CITY OF PIPERTON, TENNESSEE

WATER AND SEWER
MASTER PLANNING STUDY

CONSOLIDATED TECHNOLOGIES, INC.
ENGINEERS IN WATER AND EARTH SCIENCES

WATER AND SEWER
MASTER PLANNING STUDY

CITY OF PIPERTON, TENNESSEE

JOSEPH D. BISHOP
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 12253
STATE OF TENNESSEE

5/14/01

Prepared by:

CONSOLIDATED TECHNOLOGIES, INC.
Engineers in Water and Earth Sciences
Nashville, Tennessee

CTI Project No. 00122

May 2001

TABLE OF CONTENTS

		Page
1	**INTRODUCTION**	**1.1**
	Purpose and Scope	1.2
	Study Area	1.2
2	**CUSTOMER PROJECTIONS**	**2.1**
	Residential	2.2
	Commercial/Industrial	2.3
	Customer Distribution	2.3
3	**FLOW PROJECTIONS**	**3.1**
	Water Projections	3.2
	Wastewater Projections	3.4
	Distribution of Customers/Flows	3.6
4	**EXISTING FACILITIES**	**4.1**
	Water Facilities	4.2
	Wastewater Facilities	4.3
5	**REQUIRED WATER FACILITIES**	**5.1**
	Description of Alternatives	5.2
	Hydraulic Modeling	5.4
	Estimated Costs	5.5
	Comparison of Alternatives	5.9
	Recommended Plan	5.10
6	**REQUIRED SEWER FACILITIES**	**6.1**
	Wastewater Treatment Facilities	6.2
	Wastewater Transmission Facilities	6.6
	Wastewater Collection Facilities	6.6
	Description of Alternatives	6.14
	Estimated Costs	6.16
	Comparison of Alternatives	6.19
	Recommended Plan	6.19
7	**FINANCIAL CONSIDERATIONS**	**7.1**
	Preliminary Rate Structures and Fees	7.3
	Potential Capital Funding Sources	7.4

APPENDICES

A City of Piperton Draft Land Use Plan, "Toward an Alternative System of Land Use Controls," July 2000

B Pipe Network and Data Files

C Ultimate Build-Out Water Facilities

D Localized Wastewater Treatment Systems

E Ultimate Build-Out Sewer Facilities

F Year 2020 Sewer Facilities with Collierville

G Calculations for Preliminary Rates and Fees

H Potential Funding Sources

LIST OF TABLES **Page**

2.1 Customer Projections 2.2

3.1 Average Daily Water Usage 3.3

3.2 Peak Daily Water Demand 3.4

3.3 Average Daily Wastewater Flows 3.5

3.4 Peak Daily Wastewater Flows 3.6

3.5 Customers 3.7

5.1 Alternative 1 - Collierville Supplies North and South 5.6

5.2 Alternative 2 - Collierville Supplies South, MLGW Supplies North 5.7

5.3 Alternative 3 - Piperton Produces Water Using Two Treatment Systems 5.8

5.4 Comparison of Water Alternatives 5.9

5.5 Selected Water Plan 5.11

6.1 Centralized Treatment Capital Costs 6.4

LIST OF TABLES (Continued)		Page
6.2	Localized Treatment Costs	6.5
6.3	Design Flow Comparison	6.9
6.4	Comparison of Estimated Costs for Treatment Gravity vs Low Pressure Sewers	6.9
6.5	Costs for Interceptor Sewers and Lift Stations Gravity Sewers	6.10
6.6	Costs for Interceptor Sewers and Lift Stations Low Pressure Sewers	6.11
6.7	Comparison of Collection System Costs Per Dwelling Unit	6.12
6.8	Alternative 1 - One Treatment Plant in South	6.17
6.9	Alternative 2 - Two Treatment Plants	6.18
6.10	Comparison of Sewer Alternatives	6.19
7.1	Tap Fees and Impact Fees	7.3
7.2	Water and Sewer Rates	7.4
7.3	Loan or Grant Sources	7.5

LIST OF FIGURES		Follows Page
1.1	Urban Growth Boundary	1.2
2.1	Existing Land Use	2.3
2.2	Year 2020 Land Use	2.3
2.3	Ultimate Build-Out Land Use	2.3
3.1	Drainage Basins	3.6
5.1	Proposed Water Distribution System	5.11
6.1	Proposed Sewer Transmission System	6.19

CHAPTER 1

Introduction

PURPOSE AND SCOPE

The purpose of this study is to provide a master plan for the water and sewer facilities needed to serve the City of Piperton as it grows to its full development potential.

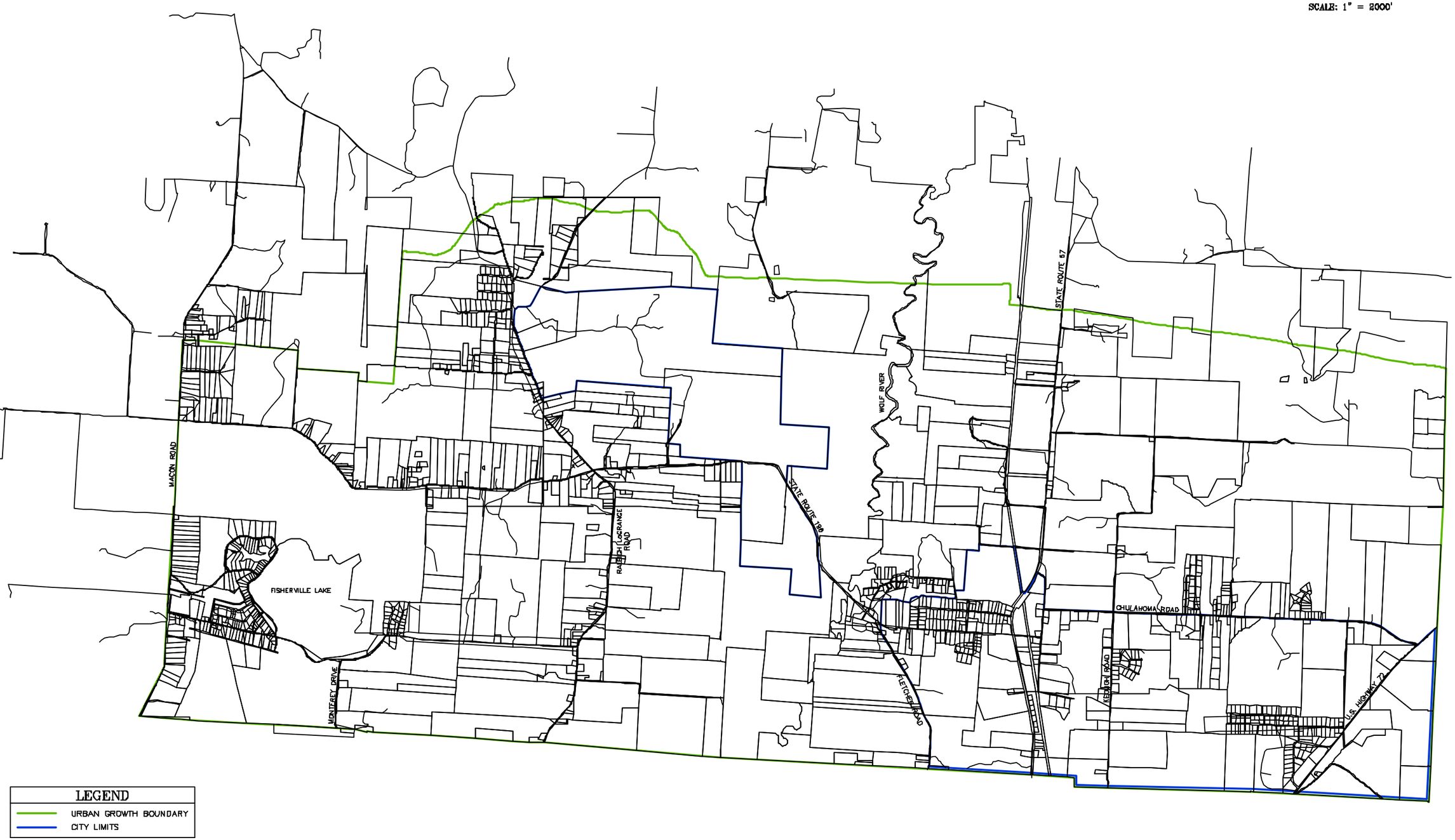
The study scope includes:

1. Description of study area.
2. Review of current conditions, including population data and existing facilities.
3. Projections of future conditions (Year 2020 and ultimate), including the number and locations of future customers.
4. Development of water and sewer facilities required to serve these customers.
5. Cost estimates for both the initial capital expenditures and for operation and maintenance of the water and sewer facilities.
6. Discussion of options for potential funding sources for recommended improvements.

STUDY AREA

The study area considered in this report is the area inside the "urban growth boundary," as defined in the City of Piperton's "Urban Growth Boundary Report," September 1999. This plan is required by Public Chapter 1101, passed by the Tennessee General Assembly in 1998. As shown on Figure 1.1, the area is bounded by the Fayette/Shelby County line to the west, the Tennessee/Mississippi state line to the south, Macon Road to the north, and an imaginary line to the west running through Alexander and Shaws Creek. The area encompasses approximately 42.5 square miles.

E:\00122\11-URBAN GROWTH BOUNDARY.DWG



ISSUED FOR		
REVIEW		
APPROVAL		
CONSTRUCTION		

THIS DRAWING IS AN INSTRUMENT OF SERVICE OWNED BY CONSOLIDATED TECHNOLOGIES, INC. (CTI), WHICH SHALL BE DEEMED THE AUTHOR AND WHICH SHALL RETAIN ALL SANCTUARY AND COMMON LAW RIGHTS, INCLUDING COPYRIGHTS. THIS DRAWING SHALL NOT BE SCANNED, COPIED, OR DISTRIBUTED TO OTHERS IN ANY FORMOR USED FOR ANY OTHER PURPOSE OR PROJECT WITHOUT PRIOR WRITTEN CONSENT OF CTI. CTI IS NOT RESPONSIBLE FOR CONSEQUENCES RELATED TO UNAUTHORIZED USE OR REUSE OF THIS DRAWING OR PORTIONS THEREOF.

3			
2			
1			
REVISION	BY	DATE	DESCRIPTION OF REVISION

CONSOLIDATED TECHNOLOGIES, INC.
ENGINEERS AND LAND SURVEYORS
NASHVILLE, TENNESSEE

DRAWN	T.B.	04/03
CHECKED	A.M.H.	04/03
REVIEW	T.B.	04/03
APPROVED	J.D.H.	04/03

CITY OF PIPERTON, TENNESSEE

URBAN GROWTH BOUNDARY

JOB NUMBER: 00122

DRAWING NUMBER: 1.1

CHAPTER 2

Customer Projections

RESIDENTIAL

The current population of the City of Piperton inside the city limits is approximately 700 persons. This figure excludes numerous subdivisions around Fisherville Lane and individual residences in the northern portion of the urban growth boundary. The estimated current population inside the study area is 1,800. Based on the recent growth in surrounding communities and the planned construction of a major interstate-type transportation corridor (State Route 385) along the western border of the study area, the population of Piperton inside the urban growth boundary is expected to increase to 25,000 by the year 2020. At ultimate development, the urban growth boundary population is expected to be 36,700 (Table 2.1).

TABLE 2.1

CITY OF PIPERTON

Customer Projections

Customer Type	Year				
	2000	2005	2010	2020	Ultimate
Residential (persons)	1,800	5,000	11,000	25,000	36,700
Commercial (acres)	100	200	320	600	900
Industrial (acres)	122	240	380	700	2,000

Source: John Huffman, Mayor of Piperton, and Consolidated Technologies, Inc.

Despite the predicted population increase, City officials propose to maintain a semi-rural atmosphere, as reflected in the most recent version of their Land Use Plan (see Appendix A). This draft plan allows residential development at a maximum density of one dwelling unit per acre as an average for each square mile of area. While the actual lot sizes can be smaller, the amount of green space within each development must be sufficient to maintain the average housing density at one dwelling unit per acre per square mile.

COMMERCIAL/INDUSTRIAL

Commercial acreage is expected to increase sixfold over the next 20 years, from 100 to 600 acres. The amount of industrial property is projected to grow at a similar rate, from 122 now to 700 acres in 2020. At ultimate build-out, commercial acreage is projected to be 900 acres, while industrial property would be 2,000 acres; most of the increase over the Year 2020 industrial acreage is expected to occur in the Northeast Mississippi Industrial Park.

CUSTOMER DISTRIBUTION

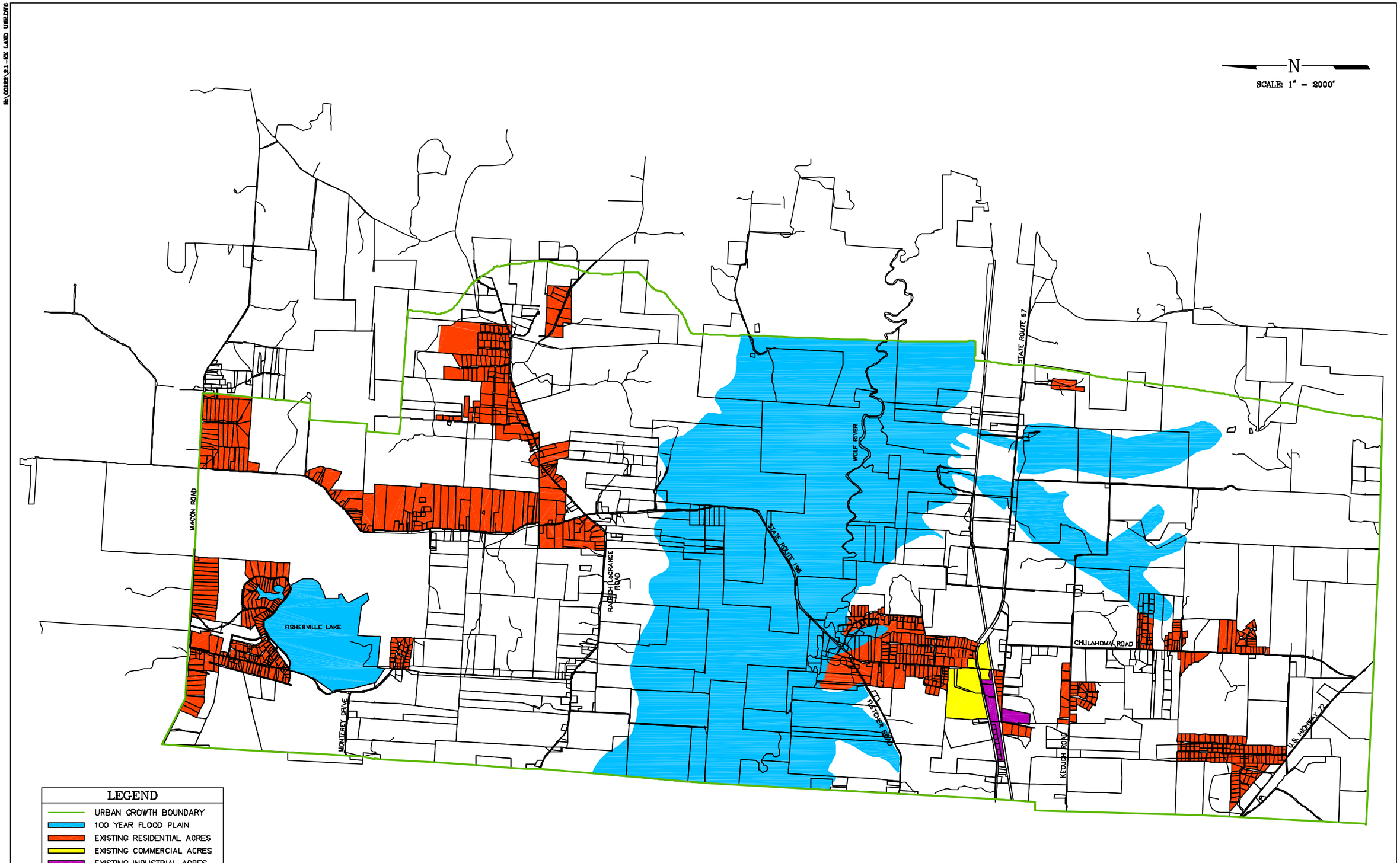
Existing land use in the urban growth boundary is presented on Figure 2.1. Development in the study area is impacted significantly by the Wolf River and its 100-year floodplain. Current residential, commercial, and industrial uses account for approximately 4,500 acres. Floodplain makes up approximately 9,000 acres. The majority of future growth will occur in the remaining "vacant" property of approximately 12,300 acres.

For the Year 2020, future residential, commercial, and industrial development is predicted to generally follow existing development and major roadways, and is based on the following assumptions:

1. No development will occur in the 100-year floodplain.
2. 75 percent of the available land south of the Wolf River will be developed.
3. All of the industrial development and 75 percent of the commercial development will be in the southern region.
4. The remainder of projected development through the Year 2020 will occur in the north.

The expected land use in the Year 2020 is presented on Figure 2.2.

For the ultimate build-out condition, the amount of "vacant" or underdeveloped property is assumed to be zero. Additional industrial acres are assumed to be located in north Mississippi. The ultimate build-out land use is presented on Figure 2.3.



ISSUED FOR		
REVIEW		
APPROVAL		
CONSTRUCTION		

THIS DRAWING IS AN INSTRUMENT OF SERVICE OWNED BY CONSOLIDATED TECHNOLOGIES, INC. (CTI), WHICH SHALL BE DEEMED THE AUTHOR AND WHICH SHALL RETAIN ALL SANCTUARY AND COMMON LAW RIGHTS, INCLUDING COPYRIGHTS. THIS DRAWING SHALL NOT BE SCANNED, COPIED, OR DISTRIBUTED TO OTHERS IN ANY FORMOR USED FOR ANY OTHER PURPOSE OR PROJECT WITHOUT PRIOR WRITTEN CONSENT OF CTI. CTI IS NOT RESPONSIBLE FOR CONSEQUENCES RELATED TO UNAUTHORIZED USE OR REUSE OF THIS DRAWING OR PORTIONS THEREOF.

REVISIONS			
1			
2			
3			
REVISION	BY	DATE	DESCRIPTION OF REVISION

CONSOLIDATED TECHNOLOGIES, INC.
ENGINEERS AT WATER AND RAILWAY STREETS
NASHVILLE, TENNESSEE

DESIGN	T.B.	04/03
DRAWN	A.M.R.	04/03
CHECKED	T.B.	04/03
APPROVED	J.D.B.	04/03

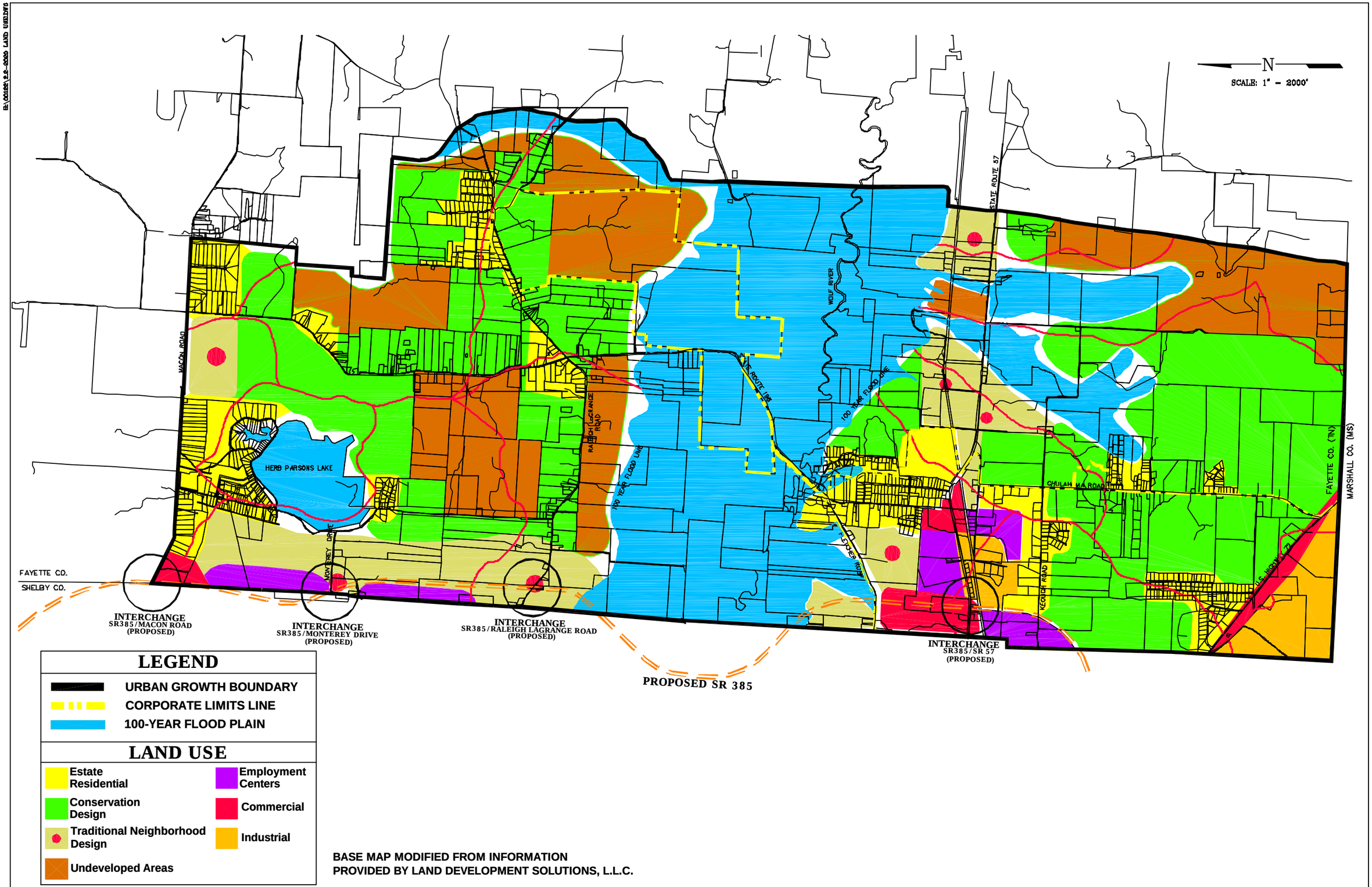
CITY OF PIPERTON, TENNESSEE

EXISTING LAND USE

JOB NUMBER 00122

DRAWING NUMBER 2.1

E:\00122\2.1-EX LAND USE.DWG



BASE MAP MODIFIED FROM INFORMATION
PROVIDED BY LAND DEVELOPMENT SOLUTIONS, L.L.C.

ISSUED FOR
REVIEW
APPROVAL
CONSTRUCTION

THIS DRAWING IS AN INSTRUMENT OF SERVICE OWNED BY CONSOLIDATED TECHNOLOGIES, INC. (CTI), WHICH SHALL BE DEEMED THE AUTHOR AND WHICH SHALL RETAIN ALL SANCTUARY AND COMMON LAW RIGHTS, INCLUDING COPYRIGHTS. THIS DRAWING SHALL NOT BE SCANNED, COPIED, OR DISTRIBUTED TO OTHERS IN ANY FORMOR USED FOR ANY OTHER PURPOSE OR PROJECT WITHOUT PRIOR WRITTEN CONSENT OF CTI. CTI IS NOT RESPONSIBLE FOR CONSEQUENCES RELATED TO UNAUTHORIZED USE OR REUSE OF THIS DRAWIND OR PORTIONS THEREOF.

REV.	DATE	BY	DESCRIPTION OF REVISION
1			
2			
3			

CONSOLIDATED TECHNOLOGIES, INC.
ENGINEERS IN WATER AND RADIO SCIENCES
NASHVILLE, TENNESSEE

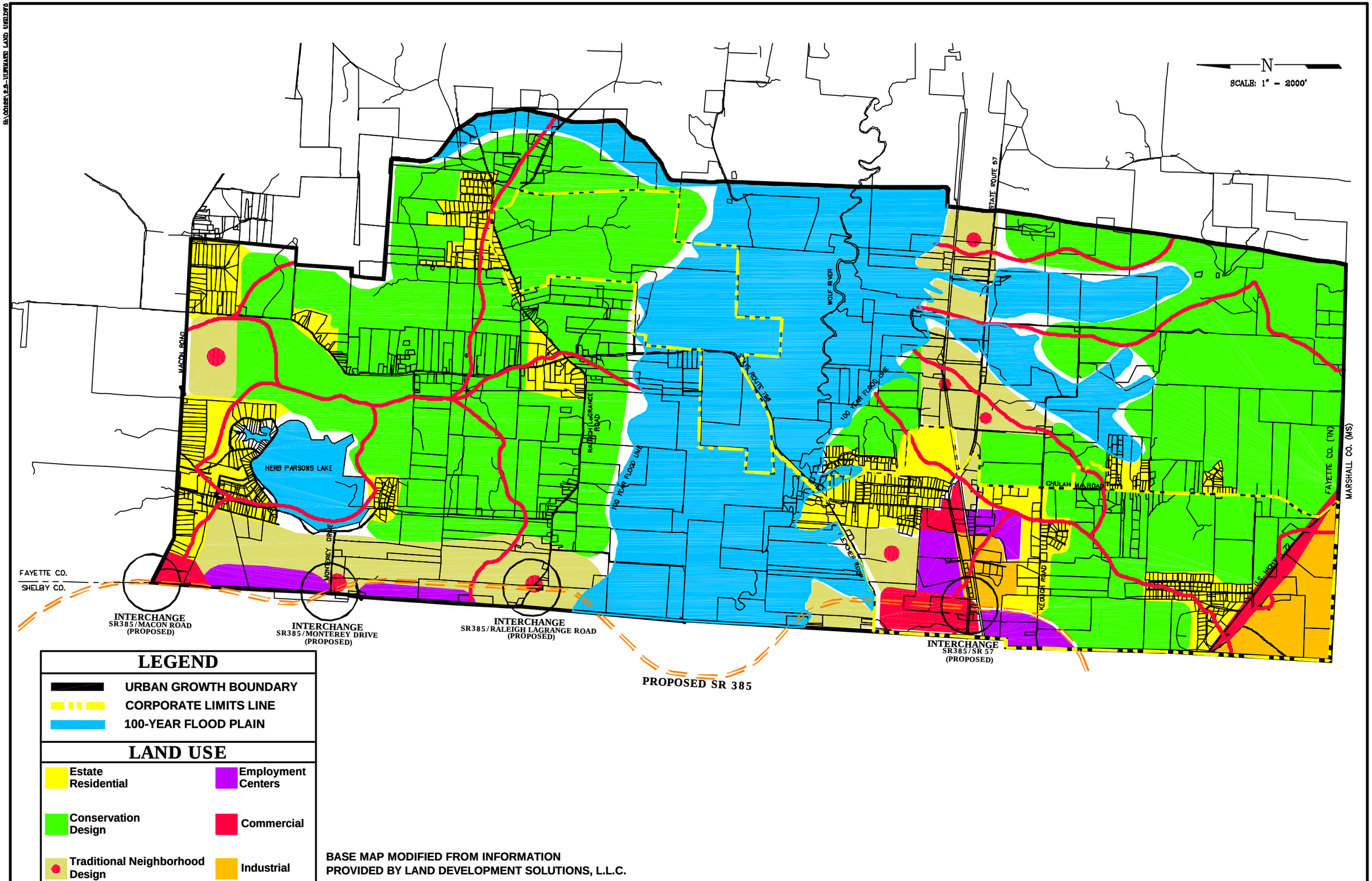
DRAWN:	T.B.	07/03
DESIGN:	A.M.R.	07/03
CHECK:	T.B.	07/03
APPR:	J.D.B.	07/03

CITY OF PIPERTON, TENNESSEE

YEAR 2020
LAND USE

JOB NUMBER
00122

DRAWING NUMBER
2.2



BASE MAP MODIFIED FROM INFORMATION PROVIDED BY LAND DEVELOPMENT SOLUTIONS, L.L.C.

ISSUED FOR
REVIEW
APPROVAL
CONSTRUCTION

THIS DRAWING IS AN INSTRUMENT OF SERVICE OWNED BY CONSOLIDATED TECHNOLOGIES, INC. (CTI), WHICH SHALL BE DEEMED THE AUTHOR AND WHICH SHALL RETAIN ALL SANCTUARY AND COMMON LAW RIGHTS, INCLUDING COPYRIGHTS. THIS DRAWING SHALL NOT BE SCANNED, COPIED, OR DISTRIBUTED TO OTHERS IN ANY FORM OR USED FOR ANY OTHER PURPOSE OR PROJECT WITHOUT PRIOR WRITTEN CONSENT OF CTI. CTI IS NOT RESPONSIBLE FOR CONSEQUENCES RELATED TO UNAUTHORIZED USE OR REUSE OF THIS DRAWING OR PORTIONS THEREOF.

REVISIONS			
1			
2			
3			
DATE	BY	CHK	DESCRIPTION OF REVISION

CONSOLIDATED TECHNOLOGIES, INC.
ENGINEERS OF WATER AND WASTE SYSTEMS
NASHVILLE, TENNESSEE

DESIGN	J.E.	04/03
DRAWN	A.M.N.	04/03
CHECK	J.E.	04/03
APPR	J.E.	04/03

CITY OF PIPERTON, TENNESSEE

ULTIMATE BUILD-OUT LAND USE

JOB NUMBER 00122

DRAWING NUMBER 2.3

CHAPTER 3

Flow Projections

FLOW PROJECTIONS

There are no public water facilities north of the river at this time. For the existing service areas south of the Wolf River, the City of Piperton obtains potable water from the City of Collierville. This potable water is received through three separate permanent flow meters installed on Highway 57, Highway 72, and Keough Road. An “Unaccounted for Water Study” prepared in 1997 showed that the City had over a 42 percent loss between the three flow meters and the 300 individual customer meters. Data on water consumption is limited, and its reliability is questionable due to problems with the meters.

Piperton has no public sewerage facilities at all. As a result, detailed records of wastewater generation are nonexistent. Therefore, projections regarding demand are based on Tennessee Department of Environmental and Conservation (TDEC) guidelines and engineering judgment.

WATER PROJECTIONS

Residential

The neighboring city of Collierville has a population of 30,000 people. Potable water usage for a typical Collierville customer ranges from 67 to 95 gallons per day (gpd) per person. TDEC suggests an average residential flow of 100 gpd per capita for design purposes. This value will be used in this study for existing and future average potable water use.

Commercial/Industrial

TDEC recommendations for potable water are based on actual building sizes and application. At this time, the size and type of future commercial developments in Piperton are unknown. TDEC guidelines for estimating commercial sewage flow recommend an average of 500 gpd per acre.

TDEC guidelines also suggest an industrial flow factor of 1,000 gpd per acre which is used in this report for existing and future conditions.

Total Average Water Demand

Estimated future average daily potable water usage for the City of Piperton is shown in Table 3.1.

TABLE 3.1 CITY OF PIPERTON Average Daily Water Usage				
	Development		Usage (gpd)	
Category	Year 2020	Ultimate	Year 2020	Ultimate
Residential (units)	8,333	12,233	2,500,000	3,670,000
Commercial (acres)	600	900	300,000	450,000
Industrial (acres)	700	2,000	700,000	2,000,000
TOTAL			3,500,000	6,120,000

Maximum Daily Demand

Maximum daily demand represents the greatest amount of water a system will use in a day. TDEC suggests small residential water systems use a multiplier of 1.5 to 2.0 times the average daily flow. Based on 12 months of data from Piperton, the highest demand in a summer month is 152 percent higher than the average monthly flow rate. Since the highest reported value is a monthly average, a multiplier of 2.0 is used in this study to estimate daily peak flows for future situations (Table 3.2).

Fire Flows

The Insurance Service Organization (ISO) suggests that water distribution systems be capable of supplying a minimum of 1,500 gpm at 20 psi for fire protection purposes. In most cases, this instantaneous demand exceeds the peak customer demand for Piperton and therefore it will govern water line sizes, as discussed in later chapters.

TABLE 3.2 CITY OF PIPERTON		
Peak Daily Water Demand		
Category	**Year 2020 Peak Demand**	**Ultimate**
Residential	5,000,000	7,340,000
Commercial	600,000	900,000
Industrial	1,400,000	4,000,000
TOTAL	7,000,000	12,240,000

WASTEWATER PROJECTIONS

Piperton has no municipal wastewater collection or treatment facilities. Residents and businesses rely on individual on-site septic systems to treat their wastewater.

Since there are no wastewater flow rates from the City of Piperton, the primary sources of information for this section are the TDEC recommendations and the water use data developed in the preceding section. This information is used to determine projected sewage flows for both average and peak conditions.

Residential

Residential flows are determined on the basis of population times average per capita contribution of wastewater. TDEC suggests an average residential flow of 100 gpd per capita for conventional gravity sewer systems, which accounts for infiltration/inflow (I/I) plus normal water consumption.

Commercial/Industrial

TDEC guidelines suggest an average commercial flow of 500 gpd per acre, which includes an allowance for I/I. The guidelines suggest an industrial flow factor of 1,000 gpd per acre, which is used in this report for future conditions.

Average Wastewater Flows

Estimated future average daily wastewater flows for the City of Piperton are shown in Table 3.3. These flows are used for sizing wastewater treatment facilities.

TABLE 3.3 CITY OF PIPERTON Average Daily Wastewater Flows				
	Development		Flow (gpd)	
Category	Year 2020	Ultimate	Year 2020	Ultimate
Residential (units)	8,333	12,233	2,500,000	3,670,000
Commercial (acres)	600	900	300,000	450,000
Industrial (acres)	700	2,000	700,000	2,000,000
TOTAL			3,500,000	6,120,000

Peak Flows

Peak flow is considered to be the maximum design flow. Although peak flows are expected to occur infrequently, they are the controlling design factor in sizing a wastewater conveyance system to prevent surcharging and/or overflows.

When sizing major interceptor sewers or pumping stations, a peaking factor of 2.5 times residential sewage flows is used due to hourly variations over a 24-hour period. Minimum flows usually occur around 4:00 a.m., with peak flows later in the morning and in early evening. In this cycle, approximately half the sewage generated in the course of the day arrives at the treatment plant in an 8-hour period. For commercial and industrial flows, anticipated peak daily flows are calculated by multiplying average daily flows by a peak factor of 2.0. Each of these peaking factors includes an allowance for normal I/I.

Estimated future peak daily wastewater flows for the City of Piperton are shown in Table 3.4.

TABLE 3.4 CITY OF PIPERTON		
Peak Daily Wastewater Flows		
	Peak Daily Flow (gpd)	
Category	**Year 2020**	**Ultimate**
Residential	6,250,000	9,175,000
Commercial	600,000	900,000
Industrial	1,400,000	4,000,000
TOTAL	8,250,000	14,075,000

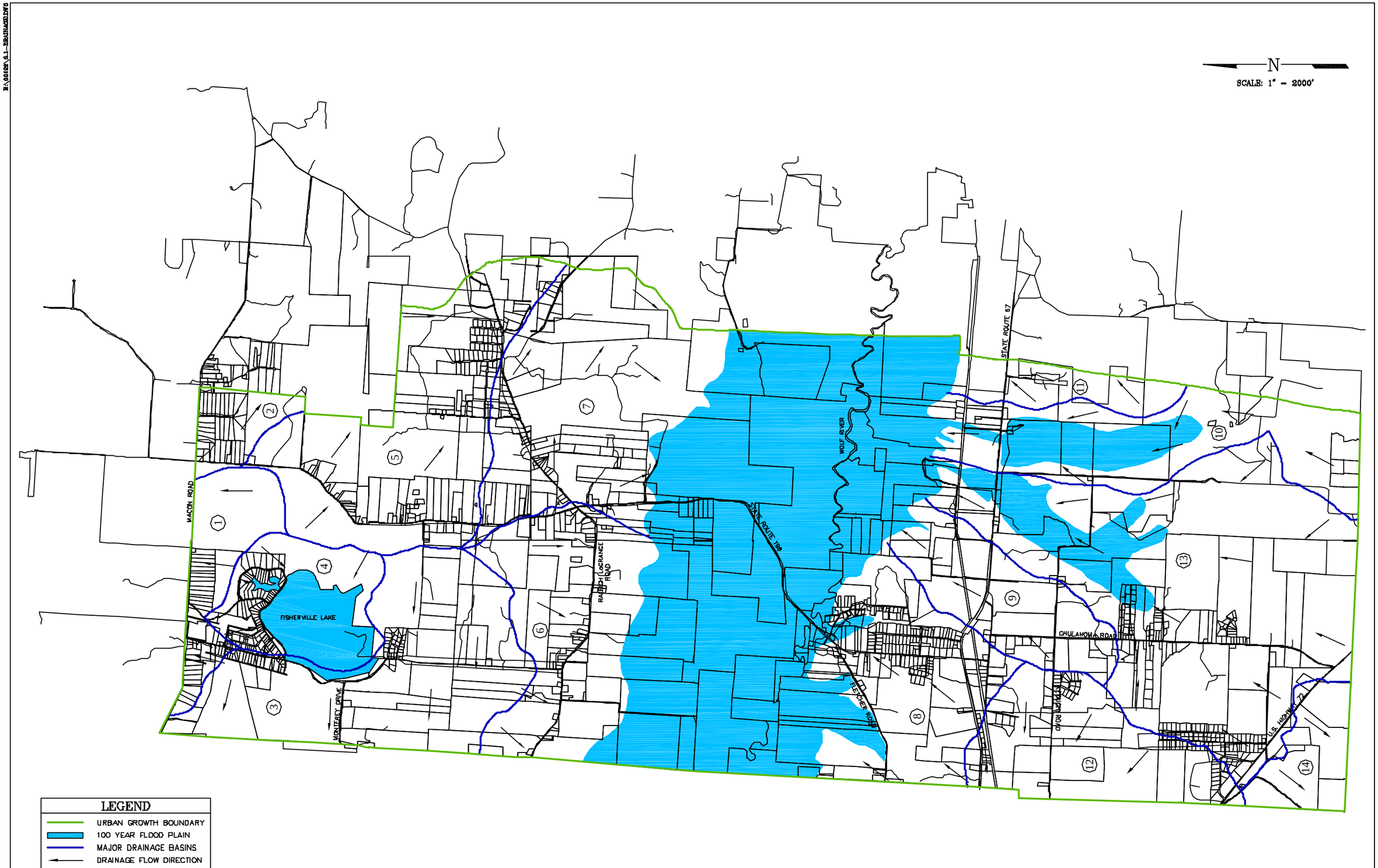
Wastewater Loading

In the absence of data on wastewater loading rates, a value of 250 mg/l for both biochemical oxygen demand (BOD) and suspended solids (SS) will be used in this report. Per TDEC guidelines, these rates are typical for residential and light commercial/industrial flows.

DISTRIBUTION OF CUSTOMERS/FLOWS

In order to prepare preliminary layouts of future water and sewer facilities, the projected locations of residential, commercial, and industrial customers within the urban growth boundary must be determined. The land use plans previously presented on Figures 2.2 and 2.3 provide some indication of these locations.

Water lines will generally follow existing road corridors or new roads as they are built to accompany new developments. Sewer lines will follow natural drainage patterns, where possible, to take advantage of gravity flow. Figure 3.1 shows the drainage basins in the study area. Table 3.5 indicates the projected population and land use in each drainage basin for the Year 2020 and ultimate build-out conditions.



ISSUED FOR		
REVIEW		
APPROVAL		
CONSTRUCTION		

THIS DRAWING IS AN INSTRUMENT OF SERVICE OWNED BY CONSOLIDATED TECHNOLOGIES, INC. (CTI), WHICH SHALL BE DEEMED THE AUTHOR AND WHICH SHALL RETAIN ALL SANCTUARY AND COMMON LAW RIGHTS, INCLUDING COPYRIGHTS. THIS DRAWING SHALL NOT BE SCANNED, COPIED, OR DISTRIBUTED TO OTHERS IN ANY FORMOR USED FOR ANY OTHER PURPOSE OR PROJECT WITHOUT PRIOR WRITTEN CONSENT OF CTI. CTI IS NOT RESPONSIBLE FOR CONSEQUENCES RELATED TO UNAUTHORIZED USE OR REUSE OF THIS DRAWING OR PORTIONS THEREOF.

REVISIONS			
1			
2			
3			
REVISION	BY	DATE	DESCRIPTION OF REVISION

CONSOLIDATED TECHNOLOGIES, INC.
ENGINEERS OF WATER AND RADIO STUDIES
NASHVILLE, TENNESSEE

DRAWN	T.A.	04/03
REVIEW	A.M.K.	04/03
DESIGN	T.A.	04/03
APPROV	J.D.H.	04/03

CITY OF PIPERTON, TENNESSEE

DRAINAGE BASINS

CTI PROJECT: 00122

DRAWING NUMBER: 3.1

TABLE 3.5

CITY OF PIPERTON

Customers

Drainage Basin No.	Year 2020			Ultimate Build-Out		
	Residential Dwellings	Commercial Acres	Industrial Acres	Residential Dwellings	Commercial Acres	Industrial Acres
North Region						
1	420	20	0	320	120	0
2	190	0	0	190	0	0
3	1,110	55	0	1,570	55	0
4	165	0	0	165	0	0
5	650	0	0	1,525	0	0
6	830	60	0	1,245	160	0
7	668	15	0	1,718	65	0
TOTAL	4,033	150	0	6,733	400	0
South Region						
8	360	335	122	360	335	122
9	700	20	0	700	20	0
10	160	0	0	824	25	0
11	200	0	0	406	0	0
12	820	45	0	820	45	0
13	2,060	30	0	2,330	55	0
14	0	20	578	0	20	578
TOTAL	4,300	450	700	5,440	500	2,000*

*Includes 1,300 acres in Northeast Mississippi Industrial Park.

CHAPTER 4

Existing Facilities

WATER FACILITIES

As mentioned in Chapter 2, there are no public water facilities north of the Wolf River, and no existing transmission mains cross the river. The following discussion of municipal water facilities is divided into two separate regions, north and south of the river.

South Side

For the distribution network south of the river, the City of Piperton acquires its potable water from the City of Collierville. The existing network consists of three metering stations, 16,000 LF of 12-inch and 75,000 LF of 6-inch PVC pipe, 70 fire hydrants, and 54 isolation valves, These water lines supply approximately 300 metered customers located within the city limits.

The master meters are located on:

1. A 6-inch line on State Route 57.
2. A 12-inch line on Keough Road.
3. A 6-inch line on U.S. Route 72.

Fire hydrant tests exhibited a static pressure of 80 psi with 56 psi residual on State Route 57, 84 psi static and 60 residual on Keough Road, and 52 psi static and 18 residual on U.S. Route 72. All flows reported were for a 500-gpm fire flow test.

North Side

On the north side of Wolf River, there are no existing public water lines in the urban growth boundary. The residents rely exclusively on individual wells for their water supply.

Memphis Light, Gas, and Water (MLGW) Division water lines are located just west of the service area -- a 6-inch line on Macon Road and an 8-inch water line on Raleigh-LaGrange Road. Both lines end at the Shelby/Fayette county line on the west side of the urban growth boundary. MLGW

and the City of Piperton have an agreement that would allow Piperton to purchase water through master meters at those locations if facilities were available. Fire hydrant tests near the county line on the 6-inch transmission main exhibited a static pressure of 68 psi and a fire flow of 600 gpm at 20 psi. The 8-inch water line has a similar static pressure and a fire flow of 1,200 gpm at 20 psi. At the current flow rates and pressures, the Memphis system has the potential to supply small residential communities with potable water but does not offer adequate fire protection for large communities.

One of the water treatment plants owned by MLGW is located approximately 5 miles west of the county line. Currently, the transmission mains consist of 6-, 8-, 10- and 12-inch lines. Because of rapid growth in the region, MLGW expects its existing system to be inadequate to serve current and future customers. Anticipating the extension of service to the Piperton area, the Master Plan prepared for MLGW proposes a new 24-inch water line. This line will originate at the water treatment plant, parallel Monterey Road, and end approximately 1,500 feet from the county line. Sections of this new pipeline have already been constructed but have not been placed in service.

WASTEWATER FACILITIES

There are no existing municipal wastewater facilities in the urban growth boundary. All residents rely exclusively on individual septic systems.

CHAPTER 5

Required Water Facilities

In developing alternative scenarios to provide potable water to residents of Piperton, the guidelines below were followed:

- The water system design must be in accordance with the TDEC Division of Water Supply, which requires the provision of 24 hours of water storage.
- All water lines will be designed for fire flow conditions (minimum of 20-psi residual at 1,500-gpm fire flow condition).
- Multiple storage tanks are preferred so that construction and costs of these tanks can be phased.
- The selected alternative must be capable of providing adequate volumes and pressures to residents throughout the urban growth boundary.

DESCRIPTION OF ALTERNATIVES

Three alternatives have been developed for providing water service to the City of Piperton through the year 2020 and for ultimate build-out. As mentioned earlier, the service area is basically bisected by the Wolf River, and there are presently no public water facilities north of the river. Therefore, the discussion of each alternative is divided into two sections: north of the Wolf River and south of the Wolf River. The alternatives include:

1	Purchase Water from One Wholesaler	Collierville would supply both the north and the south regions.
2	Purchase Water from Two Wholesalers	Memphis Light, Gas, and Water (MLGW) would supply the north; Collierville would continue to supply the south.
3	Construct and Operate Two Water Treatment Systems	Piperton would develop its own water system, with one treatment plant in the south and one in the north.

The following sections describe each alternative in detail based on Year 2020 conditions. The ultimate build-out conditions would be similar, except for some larger lines and additional storage tanks. Appendix B includes the ultimate build-out information.

Alternative 1 - Purchase Water from Collierville for Both the North and South Regions

With Alternative 1, water for both the north and south regions would be purchased from Collierville through the three existing metering locations. These meters as well as the entire existing distribution network south of the river would undergo a major upgrade to sustain the projected 7-mgd peak daily demand for the total system (4.4 mgd for the south, 2.6 for the north).

In order to reach the northern region, a single main on State Route 196 would be required to cross the Wolf River. A booster station would be required in the northern region to maintain the proper hydraulic grade. Storage tanks in both the north and south would support a 24-hour average demand.

Alternative 2 - Purchase Water from Two Wholesalers (Collierville for South, MLGW for North)

For the south region, water would continue to be purchased from Collierville. The existing distribution system would be upgraded and expanded to handle the projected peak demand of 4.4 mgd in this region and to include storage tanks for fire protection and peak flow conditions.

The north region would be served by MLGW through new master meters on Macon, Raleigh-LaGrange, and Monterey Roads. A new distribution network would be constructed, with storage tanks for fire protection and peak flow conditions (peak demand of 2.6 mgd). Unlike Alternative 1, this option would not require a river crossing or a booster station to serve the north region.

Alternative 3 - Construct and Operate Two Water Treatment Systems

A third alternative would be for Piperton to cease the wholesale purchase of water and to construct and operate its own water system. This study examined the construction of one treatment plant north of the river and one to the south. New production wells with a total production capability of 7.0 mgd would be required to accommodate the year 2020 peak daily demand. The ground water would be treated as required, filtered, disinfected with chlorine, and discharged into a clearwell for storage and CT requirements. High service pumps would dispense the treated water into the distribution system.

HYDRAULIC MODELING

In order to ensure that adequate flows and pressures would be available to all customers, a computer model was used to simulate conditions under all three alternatives. The computer analysis used “WaterCAD for Windows, Version 3.0," by Haestad Methods, Inc. The basis of the program is a direct solution of the basic pipe system hydraulic equations utilizing the Hazen Williams equation to compute water line hydraulic losses. Input data includes:

1. Length, diameter, and material type of the pipe to be included in the analysis.
2. Elevations at pipe intersections and nodes (obtained from the USGS maps).
3. Storage tank information, including location, dimensions, and elevations (as determined by USGS maps and trial and error.)
4. Water demand information and location. (This was installed in the program by inserting the average daily demand at node locations closest to the projected demand. A global edit function was used in the model to incorporate the peak daily demand of 2.0 times the average demand.)
5. Fire flow demands of 500 gpm.

The hydraulic grade for both the south and north regions was set at 550 feet mean sea level (msl), which is approximately the grade of both the Collierville distribution system and the MLGW distribution system. Storage tanks (two in the north and two in the south) were placed in areas of adequate elevation to allow storage for peak demands and fire flow conditions. Both tanks in the southern region were one-million-gallon elevated storage tanks, while the northern region used a 500,000-gallon tank and a 750,000-gallon elevated storage tank.

The WaterCAD Model produces output data for every pump, pipe, storage tank, and system node. Specific data examined for the model included node pressure, pipe pressure losses, pipe flow rates, and storage tank response. (See Appendix B for pipe network and data files.)

The distribution system was analyzed for fire flow conditions (1,500-gpm demand and 20-psi residual) throughout the urban growth boundary. Fire flow conditions, rather than residential usage, govern the required size of transmission mains throughout the distribution system.

To allow adequate fire flow pressures and flow rates at all points (including dead ends), the model indicates that a minimum pipe size of 12 inches is required for the main pipe network. Individual

subdivisions may be able to use 8- or 10-inch lines within their confines; however, the main piping network must be adequately sized for all flows.

ESTIMATED COSTS

Construction costs for the water treatment, pumping, and transmission facilities are based on actual construction costs for similar components on other projects. The basic costs for each component have been adjusted to reflect anticipated construction conditions in the Piperton area. All construction costs are presented as current (Year 2001) costs.

To arrive at total project costs for the alternative analysis, a variety of incidental costs must be added to the estimated construction costs. For preliminary purposes, these costs were estimated as a percentage of construction costs. Construction cost estimates are considered to be at the conceptual stage; therefore an allowance of 15 percent for construction contingencies is included. Other project costs such as engineering, legal, administrative, etc., are included at 15 percent of the total construction costs for this report.

Property costs for storage tanks or treatment plants are assumed to be $5,000 per acre. Easement costs for distribution lines are assumed to be $1.50 per linear foot of water line on private easements and $2,000 per acre for well sites or wellhead protection areas.

Operation and maintenance (O&M) costs are based on data from comparable systems and engineering judgment. No attempt is made to determine detailed costs of personnel, utilities, chemicals, etc. Instead, “order of magnitude” estimates of O&M costs are utilized for the alternative analysis.

To compare costs on an annualized basis, it is assumed that the cost of capital includes an interest rate of 7 percent for an amortization period of 20 years.

Tables 5.1, 5.2, and 5.3 contain the capital costs and O&M costs for Alternatives 1, 2, and 3 respectively. Appendix C contains similar cost tables for the ultimate build-out conditions (5.1u, 5.2u, and 5.3u).

TABLE 5.1 CITY OF PIPERTON				
Alternative 1 - Collierville Supplies North and South				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
500,000-gallon Elevated Storage Tank	EA	1	$525,000	$ 525,000
750,000-gallon Elevated Storage Tank	EA	1	750,000	750,000
12-inch Ductile Iron Pipe	LF	102,400	27	2,764,800
Subtotal				$ 4,039,800
Wolf River Crossing				
16-inch Ductile Iron Pipe	LF	17,800	$ 38	$ 676,000
12-inch Ductile Iron Pipe Replacing Existing 6-inch PVC	LF	13,800	27	373,000
River Crossing - Directional Drill	LF	500	200	100,000
Booster Station (2.5 mgd), Building, and Controls	EA	1	200,000	200,000
Subtotal				$ 1,349,000
Southern Region				
1,000,000-gallon Elevated Storage Tank	EA	2	$1,000,000	$ 2,000,000
12-inch Ductile Iron Pipe	LF	66,500	27	1,795,500
12-inch Ductile Iron Replacing Existing 6-inch PVC	LF	21,200	27	572,400
Subtotal				$ 4,367,900
Estimated Construction Cost				$ 9,756,700
Construction Contingencies				1,463,500
Engineering, Legal, Administrative, Etc.				1,463,500
Land and Easements				49,700
Total Project Cost				$ 12,733,400
Annual Operation & Maintenance Costs				
Purchased Water				$ 1,277,500
Distribution System Maintenance				1,277,500
Depreciation				133,300
Total O&M Cost				$ 2,688,300

TABLE 5.2 CITY OF PIPERTON				
Alternative 2 - Collierville Supplies South, MLGW Supplies North				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
500,000-gallon Elevated Storage Tank	EA	1	$525,000	$ 525,000
750,000-gallon Elevated Storage Tank	EA	1	750,000	750,000
12-inch Ductile Iron Pipe	LF	102,400	27	2,764,800
Subtotal				$ 4,039,800
Southern Region				
1,000,000-gallon Elevated Storage Tank	EA	2	$1,000,000	$ 2,000,000
12-inch Ductile Iron Pipe	LF	66,500	27	1,795,500
12-inch Ductile Iron Pipe Replacing Existing 6-inch PVC	LF	21,200	27	572,400
12-inch Ductile Iron Pipe Replacing Existing 6-inch PVC	LF	13,800	27	372,600
Subtotal				$ 4,740,500
Estimated Construction Cost				$ 8,780,300
Construction Contingencies				1,317,000
Engineering, Legal, Administrative, Etc.				1,317,000
Land and Easements				44,500
Total Project Cost				$ 11,458,800
Annual Operation & Maintenance Costs				
Purchased Water				$ 1,277,500
Distribution System Maintenance				1,277,500
Depreciation				120,500
Total O&M Cost				$ 2,675,500

TABLE 5.3 CITY OF PIPERTON				
Alternative 3 - Piperton Produces Water Using Two Treatment Systems				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Alternative 2 Tank and Transmission Main Costs				
Total Alternative 2 Distribution System (from Table 5.2)				$ 8,780,300
Additional Items - Northern Region				
High Service Wells and Raw Water Line (1.0 mgd)	EA	2	$ 350,000	$ 700,000
Treatment System (2 mgd)	EA	1	3,000,000	3,000,000
CT Tank (400,000 gallon)	EA	1	250,000	250,000
12-inch Ductile Iron Pipe	LF	1,000	27	27,000
Subtotal				$ 3,977,000
Additional Items - Southern Region				
High Service Wells and Raw Water Line (1.0 mgd)	EA	4	$ 350,000	$ 1,400,000
Treatment System (3.5 mgd)	EA	1	5,250,000	5,250,000
CT Tank (750,000 gallon)	EA	1	400,000	400,000
12-inch Ductile Iron Pipe Replacing Existing 6-inch PVC	LF	10,500	27	283,500
12-inch Ductile Iron Pipe	LF	1,000	27	27,000
Subtotal				$ 7,360,500
Additional Items Total				$ 11,337,500
Estimated Construction Cost				$ 20,117,800
Construction Contingencies				3,017,700
Engineering, Legal, Administrative, Etc.				3,017,700
Land and Easements				165,700
Total Project Cost				$ 26,318,900
Annual Operation & Maintenance Costs				
Water Production				638,800
Distribution System Maintenance				1,277,500
Depreciation				395,700
Total O & M Cost				$ 2,312,000

COMPARISON OF ALTERNATIVES

Table 5.4 compares the estimated costs of the three identified alternatives for future water facilities in Piperton on an annual basis.

TABLE 5.4 CITY OF PIPERTON Comparison of Water Alternatives				
	Capital Cost	**O&M Cost**	**Debt Service***	**Total Annual Cost**
Alternative 1	$12,733,400	$2,688,300	$1,196,900	$3,885,200
Alternative 2	$11,458,800	$2,675,500	$1,077,100	$3,752,600
Alternative 3	$26,318,900	$2,312,000	$2,474,000	$4,786,000
*Based on interest rate of 7 percent for 20 years.				

Alternative 2, purchasing water from two wholesalers, has the lowest capital cost, lowest O&M cost, and the lowest total annual cost of the three alternatives. Alternative 1 is slightly more expensive, due primarily to the capital and operating costs for the required Wolf River crossing and booster pumping station.

Alternative 3 would involve the City of Piperton producing its own water, while Alternatives 1 and 2 involve purchasing water from Collierville and/or MLGW. At the present time, the cost to purchase water is $1.00 per 1,000 gallons. The estimated cost to produce water (excluding any capital costs for supply or treatment facilities) is $0.50 per 1,000 gallons. In order for Alternative 3 to be less expensive than Alternative 1 or 2, the incremental capital cost difference for constructing wells, water treatment plant(s), and CT tanks must be less than $0.50 per 1,000 gallons on an amortized debt basis. Based on the cost estimates presented herein and the average daily consumption of 3.5 mgd in the Year 2020, the amortized debt cost for the treatment portions of Alternative 3 equals $1.00 per 1,000 gallons. This means that the total annual cost of Alternative 3 is significantly higher than that of the other two alternatives, thus precluding its selection.

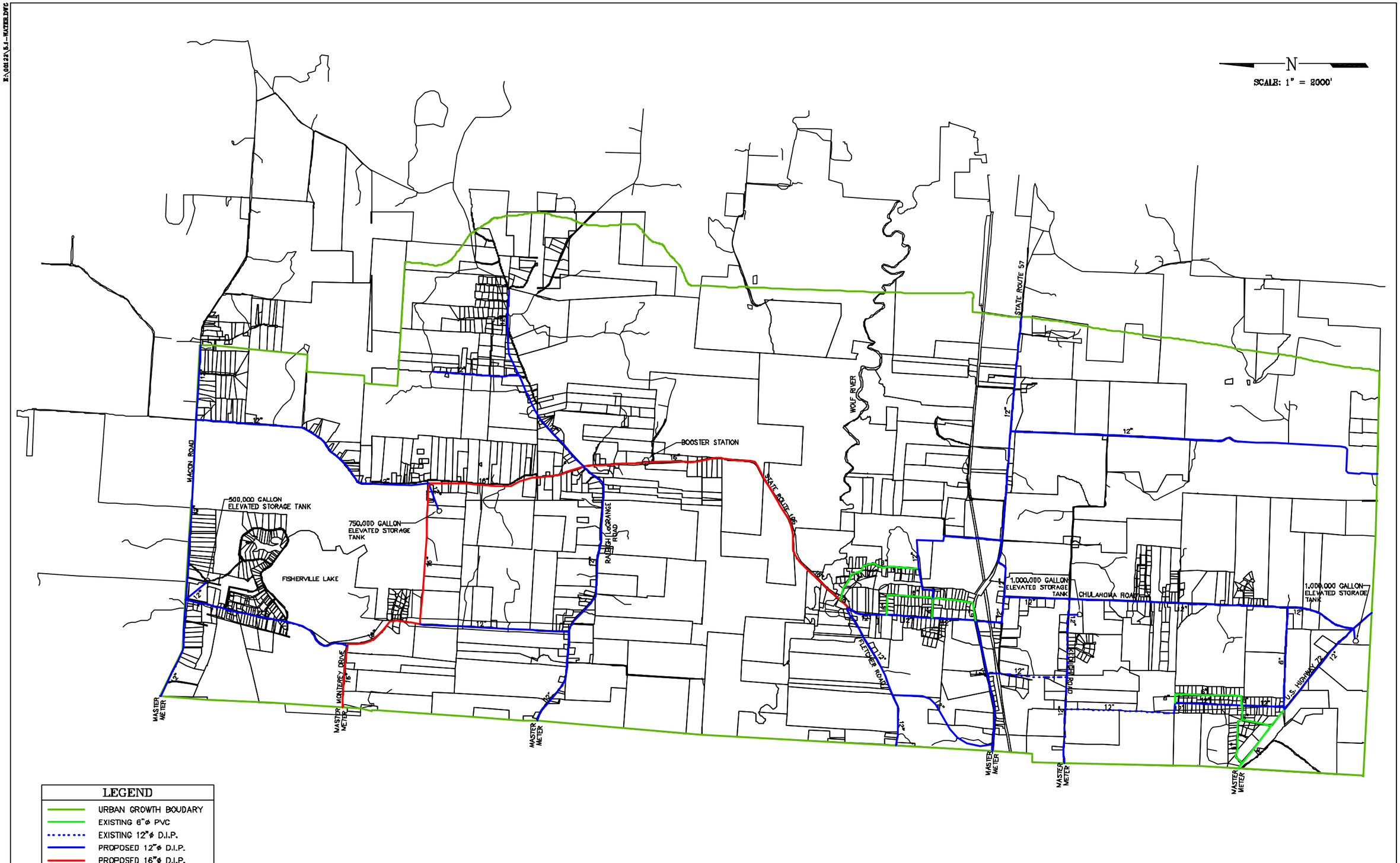
RECOMMENDED PLAN

A combination of features from Alternative 1 and Alternative 2 appears to be the best solution for providing an economical and flexible water supply network for Piperton. The solution would be to connect to both the Collierville and MLGW water systems as shown for Alternative 2 and also to construct the Wolf River crossing and booster pumping station as shown for Alternative 1. Under this variation, the City of Piperton would have the ability to purchase treated water from either or both wholesalers. This would likely improve Piperton's water rate negotiating position while also producing backup flexibility should either the Collierville or MLGW system experience significant problems.

Table 5.5 below presents the costs for this variation. For purposes of this study, it has been labeled the "selected water plan." It is recommended that future implementation of water facilities in the City of Piperton and its urban growth boundary be in accordance with this plan. Figure 5.1 presents the proposed water distribution system and other water facilities required for the selected water plan to serve the Year 2020 population.

TABLE 5.5 CITY OF PIPERTON				
Selected Water Plan				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
500,000-gallon Elevated Storage Tank	EA	1	$525,000	$ 525,000
750,000-gallon Elevated Storage Tank	EA	1	750,000	750,000
12-inch Ductile Iron Pipe	LF	80,700	27	2,178,900
16-inch Ductile Iron Pipe	LF	21,700	38	824,600
Subtotal				$ 4,278,500
Wolf River Crossing				
16-inch Ductile Iron Pipe	LF	17,800	$ 38	$ 676,400
12-inch Ductile Iron Pipe Replacing Existing 6-inch PVC	LF	13,800	27	372,600
River Crossing - Directional Drill	LF	500	200	100,000
Booster Station (4.5 mgd), Building, and Controls	EA	1	360,000	360,000
Subtotal				$ 1,509,000
Southern Region				
1,000,000-gallon Elevated Storage Tank	EA	2	$1,000,000	$ 2,000,000
12-inch Ductile Iron Pipe	LF	66,500	27	1,795,500
12-inch Ductile Iron Replacing Existing 6-inch PVC	LF	21,200	27	572,400
Subtotal				$ 4,367,900
Estimated Construction Cost				10,155,400
Construction Contingencies				1,523,300
Engineering, Legal, Administrative, Etc.				1,523,300
Land and Easements				49,700
Total Project Cost				$ 13,251,700
Annual Operation & Maintenance Costs				
Purchased Water				$ 1,277,500
Distribution System Maintenance				1,277,500
Depreciation				140,800
Total O & M Cost				$ 2,695,800

E:\00122\5.1-WATER.DWG



ISSUED FOR
REVIEW
APPROVAL
CONSTRUCTION

THIS DRAWING IS AN INSTRUMENT OF SERVICE OWNED BY CONSOLIDATED TECHNOLOGIES, INC. (CTI), WHICH SHALL BE DEEMED THE AUTHOR AND WHICH SHALL RETAIN ALL SANCTUARY AND COMMON LAW RIGHTS, INCLUDING COPYRIGHTS. THIS DRAWING SHALL NOT BE SCANNED, COPIED, OR DISTRIBUTED TO OTHERS IN ANY FORM OR USED FOR ANY OTHER PURPOSE OR PROJECT WITHOUT PRIOR WRITTEN CONSENT OF CTI. CTI IS NOT RESPONSIBLE FOR CONSEQUENCES RELATED TO UNAUTHORIZED USE OR REUSE OF THIS DRAWING OR PORTIONS THEREOF.

REVISIONS			
3			
2			
1			
REVISION	BY	DATE	DESCRIPTION OF REVISION

CONSOLIDATED TECHNOLOGIES, INC.
ENGINEERS OF WATER AND SEWER SERVICES
NASHVILLE, TENNESSEE

DRAWN	J.S.	04/03
DESIGN	A.M.T.	04/03
CHECK	J.S.	04/03
APPROV	J.S.B.	04/03

CITY OF PIPERTON, TENNESSEE

PROPOSED WATER DISTRIBUTION SYSTEM

CTI PROJECT: 00122

DRAWING NUMBER: 5.1

CHAPTER 6

Required Sewer Facilities

REQUIRED SEWER FACILITIES

In developing alternative scenarios to provide wastewater collection, transmission, and treatment for residents of Piperton, the guidelines below were followed:

- Sewer system design must be in accordance with the TDEC Division of Water Pollution Control.
- Sewer collection and transmission facilities will be designed for peak flow conditions, including an adequate allowance for infiltration/inflow (I/I).
- Wastewater treatment plants must be designed to meet effluent criteria established by TDEC (assumed to be secondary limits for discharge to Wolf River and tertiary/advanced tertiary for all other receiving streams).
- The selected alternative must be capable of providing adequate transmission and treatment capacity for residents throughout the urban growth boundary.

Since Piperton has no existing sewer facilities, the City is free to explore a wide range of alternatives for wastewater treatment, transmission, and collection. A general overview of the types of options available is given below.

WASTEWATER TREATMENT FACILITIES

Most communities in America have a sewer collection and transmission system delivering wastewater to one or more centralized wastewater treatment plants. Typically these plants are of "conventional" design, using some variation of aerobic process to break down and remove the harmful pollutants. Such a system within the Piperton urban growth boundary would likely consist of one or two central wastewater treatment plants discharging treated effluent to the Wolf River. In fact, the "Preliminary Engineering Report, Wastewater Treatment Facilities for Piperton, Tennessee" (BWSC, 1998), recommended this type of facility for the southern region of Piperton. That report suggested the use of an aerated lagoon type facility, which would be an appropriate process for Piperton until flows exceed a certain level. (Both Rossville and Collierville have aerated

lagoon type facilities, as do many other communities in west Tennessee.) Aerated lagoon facilities are most appropriate for small and/or rural communities. As flows increase, it is likely that effluent limitations will become more stringent. This could necessitate consideration of mechanical treatment processes such as oxidation ditches. For this report, wastewater treatment facilities with an average design flow of more than 2.5 mgd will be considered to require some mechanical treatment processes.

A centralized wastewater treatment system offers the following advantages :

- Low maintenance.
- Centralized operation.
- One (or two) discharge permits.

Disadvantages of such a system include:

- Large wastewater collection system required.
- Large land tract required.
- Possible odor problems.

As an alternative to centralized wastewater treatment facilities of conventional design, localized treatment units involving the construction of small wastewater collection and treatment systems in individual drainage basins or subdivisions are sometimes used. Under this scenario, treatment units could be sized for a few houses or hundreds of residences.

Localized treatment units for Piperton would require either discharge to small surface streams or, more likely, surface or subsurface land application of treated effluent to meet TDEC requirements. Three types of localized treatment systems that might be applicable for Piperton are recirculating sand filter, constructed wetland, or BioClere™. These processes are described in detail in Appendix D and, though somewhat different, each has similar advantages and disadvantages:

Advantages

- Large wastewater collection system not required.
- Low aesthetic impact.
- Minimal operator control required.

Disadvantages

- Higher unit cost than centralized systems.
- Higher periodic maintenance expense.
- Large land requirement for land application.
- Numerous discharge permits required.

The capital costs of two conventional wastewater treatment facilities sized to handle the Year 2020 wastewater flow are presented in Table 6.1, while the costs for three types of localized treatment process are presented in Table 6.2. From a comparison of these tables, it is clear that centralized treatment is more cost-effective than localized processes.

TABLE 6.1

CITY OF PIPERTON

Centralized Treatment Capital Costs

Item Description	Unit	Quantity	Unit Price	Cost
North Treatment Plant (1.3 mgd)	LS	1	$2,450,000	$ 2,450,000
South Treatment Plant (2.2 mgd)	LS	1	3,800,000	3,800,000
Subtotal				$ 6,250,000
Construction Contingencies				937,500
Engineering, Legal, Administrative, Etc.				937,500
Land and Easements				80,000
Total Project Cost				$ 8,205,000

TABLE 6.2

CITY OF PIPERTON

Localized Treatment Costs

Drainage Basin No.	Average Flow (gpd)	Recirculating Sand Filter		Constructed Wetland		BioClere™	
		Cost ($10.00/ gpd)	Land Required (acres)	Cost ($5.50/ gpd)	Land Required (acres)	Cost ($5.00/ gpd)	Land Required (acres)
North Region							
1	136,000	$ 1,360,000	27	$ 748,000	30	$ 680,000	27
2	57,000	570,000	12	314,000	13	285,000	12
3	361,000	3,610,000	72	1,986,000	78	1,805,000	72
4	50,000	500,000	10	275,000	14	250,000	10
5	195,000	1,950,000	39	1,073,000	44	975,000	39
6	279,000	2,790,000	56	1,535,000	61	1,395,000	56
7	208,000	2,080,000	42	1,144,000	46	1,040,000	42
Total		$ 12,860,000	258	$ 7,075,000	286	$ 6,430,000	258
South Region							
8	398,000	$ 5,572,000	80	$ 2,189,000	87	$ 1,990,000	80
9	220,000	3,080,000	44	1,210,000	48	1,100,000	44
10	48,000	672,000	10	264,000	11	240,000	10
11	60,000	840,000	12	330,000	13	300,000	12
12	269,000	3,766,000	54	1,480,000	59	1,345,000	54
13	633,000	8,862,000	127	3,482,000	138	3,165,000	127
14	588,000	8,232,000	118	3,234,000	128	2,940,000	118
Total		$ 31,024,000	445	$ 12,189,000	484	$ 11,080,000	445
Construction Contingencies		6,582,600		2,889,600		2,626,500	
Engineering, Legal, Administration, Etc.		6,582,600		2,889,600		2,626,500	
Land and Easements		3,505,000		3,850,000		3,505,000	
Total Project Cost		$ 60,554,200		$ 28,893,200		$ 26,268,000	

WASTEWATER TRANSMISSION FACILITIES

Wastewater transmission facilities usually consist of gravity interceptor sewers (10 inches in diameter and larger) and wastewater pumping stations with force mains to transfer sewage from one drainage basin to the next. Transmission facilities are sized to handle peak wastewater flows, including an allowance for I/I. Peak flow is usually determined by multiplying average daily flow by a peak factor ranging from 4.0 to 2.5. For this study, a peak factor of 2.5 is used.

Ordinarily interceptor sewers follow the natural drainage patterns of an area. When flows from that area can no longer be effectively carried by gravity to the destination point, a pump station with force main is required to transport the collected wastewater into the adjoining drainage basin or to a treatment facility.

The areas north and south of the Wolf River both have seven major identified drainage basins. Thus, a series of interceptor sewers and pump stations with force mains will be required to collect and transport the wastewater downstream to the treatment plant(s). The major questions are the routes, sizes of pipe, and locations and sizes of pump stations and force mains. The next section will discuss wastewater flows in more detail to allow determination of the required wastewater transmission facilities.

WASTEWATER COLLECTION FACILITIES

The most expensive unit process in wastewater collection, transmission, and treatment is the collection system. The topography of the land, along with the location of the treatment facilities, influences the selection of the most cost-effective collectors for each region. The following sections describe different types of systems.

Gravity

The majority of existing sewer systems are gravity sewers, which are the simplest type of collection system; the pipes are installed at a specific grade and carry flows by gravity to a specific destination. Typically, the smallest gravity lines installed in communities are 8 inches in diameter. These can deliver wastewater flows from up to 350 residences. Individual dwellings use gravity service lines (typically 4-inch-diameter pipes) to connect to the gravity sewers.

Pumping stations are used in conjunction with gravity sewers to move the sewage from a low elevation to a higher elevation. Occasionally they are used to pump the sewage to the next

drainage basin, where it will discharge into another gravity sewer. The process is repeated until the sewage reaches the treatment plant.

Advantages

- Low maintenance.
- Simplicity.
- Lower life-cycle costs.

Disadvantages

- I/I problems in older or improperly installed systems, resulting in sewer bypassing and overloading of the treatment plant.
- Higher initial costs.
- Must be installed according to the topography of the environment.

STEP/STEG

STEP (septic tank effluent pump) and STEG (septic tank effluent gravity) systems operate similarly to a septic tank attached to a centralized collection system. In both systems, wastewater from an individual residence goes through a septic tank, from which the effluent is either pumped into a low pressure sewer system (STEP) or transported by gravity (STEG) to the centralized transmission facilities.

Advantages

- Reduction of the organic loading on the treatment facility.
- Elimination of sediment and other possible sewer clogging items.
- Reduction of I/I problems.

Disadvantages

- Higher cost to the homeowner.
- Space needed to install an underground tank.
- Higher maintenance (periodic cleaning of each septic tank).

Grinder Pumps/Low Pressure Sewer

With a grinder pump and low pressure sewers, each individual homeowner installs a small underground tank and grinder pump. Sewage flows from the home to the tank and is pumped by a grinder pump into a low pressure sewage line. The local system of low pressure sewer lines eventually connects to centralized wastewater transmission facilities.

Advantages

- Pipes following topography.
- Reduced pipe sizes (as small as 1-1/4 inches in diameter).
- Minimal I/I problems.

Disadvantages

- Requires every homeowner to have a grinder pump station near their dwelling.
- Higher maintenance.

Combination

A combination would involve installing a grinder pump/low pressure sewer system in regions with difficult topography. The effluent of that system would discharge into a gravity sewer system installed in less difficult topography. The combination system allows the designer to use the best available collection system for specific regions.

The design of different wastewater collection system alternatives uses different design flows as indicated in Table 6.3. This is due to the reduced I/I expected in non-conventional systems because of smaller pipe sizes or pressurized systems. Ultimately, lower flows can mean smaller wastewater treatment and/or transmission facilities. For example, Table 6.4 indicates the estimated project cost for wastewater treatment using conventional gravity collection systems as compared with one using low pressure collection systems. Tables 6.5 and 6.6 present the costs for interceptor sewers and pump stations for gravity collection systems and for low pressure collection systems, respectively.

TABLE 6.3

CITY OF PIPERTON

Design Flow Comparison

Collection Type	Flow (Average Plus I/I) (gpd)	Total Flow per Capita (gpd)	Total Average Residential Flow (Year 2020)	Peak Residential Flow (Year 2020) 2.5 Peak
Gravity	60 + 40	100	2,500,000	6,250,000
STEG	60 + 20	80	2,000,000	5,000,000
Grinder Pump	60 + 10	70	1,750,000	4,375,000
STEP	60 + 10	70	1,750,000	4,375,000

TABLE 6.4

CITY OF PIPERTON

Comparison of Estimated Costs for Treatment Gravity vs Low Pressure Sewers

Item Description	Unit	Quantity	Unit Price	Cost
Gravity Sewers				
North Treatment Plant (1.3 mgd)	LS	1	$2,450,000	$ 2,450,000
South Treatment Plant (2.2 mgd)	LS	1	3,800,000	3,800,000
Subtotal				$ 6,250,000
Construction Contingencies				937,500
Engineering, Legal, Administrative, Etc.				937,500
Land and Easements				80,000
Total Project Cost				$ 8,205,000
Low Pressure Sewers				
North Treatment Plant (1.0 mgd)	LS	1	$2,000,000	$ 2,000,000
South Treatment Plant (1.6 mgd)	LS	1	2,900,000	2,900,000
Subtotal				$ 4,900,000
Construction Contingencies				735,000
Engineering, Legal, Administrative, Etc.				735,000
Land and Easements				65,000
Total Project Cost				$ 6,435,000

TABLE 6.5 CITY OF PIPERTON				
Costs for Interceptor Sewers and Lift Stations Gravity Sewers				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
10-inch PVC	LF	34,400	$ 32	$ 1,100,800
12-inch PVC	LF	25,000	35	875,000
15-inch PVC	LF	6,000	40	240,000
18-inch PVC	LF	9,800	49	480,200
21-inch PVC	LF	2,300	61	140,300
Pump Stations (4)	LS	1	365,000	365,000
6-inch DIP Force Main	LF	13,800	19	262,200
8-inch DIP Force Main	LF	6,800	22	149,600
10-inch DIP Force Main	LF	12,500	24	300,000
Subtotal				$ 3,913,100
Southern Region				
10-inch PVC	LF	35,700	$ 32	$ 1,142,400
12-inch PVC	LF	14,900	35	521,500
15-inch PVC	LF	15,200	40	608,000
18-inch PVC	LF	7,200	49	352,800
21-inch PVC	LF	5,500	61	335,500
Pump Stations (5)	LS	1	428,000	428,000
4-inch DIP Force Main	LF	8,000	15	120,000
6-inch DIP Force Main	LF	7,100	19	134,900
10-inch DIP Force Main	LF	14,700	24	352,800
Subtotal				$ 3,995,900
Total Construction Cost				$ 7,909,000
Construction Contingencies				1,186,500
Engineering, Legal, Administrative, Etc.				1,186,500
Land and Easements				318,000
Total Project Cost				$ 10,600,000

TABLE 6.6

CITY OF PIPERTON

Costs for Interceptor Sewers and Lift Stations
Low Pressure Sewers

Item Description	Unit	Quantity	Unit Price	Cost
Northern Region				
8-inch PVC	LF	23,700	$ 29	$ 687,300
10-inch PVC	LF	35,700	32	1,142,400
12-inch PVC	LF	6,000	35	210,000
15-inch PVC	LF	12,100	40	484,000
Pump Stations (4)	LS	1	255,000	255,000
4-inch DIP Force Main	LF	13,800	15	207,000
6-inch DIP Force Main	LF	6,800	19	129,200
10-inch DIP Force Main	LF	12,500	24	300,000
Subtotal				$ 3,414,900
Southern Region				
8-inch PVC	LF	35,700	$ 29	$ 1,035,300
10-inch PVC	LF	14,900	32	476,800
12-inch PVC	LF	15,200	35	532,000
15-inch PVC	LF	12,700	40	508,000
Pump Stations (5)	LS	1	300,000	300,000
4-inch DIP Force Main	LF	8,000	15	120,000
6-inch DIP Force Main	LF	7,100	19	134,900
8-inch DIP Force Main	LF	5,000	22	110,000
10-inch DIP Force Main	LF	9,700	24	232,800
Subtotal				$ 3,449,800
Total Construction Cost				$ 6,864,700
Construction Contingencies				1,029,600
Engineering, Legal, Administrative, Etc.				1,029,600
Land and Easements				318,000
Total Project Cost				$ 9,241,900

Table 6.7 presents collection system costs per dwelling unit for conventional gravity sewers, STEG systems, STEP systems, and grinder pump systems. These costs were developed with the assumption that the base density was one dwelling unit per acre.

The comparison indicates that despite the higher capital costs for a conventional gravity collection system, its significantly lower O&M costs make it the lowest cost alternative on an annual cost basis.

TABLE 6.7

CITY OF PIPERTON

Comparison of Collection System Costs Per Dwelling Unit

Quantity	Description	Costs
	Conventional Gravity Sewers	
200 LF	8-inch PVC Gravity Sewer @ $28/LF	$ 5,600
200 LF	4-inch PVC Service Line @ $15/LF	3,000
100%	Manhole Costs @ $1,500/EA	1,500
200 LF	Asphalt Paving @ $10/LF	2,000
10%	Miscellaneous and Property Restoration	1,210
	Total per Two Dwellings	$ 13,310
	TOTAL per Dwelling	$ 6,655
	Septic Tank Effluent Gravity (STEG) Systems	
200 LF	6-inch PVC Gravity Sewer @ $23/LF	$ 4,600
200 LF	4-inch PVC Service Line @ $15/LF	3,000
2 EA	Watertight Septic Tank @ $2,000/EA	4,000
100%	Cleanouts @ $1,000/EA	1,000
200 LF	Asphalt Paving @ $10/LF	2,000
10%	Miscellaneous and Property Restoration	1,460
	Total per Two Dwellings	$ 16,060
	TOTAL per Dwelling	$ 8,030

TABLE 6.7 (Continued)

CITY OF PIPERTON

Comparison of Collection System Costs

Quantity	Description	Costs
	Grinder Pump (GP) Systems	
200 LF	2-inch PVC Low Pressure Sewer @ $7/LF	$ 1,400
180 LF	1-1/4-inch PVC Service Line @ $5/LF	900
20 LF	4-inch PVC Service Line @ $15/LF	300
2 EA	Electrical Connection @ $1,000/EA	2,000
2 EA	Grinder Pump @ $4,500/EA	9,000
50%	Cleanouts, Line Valves, Air Valves @ $1,500	750
30 LF	Asphalt Paving @ $10/LF	300
10%	Miscellaneous and Property Restoration	1,465
	Total per Two Dwellings	$ 16,115
	TOTAL per Dwelling	$ 8,058
	Septic Tank Effluent Pump (STEP) Systems	
200 LF	2-inch PVC Low Pressure Sewer @ $7/LF	$ 1,400
180 LF	1-1/4-inch PVC Service Line @ $5/LF	900
20 LF	4-inch PVC Service Line @ $15/LF	300
2 EA	Electrical Connection @ $1,000/EA	2,000
2 EA	Septic Tank Effluent Pump @ $4,250/EA	8,500
2 EA	Watertight Septic Tank @ $2,000/EA	4,000
50%	Cleanouts, Line Valves, Air Valves @ $1,500	750
30 LF	Asphalt Paving @ $10/LF	300
10%	Miscellaneous and Property Restoration	1,815
	Total per Two Dwellings	$ 19,965
	TOTAL per Dwelling	$ 9,983

Assumptions:
- Houses can be connected to sewers from both sides of the street.
- 200 feet between houses.
- 100 feet from road to house.

Comparison Summary					
Collection System Type	Collection		Treatment & Transmission[1]		Annual Cost
	Capital Cost	O&M Cost	Capital Cost	O&M Cost	
Gravity Sewers (GS)[2]	$ 8,319	$0	$2,257	$219	$1,213
Septic Tank Effluent[2] Gravity (STEG)	$10,038	$60	$2,006	$175	$1,367
Grinder Pumps (GP)	$ 8,057	$146	$1,881	$153	$1,233
Septic Tank Effluent Pump (STEP)	$ 9,985	$176	$1,881	$153	$1,444

[1]Costs for GS calculated with average daily flow (adf) of 100 gpd/capita; for STEG with adf of 80 gpd/capita; and for GP or STEP with adf of 70 gpd/capita.
[2]For GS and STEG systems, the probability exists that 50 percent of the installed lines will only serve one side of a street. This results in a per connection capital cost increase of 25 percent.

DESCRIPTION OF ALTERNATIVES

The evaluation presented in the previous sections indicates that a proposed sewer system for Piperton should consist of conventional centralized wastewater treatment plant(s), conventional interceptor sewers and pump stations/force mains for wastewater transmission, and conventional gravity sewers for wastewater collection. Because the urban growth boundary is divided by the significant floodplain of the Wolf River, the alternatives for sewer service basically involve the construction of either one or two wastewater treatment plants:

Alternative		
1	One Treatment Plant in South	All wastewater flows from north and south would be directed to this plant.
2	One Treatment Plant in South and One Plant in North	No connection would be made between the two systems.

Two other alternatives were briefly examined and eliminated from further consideration for a variety of reasons, as follows:

- Transmission of all flows to the City of Memphis interceptor sewer at Grays Creek for eventual treatment at Memphis. This alternative has a significant transmission system cost, and the City of Memphis presently has no interest in serving areas outside Shelby County.

- Transmission of some or all flows to the City of Rossville's existing wastewater treatment plant. This alternative has a significant transmission system cost and an uncertain treatment system cost. Also Rossville's plant has insufficient capacity for the entire Piperton flow.

The following sections describe the two main alternatives in detail based on Year 2020 conditions. The ultimate build-out conditions would be similar, except for some larger lines, pumping stations, and treatment facilities. Appendix E includes the ultimate build-out information.

Appendix F contains cost tables that indicate the potential impact of a 1.0-mgd wastewater contribution from the City of Collierville. Due to the uncertainty of a potential contract for Piperton to treat a portion of Collierville's wastewater, the cost information is included, but no recommendation is presented.

Alternative 1 - One Treatment Plant in South

With Alternative 1, wastewater from both the north and south regions would be transmitted to a main wastewater treatment plant at a centralized location. Several locations were reviewed. The site identified in the previous treatment plant study was used.

Facilities required to transmit the wastewater flow from the northern region to a treatment plant in the south would consist of a major pump station and 16-inch force main crossing the Wolf River and its floodplain.

It should be noted that an alternative for one treatment plant in the north was not considered because the south has more existing development and more projected flow for the Year 2020 condition.

The treatment plant capacity for the Year 2020 would be 3.5 mgd (2.2 mgd for the south, 1.3 mgd for the north).

Alternative 2 - Two Treatment Plants (South and North)

This alternative would include a wastewater treatment plant (capacity 2.2 mgd) at the aforementioned location in the south and a second wastewater treatment plant (capacity 1.3 mgd) located off Kirk Road near the Wolf River in the north.

Unlike Alternative 1, this option would not require a force main river crossing or major pump station to serve the northern region.

ESTIMATED COSTS

Construction costs for the wastewater treatment and transmission facilities are based on actual construction costs for similar components on other recent projects. The basic costs for each component have been adjusted to reflect anticipated construction conditions in the Piperton area. All construction costs are presented as current (Year 2001) costs.

To arrive at total project costs for the alternative analysis, a variety of incidental costs must be added to the estimated construction costs. For preliminary purposes, these costs were estimated as a percentage of construction costs. Construction cost estimates are considered to be at the conceptual stage; therefore, an allowance of 15 percent for construction contingencies is included. Other project costs such as engineering, legal, administrative, etc., are included at 15 percent of the total construction costs for this report.

Property costs for pumping stations or treatment plants are assumed to be $5,000 per acre. Easement costs for interceptor sewers or force mains are assumed to be $1.50 per linear foot of sewer line on private easements.

O&M costs are based on data from comparable systems and engineering judgment. No attempt is made to determine detailed costs of personnel, utilities, chemicals, etc. Instead, “order of magnitude” estimates of O&M costs are used for the alternative analysis.

To compare costs on an annualized basis, it is assumed that the cost of capital includes an interest rate of 7 percent for an amortization period of 20 years.

Tables 6.8 and 6.9 contain the capital costs and O&M costs for Alternatives 1 and 2, respectively.

TABLE 6.8 CITY OF PIPERTON				
Alternative 1 - One Treatment Plant in South				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
Interceptor Sewer and Lift Stations (from Table 6.5)				$ 3,913,100
Wolf River Crossing				
Major Pumping Station (3 mgd)	EA	1	$315,000	$ 315,000
16-inch DIP Force Main	LF	17,500	38	665,000
Wolf River Crossing	LF	500	200	100,000
Subtotal				$ 1,080,000
Southern Region				
Interceptor Sewers and Lift Stations (from Table 6.5)				$ 3,995,900
South Treatment Plant (3.5 mgd)	LS	1	7,250,000	7,250,000
Estimated Construction Cost				16,239,000
Construction Contingencies				2,435,900
Engineering, Legal, Administrative, etc.				2,435,900
Land and Easements				394,800
Total Project Cost				$ 21,505,600
Annual O&M Costs				
Wastewater Treatment				$ 1,788,500
Transmission and Collection				766,500
Depreciation				287,800
Total O&M Cost				$ 2,842,800

TABLE 6.9 CITY OF PIPERTON				
Alternative 2 - Two Treatment Plants				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
Interceptor Sewer and Lift Stations (from Table 6.5)				$ 3,913,100
North Treatment Plant (1.3 mgd)	LS	1	2,450,000	2,450,000
Subtotal				$ 6,363,100
Southern Region				
Interceptor Sewers and Lift Stations (from Table 6.5)				$ 3,995,900
South Treatment Plant (2.2 mgd)	LS	1	3,800,000	3,800,000
Subtotal				$ 7,795,900
Estimated Construction Cost				14,159,000
Construction Contingencies				2,123,900
Engineering, Legal, Administrative, Etc.				2,123,900
Land and Easements				398,000
Total Project Cost				$ 18,804,800
Annual O&M Costs				
Wastewater Treatment				$ 1,788,500
Transmission and Collection				766,500
Depreciation				247,300
Total O&M Cost				$ 2,802,300

COMPARISON OF ALTERNATIVES

Table 6.10 compares the estimated costs of the two identified alternatives for future sewer facilities in Piperton on an annual basis.

TABLE 6.10				
CITY OF PIPERTON				
Comparison of Sewer Alternatives				
Alternative	Capital Cost	O&M Cost	Debt Service*	Total Annual Costs
1	$21,505,600	$2,842,800	$2,021,500	$4,864,300
2	$18,804,800	$2,802,300	$1,767,700	$4,570,000
*Based on interest rate of 7 percent for 20 years.				

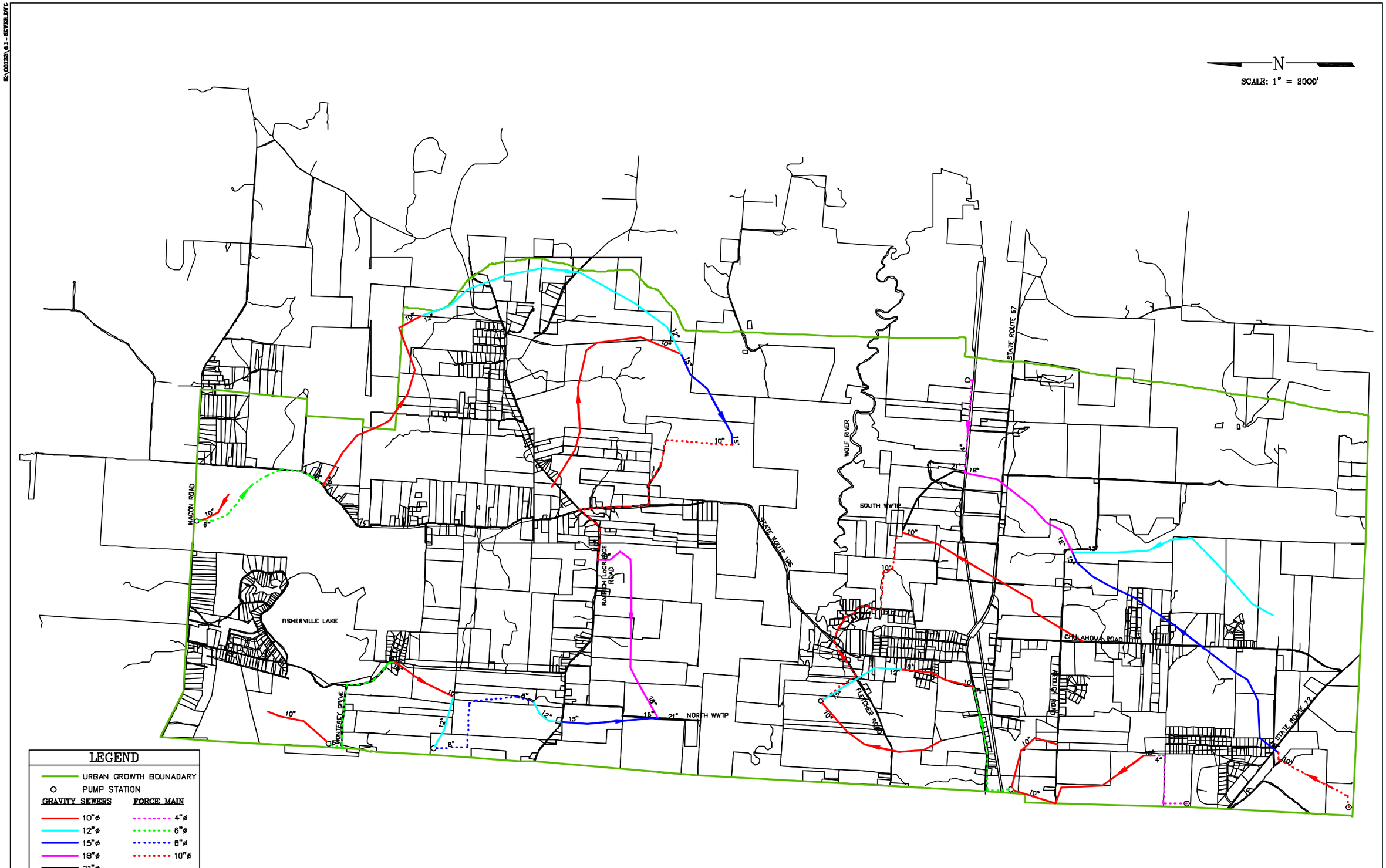
RECOMMENDED PLAN

Alternative 2, two treatment plants (one in north and one in south) has the lowest capital cost, lowest O&M cost, and the lowest total annual cost. Alternative 1 is more expensive than Alternative 2, primarily due to the capital costs for a mechanical treatment plant, a major pumping station, and the force main across the Wolf River.

Alternative 2 also probably has slightly more flexibility than Alternative 1 from a phasing standpoint. Because the southern region of Piperton has an existing population base within the city limits, it may be possible to construct a treatment plant in the south before building a facility in the north.

In consideration of these factors, Alternative 2, two treatment plants, is recommended as the selected sewer plan. It is recommended that future implementation of sewer facilities in the City of Piperton and its urban growth boundary be in accordance with this plan. Figure 6.1 presents the proposed sewer transmission system to serve the Year 2020 population.

E:\00122\01-SEWER.DWG



ISSUED FOR		
REVIEW		
APPROVAL		
CONSTRUCTION		

THIS DRAWING IS AN INSTRUMENT OF SERVICE OWNED BY CONSOLIDATED TECHNOLOGIES, INC. (CTI), WHICH SHALL BE DEEMED THE AUTHOR AND WHICH SHALL RETAIN ALL SANCTUARY AND COMMON LAW RIGHTS, INCLUDING COPYRIGHTS. THIS DRAWING SHALL NOT BE SCANNED, COPIED, OR DISTRIBUTED TO OTHERS IN ANY FORM OR USED FOR ANY OTHER PURPOSE OR PROJECT WITHOUT PRIOR WRITTEN CONSENT OF CTI. CTI IS NOT RESPONSIBLE FOR CONSEQUENCES RELATED TO UNAUTHORIZED USE OR REUSE OF THIS DRAWING OR PORTIONS THEREOF.

REVISIONS	BY	DATE	DESCRIPTION OF REVISION
1			
2			
3			

CONSOLIDATED TECHNOLOGIES, INC.
ENGINEERING OF WATER AND WASTE SERVICES
NASHVILLE, TENNESSEE

DRAWN	J.B.	04/03
DESIGN	A.M.T.	04/03
CHECK	J.B.	04/03
APPR	J.D.B.	04/03

CITY OF PIPERTON, TENNESSEE

PROPOSED SEWER TRANSMISSION SYSTEM

JOB NUMBER: 00122

DRAWING NUMBER: S.1

CHAPTER 7

Financial Considerations

FINANCIAL CONSIDERATIONS

The major cost components of municipal water and sewer systems are the capital costs incurred in constructing the public infrastructure and the O&M costs incurred on a daily basis. Capital costs are generally amortized over a period of years as they are paid for through a number of options, including tap fees, municipal bonds, grants, and/or governmental loans.

The municipal water and sewer system is usually operated as an "Enterprise Fund." Enterprise Funds are used for operations that are financed and operated in a manner similar to private business enterprises, where the intent of the governing body is that the costs (expenses, including depreciation) of providing goods and services to the general public on a continuing basis be financed or recovered primarily through user charges. In Piperton's case, this means that the operation of the water and sewer system would not rely on General Fund (property and sales tax) revenues. Instead, the operation would be financed by the actual users of the system through tap fees and user charges. In general, capital costs would be considered to be paid with funds (revenue) generated by tap fees. O&M costs (including depreciation) would be considered to be paid with revenue generated by user charges (water and sewer rates).

For accounting purposes, the Water and Sewer Enterprise Fund would include a balance sheet, which presents all assets and liabilities (whether current or noncurrent) associated with the water and sewer activities. The Enterprise Fund equity (net total assets) would be segregated into contributed capital and retained earnings components.

The Water and Sewer Enterprise Fund would also include a statement of revenues and expenses on an accrual basis of accounting, in which revenues are recognized when earned and expenses are recognized when incurred. Depreciation of capital assets is included as an expense in amounts sufficient to relate the cost of the depreciable assets to operations over their estimated service lives on a straight-line basis.

PRELIMINARY RATE STRUCTURES AND FEES

Preliminary water and sewer rates and fees have been calculated based on the capital costs and operation and maintenance costs of facilities to serve Piperton in the Year 2020.

Tap Fees

Water and sewer tap fees have two components: the actual cost for making the tap and the portion of the tap fee needed for contribution to capital projects. The assumption is made that the actual cost of making a water or sewer tap averages $500. Thus, the remaining cost portion of each tap fee is available for contribution to capital projects. The tap fees for water and sewer are calculated to cover the additional requirements for contributed capital on an equitable basis related to the average daily flow of residential, commercial, or industrial categories.

The preliminary tap fees are shown in Table 7.1.

TABLE 7.1

CITY OF PIPERTON

Tap Fees [1]		
Category	**Water**	**Sewer**
Residential	$1,700	$2,200
Commercial	$2,400	$3,200
Industrial	$4,300	$5,900

[1]Tap fees are per unit/lot for residential and per acre for commercial/industrial.

User Charge Rates

User charges or water and sewer rates are based on water meter readings on a monthly basis. These charges are used to generate sufficient revenues to offset the annual O&M expenses (including depreciation) of the water and sewer system. A minimum monthly bill for each service (water and sewer) is established for zero to 3,000 gallons per month. This bill represents administrative and meter reading expenses incurred regardless of the consumption of a particular customer.

The preliminary water and sewer rates are shown in Table 7.2.

TABLE 7.2 CITY OF PIPERTON		
Water and Sewer Rates		
Usage	**Water Rate**	**Sewer Rate**
0-3,000 Gallons/Month	$11.50 Minimum Bill	$12.90 Minimum Bill
3,000-10,000 Gallons/Month	$2.00 Per 1,000 Gallons	$1.95 Per 1,000 Gallons
All Above 10,000 Gallons/Month	$1.80 Per 1,000 Gallons	$1.75 Per 1,000 Gallons

Appendix G contains confirming calculations for the preliminary tap fees and rates.

POTENTIAL CAPITAL FUNDING SOURCES

Traditional capital funding sources for municipal water and sewer projects in Tennessee have included municipal bonds, governmental grants and/or loans, or contributed capital from users. By establishing tap fees proportional to the estimated cost of capital facilities, the potential reliance on other sources of capital (bonds, grants, or loans) is minimized. However, it may become necessary to utilize these other alternatives on a short term basis to construct facilities prior to the time when sufficient contributed capital (tap fees) are collected. In addition, if governmental grants and/or low interest loans become available for specific projects or circumstances, it may be in Piperton's best interest to explore some of these programs.

The University of Tennessee Municipal Technical Advisory Service (MTAS) has published a report entitled "Finding Money III," regarding potential loan or grant sources for municipal public works projects in Tennessee. Not all programs would be applicable to the Piperton situation. Table 7.3 presents a brief summary of the applicable loan or grant sources, while Appendix H contains additional specifics on the cited programs.

TABLE 7.3 CITY OF PIPERTON			
Loan or Grant Sources			
Agency	**Program**	**Type**	**Terms**
Financial Institutions	Municipal Bonds	Loans	Local government determines maximum amount of bonds, interest varies, related costs are usually 1 to 3 percent of bond issue, applicants must be ratable
Rural Development	Water and Waste Disposal	Loans and Grants	Interest varies, 40 years
Tennessee Department of Economic and Community Development	Community Development Block Grant	Grants	For water/wastewater up to $500,000, cannot exceed $750,000 for two successive years, assistance limited by community's ability to pay
Tennessee Department of Economic and Community Development	Industrial Infrastructure Program	Loans and Grants	Grants up to $1 million, site preparation grants up to $100,000, grant rates based on ability to pay
Tennessee Department of Environment and Conservation	State Revolving Fund	Loans	Interest from 0 percent to market rate, no maximum or minimum amount, 20 years
Local Development Authority	Loan Program	Loans	Interest varies, 30 years, cost of issuing bond about 2 percent.
TML Municipal Bond Fund	TMBF Alternative Loan Program	Loans	Up to $1 million, 12 years, interest fixed or variable
TML Municipal Bond Fund	TMBF Variable Rate Pooled Loan Program	Loans	Minimum loan of about $1 million, tax-exempt, variable rates
Source: UT Municipal Technical Advisory Service, "Finding Money III," Pages 12 and 13.			

APPENDIX A

City of Piperton Draft Land Use Plan
"Toward an Alternative System of Land Use Controls,"
July 2000

CITY OF PIPERTON

Toward An Alternative System Of Land Use Controls

An Overview

July, 2000

CITY OF PIPERTON

TOWARD AN ALTERNATIVE SYSTEM OF LAND USE CONTROLS

INTRODUCTION:

Currently the City of Piperton regulates land development within its jurisdiction utilizing traditional land use controls that separate land use into four basic categories (*zone districts*): *residential; commercial; office; and industrial*. Additionally, within each land use category the city provides for traditional use, intensity (*e.g. building coverage*), and bulk requirements (*e.g. lot size*) that regulate everything from use and square feet of floor area permitted, to minimum lot sizes.

Collectively, the system of land use controls employed by the City of Piperton is known as zoning. Zoning is the primary means of land use control utilized by local governments throughout the United States. Zoning's legal validity was established by the 1926 Supreme Court decision *Village of Euclid v. Ambler Realty Co.*, in which the Court determined that a system of land use regulation that rigidly categorized and separated land uses was a valid application of a local government's "police powers". The Euclid decision solidified the philosophical underpinnings of zoning that *recognizes the superiority of detached, single-family residential land use,* and the *presumption that different land uses are incompatible with one another and, therefore, must be separated.*

While traditional zoning has been effective in promulgating existing land use patterns, as well as protecting the status quo, increasingly, planners, community leaders, and citizens impacted by traditional zoning have began to recognize the potentially harmful by-products of this land use control technique including, *the proliferation of "sprawl"; loss of valuable natural resources; and a hindrance to more flexible, innovative land development techniques (e.g. conservation subdivision design; and traditional neighborhood/village design).*

Having recognized the inability of its existing system of zoning, and by extension, subdivision regulations, to promote a pattern of development that encourages the preservation of open space and the protection of environmentally sensitive areas; discourages "cookie-cutter" subdivisions; and promotes its rural character, the City of Piperton seeks to adopt an alternative system of land use controls whose basis is grounded in the following rationales.

CITY OF PIPERTON

TOWARD AN ALTERNATIVE SYSTEM OF LAND USE CONTROLS

ALTERNATIVE LAND USE SYSTEM RATIONALES:

1) The City of Piperton (the city) recognizes that from the perspective of the community, the only information that is necessary to effectively plan for municipal infrastructure and services is the **number** of dwelling units on a parcel of land. Another words, if the city knows that there will be thirty dwelling units on a parcel of land, that is really all the information necessary to plan sewer and water systems and predict tax revenues; the city does not necessarily have a big stake in the how the houses are placed on the parcel. Accordingly, the city will establish a population/density per square mile threshold, which will be applicable to any parcel within the city's jurisdiction on a proportional basis. This approach will replace the more traditional method of regulating density through minimum lot size requirements.

   Population/Density per Square Mile (PSM) –

   2,000 persons per square mile (*typical suburban/exurban density)*

   3.125 persons per acre (*2,000 persons / 640 acres)*

   1.04 dwelling unit per acre (*3.125 persons / assumed household/dwelling unit size of 3 persons*)

   Based on the above population/density threshold the city's overall density would equate to **1 dwelling unit per acre**. Development density on a site- specific basis, however, would be dependent upon the zone district in which the site was located, and which development option, under the city's proposed alternative system of land use controls, the developer selected. However, a primary component of the city's proposed alternative system of land use controls will be to ensure that development density, on a cumulative basis, does not exceed **1 dwelling unit per acre, per square mile.**

2) In accordance with the above rational, developers choosing to utilize the city's proposed alternative system of land use controls will receive maximum flexibility with regard to bulk requirements (*i.e. lot sizes, yard setbacks*). A developer's option to take advantage of the flexibility offered under the city's proposed alternative system of land use controls will be predicated, in large part, on the city's ability to offer density bonuses on a parcel, to the extent that the city's overall density of **1 dwelling unit per acre, per square mile** is not exceeded.

CITY OF PIPERTON

TOWARD AN ALTERNATIVE SYSTEM OF LAND USE CONTROLS

ALTERNATIVE LAND USE SYSTEM RATIONALES:

3) The city is cognizant of the need to ensure the compatibility of varying development types (*i.e. large lots, small lots)* adjacent to one another. Accordingly, developments utilizing the proposed alternative system of land use controls approach whose density exceeds the city's threshold density of **1 dwelling unit per acre, per square mile** shall be required to maintain a *"compatibility buffer"* of a size to be determined under the city's proposed alternative system of land use controls.

4) The city's proposed alternative system of land use controls is premised on the idea that development patterns that provide for the preservation of open space should be encouraged, while development patterns that promote homogenized sprawl should be discouraged. The city can effectuate this idea through the use of density incentives based on the city's overall threshold density.

5) The city's proposed alternative system of land use controls is responsive to the developer's desire to be able to provide a variety of development products based on existing market conditions.

6) The city's proposed alternative system of land use controls will be integrated with the city's existing zoning districts in such a manner that will provide the developer with the option to develop either conventionally (*utilizing an existing conventional zone district*) or utilizing the proposed alternative system of land use controls approach, which provides density incentives for utilizing suggested innovative development techniques designed to ensure the conservation of useable open space.

7) The initial basis for required open space set asides within developments utilizing the proposed alternative system of land use controls approach will be 50 percent of the proposed development site. Under this approach, a developer would be permitted to develop at a base density commensurate with the established development "design type". Finally, the developer would be rewarded with density bonuses for enhancement treatments (*e.g. development amenities such as walking trails, playgrounds etc.*).

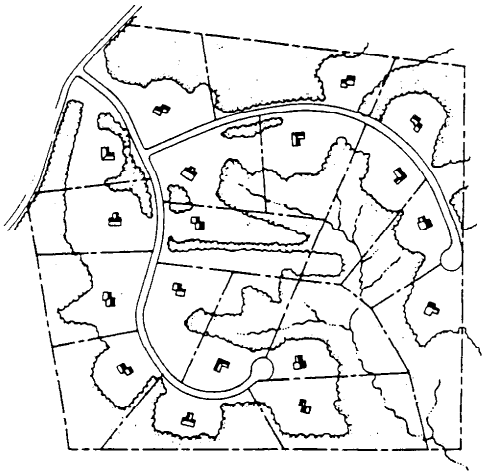
CITY OF PIPERTON

TOWARD AN ALTERNATIVE SYSTEM OF LAND USE CONTROLS

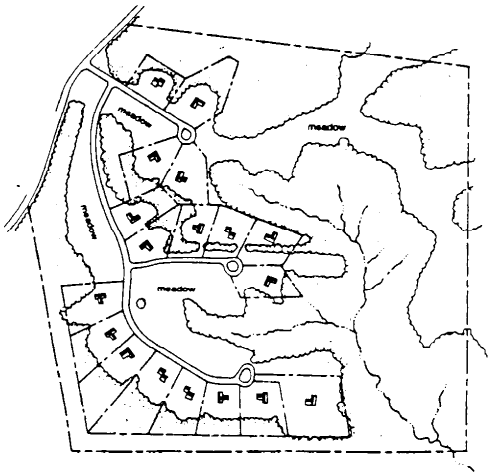
DESIGN TYPES:

8) There are two design types recommended under the proposed alternative system of land use controls:

CONSERVATION DESIGN – a design technique that emphasizes the preservation of open space *(public and private)* and natural resources. Utilizing the conservation design technique, a developer would be charged with the responsibility of setting aside at least fifty percent of his site, and either prohibiting the future development of the fifty percent set aside using conservation easements, and/or simply dedicating it as public open space. In return, the regulating authority would permit the developer the flexibility to develop the same number of lots on the remaining fifty percent of his site as he could on the entire site should he chose to develop the site utilizing traditional zoning. The concept is best understood through the graphic illustration below:



Traditional Zoning
(2-Acre Lots)
18 lots – No Open Space



Conservation Design
(1/2 Acre/1 Acre Lots)
18 lots – 50% Open Space

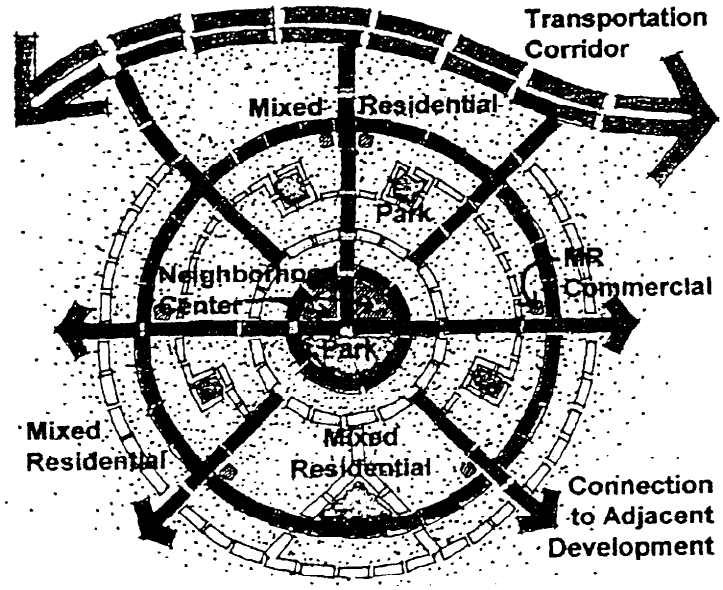
CITY OF PIPERTON

TOWARD AN ALTERNATIVE SYSTEM OF LAND USE CONTROLS

DESIGN TYPES:

<u>TRADITIONAL NEIGHBORHOOD/VILLAGE DESIGN</u> – a design technique that is based on urban conventions that were prevalent in the United States from colonial times until the 1940's, and generally based on the following design principles: *All neighborhoods/villages have identifiable centers and edges; all neighborhoods/villages are limited in size to encourage pedestrian activity (*a distance not greater than ¼ mile); *Uses and housing types are mixed and in close proximity to one another; and Street networks are interconnected and blocks are small.* The neighborhood/village is the building block of traditional neighborhood/village design. Within a neighborhood/village a multitude of land uses may be arranged to service the needs of the resident population in a convenient pedestrian-scaled environment.

Developments incorporating the neighborhood/village design technique will either be rural (*village*), or urban (*neighborhood*) in their orientation. In villages, the edge of the development is typically defined by open space, while in neighborhoods, the development edge is usually another neighborhood.



Design of a Traditional Neighborhood District

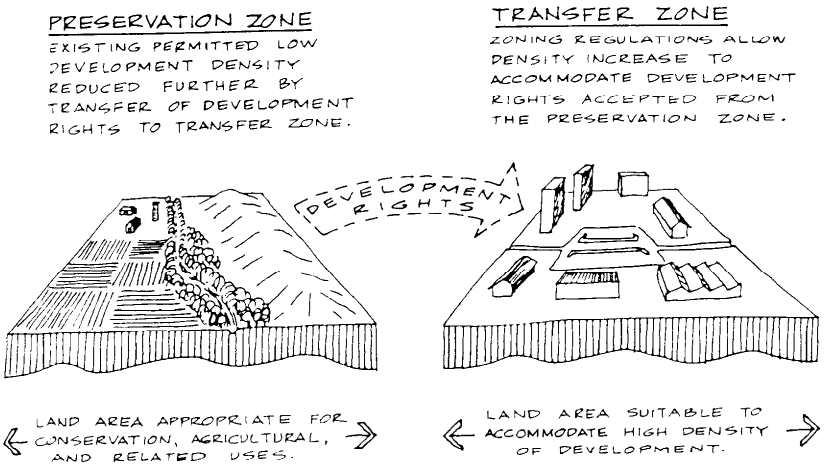
CITY OF PIPERTON

TOWARD AN ALTERNATIVE SYSTEM OF LAND USE CONTROLS

ADDITIONAL LAND CONSERVATION TECHNIQUES:

TRANSFER OF DEVELOPMENT RIGHTS (TDR): in order to both protect property rights and encourage the preservation of open space and environmentally sensitive areas, it is desirable to minimize the loss of value occasioned by either a regulatory requirement to preserve open land on private property or by voluntary action to do so. Accordingly, the City of Piperton will seek to implement a relatively new land development control technique used to preserve open space and farmland and to direct development to suitable areas. Most generally, TDR permits an owner of real property to sell or exchange the development rights associated with that property to another owner in return for compensation. The purchaser of the development rights, which are recognized by the regulating authority, will then propose the transfer of the acquired development rights from the preservation zone (*"sending district"*) to the transfer zone (*"receiving district"*).

A property within a receiving district (*designated areas within the city determined to be appropriate for higher density development*) that has received additional development rights may be development more intensely than the property's underlying zone district would otherwise permit.



TRANSFER OF DEVELOPMENT RIGHTS

CITY OF PIPERTON

TOWARD AN ALTERNATIVE SYSTEM OF LAND USE CONTROLS

SYSTEM IN PRACTICE:

The following tables illustrate the proposed modifications and additions to the City of Piperton's development districts.

1) **Development Districts Established –**

Conventional Zone Districts:

District*	Min. Lot Area	Max. Lot Area	Min. Lot Width	Min. Front Yard	Min. Side Yard	Min. Rear Yard	Gross Density
R-C	5 Ac.	None	300'	35'	50'	25'	.2 DU/ Ac.
R-1	1~~2~~ Ac.	10 Ac.**	175'	30'	30'	25'	.5 DU/ Ac.

***THE R-2 DISTRICT IS PROPOSED TO BE REPEALED.**
****THE MAXIMUM R-1 ZONE DISTRICT AREA IS 10 ACRES.**

Alternative System Development "Design Types"

Design Type	Max. Acres Per Sq. Mile	Min. Lot Area	Min. Yard Areas	Base Density	Density* Bonuses	Max Density
Conservation	640	varies	varies	0.75/ DUA	0.25/DUA	1/ DUA
TND/~~Village~~	46 – ~~120~~ 22**	varies	varies	3/ DUA	2/DUA	5/ DUA

***ENHANCEMENT BONUS**
****INCLUDES ALL LAND USES**

CITY OF PIPERTON

TOWARD AN ALTERNATIVE SYSTEM OF LAND USE CONTROLS

COMMUNITY BENEFTIS OF THE ALTERNATIVE SYSTEM OF LAND USE CONTROLS:

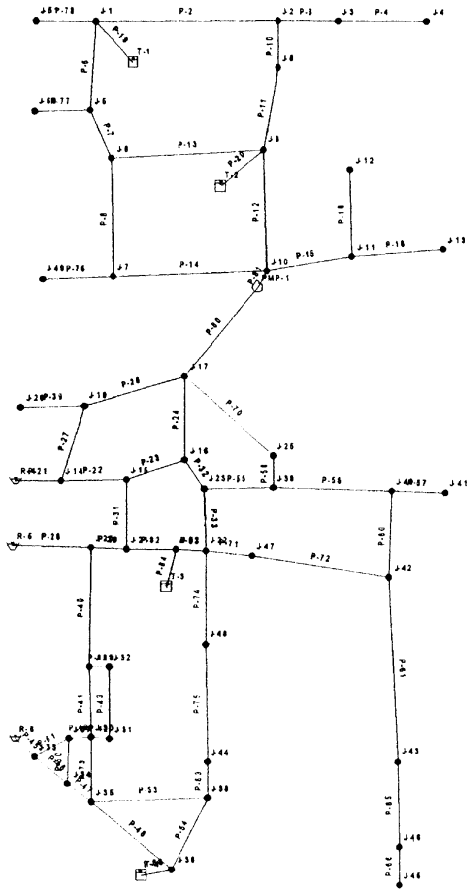
- *Significant reduction in future suburban "sprawl" development.*
- *The protection and preservation of the city's rural landscape and environmentally sensitive areas.*
- *The development of an interconnected network of community green spaces.*
- *Protection of property values.*
- *Reduction in the costs of municipal services.*
- *Reduction in traffic congestion by reducing the number and length of necessary trips.*
- *Encourages "non-vehicular" modes of transportation (i.e. walking, bicycling, etc.).*
- *THE CREATION OF BETTER LIVING ENVIRONMENT FOR THE CITIZENS OF THE CITY OF PIPERTON.*

APPENDIX B

Pipe Network and Data Files

ALTERNATIVE 1

Scenario: Peak Flow Base



Title: Piperton
c:\...\piperton\piperton river crossing.wcd
04/11/01 10:01:47 PM

Consolidated Technologies Inc
© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Project Engineer: Consolidated Technologies
WaterCAD v4.1 [424a]
Page 1 of 1

Scenario: Peak Flow Base
Steady State Analysis
Pipe Report

Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Check Valve?	Minor Loss Coefficient	Control Status	Discharge (gpm)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
P-2	8,600.00	10.0	Ductile Iron	130.0	false	0.00	Open	358.81	524.52	516.51	8.01	0.93
P-3	3,300.00	10.0	Ductile Iron	130.0	false	0.00	Open	604.00	516.51	508.46	8.05	2.44
P-4	1.00	10.0	Ductile Iron	130.0	false	0.00	Open	500.00	508.46	508.46	1.71e-3	1.71
P-6	8,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	169.77	526.50	524.52	1.98	0.23
P-7	4,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	-335.77	526.50	529.79	3.29	0.82
P-8	7,200.00	10.0	Ductile Iron	130.0	false	0.00	Open	-196.86	529.79	532.00	2.21	0.31
P-10	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	-327.19	516.51	520.43	3.92	0.78
P-11	7,800.00	10.0	Ductile Iron	130.0	false	0.00	Open	-515.19	520.43	534.61	14.18	1.82
P-12	7,700.00	12.0	Ductile Iron	130.0	false	0.00	Open	-609.49	534.61	542.47	7.86	1.02
P-13	7,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	-304.91	529.79	534.61	4.82	0.69
P-14	9,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	-404.86	532.00	542.47	10.48	1.16
P-15	5,200.00	10.0	Ductile Iron	130.0	false	0.00	Open	374.00	542.47	537.25	5.23	1.01
P-16	4,200.00	10.0	Ductile Iron	130.0	false	0.00	Open	96.00	537.25	536.91	0.34	0.08
P-18	4,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	128.00	537.25	536.63	0.62	0.14
P-19	1,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-407.04	524.52	525.00	0.48	0.48
P-20	1,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-360.61	534.61	535.00	0.39	0.39
P-21	2,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	1,866.22	550.00	533.82	16.18	8.09
P-22	3,600.00	12.0	Ductile Iron	130.0	false	0.00	Open	711.63	533.82	528.92	4.90	1.36
P-23	2,700.00	12.0	Ductile Iron	130.0	false	0.00	Open	922.00	528.92	522.99	5.93	2.20
P-24	6,500.00	12.0	Ductile Iron	130.0	false	0.00	Open	737.21	522.99	513.56	9.44	1.45
P-26	5,100.00	12.0	Ductile Iron	130.0	false	0.00	Open	-842.59	513.56	523.04	9.48	1.86
P-27	5,800.00	12.0	Ductile Iron	130.0	false	0.00	Open	-842.59	523.04	533.82	10.78	1.86
P-28	2,500.00	12.0	PVC	150.0	false	0.00	Open	1,953.68	550.00	533.10	16.90	6.76
P-29	1,500.00	12.0	PVC	150.0	false	0.00	Open	1,141.98	533.10	529.35	3.75	2.50
P-31	3,900.00	12.0	PVC	150.0	false	0.00	Open	-210.37	528.92	529.35	0.43	0.11
P-32	2,400.00	12.0	Ductile Iron	130.0	false	0.00	Open	184.79	522.99	522.72	0.27	0.11
P-33	3,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-216.24	522.72	523.17	0.45	0.15
P-39	2,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	0.00	523.04	523.04	0.00	0.00
P-40	5,500.00	12.0	PVC	150.0	false	0.00	Open	623.70	533.10	528.61	4.50	0.82
P-41	5,300.00	10.0	Ductile Iron	130.0	false	0.00	Open	342.03	528.61	524.09	4.52	0.85
P-42	500.00	6.0	PVC	150.0	false	0.00	Open	-93.68	524.09	524.45	0.36	0.72
P-43	5,300.00	6.0	PVC	150.0	false	0.00	Open	-93.68	524.45	528.25	3.80	0.72
P-44	500.00	6.0	PVC	150.0	false	0.00	Open	-93.68	528.25	528.61	0.36	0.72
P-45	2,000.00	6.0	PVC	150.0	false	0.00	Open	374.47	550.00	531.39	18.61	9.30
P-46	2,000.00	6.0	PVC	150.0	false	0.00	Open	186.81	531.39	526.25	5.14	2.57
P-47	1,000.00	6.0	PVC	150.0	false	0.00	Open	170.32	526.25	524.09	2.17	2.17

Scenario: Peak Flow Base
Steady State Analysis
Pipe Report

Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Check Valve?	Minor Loss Coefficient	Control Status	Discharge (gpm)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
P-48	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	-148.71	524.09	525.00	0.91	0.18
P-49	700.00	6.0	PVC	150.0	false	0.00	Open	-204.15	524.09	526.21	2.12	3.03
P-50	1,500.00	6.0	PVC	150.0	false	0.00	Open	-16.49	526.21	526.25	0.04	0.03
P-51	2,000.00	6.0	PVC	150.0	false	0.00	Open	-187.66	526.21	531.39	5.18	2.59
P-53	4,800.00	6.0	PVC	150.0	false	0.00	Open	13.12	524.18	524.09	0.09	0.02
P-54	3,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	170.41	525.00	524.18	0.82	0.23
P-55	3,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	401.04	522.72	519.29	3.43	1.14
P-56	5,300.00	10.0	Ductile Iron	130.0	false	0.00	Open	226.49	519.29	517.19	2.11	0.40
P-57	4,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	150.00	517.19	516.35	0.83	0.19
P-58	2,800.00	10.0	Ductile Iron	130.0	false	0.00	Open	-174.55	518.60	519.29	0.69	0.25
P-60	4,700.00	10.0	Ductile Iron	130.0	false	0.00	Open	-7.51	517.19	517.19	3.42e-3	7.27e-4
P-61	8,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	250.00	517.19	513.37	3.82	0.48
P-63	1,000.00	6.0	PVC	150.0	false	0.00	Open	-157.29	522.31	524.18	1.87	1.87
P-65	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	125.00	513.37	512.71	0.66	0.13
P-66	1.00	10.0	Ductile Iron	130.0	false	0.00	Open	125.00	512.71	512.71	1.22e-4	0.12
P-68	1.00	12.0	Ductile Iron	130.0	false	0.00	Open	-444.12	525.00	525.00	5.49e-4	0.55
P-70	7,500.00	6.0	PVC	150.0	false	0.00	Open	-90.55	513.56	518.60	5.05	0.67
P-71	2,800.00	10.0	Ductile Iron	130.0	false	0.00	Open	347.51	523.17	520.72	2.46	0.88
P-72	7,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	257.51	520.72	517.19	3.53	0.50
P-73	1.00	10.0	Ductile Iron	130.0	false	0.00	Open	639.86	524.09	524.09	2.69e-3	2.69
P-74	4,189.00	6.0	PVC	150.0	false	0.00	Open	30.71	523.17	522.79	0.38	0.09
P-75	5,311.00	6.0	PVC	150.0	false	0.00	Open	30.71	522.79	522.31	0.48	0.09
P-76	1.00	10.0	Ductile Iron	130.0	false	0.00	Open	0.00	532.00	532.00	0.00	0.00
P-77	1.00	10.0	Ductile Iron	130.0	false	0.00	Open	0.00	526.50	526.50	0.00	0.00
P-78	1.00	10.0	Ductile Iron	130.0	false	0.00	Open	0.00	524.52	524.52	0.00	0.00
P-80	16,372.00	16.0	Ductile Iron	130.0	false	0.00	Open	1,538.35	513.56	490.73	22.83	1.39
P-81	1,428.00	16.0	Ductile Iron	130.0	false	0.00	Open	1,538.35	544.47	542.47	1.99	1.39
P-82	2,531.00	12.0	PVC	150.0	false	0.00	Open	931.61	529.35	525.00	4.35	1.72
P-83	1,469.00	12.0	PVC	150.0	false	0.00	Open	782.46	525.00	523.17	1.83	1.24
P-84	1.00	12.0	Ductile Iron	130.0	false	0.00	Open	-149.14	525.00	525.00	6.1e-5	0.06

Scenario: Peak Flow Base
Steady State Analysis
Junction Report

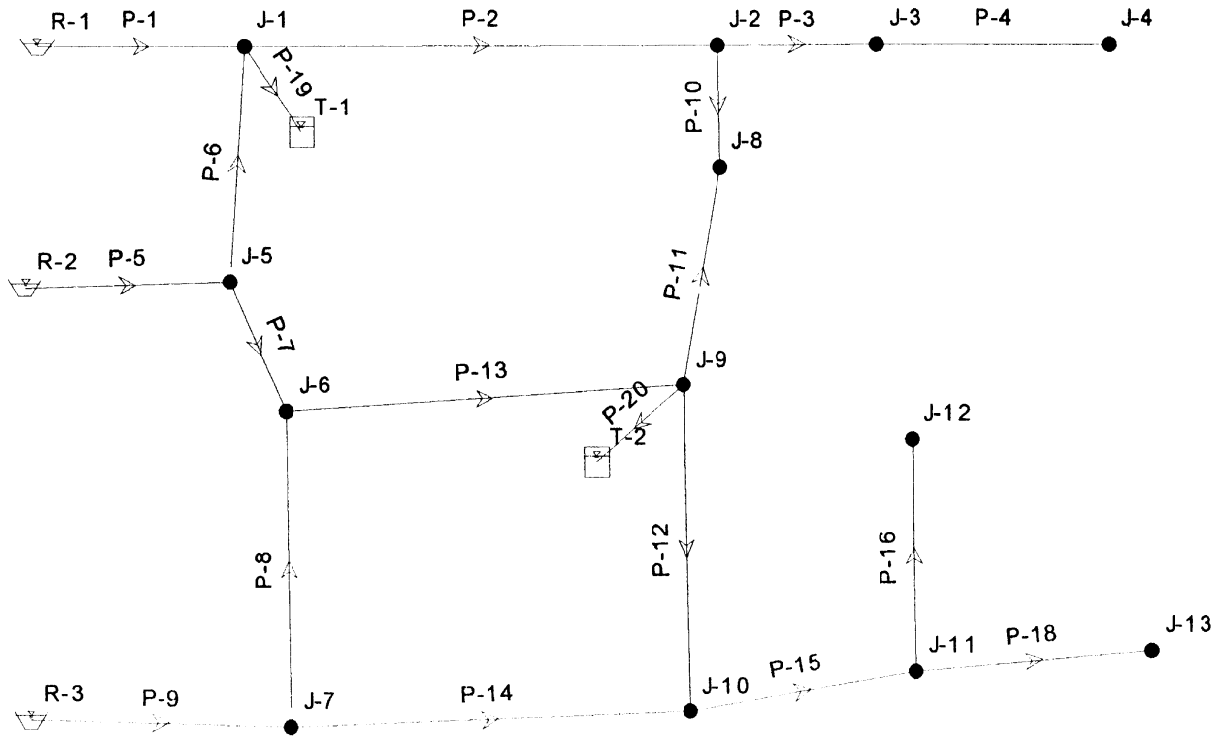
Label	Elevation (ft)	Zone	Type	Demand (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
J-1	400.00	Zone-1	Demand	218.00	Fixed	218.00	524.52	53.84
J-2	410.00	Zone-1	Demand	82.00	Fixed	82.00	516.51	46.06
J-3	390.00	Zone-1	Demand	104.00	Fixed	104.00	508.46	51.23
J-4	350.00	Zone-1	Demand	500.00	Fixed	500.00	508.46	68.52
J-5	360.00	Zone-1	Demand	166.00	Fixed	166.00	526.50	72.00
J-6	410.00	Zone-1	Demand	166.00	Fixed	166.00	529.79	51.80
J-7	360.00	Zone-1	Demand	208.00	Fixed	208.00	532.00	74.38
J-8	420.00	Zone-1	Demand	188.00	Fixed	188.00	520.43	43.43
J-9	410.00	Zone-1	Demand	150.00	Fixed	150.00	534.61	53.89
J-10	400.00	Zone-1	Demand	150.00	Fixed	150.00	542.47	61.61
J-11	370.00	Zone-1	Demand	150.00	Fixed	150.00	537.25	72.32
J-12	350.00	Zone-1	Demand	96.00	Fixed	96.00	536.91	80.82
J-13	350.00	Zone-1	Demand	128.00	Fixed	128.00	536.63	80.70
J-14	350.00	Zone-1	Demand	312.00	Fixed	312.00	533.82	79.49
J-15	350.00	Zone-1	Demand	0.00	Fixed	0.00	528.92	77.37
J-16	350.00	Zone-1	Demand	0.00	Fixed	0.00	522.99	74.81
J-17	320.00	Zone-1	Demand	132.00	Fixed	132.00	513.56	83.70
J-19	310.00	Zone-1	Demand	0.00	Fixed	0.00	523.04	92.12
J-20	350.00	Zone-1	Demand	188.00	Fixed	188.00	533.10	79.18
J-21	350.00	Zone-1	Demand	0.00	Fixed	0.00	529.35	77.56
J-22	360.00	Zone-1	Demand	188.00	Fixed	188.00	523.17	70.56
J-23	350.00	Zone-1	Demand	0.00	Fixed	0.00	522.72	74.69
J-25	350.00	Zone-1	Demand	84.00	Fixed	84.00	518.60	72.91
J-28	320.00	Zone-1	Demand	0.00	Fixed	0.00	523.04	87.80
J-29	410.00	Zone-1	Demand	188.00	Fixed	188.00	528.61	51.29
J-30	410.00	Zone-1	Demand	0.00	Fixed	0.00	524.09	49.34
J-31	410.00	Zone-1	Demand	0.00	Fixed	0.00	524.45	49.49
J-32	410.00	Zone-1	Demand	0.00	Fixed	0.00	528.25	51.13
J-33	410.00	Zone-1	Demand	0.00	Fixed	0.00	531.39	52.49
J-34	410.00	Zone-1	Demand	0.00	Fixed	0.00	526.25	50.27
J-35	400.00	Zone-1	Demand	972.00	Fixed	972.00	524.09	53.66
J-36	400.00	Zone-1	Demand	125.00	Fixed	125.00	525.00	54.05
J-37	410.00	Zone-1	Demand	0.00	Fixed	0.00	526.21	50.25
J-38	380.00	Zone-1	Demand	0.00	Fixed	0.00	524.18	62.35
J-39	350.00	Zone-1	Demand	0.00	Fixed	0.00	519.29	73.21
J-40	325.00	Zone-1	Demand	84.00	Fixed	84.00	517.19	83.11
J-41	320.00	Zone-1	Demand	150.00	Fixed	150.00	516.35	84.91

Scenario: Peak Flow Base
Steady State Analysis
Junction Report

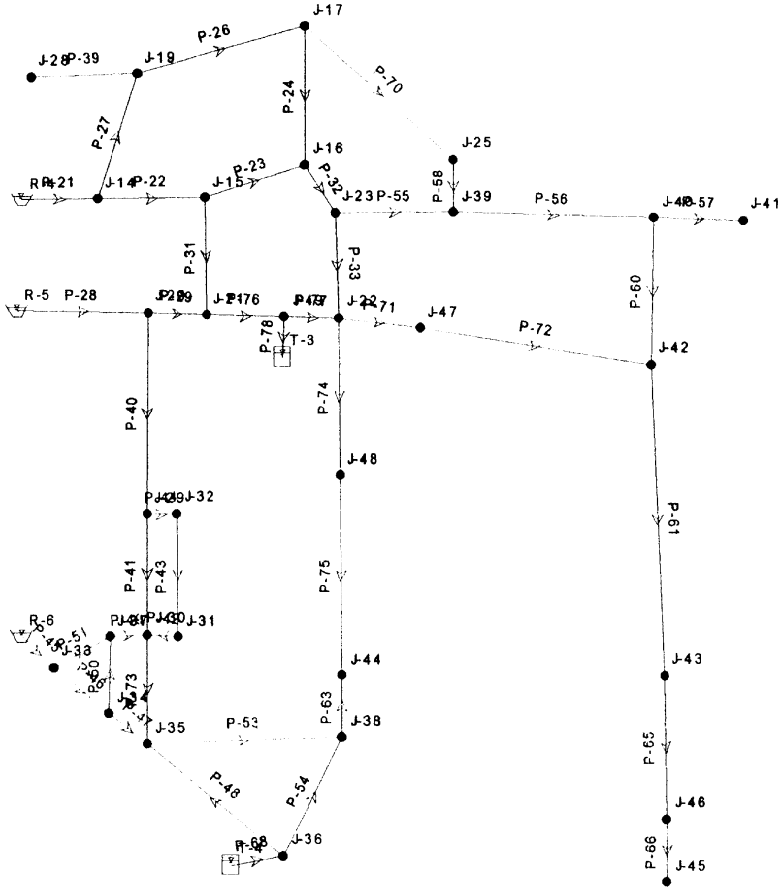
Label	Elevation (ft)	Zone	Type	Demand (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
J-42	360.00	Zone-1	Demand	0.00	Fixed	0.00	517.19	67.97
J-43	380.00	Zone-1	Demand	125.00	Fixed	125.00	513.37	57.67
J-44	360.00	Zone-1	Demand	188.00	Fixed	188.00	522.31	70.19
J-45	400.00	Zone-1	Demand	125.00	Fixed	125.00	512.71	48.74
J-46	400.00	Zone-1	Demand	0.00	Fixed	0.00	512.71	48.74
J-47	360.00	Zone-1	Demand	90.00	Fixed	90.00	520.72	69.50
J-48	410.00	Zone-1	Demand	0.00	Fixed	0.00	522.79	48.77
J-49	360.00	Zone-1	Demand	0.00	Fixed	0.00	532.00	74.38
J-50	360.00	Zone-1	Demand	0.00	Fixed	0.00	526.50	72.00
J-51	360.00	Zone-1	Demand	0.00	Fixed	0.00	524.52	71.14
J-52	360.00	Zone-1	Demand	0.00	Fixed	0.00	525.00	71.35

ALTERNATIVE 2

Scenario: Peak Flow Base



Scenario: Peak Flow Base



Scenario: Peak Flow Base
Steady State Analysis
Junction Report

Label	Elevation (ft)	Zone	Type	Demand (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
J-1	400.00	Zone-1	Demand	218.00	Fixed	218.00	526.87	54.86
J-2	410.00	Zone-1	Demand	82.00	Fixed	82.00	523.65	49.14
J-3	390.00	Zone-1	Demand	104.00	Fixed	104.00	523.33	57.66
J-4	350.00	Zone-1	Demand	0.00	Fixed	0.00	523.33	74.96
J-5	360.00	Zone-1	Demand	166.00	Fixed	166.00	537.92	76.94
J-6	410.00	Zone-1	Demand	166.00	Fixed	166.00	532.88	53.14
J-7	360.00	Zone-1	Demand	208.00	Fixed	208.00	533.75	75.14
J-8	420.00	Zone-1	Demand	188.00	Fixed	188.00	523.59	44.79
J-9	410.00	Zone-1	Demand	150.00	Fixed	150.00	525.11	49.78
J-10	400.00	Zone-1	Demand	150.00	Fixed	150.00	524.55	53.86
J-11	370.00	Zone-1	Demand	150.00	Fixed	150.00	519.32	64.57
J-12	350.00	Zone-1	Demand	96.00	Fixed	96.00	518.98	73.07
J-13	350.00	Zone-1	Demand	128.00	Fixed	128.00	518.70	72.95
J-14	350.00	Zone-1	Demand	312.00	Fixed	312.00	539.16	81.80
J-15	350.00	Zone-1	Demand	0.00	Fixed	0.00	533.81	79.48
J-16	350.00	Zone-1	Demand	0.00	Fixed	0.00	532.04	78.72
J-17	320.00	Zone-1	Demand	132.00	Fixed	132.00	532.99	92.11
J-19	310.00	Zone-1	Demand	0.00	Fixed	0.00	535.88	97.68
J-20	350.00	Zone-1	Demand	188.00	Fixed	188.00	535.30	80.13
J-21	350.00	Zone-1	Demand	0.00	Fixed	0.00	533.14	79.19
J-22	360.00	Zone-1	Demand	188.00	Fixed	188.00	527.43	72.40
J-23	350.00	Zone-1	Demand	0.00	Fixed	0.00	528.93	77.38
J-25	350.00	Zone-1	Demand	84.00	Fixed	84.00	527.20	76.63
J-28	320.00	Zone-1	Demand	0.00	Fixed	0.00	535.88	93.35
J-29	410.00	Zone-1	Demand	188.00	Fixed	188.00	528.54	51.26
J-30	410.00	Zone-1	Demand	0.00	Fixed	0.00	524.73	49.62
J-31	410.00	Zone-1	Demand	0.00	Fixed	0.00	525.04	49.75
J-32	410.00	Zone-1	Demand	0.00	Fixed	0.00	528.24	51.13
J-33	410.00	Zone-1	Demand	0.00	Fixed	0.00	531.86	52.69
J-34	410.00	Zone-1	Demand	0.00	Fixed	0.00	526.84	50.53
J-35	400.00	Zone-1	Demand	972.00	Fixed	972.00	524.73	53.94
J-36	400.00	Zone-1	Demand	125.00	Fixed	125.00	524.79	53.97
J-37	410.00	Zone-1	Demand	0.00	Fixed	0.00	526.80	50.51
J-38	380.00	Zone-1	Demand	0.00	Fixed	0.00	524.51	62.49
J-39	350.00	Zone-1	Demand	0.00	Fixed	0.00	527.19	76.62
J-40	325.00	Zone-1	Demand	84.00	Fixed	84.00	523.84	85.98
J-41	320.00	Zone-1	Demand	150.00	Fixed	150.00	523.00	87.79

Scenario: Peak Flow Base
Steady State Analysis
Junction Report

Label	Elevation (ft)	Zone	Type	Demand (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
J-42	360.00	Zone-1	Demand	0.00	Fixed	0.00	523.69	70.79
J-43	380.00	Zone-1	Demand	125.00	Fixed	125.00	519.87	60.49
J-44	360.00	Zone-1	Demand	188.00	Fixed	188.00	523.42	70.67
J-45	400.00	Zone-1	Demand	125.00	Fixed	125.00	519.21	51.55
J-46	400.00	Zone-1	Demand	0.00	Fixed	0.00	519.21	51.55
J-47	360.00	Zone-1	Demand	90.00	Fixed	90.00	525.75	71.68
J-48	410.00	Zone-1	Demand	0.00	Fixed	0.00	525.66	50.02
J-49	360.00	Zone-1	Demand	0.00	Fixed	0.00	527.50	72.43

Scenario: Peak Flow Base
Steady State Analysis
Pipe Report

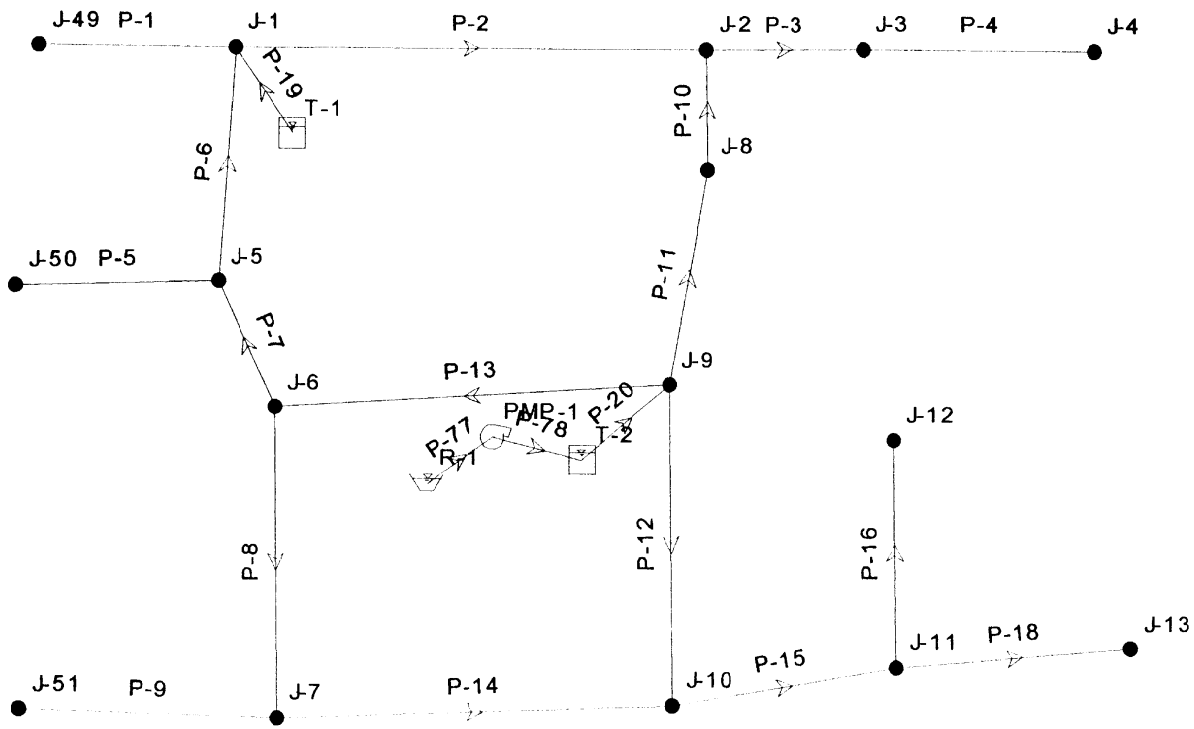
Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Check Valve?	Minor Loss Coefficient	Control Status	Discharge (gpm)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
P-1	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	853.54	550.00	526.87	23.13	4.63
P-2	8,600.00	10.0	Ductile Iron	130.0	false	0.00	Open	219.55	526.87	523.65	3.23	0.38
P-3	3,300.00	10.0	Ductile Iron	130.0	false	0.00	Open	104.00	523.65	523.33	0.31	0.09
P-4	1.00	10.0	Ductile Iron	130.0	false	0.00	Open	0.00	523.33	523.33	0.00	0.00
P-5	3,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	1,279.45	550.00	537.92	12.08	4.03
P-6	8,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	429.85	537.92	526.87	11.05	1.30
P-7	4,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	683.60	537.92	532.88	5.05	1.26
P-8	7,200.00	10.0	Ductile Iron	130.0	false	0.00	Open	-119.69	532.88	533.75	0.88	0.12
P-9	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	705.18	550.00	533.75	16.25	3.25
P-10	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	33.55	523.65	523.59	0.06	0.01
P-11	7,800.00	10.0	Ductile Iron	130.0	false	0.00	Open	-154.45	523.59	525.11	1.53	0.20
P-12	7,700.00	12.0	Ductile Iron	130.0	false	0.00	Open	146.51	525.11	524.55	0.56	0.07
P-13	7,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	637.29	532.88	525.11	7.76	1.11
P-14	9,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	377.49	533.75	524.55	9.20	1.02
P-15	5,200.00	10.0	Ductile Iron	130.0	false	0.00	Open	374.00	524.55	519.32	5.23	1.01
P-16	4,200.00	10.0	Ductile Iron	130.0	false	0.00	Open	96.00	519.32	518.98	0.34	0.08
P-18	4,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	128.00	519.32	518.70	0.62	0.14
P-19	1,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	845.84	526.87	525.00	1.87	1.87
P-20	1,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	186.33	525.11	525.00	0.11	0.11
P-21	2,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	1,502.39	550.00	539.16	10.84	5.42
P-22	3,600.00	12.0	Ductile Iron	130.0	false	0.00	Open	747.24	539.16	533.81	5.36	1.49
P-23	2,700.00	12.0	Ductile Iron	130.0	false	0.00	Open	479.22	533.81	532.04	1.77	0.65
P-24	6,500.00	12.0	Ductile Iron	130.0	false	0.00	Open	-213.61	532.04	532.99	0.95	0.15
P-26	5,100.00	12.0	Ductile Iron	130.0	false	0.00	Open	-443.15	532.99	535.88	2.89	0.57
P-27	5,800.00	12.0	Ductile Iron	130.0	false	0.00	Open	-443.15	535.88	539.16	3.28	0.57
P-28	2,500.00	12.0	PVC	150.0	false	0.00	Open	1,812.12	550.00	535.30	14.70	5.88
P-29	1,500.00	12.0	PVC	150.0	false	0.00	Open	846.83	535.30	533.14	2.16	1.44
P-31	3,900.00	12.0	PVC	150.0	false	0.00	Open	268.02	533.81	533.14	0.67	0.17
P-32	2,400.00	12.0	Ductile Iron	130.0	false	0.00	Open	692.83	532.04	528.93	3.11	1.29
P-33	3,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	415.02	528.93	527.43	1.50	0.50
P-39	2,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	0.00	535.88	535.88	0.00	0.00
P-40	5,500.00	12.0	PVC	150.0	false	0.00	Open	777.29	535.30	528.54	6.76	1.23
P-41	5,300.00	12.0	Ductile Iron	130.0	false	0.00	Open	503.88	528.54	524.73	3.81	0.72
P-42	500.00	6.0	PVC	150.0	false	0.00	Open	-85.40	524.73	525.04	0.30	0.60
P-43	5,300.00	6.0	PVC	150.0	false	0.00	Open	-85.40	525.04	528.24	3.20	0.60
P-44	500.00	6.0	PVC	150.0	false	0.00	Open	-85.40	528.24	528.54	0.30	0.60

Scenario: Peak Flow Base
Steady State Analysis
Pipe Report

Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Check Valve?	Minor Loss Coefficient	Control Status	Discharge (gpm)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
P-45	2,000.00	6.0	PVC	150.0	false	0.00	Open	369.39	550.00	531.86	18.14	9.07
P-46	2,000.00	6.0	PVC	150.0	false	0.00	Open	184.28	531.86	526.84	5.01	2.51
P-47	1,000.00	6.0	PVC	150.0	false	0.00	Open	167.99	526.84	524.73	2.11	2.11
P-48	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	-34.75	524.73	524.79	0.06	0.01
P-49	700.00	6.0	PVC	150.0	false	0.00	Open	-201.41	524.73	526.80	2.07	2.95
P-50	1,500.00	6.0	PVC	150.0	false	0.00	Open	-16.29	526.80	526.84	0.04	0.03
P-51	2,000.00	6.0	PVC	150.0	false	0.00	Open	-185.12	526.80	531.86	5.05	2.53
P-53	4,800.00	6.0	PVC	150.0	false	0.00	Open	-21.43	524.51	524.73	0.22	0.05
P-54	3,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	96.20	524.79	524.51	0.29	0.08
P-55	3,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	277.81	528.93	527.19	1.74	0.58
P-56	5,300.00	10.0	Ductile Iron	130.0	false	0.00	Open	291.35	527.19	523.84	3.36	0.63
P-57	4,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	150.00	523.84	523.00	0.83	0.19
P-58	2,800.00	10.0	Ductile Iron	130.0	false	0.00	Open	13.54	527.20	527.19	0.01	2.18e-3
P-60	4,700.00	10.0	Ductile Iron	130.0	false	0.00	Open	57.35	523.84	523.69	0.15	0.03
P-61	8,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	250.00	523.69	519.87	3.82	0.48
P-63	1,000.00	6.0	PVC	150.0	false	0.00	Open	-117.62	523.42	524.51	1.09	1.09
P-65	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	125.00	519.87	519.21	0.66	0.13
P-66	1.00	10.0	Ductile Iron	130.0	false	0.00	Open	125.00	519.21	519.21	1.83e-4	0.18
P-68	1,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-255.94	524.79	525.00	0.21	0.21
P-70	7,500.00	6.0	PVC	150.0	false	0.00	Open	97.54	532.99	527.20	5.79	0.77
P-71	2,800.00	10.0	Ductile Iron	130.0	false	0.00	Open	282.65	527.43	525.75	1.68	0.60
P-72	7,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	192.65	525.75	523.69	2.06	0.29
P-73	1.00	12.0	Ductile Iron	130.0	false	0.00	Open	790.69	524.73	524.73	1.65e-3	1.65
P-74	4,189.00	6.0	PVC	150.0	false	0.00	Open	70.38	527.43	525.66	1.77	0.42
P-75	5,311.00	6.0	PVC	150.0	false	0.00	Open	70.38	525.66	523.42	2.24	0.42
P-76	2,355.00	12.0	PVC	150.0	false	0.00	Open	1,114.86	533.14	527.50	5.64	2.39
P-77	1,645.00	12.0	PVC	150.0	false	0.00	Open	126.01	527.50	527.43	0.07	0.04
P-78	1,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-988.85	525.00	527.50	2.50	2.50

ALTERNATIVE 3

Scenario: Peak Flow Base

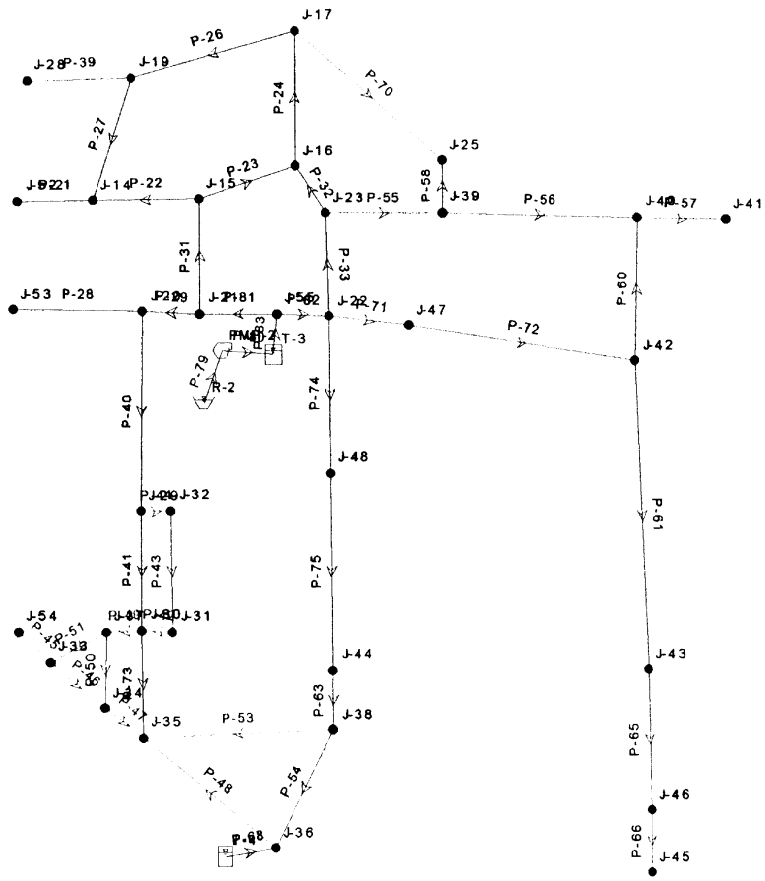


Title: Piperton
c:\my documents\piperton\piperton wells trial2.wcd
04/11/01 10:12:17 PM

Consolidated Technologies Inc
© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Project Engineer: Consolidated Technologies
WaterCAD v4.1 [424a]
Page 1 of 1

Scenario: Peak Flow Base



Title: Piperton
c:\my documents\piperton\piperton wells trial2.wcd
04/11/01 10:11:56 PM

Consolidated Technologies Inc
© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Project Engineer: Consolidated Technologies
WaterCAD v4.1 [424a]
Page 1 of 1

Scenario: Peak Flow Base
Steady State Analysis
Junction Report

Label	Elevation (ft)	Zone	Type	Demand (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
J-1	400.00	Zone-1	Demand	218.00	Fixed	218.00	524.90	54.01
J-2	410.00	Zone-1	Demand	82.00	Fixed	82.00	524.89	49.68
J-3	390.00	Zone-1	Demand	104.00	Fixed	104.00	524.58	58.20
J-4	350.00	Zone-1	Demand	0.00	Fixed	0.00	524.58	75.49
J-5	360.00	Zone-1	Demand	166.00	Fixed	166.00	525.13	71.41
J-6	410.00	Zone-1	Demand	166.00	Fixed	166.00	525.74	50.05
J-7	360.00	Zone-1	Demand	208.00	Fixed	208.00	522.04	70.07
J-8	420.00	Zone-1	Demand	188.00	Fixed	188.00	526.16	45.91
J-9	410.00	Zone-1	Demand	150.00	Fixed	150.00	533.68	53.48
J-10	400.00	Zone-1	Demand	150.00	Fixed	150.00	521.80	52.67
J-11	370.00	Zone-1	Demand	150.00	Fixed	150.00	516.57	63.38
J-12	350.00	Zone-1	Demand	96.00	Fixed	96.00	516.23	71.88
J-13	350.00	Zone-1	Demand	128.00	Fixed	128.00	515.95	71.76
J-14	350.00	Zone-1	Demand	312.00	Fixed	312.00	531.45	78.47
J-15	350.00	Zone-1	Demand	0.00	Fixed	0.00	532.33	78.84
J-16	350.00	Zone-1	Demand	0.00	Fixed	0.00	532.32	78.84
J-17	320.00	Zone-1	Demand	132.00	Fixed	132.00	531.50	91.46
J-19	310.00	Zone-1	Demand	0.00	Fixed	0.00	531.48	95.78
J-20	350.00	Zone-1	Demand	188.00	Fixed	188.00	530.57	78.09
J-21	350.00	Zone-1	Demand	0.00	Fixed	0.00	533.15	79.20
J-22	360.00	Zone-1	Demand	188.00	Fixed	188.00	534.39	75.41
J-23	350.00	Zone-1	Demand	0.00	Fixed	0.00	532.57	78.95
J-25	350.00	Zone-1	Demand	84.00	Fixed	84.00	530.71	78.15
J-28	320.00	Zone-1	Demand	0.00	Fixed	0.00	531.48	91.45
J-29	410.00	Zone-1	Demand	188.00	Fixed	188.00	524.35	49.45
J-30	410.00	Zone-1	Demand	0.00	Fixed	0.00	520.93	47.97
J-31	410.00	Zone-1	Demand	0.00	Fixed	0.00	521.20	48.09
J-32	410.00	Zone-1	Demand	0.00	Fixed	0.00	524.08	49.33
J-33	410.00	Zone-1	Demand	0.00	Fixed	0.00	520.93	47.97
J-34	410.00	Zone-1	Demand	0.00	Fixed	0.00	520.93	47.97
J-35	400.00	Zone-1	Demand	972.00	Fixed	972.00	520.93	52.30
J-36	400.00	Zone-1	Demand	125.00	Fixed	125.00	524.62	53.89
J-37	410.00	Zone-1	Demand	0.00	Fixed	0.00	520.93	47.97
J-38	380.00	Zone-1	Demand	0.00	Fixed	0.00	524.83	62.63
J-39	350.00	Zone-1	Demand	0.00	Fixed	0.00	530.78	78.18
J-40	325.00	Zone-1	Demand	84.00	Fixed	84.00	528.59	88.04
J-41	320.00	Zone-1	Demand	150.00	Fixed	150.00	527.76	89.84

Scenario: Peak Flow Base
Steady State Analysis
Junction Report

Label	Elevation (ft)	Zone	Type	Demand (gpm)	Pattern	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
J-42	360.00	Zone-1	Demand	0.00	Fixed	0.00	528.59	72.90
J-43	380.00	Zone-1	Demand	125.00	Fixed	125.00	524.78	62.61
J-44	360.00	Zone-1	Demand	188.00	Fixed	188.00	525.03	71.36
J-45	400.00	Zone-1	Demand	125.00	Fixed	125.00	524.11	53.67
J-46	400.00	Zone-1	Demand	0.00	Fixed	0.00	524.11	53.67
J-47	360.00	Zone-1	Demand	90.00	Fixed	90.00	532.00	74.38
J-48	410.00	Zone-1	Demand	0.00	Fixed	0.00	530.26	52.01
J-49	400.00	Zone-1	Demand	0.00	Fixed	0.00	524.90	54.01
J-50	360.00	Zone-1	Demand	0.00	Fixed	0.00	525.13	71.41
J-51	360.00	Zone-1	Demand	0.00	Fixed	0.00	522.04	70.07
J-52	350.00	Zone-1	Demand	0.00	Fixed	0.00	531.45	78.47
J-53	350.00	Zone-1	Demand	0.00	Fixed	0.00	530.57	78.09
J-54	410.00	Zone-1	Demand	0.00	Fixed	0.00	520.93	47.97
J-55	360.00	Zone-1	Demand	0.00	Fixed	0.00	540.00	77.84

Scenario: Peak Flow Base
Steady State Analysis
Pipe Report

Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Check Valve?	Minor Loss Coefficient	Control Status	Discharge (gpm)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
P-1	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	0.00	524.90	524.90	0.00	0.00
P-2	8,600.00	10.0	Ductile Iron	130.0	false	0.00	Open	8.30	524.90	524.89	0.01	8.73e-4
P-3	3,300.00	10.0	Ductile Iron	130.0	false	0.00	Open	104.00	524.89	524.58	0.31	0.09
P-4	1.00	10.0	Ductile Iron	130.0	false	0.00	Open	0.00	524.58	524.58	0.00	0.00
P-5	3,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	0.00	525.13	525.13	0.00	0.00
P-6	8,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	52.78	525.13	524.90	0.23	0.03
P-7	4,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-218.78	525.13	525.74	0.61	0.15
P-8	7,200.00	10.0	Ductile Iron	130.0	false	0.00	Open	260.43	525.74	522.04	3.70	0.51
P-9	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	0.00	522.04	522.04	0.00	0.00
P-10	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	-177.70	524.89	526.16	1.27	0.25
P-11	7,800.00	10.0	Ductile Iron	130.0	false	0.00	Open	-365.70	526.16	533.68	7.52	0.96
P-12	7,700.00	10.0	Ductile Iron	130.0	false	0.00	Open	471.57	533.68	521.80	11.88	1.54
P-13	7,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-645.21	525.74	533.68	7.94	1.13
P-14	9,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	52.43	522.04	521.80	0.24	0.03
P-15	5,200.00	10.0	Ductile Iron	130.0	false	0.00	Open	374.00	521.80	516.57	5.23	1.01
P-16	4,200.00	10.0	Ductile Iron	130.0	false	0.00	Open	96.00	516.57	516.23	0.34	0.08
P-18	4,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	128.00	516.57	515.95	0.62	0.14
P-19	1,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-173.52	524.90	525.00	0.10	0.10
P-20	1,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-1,632.48	533.68	540.00	6.32	6.32
P-21	2,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	0.00	531.45	531.45	0.00	0.00
P-22	3,600.00	12.0	Ductile Iron	130.0	false	0.00	Open	-280.22	531.45	532.33	0.87	0.24
P-23	2,700.00	12.0	Ductile Iron	130.0	false	0.00	Open	19.39	532.33	532.32	4.7e-3	1.74e-3
P-24	6,500.00	12.0	Ductile Iron	130.0	false	0.00	Open	196.98	532.32	531.50	0.82	0.13
P-26	5,100.00	12.0	Ductile Iron	130.0	false	0.00	Open	31.78	531.50	531.48	0.02	4.32e-3
P-27	5,800.00	12.0	Ductile Iron	130.0	false	0.00	Open	31.78	531.48	531.45	0.03	4.33e-3
P-28	2,500.00	12.0	PVC	150.0	false	0.00	Open	0.00	530.57	530.57	0.00	0.00
P-29	1,500.00	12.0	PVC	150.0	false	0.00	Open	-931.64	530.57	533.15	2.58	1.72
P-31	3,900.00	12.0	PVC	150.0	false	0.00	Open	-299.61	532.33	533.15	0.82	0.21
P-32	2,400.00	12.0	Ductile Iron	130.0	false	0.00	Open	-177.59	532.32	532.57	0.25	0.10
P-33	3,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-459.75	532.57	534.39	1.82	0.61
P-39	2,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	0.00	531.48	531.48	0.00	0.00
P-40	5,500.00	12.0	PVC	150.0	false	0.00	Open	743.64	530.57	524.35	6.23	1.13
P-41	5,300.00	12.0	Ductile Iron	130.0	false	0.00	Open	475.12	524.35	520.93	3.41	0.64
P-42	500.00	6.0	PVC	150.0	false	0.00	Open	-80.53	520.93	521.20	0.27	0.54
P-43	5,300.00	6.0	PVC	150.0	false	0.00	Open	-80.53	521.20	524.08	2.87	0.54
P-44	500.00	6.0	PVC	150.0	false	0.00	Open	-80.53	524.08	524.35	0.27	0.54

Scenario: Peak Flow Base
Steady State Analysis
Pipe Report

Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Check Valve?	Minor Loss Coefficient	Control Status	Discharge (gpm)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)
P-45	2,000.00	6.0	PVC	150.0	false	0.00	Open	0.00	520.93	520.93	0.00	0.00
P-46	2,000.00	6.0	PVC	150.0	false	0.00	Open	1.59	520.93	520.93	1.22e-4	6.1e-5
P-47	1,000.00	6.0	PVC	150.0	false	0.00	Open	2.89	520.93	520.93	3.66e-4	3.66e-4
P-48	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	-316.18	520.93	524.62	3.68	0.74
P-49	700.00	6.0	PVC	150.0	false	0.00	Open	2.89	520.93	520.93	3.05e-4	4.36e-4
P-50	1,500.00	6.0	PVC	150.0	false	0.00	Open	1.30	520.93	520.93	1.83e-4	1.22e-4
P-51	2,000.00	6.0	PVC	150.0	false	0.00	Open	1.59	520.93	520.93	6.1e-5	3.05e-5
P-53	4,800.00	6.0	PVC	150.0	false	0.00	Open	100.18	524.83	520.93	3.89	0.81
P-54	3,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	-81.81	524.62	524.83	0.21	0.06
P-55	3,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	282.16	532.57	530.78	1.79	0.60
P-56	5,300.00	10.0	Ductile Iron	130.0	false	0.00	Open	231.36	530.78	528.59	2.19	0.41
P-57	4,500.00	10.0	Ductile Iron	130.0	false	0.00	Open	150.00	528.59	527.76	0.83	0.19
P-58	2,800.00	10.0	Ductile Iron	130.0	false	0.00	Open	-50.80	530.71	530.78	0.07	0.03
P-60	4,700.00	10.0	Ductile Iron	130.0	false	0.00	Open	-2.64	528.59	528.59	4.88e-4	1.04e-4
P-61	8,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	250.00	528.59	524.78	3.82	0.48
P-63	1,000.00	10.0	PVC	150.0	false	0.00	Open	181.99	525.03	524.83	0.20	0.20
P-65	5,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	125.00	524.78	524.11	0.66	0.13
P-66	1.00	10.0	Ductile Iron	130.0	false	0.00	Open	125.00	524.11	524.11	1.22e-4	0.12
P-68	1,000.00	12.0	Ductile Iron	130.0	false	0.00	Open	-359.37	524.62	525.00	0.38	0.38
P-70	7,500.00	6.0	PVC	150.0	false	0.00	Open	33.20	531.50	530.71	0.79	0.11
P-71	2,800.00	10.0	Ductile Iron	130.0	false	0.00	Open	342.64	534.39	532.00	2.39	0.85
P-72	7,000.00	10.0	Ductile Iron	130.0	false	0.00	Open	252.64	532.00	528.59	3.41	0.49
P-73	1.00	12.0	Ductile Iron	130.0	false	0.00	Open	552.75	520.93	520.93	8.54e-4	0.85
P-74	4,189.00	10.0	Ductile Iron	130.0	false	0.00	Open	369.99	534.39	530.26	4.13	0.99
P-75	5,311.00	10.0	Ductile Iron	130.0	false	0.00	Open	369.99	530.26	525.03	5.23	0.99
P-77	1.00	12.0	Ductile Iron	130.0	false	0.00	Open	1,847.46	400.00	399.99	0.01	7.93
P-78	1.00	12.0	Ductile Iron	130.0	false	0.00	Open	1,847.46	540.01	540.00	0.01	7.93
P-79	1.00	16.0	Ductile Iron	130.0	false	0.00	Open	3,199.98	400.00	399.99	0.01	5.40
P-80	1.00	16.0	Ductile Iron	130.0	false	0.00	Open	3,199.98	540.01	540.00	0.01	5.43
P-81	2,380.00	12.0	PVC	150.0	false	0.00	Open	-1,231.25	533.15	540.00	6.85	2.88
P-82	1,620.00	12.0	PVC	150.0	false	0.00	Open	1,360.38	540.00	534.39	5.61	3.46
P-83	1.00	16.0	Ductile Iron	130.0	false	0.00	Open	2,591.63	540.00	540.00	3.66e-3	3.66

APPENDIX C

Ultimate Build-Out Water Facilities

TABLE 5.1u CITY OF PIPERTON				
Alternative 1 - Collierville Supplies North and South (Ultimate)				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
500,000-gallon Elevated Storage Tank	EA	1	$525,000	$ 525,000
750,000-gallon Elevated Storage Tank	EA	2	750,000	1,500,000
12-inch Ductile Iron Pipe	LF	103,400	27	2,791,800
Subtotal				$ 4,816,800
Wolf River Crossing				
16-inch Ductile Iron Pipe	LF	17,800	$ 38	$ 676,400
12-inch Ductile Iron Pipe Replacing Existing 6-inch PVC	LF	13,800	27	372,600
River Crossing - Directional Drill	LF	500	200	100,000
Booster Station (4.4 mgd), Building, and Controls	EA	1	352,000	352,000
Subtotal				$ 1,501,000
Southern Region				
1,000,000-gallon Elevated Storage Tank	EA	3	$1,000,000	$ 3,000,000
12-inch Ductile Iron Pipe	LF	66,500	27	1,795,500
12-inch Ductile Iron Replacing Existing 6-inch PVC	LF	17,400	27	469,800
16-inch Ductile Iron Replacing Existing 6-inch PVC	LF	3,800	38	144,400
Subtotal				$ 5,409,700
Estimated Construction Cost				$ 11,727,500
Construction Contingencies				1,759,100
Engineering, Legal, Administrative, Etc.				1,759,100
Land and Easements				57,300
Total Project Cost				$ 15,303,000
Annual Operation & Maintenance Costs				
Purchased Water				$ 2,233,800
Distribution System Maintenance				2,233,800
Depreciation				172,900
Total O&M Cost				$ 4,640,500

TABLE 5.2u CITY OF PIPERTON				
Alternative 2 - Collierville Supplies South, MLGW Supplies North (Ultimate)				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
500,000-gallon Elevated Storage Tank	EA	1	$525,000	$ 525,000
750,000-gallon Elevated Storage Tank	EA	2	750,000	1,500,000
12-inch Ductile Iron Pipe	LF	103,400	27	2,791,800
Subtotal				$ 4,816,800
Southern Region				
1,000,000-gallon Elevated Storage Tank	EA	3	$1,000,000	$ 3,000,000
12-inch Ductile Iron Pipe	LF	67,500	27	1,822,500
12-inch Ductile Iron Pipe Replacing Existing 6-inch PVC	LF	25,000	27	675,000
12-inch Ductile Iron Pipe Replacing Existing 6-inch PVC	LF	13,800	27	372,600
Subtotal				$ 5,870,100
Estimated Construction Cost				$ 10,686,900
Construction Contingencies				1,603,000
Engineering, Legal, Administrative, Etc.				1,603,000
Land and Easements				53,600
Total Project Cost				$ 13,946,500
Annual Operation & Maintenance Costs				
Purchased Water				$ 2,233,800
Distribution System Maintenance				2,233,800
Depreciation				157,100
Total O&M Cost				$ 4,624,700

TABLE 5.3u CITY OF PIPERTON				
Alternative 3 - Piperton Produces Water Using Two Treatment Systems (Ultimate)				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Alternative 2 Tank and Transmission Main Costs				
Total Alternative 2 Distribution System (from Table 5.2u)				$ 10,686,900
Additional Items - Northern Region				
High Service Wells and Raw Water Line (1.0 mgd)	EA	4	$ 350,000	$ 1,400,000
Treatment System (4 mgd)	EA	1	6,000,000	6,000,000
CT Tank (400,000 gallon)	EA	2	250,000	500,000
16-inch Ductile Iron Pipe	LF	1,000	38	38,000
Subtotal				$ 7,938,000
Additional Items - Southern Region				
High Service Wells and Raw Water Line (1.0 mgd)	EA	8	$ 350,000	$ 2,800,000
Treatment System (8 mgd)	EA	1	12,000,000	12,000,000
CT Tank (750,000 gallon)	EA	2	400,000	800,000
12-inch Ductile Iron Pipe Replacing Existing 6-inch PVC	LF	10,500	27	283,500
20-inch Ductile Iron Pipe	LF	1,000	50	50,000
Subtotal				$ 15,933,500
Additional Items Total				$ 23,871,500
Estimated Construction Cost				$ 34,558,400
Construction Contingencies				5,183,800
Engineering, Legal, Administrative, Etc.				5,183,800
Land and Easements				290,700
Total Project Cost				$ 45,216,700
Annual Operation & Maintenance Costs				
Water Production				$ 1,116,900
Distribution System Maintenance				2,233,800
Depreciation				730,300
Total O & M Cost				$ 4,081,000

APPENDIX D

Localized Wastewater Treatment Systems

LOCALIZED WASTEWATER SYSTEMS

Localized treatment units consist of wastewater collection systems and treatment units in individual drainage basins or subdivisions. Sizes of treatment units can range from those that are small enough to serve a few houses to those that serve hundreds of residences. Treatment units can discharge the effluent to surface or subsurface environments. Three types of localized treatment are described below.

Recirculating Sand Filters

There are numerous types of sand filters, including recirculating sand filters, trickling filters, modified trickling filters, etc. All of these filters operate in a similar manner. The wastewater flows into a settling tank to remove the heavy solids. The effluent is then sprayed or trickled over a porous media (i.e., sand). Biological mass attach to the media and remove the organic matter through aerobic decomposition. The wastewater is usually recirculated over the media numerous times to achieve the desired effluent. Other staging tanks can be installed for nitrogen removal. The final effluent is disinfected prior to discharge. A schematic of a typical recirculating sand filter is shown on Figure D-1.

Constructed Wetlands

Constructed wetlands are wastewater treatment systems consisting of shallow ponds or channels which have been planted with aquatic plants such as cattails, water lilies, common reed, and holly. Natural microbial, biological, physical, and chemical processes treat the wastewater as it flows through the lagoons.

The wastewater flows into a settling tank or lagoon to remove the solids. It then flows through either a free water surface or a porous media in a lined wetland. Plants, bacteria, algae, and other natural wetland organisms remove organic matter in the waste through anaerobic and aerobic decomposition. Nitrogen and phosphorous, common products in residential waste, are utilized during plant growth. The final effluent is disinfected prior to discharge. A schematic of a free water surface constructed wetland is shown on Figure D-2.

BioClere™

The BioClere™ wastewater treatment system uses a modular modified trickling filter over a clarifier. The system operates similarly to a sand filter, with the exception of prefabricated construction and the use of synthetic media. Untreated wastewater flows into a supply tank to remove the heavy solids. The effluent is then sprayed or trickled over the synthetic media biological mass. The bacteria attached to the media remove the organic matter through aerobic decomposition. Sludge that sloughs off the filters settles to the bottom and is pumped back into the septic tank. Other staging tanks can be installed for nitrogen removal. The final effluent is disinfected prior to discharge. A schematic of the BioClere™ system is shown on Figure D-3.

10:07:10
16 APR 101
c:\000122\figures.dgn

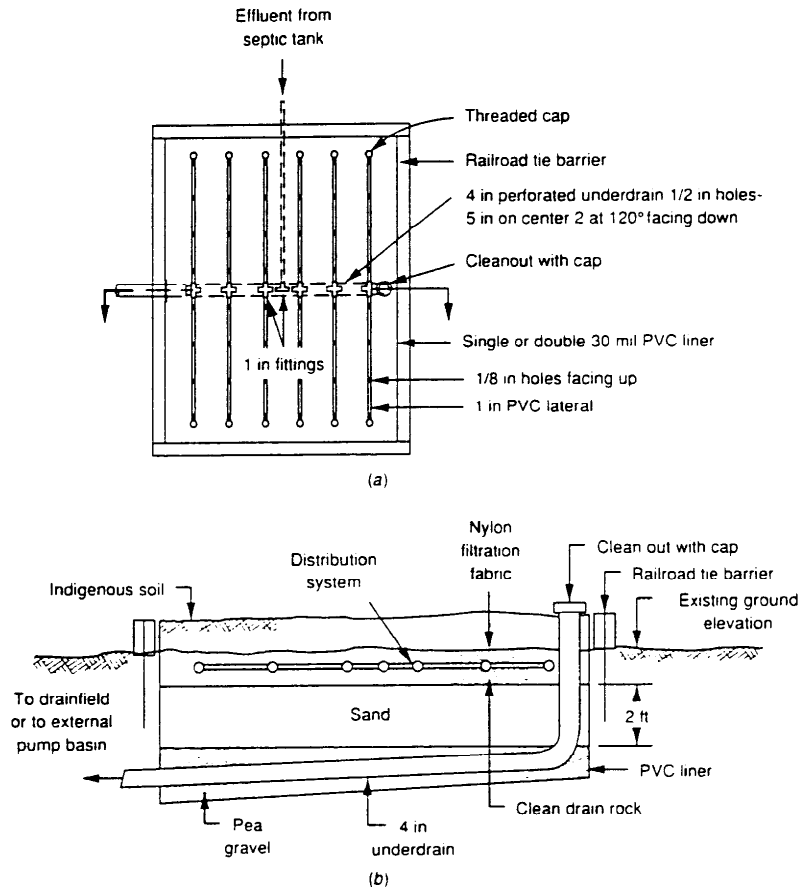


FIGURE 14-10
Typical schematic for an intermittent sand filter: (*a*) plan view and (*b*) section through filter.

SOURCE: " WASTEWATER ENGINEERING ", METCALF & EDDY, INC. 1991, PAGE 1036

WATER AND SEWER MASTER PLAN

FIGURE D-1

RECIRCULATING SAND FILTER

CITY OF PIPERTON | 00122

10:07:10
16 APR 101
c:\000122\figures.dgn

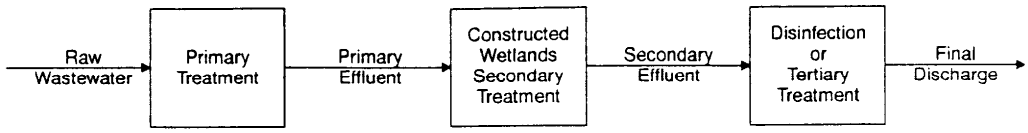


Figure 2-1. Constructed wetlands in wastewater treatment train

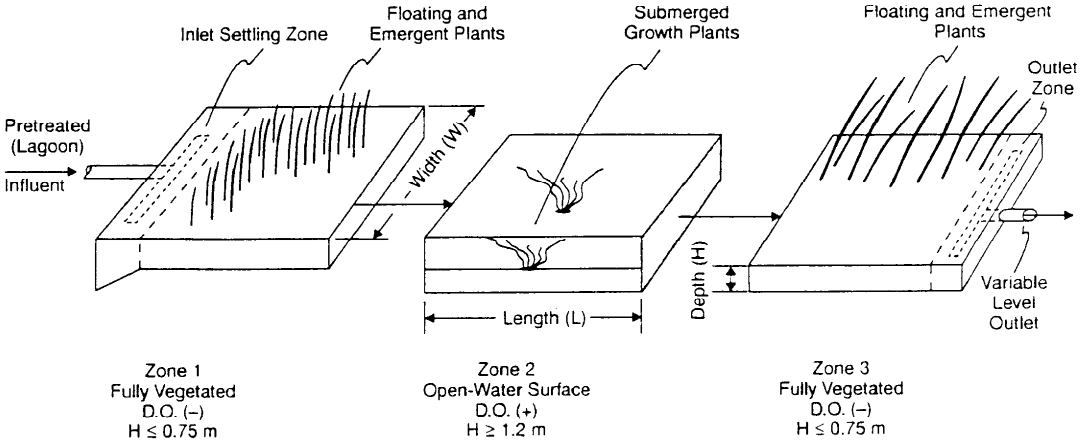


Figure 2-2. Elements of a free water surface (FWS) constructed wetland

SOURCE: " CONSTRUCTED WETLANDS TREATMENT OF MUNICIPAL WASTEWATERS "
U. S. EPA, 2000, PAGE 11

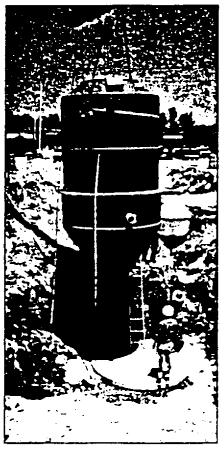
WATER AND SEWER MASTER PLAN

FIGURE D-2

CONSTRUCTED WETLAND

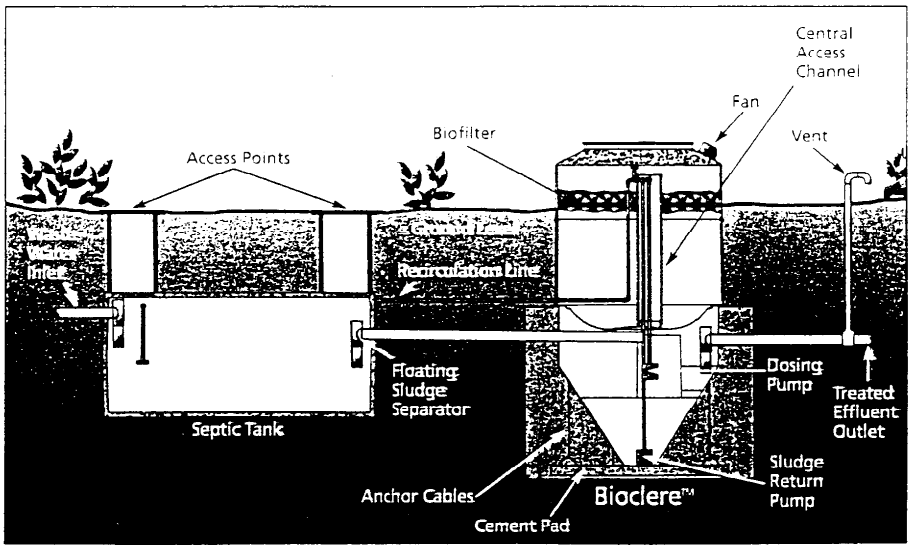
CITY OF PIPERTON | 00122

10:07:11
16 APR 101
c:\000122\figures.dgn



Summary of Bioclere Analytical Results Previously Tested to Criteria C-9 by National Sanitation Foundation

		Median	Average	Min.	Max.	Interquartile Range	
Temperature C	influent	13	13.2	10	17	11	14
	septic tank effluent	11	10.9	5	15	8	14
	effluent	11	11.4	5	16	3	14
pH	influent	7.5	7.6	7.3	7.9	7.5	7.7
	septic tank effluent	7.5	7.6	7.1	8.1	7.4	7.8
	effluent	8.0	7.9	7.4	8.5	7.8	8.1
Biochemical Oxygen Demand (mg/L)	influent	170	167	80	290	130	210
	septic tank effluent	73	74	44	100	62	86
	effluent	11	13	5	45	8	16
Suspended Solids (mg/L)	influent	120	141	54	720	97	160
	septic tank effluent	40	47	18	200	33	52
	effluent	13	17	5	50	8	24
Volatile Suspended Solids (mg/L)	influent	100	111	37	430	77	120
	septic tank effluent	32	37	13	160	26	42
	effluent	10	14	5	35	7	20
Dissolved Oxygen (mg/L)	effluent	5.6	5.9	3.4	10.2	4.7	6.5



SOURCE: AWT ENVIRONMENTAL, INC.
NEW BEDFORD, MA.

WATER AND SEWER MASTER PLAN

FIGURE D-3

BIOCLERE TM

CTi

CITY OF PIPERTON

00122

APPENDIX E

Ultimate Build-Out Sewer Facilities

TABLE 6.5u CITY OF PIPERTON				
Costs for Interceptor Sewers and Lift Stations Gravity Sewers (Ultimate)				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
10-inch PVC	LF	26,900	$ 32	$ 860,800
12-inch PVC	LF	20,600	35	721,000
15-inch PVC	LF	16,800	40	672,000
18-inch PVC	LF	6,000	49	294,000
21-inch PVC	LF	9,800	61	597,800
24-inch PVC	LF	2,300	75	172,500
Pump Stations (4)	LS	1	521,000	521,000
6-inch DIP Force Main	LF	13,800	19	262,200
8-inch DIP Force Main	LF	6,800	22	149,600
10-inch DIP Force Main	LF	12,500	38	475,000
Subtotal				$ 4,725,900
Southern Region				
10-inch PVC	LF	46,700	$ 32	$ 1,494,400
12-inch PVC	LF	4,900	35	171,500
15-inch PVC	LF	25,200	40	1,008,000
21-inch PVC	LF	27,700	75	2,077,500
Pump Stations (5)	LS	1	815,000	815,000
4-inch DIP Force Main	LF	3,800	15	57,000
6-inch DIP Force Main	LF	11,300	19	214,700
10-inch DIP Force Main	LF	14,700	38	558,600
Subtotal				$ 6,396,700
Total Construction Cost				$ 11,122,600
Construction Contingencies				1,668,400
Engineering, Legal, Administrative, Etc.				1,668,400
Land and Easements				359,700
Total Project Cost				$ 14,819,100

TABLE 6.8u CITY OF PIPERTON				
Alternative 1 - One Treatment Plant in South (Ultimate)				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
Interceptor Sewer and Lift Stations (from Table 6.5u)				$ 4,725,900
Wolf River Crossing				
Major Pumping Station (5 mgd)	EA	1	$525,000	$ 525,000
20-inch DIP Force Main	LF	17,500	50	875,000
Wolf River Crossing	LF	500	250	125,000
Subtotal				$ 1,525,000
Southern Region				
Interceptor Sewers and Lift Stations (from Table 6.5)				$ 6,395,700
South Treatment Plant (6.1 mgd)	LS	1	15,050,000	15,050,000
Estimated Construction Cost				27,696,600
Construction Contingencies				4,154,500
Engineering, Legal, Administrative, etc.				4,154,500
Land and Easements				486,500
Total Project Cost				$ 36,492,100
Annual O&M Costs				
Wastewater Treatment				$ 3,127,300
Transmission and Collection				1,340,300
Depreciation				530,700
Total O&M Cost				$ 4,998,300

TABLE 6.9u CITY OF PIPERTON				
Alternative 2 - Two Treatment Plants (Ultimate)				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
Interceptor Sewer and Lift Stations (from Table 6.5u)				$ 4,725,900
North Treatment Plant (2.2 mgd)	LS	1	3,800,000	3,800,000
Subtotal				$ 8,525,900
Southern Region				
Interceptor Sewers and Lift Stations (from Table 6.5u)				$ 6,395,700
South Treatment Plant (3.9 mgd)	LS	1	8,450,000	8,450,000
Subtotal				$ 14,845,700
Estimated Construction Cost				23,371,600
Construction Contingencies				3,505,700
Engineering, Legal, Administrative, Etc.				3,505,700
Land and Easements				499,700
Total Project Cost				$ 30,882,700
Annual O&M Costs				
Wastewater Treatment				$ 3,127,300
Transmission and Collection				1,340,300
Depreciation				437,600
Total O&M Cost				$ 4,905,200

APPENDIX F

Year 2020 Sewer Facilities with Collierville

TABLE 6.5C SOUTH

CITY OF PIPERTON

Costs for Interceptor Sewers and Lift Stations (with Collierville)

Item Description	Unit	Quantity	Unit Price	Cost
Northern Region				
10-inch PVC	LF	34,400	$ 32	$ 1,100,800
12-inch PVC	LF	25,000	35	875,000
15-inch PVC	LF	6,000	40	240,000
18-inch PVC	LF	9,800	49	480,200
21-inch PVC	LF	2,300	61	140,300
Pump Stations (4)	LS	1	365,000	365,000
6-inch DIP Force Main	LF	13,800	19	262,200
8-inch DIP Force Main	LF	6,800	22	149,600
10-inch DIP Force Main	LF	12,500	24	300,000
Subtotal				$ 3,913,100
Southern Region				
10-inch PVC	LF	35,700	$ 32	$ 1,142,400
12-inch PVC	LF	14,900	35	521,500
15-inch PVC	LF	15,200	40	608,000
18-inch PVC	LF	7,200	49	352,800
21-inch PVC	LF	5,500	61	335,500
Pump Stations (5)	LS	1	428,000	428,000
4-inch DIP Force Main	LF	8,000	15	120,000
6-inch DIP Force Main	LF	7,100	19	134,900
10-inch DIP Force Main	LF	5,000	24	120,000
20-inch DIP Force Main	LF	13,000	50	650,000
24-inch DIP Force Main	LF	9,700	65	630,500
Collierville Pump Station (6 mgd)	LS	1	630,000	630,000
Subtotal				$ 5,673,600
Total Construction Cost				$ 9,586,700
Construction Contingencies				1,438,000
Engineering, Legal, Administrative, Etc.				1,438,000
Land and Easements				335,600
Total Project Cost				$ 12,798,300

TABLE 6.9C SOUTH CITY OF PIPERTON				
Alternative 2 - Two Treatment Plants (with Collierville)				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
Interceptor Sewer and Lift Stations (from Table 6.5C)				$ 3,913,100
North Treatment Plant (1.3 mgd)	LS	1	2,450,000	2,450,000
Subtotal				$ 6,363,100
Southern Region				
Interceptor Sewers and Lift Stations (from Table 6.5C)				$ 5,673,600
South Treatment Plant (5.2 mgd)	LS	1	12,350,000	12,350,000
Subtotal				$ 18,023,600
Estimated Construction Cost				24,386,700
Construction Contingencies				3,658,000
Engineering, Legal, Administrative, Etc.				3,658,000
Land and Easements				465,600
Total Project Cost				$ 32,168,300
Annual O&M Costs				
Wastewater Treatment				$ 3,321,500
Transmission and Collection (Assumes Collierville pays its own pumping cost)				766,500
Depreciation				493,500
Total O&M Cost				$ 4,581,500

TABLE 6.5C NORTH

CITY OF PIPERTON

Costs for Interceptor Sewers and Lift Stations (with Collierville)

Item Description	Unit	Quantity	Unit Price	Cost
Northern Region				
10-inch PVC	LF	34,400	$ 32	$ 1,100,800
12-inch PVC	LF	25,000	35	875,000
15-inch PVC	LF	6,000	40	240,000
18-inch PVC	LF	9,800	49	480,200
21-inch PVC	LF	2,300	61	140,300
Pump Stations (4)	LS	1	365,000	365,000
6-inch DIP Force Main	LF	13,800	19	262,200
8-inch DIP Force Main	LF	6,800	22	149,600
10-inch DIP Force Main	LF	12,500	24	300,000
20-inch DIP Force Main	LF	23,000	50	1,150,000
Collierville Pump Station	LS	1	630,000	630,000
Subtotal				$ 5,693,100
Southern Region				
10-inch PVC	LF	35,700	$ 32	$ 1,142,400
12-inch PVC	LF	14,900	35	521,500
15-inch PVC	LF	15,200	40	608,000
18-inch PVC	LF	7,200	49	352,800
21-inch PVC	LF	5,500	61	335,500
Pump Stations (5)	LS	1	428,000	428,000
4-inch DIP Force Main	LF	8,000	15	120,000
6-inch DIP Force Main	LF	7,100	19	134,900
10-inch DIP Force Main	LF	14,700	24	352,800
Subtotal				$ 3,995,900
Total Construction Cost				$ 9,689,000
Construction Contingencies				1,453,400
Engineering, Legal, Administrative, Etc.				1,453,400
Land and Easements				349,100
Total Project Cost				$ 12,944,900

TABLE 6.9C NORTH CITY OF PIPERTON				
Alternative 2 - Two Treatment Plants (with Collierville)				
Capital Costs				
Item Description	**Unit**	**Quantity**	**Unit Price**	**Cost**
Northern Region				
Interceptor Sewer and Lift Stations (from Table 6.5C)				$ 5,693,100
North Treatment Plant (4.3 mgd)	LS	1	9,650,000	9,650,000
Subtotal				$ 15,343,100
Southern Region				
Interceptor Sewers and Lift Stations (from Table 6.5C)				$ 3,995,900
South Treatment Plant (2.2 mgd)	LS	1	3,800,000	3,800,000
Subtotal				$ 7,795,900
Estimated Construction Cost				23,139,000
Construction Contingencies				3,470,900
Engineering, Legal, Administrative, Etc.				3,470,900
Land and Easements				479,100
Total Project Cost				$ 30,559,900
Annual O&M Costs				
Wastewater Treatment				$ 3,321,500
Transmission and Collection (Assumes Collierville pays its own pumping cost)				766,500
Depreciation				460,900
Total O&M Cost				$ 4,548,900

APPENDIX G

Calculations for Preliminary Rates and Fees

CITY OF PIPERTON
WATER AND SEWER MASTER PLANNING STUDY

Tap Fee and Rate - Calculations

May 14, 2001

Customers/Acres:	8,333	units	Residential	300	gpd/unit	2,500,000	
	600	acres	Commercial	500	gpd/acre	300,000	
	700	acres	Industrial	1,000	gpd/acre	700,000	
					Total	3,500,000	gpd
Annual Usage:						1,277,500	1,000 gals/yr

Tap Fees are calculated on the basis of capital costs divided by the average daily flows plus the actual cost for the taps (assumed to be $500 each)

	Capital Cost	Impact Cost ($/1000 gals/yr)
Water	$13,251,700	$10.37
Sewer	$18,804,800	$14.72

			Water	Sewer	Round off to next 100	
Tap Fees by Category:	Residential	(unit)	$1,636	$2,112	$1,700	$2,200
	Commercial	(acre)	$2,393	$3,186	$2,400	$3,200
	Industrial	(acre)	$4,285	$5,873	$4,300	$5,900

Water and Sewer User Charge Rates are calculated on the basis of O & M costs divided by average daily flows after a reduction in costs for administrative/meter service is charged equitably to all customer classes

Connections:	8,333	Residential		
	60	Commercial	acres per connection:	10
	20	Industrial	acres per connection:	35
Total	8,413			

	O & M Cost	Admin %	Admin Cost	Admin Cost per Custo
Water	$2,695,800	22.5	$606,600	$6.01
Sewer	$2,802,300	27.5	$770,600	$7.63

	O & M Cost Remaining	Remaining Cost per 1
Water	$2,089,200	$1.64
Sewer	$2,031,700	$1.59

Calculate Water Rates (assumes 10% coverage)

Rate Blocks (as per existing Piperton rates) Round off

CITY OF PIPERTON
WATER AND SEWER MASTER PLANNING STUDY

Tap Fees and Rates - Summary

May 14, 2001

Water Fees*

	Tap Fee	
Residential	$1,700	(per unit or lot)
Commercial	$2,400	(per acre)
Industrial	$4,300	(per acre)

Water Rates**

Usage	Rate
0 - 3,000 gallons/month	$ 11.50 minimum bill
3,000 - 10,000 gallons/month	$2.00 per 1,000 gallons
10,000 - above	$1.80 per 1,000 gallons

Sewer Fees*

	Tap Fee	
Residential	$2,200	(per unit or lot)
Commercial	$3,200	(per acre)
Industrial	$5,900	(per acre)

Sewer Rates**

Usage	Rate
0 - 3,000 gallons/month	$12.90 minimum bill
3,000 - 10,000 gallons/month	$1.95 per 1,000 gallons
10,000 - above	$1.75 per 1,000 gallons

*For new developments, the actual installation and costs of same shall be paid by the developer or property owner.

**Does not include applicable taxes, deposits, etc.

00122.fee&rates.summary.wb3

CITY OF PIPERTON
WATER AND SEWER MASTER PLANNING STUDY

Capital Generation from Tap Fees

May 14, 2001

Connections:	233	Existing		
	8,100	Future Residential		
	60	Future Commer	600	acres
	20	Future Industria	700	acres
Total	8,413			

Water Fees

	Tap Fee	
Residential	$1,700	(per unit or lot)
Commercial	$2,400	(per acre)
Industrial	$4,300	(per acre)

Capital Generation from Water

	Tap Fee Generation*	Coverage
Existing Residential	$0	
Future Residential	$9,720,000	
Future Commercial	$1,140,000	
Future Industrial	$2,660,000	
Total	$13,520,000	
Total Water Capital Generation		2.0%

Sewer Fees

	Tap Fee	
Residential	$2,200	(per unit or lot)
Commercial	$3,200	(per acre)
Industrial	$5,900	(per acre)

Capital Generation from Sewer

	Tap Fee Generation*	Coverage
Existing Residential	$396,100	
Future Residential	$13,770,000	
Future Commercial	$1,620,000	
Future Industrial	$3,780,000	
Total	$19,566,100	
Total Sewer Capital Generation		4.0%

CITY OF PIPERTON
WATER AND SEWER MASTER PLANNING STUDY

Revenue Generation from User Charges

May 14, 2001

Connections:	8,333	Residential
	60	Commercial
	20	Industrial
Total	8,413	

Projected Usage:		Connections	Gals/Month	Total (1000 gals/yr)	
		2,400	6,400	184,320	
		2,648	8,600	273,274	
		1,683	16,000	323,136	
		1,682	24,500	494,508	
	Total	8,413	Total	1,275,238	(equals approximately 1,277,500)

Calculate Water Revenue

Rate Blocks			Revenue/Month	Revenue/Year	Coverage
0 - 3,000 gallons/month	$11.50	Flat Rate	$96,750	$1,160,994	
3,000 - 10,000 gallons/month	$2.00	Per 1000 Gal	$93,088	$1,117,051	
10,000 - above	$1.80	Per 1000 Gal	$62,077	$744,919	
		Total	$251,914	$3,022,964	12.1%

Calculate Sewer Revenue

Rate Blocks			Revenue/Month	Revenue/Year	
0 - 3,000 gallons/month	$12.90	Flat Rate	$108,528	$1,302,332	
3,000 - 10,000 gallons/month	$1.95	Per 1000 Gal	$90,760	$1,089,125	
10,000 - above	$1.75	Per 1000 Gal	$60,352	$724,227	
		Total	$259,640	$3,115,684	11.2%

Water Blocks

From (gal/mon)	To (gal/mon)
0	3000
3000	10000
10000	above

Sewer Blocks

From (gal/mon)	To (gal/mon)
0	3000
3000	10000
10000	above

CITY OF PIPERTON
WATER AND SEWER MASTER PLANNING STUDY

Tap Fee and Rate - Calculations (Water Treatment Option)

May 14, 2001

Customers/Acres:	8,333	units	Residential	300	gpd/unit	2,500,000	
	600	acres	Commercial	500	gpd/acre	300,000	
	700	acres	Industrial	1,000	gpd/acre	700,000	
					Total	3,500,000	gpd
Annual Usage:						1,277,500	1,000 gals/yr

Tap Fees are calculated on the basis of capital costs divided by the average daily flows plus the actual cost for the taps (assumed to be $500 each)

	Capital Cost	Impact Cost ($/1000 gals/yr)
Water	$26,318,900	$20.60
Sewer	$18,804,800	$14.72

			Water	Sewer	Round off to next 100	
Tap Fees by Category:	Residential	(unit)	$2,756	$2,112	$2,800	$2,200
	Commercial	(acre)	$4,260	$3,186	$4,300	$3,200
	Industrial	(acre)	$8,019	$5,873	$8,100	$5,900

Water and Sewer User Charge Rates are calculated on the basis of O & M costs divided by average daily flows after a reduction in costs for administrative/meter service is charged equitably to all customer classes

Connections:	8,333	Residential		
	60	Commercial	acres per connection:	10
	20	Industrial	acres per connection:	35
Total	8,413			

	O & M Cost	Admin %	Admin Cost	Admin Cost per Custo
Water	$2,312,000	22.5	$520,200	$5.15
Sewer	$2,802,300	27.5	$770,600	$7.63

	O & M Cost Remaining	Remaining Cost per 1
Water	$1,791,800	$1.40
Sewer	$2,031,700	$1.59

Calculate Water Rates (assumes 10% coverage)

Rate Blocks (as per existing Piperton rates) Round off

CITY OF PIPERTON
WATER AND SEWER MASTER PLANNING STUDY

Tap Fees and Rates - Summary (Water Treatment Option)

May 14, 2001

Water Fees*

	Tap Fee	
Residential	$2,800	(per unit or lot)
Commercial	$4,300	(per acre)
Industrial	$8,100	(per acre)

Water Rates**

Usage	Rate
0 - 3,000 gallons/month	$10.00 minimum bill
3,000 - 10,000 gallons/month	$1.75 per 1,000 gallons
10,000 - above	$1.55 per 1,000 gallons

Sewer Fees*

	Tap Fee	
Residential	$2,200	(per unit or lot)
Commercial	$3,200	(per acre)
Industrial	$5,900	(per acre)

Sewer Rates**

Usage	Rate
0 - 3,000 gallons/month	$12.90 minimum bill
3,000 - 10,000 gallons/month	$1.95 per 1,000 gallons
10,000 - above	$1.75 per 1,000 gallons

*For new developments, the actual installation and costs of same shall be paid by the developer or property owner.

**Does not include applicable taxes, deposits, etc.

00122.fee&rates.summary.treat.wb3

APPENDIX H

Potential Funding Sources

CONTACT

MUNICIPAL BONDS

Private financial institutions are a traditional source of funding for municipal public works.

Go to a local financial institution with public finance expertise. Look for a full-service institution that can:

- analyze a local government's current financial condition and develop projections of future performance;
- develop capital facilities plans and assess current needs;
- prepare detailed plans for debt issues and coordinate timing with project requirements;
- help select bond counsel and prepare notices, resolutions, and other documentation;
- prepare and arrange printing of preliminary and final official statements;
- analyze need for and assist with bond insurance, letter of credit, or other credit enhancements;
- make presentations to rating agencies or bond insurers;
- give advice on selecting a financial institution to act as registrar, paying agent, or trustee;
- choose proper timing of bond sale, prepare the advertisement, and distribute official statements to prospective investors;
- arrange printing, proof of authenticity, and delivering bonds at closing;
- assist the issuer and bond counsel;
- advise issuer on the best investment plan for bond proceeds and help with arbitrage situations; and
- assist the issuer with post-issue financial reporting that meets state and federal regulations.

The various types of municipal bonds include: general obligation bonds, special tax bonds and special assessments, revenue bonds, industrial revenue bonds, and double-barrel bonds. General obligation bonds are backed by the full faith and credit of the municipality. The municipality pledges its full taxing authority as security for payment of the loan. Special tax bonds and assessments are secured by special taxes created specifically to pay off the bond. Revenue bonds are payable from receipts from specific sources, such as water sales or wastewater service revenues. Industrial revenue bonds finance building an industrial facility to be leased to an industry. The lease payments are pledged to pay off the bond. A double-barrel bond is backed by collateral from at least two sources. For example, revenues from water sales and the full taxing authority of the municipality could be pledged as security for a double-barrel bond.

WHO QUALIFIES?	Any local government authorized to incur debt. Local governments should generally consider using bond issues for large, long-term debt that is more than $1 million and longer than 12 years. Applicants must be credit-worthy or insurable. In other words, they must be ratable by a recognized rating agency such as Moody's or Standard and Poor's.
HOW ARE THE FUNDS USED?	Bonds are an unlimited source of money. The local government determines the maximum amount of the bonds. They sometimes complement funding from other sources, particularly grant funding.
WHAT ARE THE TERMS?	Interest rates vary. Applicants must be aware of the federal tax laws' effects on bond issues. Applicants should consider the costs associated with issuing bonds, such as legal, insurance, publications and advertising notices, printing, rating agency, bond registration, and financial advice. These costs are usually 1 percent to 3 percent of the bond issue. The borrower can lower the interest rate by reducing the amount borrowed, shortening the payback period, taking advantage of arbitrage allowed by federal tax laws, and enhancing credit worthiness. It is advisable to seek legal and financial advice on arbitrage and insurance. It takes about six weeks to issue bonds for a local government that has been through the process before and has established credit. If the local government has not issued bonds previously, the process takes eight weeks to six months. It is important to involve a financial advisor early in the process. Pitfalls local governments face in issuing bonds include: (1) user rates that are insufficient to cover debt service, (2) costs incurred on the project before the bonds are issued may not be covered, (3) inaccurate record keeping during the project, and (4) using bond money for other than the stated purpose.

HOW TO APPLY	Use the following selection steps to choose a full-service financial institution to assist in all phases of issuing municipal bonds. $ Study project details. Define the project and think through time and budget constraints. $ Solicit information. Begin the selection process with an invitation to submit information. $ Think expertise, not cost. Base financial services on competence, creativity, and performance first. Weigh cost second. $ Review qualifications. Consider technical expertise, experience with similar projects, reputation with existing clients, workload, and factors peculiar to your project. $ Narrow the field. Short list the few most qualified firms and schedule separate presentations. $ Hear presentations. Select a committee or convene the entire council to hear presentations from each firm. $ Rank the institutions. After the presentations, list the firms in order of preference. It's helpful to use prepared score sheets. $ Negotiate. Begin with the top-ranked institution. If negotiations fall apart, go on to the second firm and so forth. Define the scope of the work and the fee. $ Put the agreement in writing.
WHEN TO APPLY	Application may be made any time of the year.

RURAL DEVELOPMENT ADMINISTRATION (Formerly Farmers Home Administration)

Rural Development is a mission area of the U.S. Department of Agriculture and includes three agencies: Rural Business-Cooperative Service (RBS), Rural Housing Service (RHS), and Rural Utilities Service (RUS). Rural Development programs were formerly operated by the Farmers Home Administration. Since each agency does not have a field structure in place, Rural Development continues to administer the programs at the local level. RUS loans and grants for community, water, and waste disposal facilities are managed by nine Rural Development area offices in Tennessee.

CONTACT

Director, Rural Utilities Service
USDA Rural Development
3322 West End Avenue, Suite 300
Nashville, Tennessee 37203-1084
Phone: (615) 783-1345
Fax: (615) 783-1301
or
Rural Utilities Service
Rural Development
U.S. Department of Agriculture
Washington, D.C. 20250

WATER AND WASTE DISPOSAL LOANS AND GRANTS

WHO QUALIFIES?

Municipalities, counties, utility districts, and local nonprofit corporations.

RUS water and waste disposal loans and grants are for rural areas in municipalities with less than 10,000 population.

Priority consideration goes to projects serving areas with fewer than 5,500 people.

Applicants must be: (1) unable to secure funds from other sources at reasonable rates and terms, (2) legally able to borrow and repay, pledge security for loans, and operate and maintain facilities, and (3) financially sound and able to manage the facility effectively. The applicant's financial soundness must be based on taxes, assessments, revenues, fees, or other satisfactory sources of income to pay all costs associated with the facility.

HOW ARE THE FUNDS USED?

To construct, repair, improve, expand, and modify rural water supply and distribution facilities, wastewater collection and treatment facilities, and solid waste disposal systems.

	To acquire a water supply or water right associated with facilities development. To pay legal, engineering, and other costs associated with facilities development. To finance facilities in conjunction with funds from other sources. To cover costs resulting from natural disasters. Grants are available for up to 75 percent of the facility development costs.
WHAT ARE THE TERMS?	Loan rates vary, depending on market rate, the community's income level, and public health problems. Interest rates are lower for an applicant with an income below 80 percent of the State Nonmetropolitan Median Household Income and in violation of a health regulation. The loan is for a maximum of 40 years or the useful life of the facility, whichever is shorter.
HOW TO APPLY	Contact the Rural Development area office, where staff members make preliminary determinations regarding engineering feasibility and economic soundness.
WHEN TO APPLY	Application may be made any time of the year.
IS TECHNICAL ASSISTANCE AVAILABLE?	Yes. If the project is viable for Rural Development participation, staff members help prepare the application. If Rural Development provides financial assistance, agency personnel make periodic oversight inspections.
	EMERGENCY COMMUNITY WATER ASSISTANCE GRANTS
WHO QUALIFIES?	Rural areas, cities, or towns with fewer than 10,000 people. The median household income in rural areas can't exceed 100 percent of the State Nonmetropolitan Median Household Income.
HOW ARE THE FUNDS USED?	To assist rural communities that have experienced a significant decline in the quantity or quality of drinking water. To cover costs resulting from natural disasters in rural areas, cities, or towns with fewer than 10,000 people. The funds are very limited.

TENNESSEE DEPARTMENT OF ECONOMIC AND COMMUNITY DEVELOPMENT

CONTACT

Office of Program Management
Tennessee Department of Economic and Community Development
Rachel Jackson State Office Building
320 Sixth Avenue North, Sixth Floor
Nashville, Tennessee 37243-0405
Phone: (615) 741-6201
Fax: (615) 741-5070

APPALACHIAN REGIONAL COMMISSION PROGRAM

WHO QUALIFIES?

The Appalachian Regional Commission Program (ARC) is administered through the Tennessee Department of Economic and Community Development (TDECD). The program's mission is to improve water and wastewater services, increase jobs, enhance education, and improve living conditions in the Appalachian Mountains through grants from the Area Development Program and the Distressed Counties Program.

The 50 Appalachian counties: Anderson, Bledsoe, Blount, Bradley, Campbell, Cannon, Carter, Claiborne, Clay, Cocke, Coffee, Cumberland, DeKalb, Fentress, Franklin, Grainger, Greene, Grundy, Hamblen, Hamilton, Hancock, Hawkins, Jackson, Jefferson, Johnson, Knox, Loudon, McMinn, Macon, Marion, Meigs, Monroe, Morgan, Overton, Pickett, Polk, Putnam, Rhea, Roane, Scott, Sequatchie, Sevier, Smith, Sullivan, Unicoi, Union, Van Buren, Warren, Washington, and White.

Counties receive one of the following designations: (1) attainment, (2) competitive, (3) distressed, or (4) regular. "Attainment" counties are not eligible for regional grants if they are the focus of a regional project serving other counties that are not attainment-designated. Hamilton County is an attainment county. "Competitive" counties are eligible for 30 percent grants. Blount County is a competitive county. "Distressed" counties are eligible for up to 80 percent funding. Campbell, Clay, Cocke, Fentress, Grundy, Hancock, Johnson, Meigs, Pickett, and Scott are distressed counties. The remaining Tennessee counties are "regular" counties. They are eligible for grant rates between 30 percent and 80 percent. The state decides — with ARC approval — which rate will apply.

HOW ARE THE FUNDS USED?	Funds may be used for infrastructure projects (water and wastewater), basic skills development, job-training programs, and enterprise development programs.
WHAT ARE THE TERMS?	The ability-to-pay index applies. The index is based on the local government's per capita income, taxable sales, and taxable property values. Eighty percent of the total costs can be federally funded.
HOW TO APPLY	Call TDECD at (615) 741-6201.
WHEN TO APPLY	Application may be made in the fall of each year.
IS TECHNICAL ASSISTANCE AVAILABLE?	Yes.
	COMMUNITY DEVELOPMENT BLOCK GRANTS The Community Development Block Grant (CDBG) Program is federally funded. Eleven cities and three counties in Tennessee receive CDBG funds directly from the federal government. Other Tennessee cities and counties may receive CDBG funds administered by the Tennessee Department of Economic and Community Development. Grants are for community livability, water/wastewater, and housing/neighborhood revitalization projects.
WHO QUALIFIES?	All city and county governments in Tennessee qualify, except municipalities with more than 50,000 people. (They receive funds directly from the federal government.) CDBG funds must: (1) benefit low- and moderate-income persons, (2) eliminate or prevent slums and blight, or (3) eliminate conditions that are detrimental to health, safety, or the public's welfare. Project selection criteria are objective and quantitative. They are based on community need for the project, feasibility, and community economic level.
HOW ARE THE FUNDS USED?	To construct, improve, and extend water, wastewater, and solid waste facilities. To provide community development services. To rehabilitate housing and revitalize neighborhoods.

WHAT ARE THE TERMS?	The level of CDBG assistance is limited by the community's ability to pay. Maximum grants are $300,000 for community livability projects and $500,000 for water/wastewater and housing rehabilitation/neighborhood revitalization projects. Grants to one applicant cannot exceed $750,000 for two successive years.
HOW TO APPLY	Obtain application forms from the program manager. The application requires a project description, financial information, federal compliance information, and engineering information. Seek help from the CDBG Program management staff, the local development district office, and your consulting engineer when completing the application.
WHEN TO APPLY	Applications are due by the annual date set by the program manager.
IS TECHNICAL ASSISTANCE AVAILABLE?	Yes, with preparing applications and administering grants.
	TENNESSEE INDUSTRIAL INFRASTRUCTURE PROGRAM In 1988, the Tennessee General Assembly appropriated $50 million to the Tennessee Department of Economic and Community Development (TDECD) for the Tennessee Industrial Infrastructure Program (TIIP). The General Assembly added $13 million for fiscal year 1993-1994. These funds are for grants and loans to local governments and businesses for job creation or retention.
WHO QUALIFIES?	County governments, municipal governments, and utility districts.
HOW ARE THE FUNDS USED?	For infrastructure improvements and job-specific training. For activities normally provided by local governments and for eligible businesses locating, expanding, or operating in Tennessee. These activities include: water systems, wastewater systems, transportation systems, site improvements, electrical and natural gas systems, and other improvements to physical infrastructure. Funds cannot be used for speculative projects. Their use requires a commitment by new businesses to locate or existing businesses to expand in Tennessee. Other economic activities may be supported by TIIP funds if the TDECD commissioner determines they have a beneficial impact on Tennessee's economy.

WHAT ARE THE TERMS?	Grant rates for TIIP are based on the ability-to-pay index used for municipal and county governments. The index is based on the local government's per capita income, taxable sales, and taxable property values. Grant rates range from 60 percent to 100 percent. The maximum TIIP grant is $1 million, except grants for site preparation. They are limited to $100,000. The grant amount for architect and engineering services varies depending on the type of project. Each project must be ready to start within six months of grant approval.
HOW TO APPLY	Ask the program manager for an application. It requires community information, business information, a statement of how the project will impact the community, a preliminary engineering report, and evidence that non-TIIP funding is or will soon be in place. Applications are reviewed in two phases. Phase 1 concentrates on the physical improvements and a project's purpose, design, and cost-effectiveness. TDECD will send copies of the application to the responsible state agency. For example, the Tennessee Department of Environment and Conservation receives copies of applications for water and wastewater projects, and applications for transportation improvement projects go to the Tennessee Department of Transportation. Other projects are reviewed for physical improvements by TDECD staff personnel. Phase 2 focuses on the impacted business. Specifically, Phase 2 covers the business' management capability and commitment to a project, cash-flow status, sales projections, and industry trends. Following Phases 1 and 2, staff recommendations are submitted to the TDECD Loan Committee for review and discussion. The ultimate responsibility for approving or disapproving the grant rests with the TDECD commissioner.
WHEN TO APPLY	Application may be made any time of the year.
IS TECHNICAL ASSISTANCE AVAILABLE?	Yes. Technical assistance is available through public hearings, workshops, and pre-application meetings.

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

DIVISION OF COMMUNITY ASSISTANCE

CONTACT

Tennessee Department of Environment and Conservation
Division of Community Assistance
Life & Casualty Tower
401 Church Street, Eighth Floor
Nashville, Tennessee 37243-1533
Phone: (615) 532-0445
Fax: (615) 532-0199
E-mail: jdunlap@mail.state.tn.us

TENNESSEE STATE REVOLVING FUND

The Tennessee State Revolving Fund (SRF) is sponsored by the federal and state governments. The U.S. Environmental Protection Agency (EPA) awards grants to establish the fund and the state provides a 20 percent matching grant. The SRF provides low-cost loans to local governments for water and wastewater facilities only.

WHO QUALIFIES?

The Tennessee Department of Environment and Conservation's Division of Community Assistance (DCA) maintains numerical listings by priority points for both water and wastewater facility projects. Municipalities, counties, and utility districts on the state water and wastewater priority ranking lists are eligible for loans.

Applicants must:

- pledge security for repayment of loans,
- agree to adjust user fees as needed to cover repayments,
- vow to maintain financial records that follow governmental accounting standards, and
- provide other requested assurances.

HOW ARE THE FUNDS USED?

To plan, design, and construct water and wastewater facilities and buy equipment. Projects may be water and wastewater treatment plants, pump stations, water distribution lines, collector wastewater lines, interceptors, water or wastewater line replacements, water or wastewater line repairs, and remedies for nonpoint source pollution problems.

WHAT ARE THE TERMS?	**Wastewater** Priority goes to wastewater projects in order of ranking on the state wastewater priority list. During the first quarter of the state fiscal year, DCA funds ready-to-go projects in priority order. After the first quarter, loans may be made to any local government on the priority list. **Water** Prior to the EPA grant application process, DCA solicits projects for the water priority list. Projects are listed in order of public health need. The water projects are then included in the DCA's "intended use plan," and they go through a public comment period before the list is finalized. Officials seeking funds for the highest-ranking projects are notified and given 120 days to complete the application process. If project officials do not respond within 120 days, DCA will notify submitters of the next highest-ranking projects until funds are obligated. For both water and wastewater projects, interest rates range from 0 percent to market rate, depending on the community's per capita income, taxable sales, and taxable property values. Most borrowers qualify for interest rates between 2 percent and 4 percent. Rates are fixed for the life of the loan. The maximum loan term is 20 years or the design life of the facility, whichever is shorter.
HOW TO APPLY	Contact the DCA office at (615) 532-0445 for application packages, which include the application form, loan agreement, financial statement forms, and forms for user charge information. Loans are recommended for approval by DCA to the Tennessee Local Development Authority Board. Since federal funds are used, facility planning documents, environmental review, project inspection, and opportunities for minority business participation are required. For wastewater projects, a wastewater use ordinance is necessary.
WHEN TO APPLY	Wastewater projects: Applications may be made any time. Water projects: Applications are solicited by DCA.
IS TECHNICAL ASSISTANCE AVAILABLE?	Yes. Contact DCA or your Municipal Technical Advisory Service (MTAS) consultant for assistance.

TENNESSEE LOCAL DEVELOPMENT AUTHORITY LOAN PROGRAM

In 1978, state lawmakers established the Tennessee Local Development Authority (TLDA) Loan Program primarily to make loans to local governments for water, wastewater, and solid waste projects. Loans also can be secured for purposes such as airports, capital projects, and rural firefighting equipment. In 1990, the law was amended to let TLDA issue bonds and make the proceeds available for loans to local governments for other capital projects.

CONTACT

Tennessee Local Development Authority
Division of Bond Finance
James K. Polk Building
505 Deaderick Street, 16th Floor
Nashville, Tennessee 37243-0273
Phone: (615) 741-4272
Fax: (615) 741-5986

WHO QUALIFIES?

County governments, metropolitan governments, incorporated towns or cities, and any special districts may borrow money from TLDA for water, wastewater, solid waste, and other capital improvements.

HOW ARE THE FUNDS USED?

For water, wastewater, and solid waste projects approved by the Tennessee Department of Environment and Conservation (TDEC).

For other capital projects approved by other state agencies before final TLDA processing.

WHAT ARE THE TERMS?

The local government must adopt user rates to cover all costs of operation and maintenance, including debt service and depreciation.

The local government must authorize the loan and pledge taxes to back the loan in case of deficiency.

The loan must be backed by sufficient state-shared taxes and reserve funds set aside by the borrower.

Monthly payments are required. Interest only is required during construction. Principal repayment begins when the project is operational or when 90 percent of the construction cost is depleted, whichever occurs first.

The loan period is 30 years or the useful life of the project, whichever is less.

The interest rate prior to issuing the bond varies. For the past several years,

	funding for this program has been based on one-year notes. Since the interest rate to the borrower is based on the interest rate of the notes, it can fluctuate from year to year. The cost of issuing the bond is about 2 percent. A reserve fund is required. The local government can prepay a TLDA loan before issuing the bond, but it cannot prepay after TLDA issues the bond.
HOW TO APPLY	Submit water, wastewater, and solid waste projects to TDEC for approval. Turn in other types of projects to the appropriate state agency for consideration. TDEC (or an appropriate state agency for projects other than water, wastewater, or solid waste) notifies TLDA of technical feasibility and the local government's interest in a TLDA loan. TLDA contacts the local government for financial information. A meeting may be necessary. The local government completes TLDA's loan application and passes a resolution authorizing the loan request. After approval by TDEC, the loan package is reviewed by the Division of Bond Finance and is then presented to the TLDA Board at a public meeting. After TLDA Board approval, the loan is sent to the Tennessee attorney general for approval. During construction, pay requests from the local government are sent to the state agency that originally approved the project (i.e., to TDEC for water, wastewater, and solid waste projects). The agency reviews and certifies payment requests to the Division of Bond Finance. Loan repayments are sent to that division from the local government.
WHEN TO APPLY	Application may be made any time of the year.
IS TECHNICAL ASSISTANCE AVAILABLE?	No.

TENNESSEE MUNICIPAL BOND FUND

The Tennessee Municipal League (TML) is composed of Tennessee cities and professional staff. One of the League's entities is the Tennessee Municipal Bond Fund (TMBF), which provides member municipalities with low-interest programs for financing capital project needs.

CONTACT

Tennessee Municipal Bond Fund
226 Capitol Boulevard, Suite 502
Nashville, Tennessee 37219
Phone: (615) 255-1561
Fax: (615) 255-7428

ALTERNATIVE LOAN PROGRAM

The Alternative Loan Program (ALP) is a special financing arrangement established by TMBF to purchase capital outlay notes. The program was developed to assist TML member cities whose financing needs do not fit other TMBF loan programs.

WHO QUALIFIES?

TML member cities.

HOW ARE THE FUNDS USED?

A wide variety of public projects is eligible for financing through the ALP. Those projects include, but are not limited to:

- water plants and water lines;
- wastewater treatment plants and sewer facilities;
- school construction and renovations;
- street and road paving;
- public building construction, expansion, renovation, and improvement;
- equipment purchases, such as firetrucks, sanitation trucks.and landfill and road material; and
- any public-purpose project that qualifies for tax-exempt financing.

WHAT ARE THE TERMS?

Although loans of any size will be considered, those under $1 million are particularly well-suited for the ALP because they are not as time-consuming or costly as bond financing. However, larger requests are frequently received.

The maximum repayment period is 12 years.

The program offers both fixed and variable rate loans.

	There is no application fee. If an application results in a loan closing, there is a legal fee for processing loan documents. This fee usually runs between $500 and $1,000.
HOW TO APPLY	Application processing time is one to two weeks.
WHEN TO APPLY	Contact the TMBF office at (615) 255-1561.
	Application may be made any time of the year.
IS TECHNICAL ASSISTANCE AVAILABLE?	Yes. TMBF offers a complete, detailed, financial advisory service for member cities.
	VARIABLE RATE LOAN POOLED PROGRAM
WHO QUALIFIES?	TML member cities.
HOW ARE THE FUNDS USED?	For any capital project eligible for tax-exempt financing.
	The loan term is subject to the project's life expectancy.
WHAT ARE THE TERMS?	The tax-exempt, variable rate is re-marketed every seven days. The rate generally ranges from 3.25 percent to 4.25 percent. Borrowers have the option of an interest rate cap or ceiling.
	There is a minimum loan amount of about $1 million.
	Closing costs are nominal and considerably less than comparable bond issues.
	At closing, borrowers execute a loan agreement for the amount of funds requested. Borrowers typically have up to 36 months to withdraw funds. Interest is paid only on the withdrawn amount.
	Completing a loan usually takes three to five weeks.
	Loans are prepayable any time with no prepayment penalty.
HOW TO APPLY	Contact the TMBF office at (615) 255-1561.
	Submit an application, annual financial reports for the last three years, and the city's current yearly budget.
WHEN TO APPLY	Application may be made any time of the year.
IS TECHNICAL ASSISTANCE AVAILABLE?	Yes. TMBF offers a complete, detailed, financial advisory service for member cities needing assistance.