainage areas in the City. Refer to Appendix G for the following information on the City's pretreatment program; 2002 Pretreatment Performance summary, limits for industrial sludges, and sample industrial discharge permit for both categorical and non-categorical.

- **The City of Wooster Codified Ordinance 907 "EROSION AND STORM RUNOFF CONTROLS"** This Ordinance adopts the "City of Wooster, Erosion and Storm Water Runoff Control Manual," as fully and completely as though wholly rewritten within. Storm Water discharges are a significant source of pollutants and cause of water use impairment in receiving streams. This document provides uniform minimum standards for control within the City's jurisdiction.

- **Street sweeping program:** The entire City is swept at least two times per year. During the months of May through late October the downtown business district (Combined Sewer Area) is swept at least once per year.

- **Catch Basin Cleaning:** All Inlets to the system are cleaned at a minimum of once per year. Typically, they are cleaned during the winter or in early spring. Furthermore catch basins are inspected in conjunction with the City's Street Paving Program. Upon Inspection the catch basins are cleaned or replaced as deemed necessary.

- **Combined Sewer System Operational Plan:** In 1995 the City developed the Combined Sewer System Operational Plan to comply with the nine minimum control measures.

4.2.2 Collection System Controls

These are controls that are conducted on the system once the storm runoff and pollutants enter the system. The controls under this heading may reduce CSO volume and frequency by removing or diverting runoff, maximizing the inflow storage and increasing the flow that is convey to the WWTP. Controls that would typify this would include sewer separation, I&I control, and flow diversion.

The following are the selected Collection System Controls for the City of Wooster LTCP;

- **Sewer Cleaning Program:** The program consists of preventative and corrective maintenance. The preventative maintenance is currently conducted at approximately 30 different segments within the City. These areas that have been determined to have chronic problems are scheduled for two cleanings per year. Corrective maintenance occurs when the City receives complaints of sewer blockages. The City will then investigate and clean the particular sewer segment. Areas that continue to be sources of complaints are then listed as chronic problem areas. These areas are then subject to routine preventative maintenance cleaning.

- **CSO Facilities Maintenance:** Routine CSO maintenance as established in the 1995 Combined Sewer System Operational Plan. Maintenance includes inspection of the Bever and Elm Street Regulators and Swirl Concentrators twice a year (during the spring and the fall). Servicing of the aforementioned CSO locations, as well as the Apple Creek Overflow, Occurs after each overflow event.

- **Inflow and Infiltration Control:** Inflow and Infiltration (I&I) control has and will continue to be performed. The following information is the initial foundation of I&I control in the City of Wooster. I&I control originally dates back to the 1979 Inflow and Infiltration Study (Henry & Jones) in which a number of trouble areas were identified and corrected. This report was re-evaluated in 1983 to further target problem areas that I&I may be eliminated. In 1985 the City past an ordinance (ordinance 923.05) that prohibited the inflow of storm water into the separated sanitary sewer system.

  The City is determined to locate sources of excessive Inflow and Infiltration by investigating potentially troubled areas. Most recently the City hired CTI Environmental, Inc. to conduct the "Sanitary Sewer System Investigation report for the Cleveland Road Area North of Smithville Western Road". As the system continues to age, infiltration will become an increasing problem.

  The City is committed to continue investigation of such areas of concern. This commitment has led to the City purchasing a new step van with a trailer mounted sewer inspection unit. This includes a color camera capable of recording to both VHS and to DVD. This unit allows the City to investigate the conditions of existing pipes and to locate problems for repairs. This enables the City to repair areas that are possible sources of excessive I/I in a cost-effective method

- **Duckbill Check Valves:** The City has installed two Red Valve, Tideflex TF-1 Slip-on check valves during the summer of 2003. This work included one 36" valve located at the Elm Street CSO and one 72" valves at the Bever Street CSO. These valves allow for the CSOs to occur when necessary but prevent flow backing into the system that shouldn't be there. By eliminating the flows that should not enter the system, the City can maximize the amount of sanitary flow that can pass through the system

and can be treated. For more information on these valves refer to Appendix K.

- **Regulators:** Regulators at both the Elm Street and the Bever Street direct dry weather flow (sanitary flow) into the interceptor during dry weather and light wet weather events. As the flow level begins to increase during storm events the regulator directs flow towards the swirl concentrators for treatment before entering the interceptor or discharging to Apple Creek.

- **Sewer Separation Projects:** Sewer Separation consists of converting a portion of the combined sewer system into separate storm and sanitary sewers. Sewer separation projects have historically been used in an attempt to eliminate CSOs or to minimize the frequency and duration of their occurrences. Other benefits of sewer separation include relieving areas that may surcharge, increase inline storage, and maximization of sanitary flows to treatment. The following is a list of proposed sewer separation projects as presented in the Finkbeiner, Pettis and Strout report entitled," Master Plan for Sewer Seperation".

LTCP Sewer Seperation Projects

- South/ Walnut/ Grant Streets Area (Storm)
- Liberty and Buckeye Streets Area (Storm)
- Walnut/ Mulberry Streets Area (Storm)
- Trunk Sewer Area- South of US 30 (Combined)
- Liberty Street Area (Storm)
- Quinby/ Park Avenues Area (Storm)
- Grant Street and Foster Path Area (Storm)
- Liberty and Buckeye Area (Combined)
- North/ Walnut/ Grant Streets Area (Storm)
- Larwill Street Area (Storm)
- Grant/ Walnut/ Clark Streets Area (Storm)
- Bever Street from North Street South (Combined)
- Gasche Street Area (Storm)
- Beall Avenue Area (Storm)
- College Avenue Area (Storm)
- Market/ Spruce Streets Area (Storm)
- Spink Street Area (Storm)
- Gasche Street Area (Combined)
- Disconnect Combined Sewer Overflows (Combined)

4.2.3 Storage Technologies

The controls that utilize storage technologies attempt to store the excessive flow to minimize the impacts of CSOs and to allow for more flow to be treated. Projects that would fall into this category are in-line storage, flow equalization, and tunnel storage.

- **In-Line Storage:** The overflow weirs at the Elm Street and the Bever Street Overflows are located above the crown of the combined sewer. Thus, enabling the pipe to fill prior to overflowing. The weir at the Henry Street/Market Street diversion is also to be raised enabling more storage.

In-line storage is also addressed as a by-product of many of the other controls. Sewer separation, duckbill check valves, I&I control are all methods that will increase the systems available capacity for wet weather flows.

4.2.4 Treatment Technologies

Treatment technologies are intended to lessen the pollutant load (solids, floatables, bacteria, or other) in the CSO receiving water. The controls can be performed at the plant through expansions, improvements or the determination of increased capacity during the wet weather stress testing. In addition to the aforementioned controls, projects may include end of pipe treatment at the CSOs by means of solids removal, disinfection, and dechlorination.

The following are the selected Treatment Technologies Controls for the City of Wooster LTCP;

- **Swirl Concentrators:** The City installed swirl concentrators at the Bever Street and Elm Street outfalls in 1987. The swirl concentrators provide the separation of solids and floatables from combined sewer overflows. Solids and floatables are then directed to the foul sewer line that eventually enters the sewer interceptor. The concentrators meet the requirement of minimum treatment as defined in the Presumptive Approach.

- **Wet Weather Stress Test:** The City conducted wet weather stress testing in 1996 and 1997. The results of the testing were listed in the report "Stress Testing of the Water Pollution Control Plant" (Jones & Henry Engineers, June, 1998). The results of this study confirmed that the WWTP could handle flows approaching 15.0 MGD.

- **WWTP Expansion:** The City of Wooster hired ATS Engineering to conduct a preliminary engineering report (January, 2002) to present improvements that would increase the plant performance and effluent quality, while improving its efficiency and lowering operating cost. The proposed upgrades will:

    - Reduce sludge yield
    - Provide for future nutrient control of phosphorous and total nitrogen
    - Reduce energy consumption
    - Provide for greater reserve treatment capacity
    - Automate monitoring and control to enable greater process control with reduced staffing
    - improve the peak handling capability from 15 MGD to 27 MGD

4.2.5 Summary of Controls

The City of Wooster has adopted the Presumptive Approach in selecting the controls for this LTCP. The City also wanted to establish two other parameters over and beyond those listed in the Presumptive Approach that would determine the selected controls. The first of those goals was to eliminate combined sewer overflow occurrences during precipitation events of less than five-year frequencies at the Apple Creek discharge. The second goal was to minimize the amount of nutrients (phosphorous and nitrates) that enter the receiving stream.

Under the Presumption Approach, controls adopted in the LTCP should be required to meet one of three criteria. The criterion that has been chosen for this

LTCP is the following; (criterion number i) *No more than an average of four overflow events per year, provided that the permitting authority may allow up to two additional overflow events per year. For the purpose of this criterion, an overflow event is one or more overflows from a CSS as a result of a precipitation event that does not receive the minimum treatment specified.* The minimum level of treatment applicable to this criterion is listed below;

- Primary clarification; removal of floatable and settleable solids may be achieved by any combination of treatment technologies or methods that are shown t be equivalent to primary clarification
- Solids and floatables disposal and
- Disinfection of effluent, if necessary, to meet WQS, protect designated uses and protect human health, including removal of harmful disinfection chemical residuals

The controls that have been chosen will enable the City's five CSOs (3 listed on NPDES Permit and two that are not) to meet the control goals as established in this LTCP (Presumptive Approach). The succeeding paragraphs summarize each of the CSOs and their corresponding controls. Figure 21 shows an updated model of the system that includes all proposed controls. It is shown in the model that CSO events will occur on average less than 4 times per year.

City of Wooster
SWMM 5.0 Models of Combined Sewers
Summary of Overflow Results
November 15, 2005

Existing Model										
Storm Frequency/ Duration	Total Rainfall (inches)	Surface Flooding * (MGal)	Apple Creek Overflow		Elm Swirl Overflow		Bever Swirl Overflow		Henry St./ Market St. Overflow	
			Peak Flow (cfs)	Total Volume (MGal)	Peak Flow (cfs)	Total Volume (MGal)	Peak Flow (cfs)	Total Volume (MGal)	Peak Flow (cfs)	Total Volume (MGal)
2-yr/1-hr	1.18	0.044	14.9	0.398	8.2	0.082	52.9	0.573	0.8	0.005
5-yr/1-hr	1.50	0.155	19.7	0.678	12.2	0.225	76.9	1.208	1.3	0.010
5-yr/2-hr	1.80	0.172	18.8	0.910	13.0	0.309	71.2	1.203	1.2	0.010
5-yr/6-hr	2.25	0.162	19.8	1.465	13.3	0.484	66.7	1.535	1.0	0.008
5-yr/12-hr	2.70	0.274	22.1	1.862	14.9	0.566	72.7	1.925	1.1	0.010
5-yr/24-hr	3.10	0.412	19.2	1.840	15.4	0.685	78.4	2.185	1.1	0.012
10-yr/1-hr	1.73	0.346	19.1	0.822	13.1	0.265	81.3	1.331	1.6	0.014

Proposed Model								
Storm Frequency/ Duration	Total Rainfall (inches)	Surface Flooding * (MGal)	Apple Creek Overflow		Elm Swirl Overflow		Bever Swirl Overflow	
			Peak Flow (cfs)	Total Volume (MGal)	Peak Flow (cfs)	Total Volume (MGal)	Peak Flow (cfs)	Total Volume (MGal)
2-yr/1-hr	1.18	0.000	0.0	0.000	0.0	0.000	0.0	0.000
5-yr/1-hr	1.50	0.000	0.0	0.000	0.0	0.000	21.1	0.069
5-yr/2-hr	1.80	0.000	0.0	0.000	0.0	0.000	15.6	0.068
5-yr/6-hr	2.25	0.000	0.0	0.000	0.0	0.000	16.0	0.046
5-yr/12-hr	2.70	0.000	0.0	0.000	1.0	0.003	20.6	0.099
5-yr/24-hr	3.10	0.000	0.0	0.000	1.8	0.013	18.8	0.126
10-yr/1-hr	1.73	0.000	0.0	0.000	0.0	0.000	27.6	0.145

* Surface Flooding represents flooding from upstream manholes.

Figure 21: SWMM Model including all proposed controls (Arcadis, November 2005)

The Henry Street and Market Street Overflows will be eliminated with the construction and implementation of all proposed controls, as shown in the SWMM Model in Figure 21. These CSOs are not currently permitted and will not

be required to be included on the City's NPDES Permit. In addition the implementation of the LTCP controls will eliminate surface flooding from the modeled overflow events. Projects that have been constructed have eliminated the use of both of these CSOs.

The Elm Street CSO has partial treatment of CSO discharges prior to entering Apple Creek by means of the existing swirl concentrator. The CSO will be significantly minimized upon the completion of the proposed LTCP goals. AS can be concluded from the SWMM model results, this overflow will be active on average less than 4 times per year. Therefore, it was determined that end-of-the-pipe treatment (disinfection) would not be a cost effective control to improve water quality.

The Bever Street CSO has partial treatment of CSO discharges prior to entering Apple Creek by means of the existing swirl concentrator. This CSO will be the most active CSO after the construction and implementation of all the proposed controls. However, based on modeling results this CSO will be active on average, less than 4 times per year. Therefore, it was determined that end-of-the-pipe treatment (disinfection) would not be a cost effective control to improve water quality.

The final CSO and the focal point of this LTCP is the Apple Creek Overflow. The controls that have been selected for the Apple Creek Overflow are intended to prevent CSO occurrences during less than five-year storm events. It is anticipated that the implementation of all the proposed controls as stated in this Section (Section 4.2) will result in the projected goal to be met. In the model performed by Arcadis the Apple Creek CSO will be inactive during storms equal to or less than five-year storm events. The CSO will also remain inactive during a 10 year 1 hour storm event.

4.3 Financing Plan

Figure 22: Proposed Project Costs

SOURCE CONTROLS	ESTIMATED PROBABLE COST
Codified Sewer Ordinances	Completed
Street Sweeping Program	Yearly O&M Costs
Catch Basin Cleaning	Yearly O&M Costs
COLLECTION SYSTEM CONTROLS	**ESTIMATED PROBABLE COST**
Sewer Cleaning Program	Yearly O&M Costs
CSO Facilities Maintenance	Yearly O&M Costs
Inflow and Infiltration Control (Sewer Inspection Equipment)	$200,000
Duckbill Check Valves	$50,000
South/ Walnut/ Grant Streets Area	$681,000
Liberty and Buckeye Streets	$309,000
Walnut/ Mulberry Area	$63,000
Trunk Sewer Area – South of US 30	$203,000
Liberty Street Area	$325,000
Quinby/ Park Avenues Area	$859,000
Grant Street and Foster Path Area	$239,000
Liberty and Buckeye Area	$86,000
North/ Walnut/ Grant Streets Area	$311,000
Larwill Street Area	$266,000
Grant/ Walnut/ Clark Streets Area	$179,000
Bever Street from North Street South	$169,000
Gasche Street Area	$639,000
Beall Avenue Area	$1,080,000
College Avenue Area	$498,000
Market/ Spruce Streets Area	$211,000
Spink Street Area	$606,000
Gasche Street Area	$68,000
STORAGE TECHNOLOGIES	**ESTIMATED PROBABLE COST**
In-Line Storage	Completed
TREATMENT TECHNOLOGIES	**ESTIMATED PROBABLE COST**
Swirl Concentrators	Completed
WWTP Improvements, Plant Expansion	$18,900,000

TOTAL PROBABLE COST OF CONSTRUCTION OF PROPOSED IMPROVEMENTS	**$25,942,000**

Implementation Schedule

Figure 23: Implementation Schedule

SOURCE CONTROLS	COMPLETION YEAR
Codified Sewer Ordinances	Completed
Street Sweeping Program	Completed
Catch Basin Cleaning	Completed
COLLECTION SYSTEM CONTROLS	**COMPLETION YEAR**
Sewer Cleaning Program	Ongoing
CSO Facilities Maintenance	Ongoing
Inflow and Infiltration Control (Sewer Inspection Equipment)	Completed in 2003
Duckbill Check Valves	Completed in 2003
South/ Walnut/ Grant Streets Area	Completed in 2002
Liberty and Buckeye Streets	Completed in 2005
Walnut/ Mulberry Area	Completed in 2001
Trunk Sewer Area – South of US 30	Completed in 2001
Liberty Street Area	Completed in 2005
Quinby/ Park Avenues Area	Completed in 2004
Grant Street and Foster Path Area	Completed in 2004
Liberty and Buckeye Area	Completed in 2006
North/ Walnut/ Grant Streets Area	2006
Larwill Street Area	2008
Grant/ Walnut/ Clark Streets Area	2006
Bever Street from North Street South	2007
Gasche Street Area	2008
Beall Avenue Area	2007
College Avenue Area	2009
Market/ Spruce Streets Area	2010
Spink Street Area	2010
Gasche Street Area	2009
STORAGE TECHNOLOGIES	**COMPLETION YEAR**
In-Line Storage	Completed
TREATMENT TECHNOLOGIES	**COMPLETION YEAR**
Swirl Concentrators	Completed
WWTP Improvements, Plant Expansion	2006-2007

4.4 Operational Plan

The City's Current operational plan, "Combined Sewer System Operational Plan" (Jones & Henry Engineers, 1995) does not require updating at this time. Implementation of the long-term controls will not effect the operation of the system other than altering the frequency of particular maintenance details (Examples: The frequency of servicing the Apple Creek Overflow will decrease due to the proposed reduction in the number of CSO occurrences).

4.5 Post Construction Compliance Monitoring

The City is required to develop the Post Construction Compliance Monitoring Program to ascertain the effectiveness of the CSO controls and to verify attainment of water quality standards.

The City of Wooster is required to monitor the three CSOs (Bever, Elm, Apple Creek) as part of the NPDES Permit. When the CSOs are discharging, the City is required to report daily, the duration and the flow rate at each location. In an effort to ascertain the effectiveness of the proposed controls the City will continue monitoring the CSOs. The City will use this information in conjunction with a National Weather Service approved rain gauge to determine that any CSO event at the Apple Creek Overflow occurs during a precipitation event of the frequency of a five-year storm or greater.

The Ohio EPA will verify attainment of water quality standards. The Killbuck Creek watershed is scheduled for field monitoring by the Ohio EPA in the year of 2007 (after implementation of controls) and a TMDL in the year 2009. Figure 24 and Figure 25, depict the long-term scheduling of field monitoring and TMDL. These figures are from the "Ohio 2002 Integrated Report" (Ohio EPA).

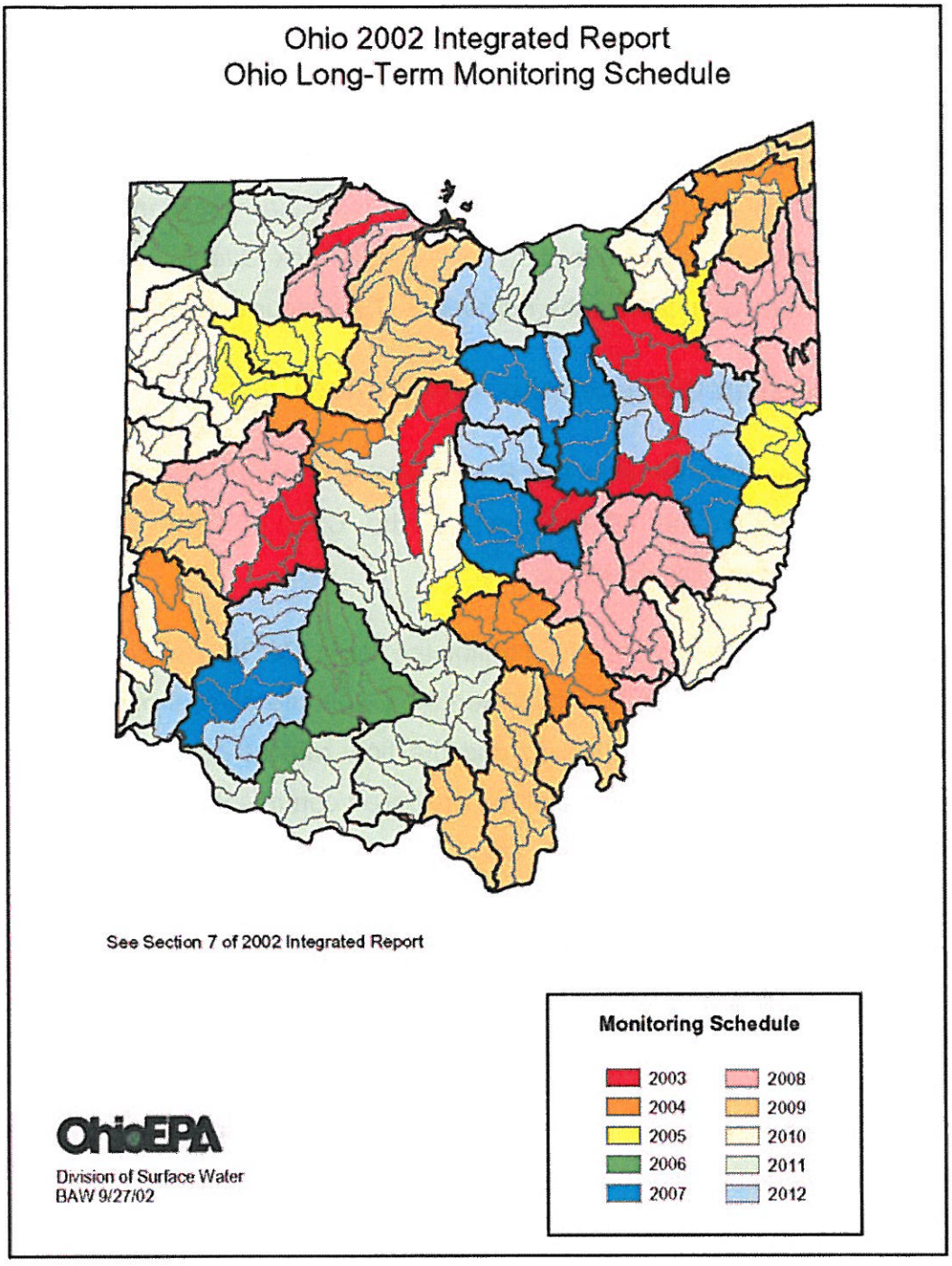

Figure 24: Ohio Long-Term Monitoring Schedule

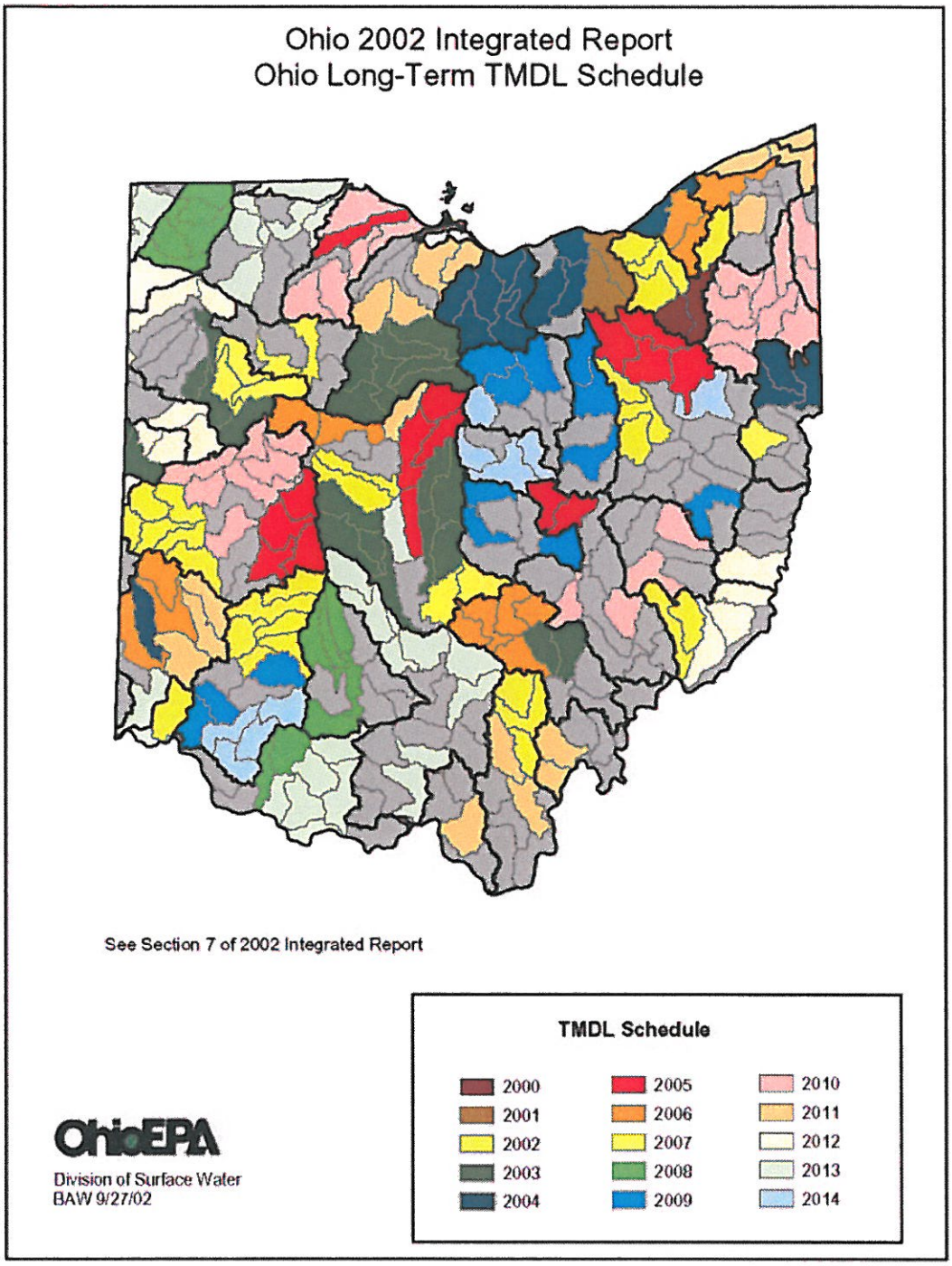

Figure 25: Ohio Long-Term TMDL Schedule