

I. Executive Summary

This study was authorized on December 19, 2012 by the Franklin Engineering Department in order to evaluate and update the expected sewer demand in the West, Mayes Creek and Watson Branch Basins. This evaluation uses data from 2011 Development Report that was compiled by the Department of Planning and Sustainability, information provided by the Engineering Department, and as-built drawings from the Water Management Department. This information was implemented to produce expected sewer flows from the West Basin, Mayes Creek Basin, and Watson Branch Basin. The findings, conclusions and recommendations for the Mayes Creek Drainage Basin are detailed in the following report.

II. Mayes Creek Drainage Basin

i. Description

The Mayes Creek Drainage Basin is located on the eastern side of the City of Franklin, Tennessee. The northern boundary of the basin is a line that extends generally from the southern City limits of Brentwood and east to the Burke Hollow Road Area. The eastern boundary of the basin is, generally, a northeast to southwest line that follows the ridge between Burke Hollow Road and Osburn Road towards the Millview Community area. The western boundary is a line that extends from near the intersection of Wilson Pike and Liberty Pike southwest to the Millview Community. The remainder of the southern boundary of the basin is the Harpeth River. The basin is generally located east of Interstate 65, with

the major portion north of Murfreesboro Road. The basin is comprised of approximately 9,849 acres, of which 7,563 acres are undeveloped. There are currently 1,277 existing developed lots with approximately 250 additional lots approved. An additional 1,035 residential units, 75,000 SF of retail space, and 100 assisted living units are not approved by the City but planned for the basin. It is anticipated the population in the fully developed basin will reach 32,344 residents.

The basin is divided into 7 distinct sub-basins based on natural drainage patterns. Basin 6 is further divided by the current location of the Franklin Urban Growth Boundary (UGB). Basins 1 through 5 lie totally within the current Franklin UGB and represent approximately 5,213 acres of the greater basin. Basin 6, divided by the current UGB, includes 381 acres inside the UGB and 1,144 acres outside the UGB. Basins 7A through 7F are located totally outside the Franklin UGB and include approximately 3,110 acres. With the exception of two subdivisions in the central portion and a few areas of scattered residential development, the basin is characterized by rural residential development and agricultural use. The northern part of the Mayes Creek Basin, specifically McKays Mill and Breezeway subdivisions, currently offer sanitary gravity sewer service to residents. These areas then pump to the Spencer Creek Drainage Basin by way of the South Prong of Spencer Creek Interceptor Sewer. The rest of the basin does not presently offer gravity sewer service. Small pockets of commercial development exist, but are not significant at this time. The location and boundaries of the study basin are shown graphically in Exhibit A.

ii. Development of Sanitary Sewer Flows

a. Rationale

The same rationale that was used for the West and Southwest No. 1 Basins was also used to determine land use within the Mayes Creek Basin. The included Figure 1 lists the various areas delineated within the sub-basins of the Mayes Creek Basin. Existing information from the 2006 Mayes Creek Drainage Basin Study and the 2011 Development Report was utilized to determine land use within the Basin.

Each sub-basin was evaluated in terms of land use, and in the majority of cases, the actual number of units proposed for specific properties were used to derive an amount of commercial space, or quantity of residential units that are currently planned for the basins. Franklin Planning Department estimates and projections were used to identify the type and extent of future development for properties where no submittals have been made to the Planning Commission, but for which a land use has been designated.

FIGURE 1 – MAYES CREEK DRAINAGE BASIN - LAND USE					
Sub-basin	Total Acres	Undeveloped Acres	Existing Lots	Proposed Lots	Retail Space (sq. ft.)
	(acres)	(acres)	(# units)	(# units)	(sq. ft.)
1	726	557	94	93	37,500
2	531	504	30	0	0
3	1,593	1,155	749*	385	37,500
4	630	473	38	645	0

5	1,733	1,175	157	262	0
6	1,525	1,315	56	0	0
7	3,111	2,722	153	0	0
Totals	9,489	7,563	1,277	1,385	75,000

**Includes 635 homes that flow to McKay's Mill Pump Station and then pump to Spencer Creek Drainage Basin*

The State of Tennessee Sewage Works Design Manual provides guidance for incremental flow for various land uses. They are listed in Figure 2 below.

FIGURE 2 – INCREMENTAL FLOW VALUES for VARIOUS LAND USE	
<u>Land Use</u>	<u>Incremental Flow</u>
Single Family Residence	350 gpd
Condominium/Apartment	250 gpd
Retail	0.15 gpd/sf
Office	0.10 gpd/sf

Areas inside the flood plain are considered unbuildable and were excluded from this study. A maximum of 2.5 units per acre was used for single family units unless the area has previously been zoned at a higher density. Average projected flows from each sub-basin are calculated from the general information presented in Figures 1 and 2 above. Sanitary sewer lines must be designed for the maximum flow that will be encountered in a given area within the drainage basin. Peaking factors are applied that allow for the differences in average daily flow and instantaneous sewer flow. These factors vary according to the number of people in the sub-area contributing to the flow. The following peaking

factors listed in Figure 3 are taken from ASCE “Sewer Design & Construction Manuals and Reports on Engineering Practice” and are used in this report.

FIGURE 3 – POPULATION PEAKING FACTORS	
<u>Tributary Population</u>	<u>Peaking Factor</u>
0 – 500	5
500 – 1,000	4
1,000 +	3.25

b. Projected Flows

Figure 4 represents an overview of the entire known development plan for the Mayes Creek Drainage Basin. A more detailed analysis of the information contained in Figure 1 and Figure 4 is presented in Table 1 – Development of Sanitary Sewer Flows in the Appendix to this study. Table 1 contains projected flows associated with each sub-basin. The information shown in Table 1 is based on information from the 2011 Development Report, counts of actual properties on which homes have been built, or field investigations and scaled roof areas calculated from existing aerial surveys. Incremental flows and peaking factors were applied to arrive at an estimated flow for each area. At the request of the City of Franklin, homes flowing to the McKay’s Mill #1 Pump Station and Breezeway Pump Stations were included in this basin study.

The calculations included in Table 1 project numbers of future residential units and commercial development areas and sewage flow from each sub-basin attributable to the proposed development. A majority of the information includes plan submittals for specific

proposed developments, while other information was derived from population densities. A value of 2.55 residential units per acre, as reported in recent U.S. census data for the City, and a floor area ration (F.A.R) of 0.28 to 1 were used to develop the amount of residential units and commercial floor space. A maximum of 2.5 units per acre was used for single family units inside the City’s Urban Growth Boundary (UGB). 1.13 units per acre was used for single family units outside the UGB.

FIGURE 4 – MAYES CREEK LAND USE and FLOW RESULTS	
<u>Description</u>	<u>Basin Projections</u>
Total Acreage	9,489 acres
No. of Existing Residential Units	1,277 units
No. of Projected Residential Units	12,684 units
Proposed SF of Commercial Space	75,000 sq. ft.
Population	32,344
Average Daily Sewage Flow	4.451 mgd
Peak Sewage Flow	14.522 mgd

Average daily sanitary sewer flow for the Mayes Creek Drainage Basin is expected to average 4.451 million gallons per day (mgd) with peaks of 14.522 mgd within the 20-year study period.

iii. Proposed Sanitary Sewers

Previous sections have provided a rationale for and projections of sewer flows from the study basin. With the flows from each sub-basin defined, proposed sanitary sewer lines can be routed in general locations to serve

the areas that are expected to contribute to future flow from the area. Exhibit B provides a general framework for serving the study basin and forms the basis for a recommendation from this study for building a conceptual framework for providing sanitary sewer service for the Mayes Creek Drainage Basin. Lines are located along drainage routes from each sub-area and are sized for the flows calculated in Table 1. Figure 5 below lists the diameters and lengths of pipeline required to serve the basin along with a preliminary cost estimate based on the preliminary routing. It must be noted that diameters were determined using minimum grades required to produce a velocity of 2 feet per second and actual ground surveys will be needed before design and construction of any sanitary sewer line shown in these conceptual drawings can be implemented.

**FIGURE 5 - ENGINEER'S OPINION OF PROBABLE COST
MAYES CREEK DRAINAGE BASIN**

<u>Description</u>	<u>Quantity/Unit</u>	<u>Unit Cost</u>	<u>Total</u>
8-inch Gravity Sewer	2,000 LF	\$65.00	\$130,000.00
12-inch Gravity Sewer	62,850 LF	\$110.00	\$6,913,500.00
18-inch Gravity Sewer	38,050 LF	\$200.00	\$7,610,000.00
24-inch Gravity Sewer	10,300 LF	\$225.00	\$2,317,500.00
30-inch Gravity Sewer	4,500 LF	\$240.00	\$1,080,000.00
36-inch Gravity Sewer	700 LF	\$265.00	\$185,500.00
42-inch Gravity Sewer	6,750 LF	\$285.00	\$1,923,750.00
48-inch Gravity Sewer	1,200 LF	\$300.00	\$360,000.00
Manholes	361 EA	\$4,250.00	\$1,534,250.00
15% Contingency Allow. for Legal, Engineering, Admin. & Esmts.	1 LS	\$3,308,175.00	\$3,308,175.00
TOTAL →			\$25,362,675.00

iv. Wastewater Treatment and Disposal

It is anticipated that flows from the Mayes Creek Drainage Basin will be conveyed by a large diameter gravity interceptor sewer starting from the mouth of the Mayes Creek Drainage Basin and terminating at the proposed location of the South Water Reclamation Facility located in the Goose Creek Drainage Basin. The connector is intended to convey the total flow from the Mayes Creek Drainage Basin as well as flow from sub-basins 5 and 5-A of the Goose Creek Drainage Basin. For more information on the proposed connector please refer to the Mayes Creek Connector Routing Study.



APPENDIX