

Southwest Basins No. 2 & No. 3 Sanitary Sewer System Study

Prepared for the City of Franklin
Engineering Department

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H I S T O R I C
F R A N K L I N
T E N N E S S E E

Prepared by:





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Table A-2: Southwest Basin No. 3 Sewer Calculations

Exhibit B-1: Overview of Southwest Basin No. 2 and No. 3

Exhibit B-2: Overview of Option 1

Exhibit B-3: Overview of Option 2

Exhibit B-4: Overview of Option 3

I. Executive Summary

This study was authorized on March 25, 2014 by the Franklin Engineering Department in order to evaluate and update the expected sewer demand in the Southwest Basins No. 2 and No. 3. This evaluation uses data from the 2011 Development Report that was compiled by the Department of Planning and Sustainability, provided by the Engineering Department, and as-built drawings from the Waste Management Department. This information was implemented to produce expected sewer flows from Southwest Basins No. 2 and No. 3. The findings, conclusions, and recommendations for the two basins are detailed in the following report.

II. Description

i. Southwest Basin No. 2

The Southwest Basin No. 2 is located in the southwestern sections of the City of Franklin's Urban Growth Boundary (UGB). The borders are roughly comprised of: Coleman Road to the north, Goose Creek Bypass to the east, Snowbird Hollow Road and West Harpeth River to the south, and Kelly Branch to the west. The exact location and boundaries are shown in Exhibit B-1.

The Southwest Basin No. 2 is comprised of approximately 2,045 acres, in which 1,441 acres are undeveloped. There are currently 197 existing lots with capacity to expand to 2,359 projected lots. The fully developed basin is anticipated to have a population of 6,486 residents.

Based on the natural terrain of the Southwest Basin No. 2, it has been divided into two distinct sub-basins. The area does not currently offer gravity sewer service to its residents.

ii. Southwest Basin No. 3

The Southwest Basin No. 3 is located in the southwestern sections of the City of Franklin's UGB. The borders are roughly comprised of: Snowbird Hollow Road to the north, Lewisburg Pike to the east, West Harpeth River to the south, and Hunter Road to the west. The exact location and boundaries are shown in Exhibit B-1.

The Southwest Basin No. 3 is comprised of approximately 2,092 acres, in which 1,135 acres are undeveloped. There are currently 231 existing lots with capacity to expand to 1,933 projected lots. The fully developed basin is anticipated to have a population of 5,316 residents.

Based on the natural terrain of the Southwest Basin No. 3, it has been divided into three distinct sub-basins. The area does not currently offer gravity sewer service to its residents.

III. Development of Sanitary Sewer Flows

i. Rationale

The two Basins flow to a common point and were analyzed together to size the gravity sewer lines. Figures 1 and 2 lists the various areas delineated within the sub-basins of Southwest Basin No. 2 and Southwest Basin No. 3 respectively. Existing information from the 2011 Development



Report and as-built drawings were utilized to determine land use within each basin.

Each sub-basin was evaluated in terms of land use, and Franklin Planning Department estimates and projections were used to identify the type and extent of future development for properties where no submittals have been submitted.

FIGURE 1 - SOUTHWEST BASIN NO. 2 LAND USE

Area Number	Description	Total Acreage	Total Undeveloped Acreage	No. Of Estimated Developed Lots	Est. Total Developed Lots In Area
1	Kittrell Rd and Hunter Rd Intersection	1,545	1,195	1,792	1,843
2	Hunter Rd to Columbia Pk	500	246	369	515
	Totals	2,045	1,441	2,162	2,359

FIGURE 2 - SOUTHWEST BASIN NO. 3 LAND USE

Area Number	Description	Total Acreage	Total Undeveloped Acreage	No. Of Estimated Developed Lots	Est. Total Developed Lots In Area
1	Hunter Rd, Columbia Pk, and Snowbird Hollow Rd	898	452	678	767
2	Goose Creek Bypass	579	199	298	389
3	Tom Anderson Rd	615	484	726	777
	Totals	2,092	1,135	1,702	1,933

The State of Tennessee Sewage Works Design Manual provides guidance for incremental flow for various land uses. The Manual recommends a flow of 350 gallons/day (gpd) for a single family residence. Every property in the two Basins were understood to be zoned for single family residence and the flow projections are based on the recommended flow.

For the purpose of this study, flood plains, steep slopes and roads were included in the undeveloped acreage calculation. 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 flows and instantaneous sewer flows. These factors vary according to the number of people in the sub-basin contributing to the flow. The following peaking factors listed in Figure 3 are taken from ASCE “Sewer Design & construction Manuals and Reports on Engineering Practices” and are used in this study.

FIGURE 3 - POPULATION PEAKING FACTORS	
Tributary Population	Peaking Factor
0-500	5
501-1000	4
1001+	3.25

ii. Projected Flows

Figure 4 and 5 represent an overview of the entire land development plan for the Southwest Basin No. 2 and No. 3, respectively. A more detailed analysis of the information contained in Figure 1, 2, 4, and 5 is contained



in Table 1 and Table 2 in the Appendix. Table 1 contains projected flows associated with each sub-basin for Southwest Basin No. 2 and Table 2 contains the project flows for Southwest Basin No. 3. The information in the tables is based on the information from the 2011 Development Report and counts of actual properties on the as-built drawings.

The calculations included in the tables project numbers of future residential units and sewage flow from each sub-basin attributable to the proposed development. A majority of the information was derived from population densities. The City of Franklin's land use plan calls for a residential density of 1.0 unit per acre. After further review a value of 1.5 residential units per acre was used based on the existing high density subdivisions in the basins and at the request of the City of Franklin.

FIGURE 4 - SOUTHWEST BASIN NO. 2 LAND USE and FLOW RESULTS

Area Number	Description	Total Acreage	No. Of Estimated Developed Lots	Est. Total Developed Lots In Area	Est. Population In Area 2.75/unit	Est. Total Population In Area	Total Average Flow (MGD)	Total Peak Flow (MGD)
1	Kittrell Rd and Hunter Rd Intersection	1,545	1,792	1,843	4,928	5,069	0.645110	2.096606
2	Hunter Rd to Columbia Pk	500	369	515	1,016	1,418	0.180413	0.586341
	Totals	2,045	2,162	2,359	5,944	6,486	0.825522	2.682947

FIGURE 5 - SOUTHWEST BASIN NO. 3 LAND USE and FLOW RESULTS

Area Number	Description	Total Acreage	No. Of Estimated Developed Lots	Est. Total Developed Lots In Area	Est. Population In Area 2.75/unit	Est. Total Population In Area	Total Average Flow (MGD)	Total Peak Flow (MGD)
1	Hunter Rd, Columbia Pk, and Snowbird Hollow Rd	898	678	767	1,865	2,110	0.268555	0.872804
2	Goose Creek Bypass	579	298	389	819	1,069	0.136115	0.442374
3	Tom Anderson Rd	615	726	777	1,996	2,136	0.271898	0.883667
	Totals	2,092	1,702	1,933	4,681	5,316	0.676568	2.198844

The average daily flow for the Southwest Basin No. 2 is estimated to have an average of 0.826 million gallons per day (MGD) and the Southwest Basin No. 3 estimated average is 0.677 MGD. The average flows will have a significant increase to 2.683 MGD and 2.199 MGD, respectively, after applying peaking factors and the two flows combine to equal 4.882 MGD.

iii. Existing Interceptor Sewers

Previous sections have provided a rationale for projections of sewer flows from the study basins. With the flows from each sub-basin defined, existing sanitary sewer lines can be evaluated, areas of insufficient capacity can be identified, and specific infrastructure improvements can be recommended. To develop Southwest Basins No. 2 and No. 3 the flow will have to be conveyed through the Goose Creek sanitary sewer that reaches out to Berry Farms and flows into the Five Mile Creek Interceptor. This is the most logical tie-in location in relation to distance and existing infrastructure capable of handling the flow from the two basins. Figure 6 below shows the size and slope of the existing sewer, and the full flow capacities. City of Franklin provided the as-built drawings from Littlejohn Engineering Associates to analyze the existing infrastructure. The existing sewer material is PVC and a Manning's roughness value of $n = 0.011$ was used to calculate capacity.

FIGURE 6 - EXISTING GOOSE CREEK GRAVITY SEWER			
SHEET	PVC SEWER DIAMETER	SLOPE	FULL FLOW CAPACITY, MGD
C2.2	18-inch	0.59%	6.176
	18-inch	0.68%	6.631
	18-inch	0.55%	5.979
	18-inch	0.75%	6.955
C2.1	18-inch	0.46%	5.441
	18-inch	0.58%	6.111
	18-inch	0.85%	7.404
	18-inch	0.66%	6.524
C2.0	18-inch	1.49%	9.789
	18-inch	0.62%	6.309
	18-inch	0.45%	5.375
	18-inch	0.75%	6.964
	18-inch	1.09%	8.380
	18-inch	0.79%	7.138

A study of the Goose Creek sub-basin, that the flow will be conveyed through, was conducted to develop the estimated peak flow from the area which is projected at 3.17 MGD. This projection came from the existing 322 units, 2.8 million square feet of commercial zoned areas, and the possible development of 254 acres. The combined projected flows for the Goose Creek sub-basin and Southwest Basin No. 2 and No.3 have a peak flow of 8.05 MGD. After analyzing the full flow capacities of the existing sewer, it is anticipated that the existing gravity sewer will not be able to handle the total combined flow and a solution is described in the following paragraphs.

The terrain between the Berry Farms gravity sewer and the common low area for the Southwest Basins, has elevation changes that causes a problem. This problem of having the water carried between the two points left only one option and that was to pump the water. The selected site for the proposed pump station is located in the southwest corner of Southwest Basin No. 2 and sits close to the West Harpeth River. This

location was selected based on the contour lines and the ability to have the Southwest Basins on gravity sewer. All proposed gravity sewers are anticipated to be able to serve all areas of the basins. A 16-inch force main will need to be constructed to convey the flow from the proposed pump station to Berry Farms sanitary sewer.

IV. Option Descriptions

There are three options to consider when conveying flows from Southwest Basin No. 2 and No. 3 to the Goose Creek sub-basin.

i. Option1: Force Main to GCB with New 27” Line and 18” Extension

Option 1, shown in Exhibit B-2, is to construct the force main to the intersection of Snowbird Hollow Road and Goose Creek Bypass, then lay a 27-inch line along the south side of the Goose Creek Bypass to the Five Mile Creek Interceptor. This will be used to convey the flows from the two Southwest Basins and lots on the southern boundary of the Goose Creek Bypass. An extension of the existing 18-inch Berry Farms sewer will be required to serve the northern boundary of the Goose Creek Bypass. This extension was calculated using the existing slope of the Berry Farms sewer. The total length of 16-inch force main is 17,398 linear feet, the proposed 27-inch line length is 10,749 linear feet and the extension of gravity sewer is 2,766 linear feet. The projected total flow to be handled is 8.05 MGD.

ii. Option 2: Force Main to GCB with New 24" Line and 24" Expansion

Option 2, shown in Exhibit B-3, is slightly different than Option 1 where a 24-inch line will run along the northern boundary of the Goose Creek Bypass until it reaches the existing Berry Farms 18-inch gravity sewer. A minimum slope was assumed for the 24-inch proposed gravity sewer. Due to the projected flows, the existing Berry Farms 18-inch sewer will need to be upsized to a 24-inch gravity sewer. Existing slopes were utilized to size the proposed 24-inch gravity sewer. This option will enable the properties north of the Goose Creek Bypass to be on gravity sewer while the southern properties will remain on septic systems. The projected quantities are: 17,398 linear feet for the 16-inch force main and 10,568 linear feet of new 24-inch gravity sewer, where 3,661 linear feet of 24-inch gravity sewer will replace the existing 18-inch Berry Farms sewer. The projected total flow to be handled is 5.56 MGD.

iii. Option 3: Force Main to Berry Farms Gravity Sewer

Option 3, shown in Exhibit B-4, is to construct the 16-inch force main the entire length to the existing 18-inch Berry Farms sewer. This will give the City of Franklin gravity sewer in the two Southwest Basins and the existing and projected area of Berry Farms Town Center. The projected density of 3.75 units per acre, for the Berry Farms Town Center, was obtained through the 2011 Development Report. The Berry Farms Town Center area to be developed is estimated at 86 acres. The existing and projected units are estimated to have a peak flow of 0.89 MGD, combined with the projected 4.88 MGD from the Southwest Basins, equals a total peak flow of 5.77 MGD. The current capacity of the Berry Farms gravity sewer has

two sections that are under sized for this amount but the overall capacity is estimated to handle the additional flow.

V. Recommendations

All three options have pros and cons when deciding which option is more suitable for the City of Franklin's needs. The price difference between the three options is estimated at \$2.4 million dollars and a breakdown of the cost estimates can be found below in Figure 7, 8, and 9. Option 1, on Exhibit B-2, will give the City of Franklin the ability serve the Southwest Basins and the entire Goose Creek sub-basin but is higher in cost. Option 2 will also allow the City to serve the Southwest Basins but will only have the capability of serving the northern portion of the Goose Creek sub-basin. The estimated 43 properties along the southern boundary of the Goose Creek Bypass will remain on septic systems. Option 3 requires a force main to be constructed across a span of almost five miles but is estimated to cost less and will not serve the portions of the Goose Creek sub-basin.

All three options share a common flaw that will require periodic flushing of the 16-inch force main to stir up the sediment in the line to produce more favorable conditions for an unknown period of time while development takes place. As shown in Table 1 and 2, in the Appendix, the existing, combined peak flow for Southwest Basin No. 2 and No. 3 is 749,000 gallons. This flow will have an estimated velocity of 0.830 feet per second (fps) which is not enough to keep the sediment suspended and the flushing will have to be continued until a flow of 1.8 MGD can be maintained. An additional option the City may want to consider is constructing two (2) parallel force mains to handle the flows from the Southwest Basins. Due to higher construction costs this option was not investigated further.

After reviewing the options for Southwest Basins No. 2 and No. 3, it will be more beneficial for the City to lay the proposed 27-inch line and extend the existing 18-inch gravity sewer from Berry Farms to allow for present and future residents to be served around the Goose Creek Bypass. The cost difference for this option is minimal while maximizing service in the Goose Creek sub-basin. Should this area be proposed to develop with greater densities, the City will need to reevaluate the basins in this area and update as necessary.

FIGURE 7 - ENGINEERS OPINION OF PROBABLE COST OPTION 1 - FORCE MAIN TO GCB, GRAVITY TO BF & FMC			
Description	Quantity / Unit	Unit Cost	Total
8-inch Gravity Sewer	35,166 LF	\$ 86.00	\$ 3,024,276.00
10-inch Gravity Sewer	14,270 LF	\$ 95.00	\$ 1,355,650.00
12-inch Gravity Sewer	4,235 LF	\$ 110.00	\$ 465,850.00
15-inch Gravity Sewer	14,000 LF	\$ 150.00	\$ 2,100,000.00
18-inch Gravity Sewer	7,615 LF	\$ 200.00	\$ 1,523,000.00
24-inch Gravity Sewer	1,127 LF	\$ 225.00	\$ 253,575.00
27-inch Gravity Sewer	10,749 LF	\$ 240.00	\$ 2,579,760.00
Manholes	210 EA	\$ 4,250.00	\$ 894,285.00
4.9 MGD Pump Station	1 LS	\$ 2,750,000.00	\$ 2,750,000.00
16-inch Force Main	17398 LF	\$ 175.00	\$ 3,044,650.00
SUBTOTAL			\$ 17,991,046.00
10% Misc. Allow. For Bypass, Mobilization, etc.	1 LS	\$ 1,799,104.60	\$ 1,799,104.60
15% Contingency Allow. For Legal, Engineering, Admin. & Esmts.	1 LS	\$ 2,698,656.90	\$ 2,698,656.90
TOTAL			\$ 22,489,000.00

FIGURE 8 - ENGINEERS OPINION OF PROBABLE COST OPTION 2 - FORCE MAIN TO GCB, GRAVITY TO BF & FMC			
Description	Quantity / Unit	Unit Cost	Total
8-inch Gravity Sewer	35,166 LF	\$ 86.00	\$ 3,024,276.00
10-inch Gravity Sewer	14,270 LF	\$ 95.00	\$ 1,355,650.00
12-inch Gravity Sewer	4,235 LF	\$ 110.00	\$ 465,850.00
15-inch Gravity Sewer	14,000 LF	\$ 150.00	\$ 2,100,000.00
18-inch Gravity Sewer	4,849 LF	\$ 200.00	\$ 969,800.00
24-inch Gravity Sewer	11,695 LF	\$ 225.00	\$ 2,631,375.00
Remove Existing 18-inch Manholes	3,661 LF 210 EA	\$ 41.00 \$ 4,250.00	\$ 150,101.00 \$ 894,285.00
4.9 MGD Pump Station	1 LS	\$ 2,750,000.00	\$ 2,750,000.00
16-inch Force Main	17,398 LF	\$ 175.00	\$ 3,044,650.00
SUBTOTAL			\$ 17,385,987.00
10% Misc. Allow. For Bypass, Mobilization, etc.	1 LS	\$ 1,738,598.70	\$ 1,738,598.70
15% Contingency Allow. For Legal, Engineering, Admin. & Esmts.	1 LS	\$ 2,607,898.05	\$ 2,607,898.05
TOTAL			\$ 21,733,000.00

FIGURE 9 - ENGINEERS OPINION OF PROBABLE COST OPTION 3 - FORCE MAIN TO BERRY FARMS GRAVITY SEWER			
Description	Quantity / Unit	Unit Cost	Total
8-inch Gravity Sewer	35,166 LF	\$ 86.00	\$ 3,024,276.00
10-inch Gravity Sewer	14,270 LF	\$ 95.00	\$ 1,355,650.00
12-inch Gravity Sewer	4,235 LF	\$ 110.00	\$ 465,850.00
15-inch Gravity Sewer	14,000 LF	\$ 150.00	\$ 2,100,000.00
18-inch Gravity Sewer	4,849 LF	\$ 200.00	\$ 969,800.00
24-inch Gravity Sewer	1,127 LF	\$ 225.00	\$ 253,575.00
Manholes	210 EA	\$ 4,250.00	\$ 894,285.00
4.9 MGD Pump Station	1 LS	\$ 2,750,000.00	\$ 2,750,000.00
16-inch Force Main	24572 LF	\$ 175.00	\$ 4,300,100.00
SUBTOTAL			\$ 16,113,536.00
10% Misc. Allow. For Bypass, Mobilization, etc.	1 LS	\$ 1,611,353.60	\$ 1,611,353.60
15% Contingency Allow. For Legal, Engineering, Admin. & Esmts.	1 LS	\$ 2,417,030.40	\$ 2,417,030.40
TOTAL			\$ 20,142,000.00



APPENDIX

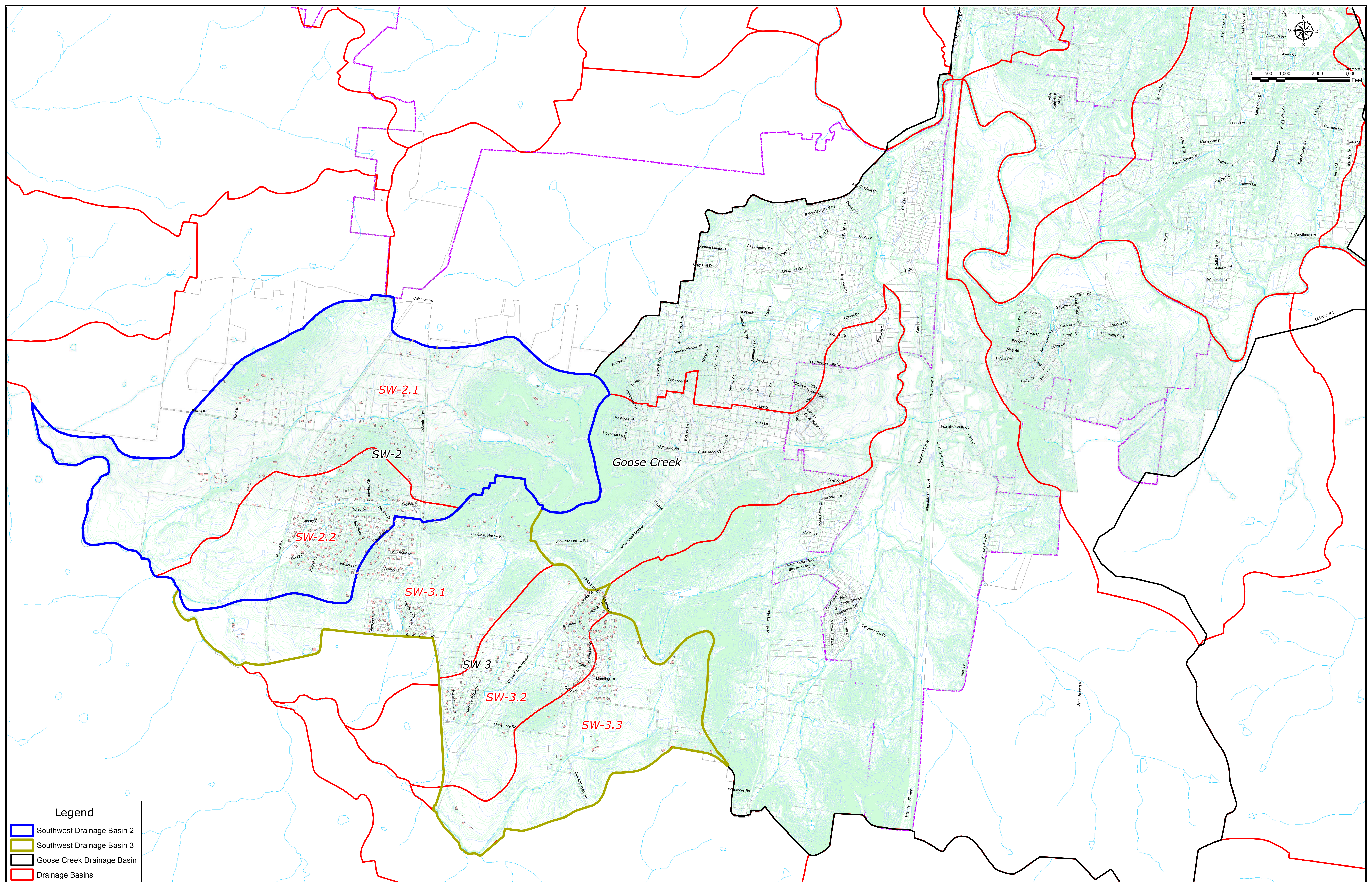
TABLE A-1

SOUTHWEST BASIN NO. 2 SEWER CALCULATIONS DEVELOPMENT OF SANITARY SEWER FLOWS													
Area Number	Description	Total Acreage	Total Undeveloped Acreage	No. Of Existing Developed Lots	No. Of Lots Planned (Planning Dept.)	Prop. Density (Units/Acre)	Population In Area 2.75/unit	Ave. Flow (GPD)	Peaking Factor	Total Average Flow (MGD)	Total Peak Flow (MGD)		
1	Kittrell Rd and Hunter Rd Intersection	1,545	1,189	51	0	2	140	17,850	5	0.017850	0.089250		
	1.A	229	205	3	0	1.5	8	1,050	5	0.001050	0.005250		
	1.B	727	541	38	0	1.5	105	13,300	5	0.013300	0.066500		
	1.C	440	294	10	0	1.5	28	3,500	5	0.003500	0.017500		
	1.D	101	101	0	0	0	0	0	0	0	0		
	1.E	48	48	0	0	0	0	0	0	0	0		
2	Hunter Rd to Columbia Pk	500	246	146	0	1.5	402	51,100	5	0.051100	0.255500		
	Totals	2,045	1,436	197	0		542	68,950		0.068950	0.344750		
FUTURE PLANNING USING THE EXISTING PROP. DENSITY OVER THE UNDEVELOPED ACREAGE													
Area Number	Description	Total Undeveloped Acreage	Prop. Density (Units/Acre)	No. Of Estimated Developed Lots	Est. Total Developed Lots In Area	Est. Population In Area 2.75/unit	Est. Total Population	Ave. Flow (GPD)	Peaking Factor	Total Average Flow (MGD)	Total Peak Flow (MGD)		
1	Kittrell Rd and Hunter Rd Intersection	1,189	1.5	1,784	1,835	4,907	5,047	642,327	3.25	0.642327	2.087563		
	1.A	205	1.5	308	311	846	854	108,675	3.25	0.108675	0.353194		
	1.B	541	1.5	812	850	2,232	2,336	297,325	3.25	0.297325	0.966306		
	1.C	294	1.5	442	452	1,215	1,242	158,102	3.25	0.158102	0.513832		
	1.D	101	1.5	152	152	417	417	53,025	3.25	0.053025	0.172331		
	1.E	48	1.5	72	72	198	198	25,200	3.25	0.025200	0.081900		
2	Hunter Rd to Columbia Pk	246	1.5	369	515	1,016	1,418	180,413	3.25	0.180413	0.586341		
	Totals	1,436		2,154	2,351	5,923	6,464	822,740		0.822740	2.673904		

TABLE A-2

SOUTHWEST BASIN NO. 3 SEWER CALCULATIONS DEVELOPMENT OF SANITARY SEWER FLOWS												
Area Number	Description	Total Acreage	Total Undeveloped Acreage	No. Of Existing Developed Lots	No. Of Lots Planned (Planning Dept.)	Prop. Density (Units/Acre)	Population In Area 2.75/unit	Ave. Flow (GPD)	Peaking Factor	Total Average Flow (MGD)	Total Peak Flow (MGD)	
1	Hunter Rd, Columbia Pk, and Snowbird Hollow Rd	898	452	89	0	1.5	245	31,150	5	0.031150	0.155750	
	1.A	600	272	69	0	1.5	190	24,150	5	0.024150	0.120750	
	1.B	298	180	20	0	1.5	55	7,000	5	0.007000	0.035000	
2	Goose Creek Bypass	579	199	91	0	1.5	250	31,850	5	0.031850	0.159250	
	2.A	200	51	60	0	1.5	165	21,000	5	0.021000	0.105000	
	2.B	69	34	8	0	1.5	22	2,800	5	0.002800	0.014000	
	2.C	311	114	23	0	1.5	63	8,050	5	0.008050	0.040250	
3	Tom Anderson Rd	615	484	51	0	1.5	140	17,850	5	0.017850	0.089250	
	3.A	85	85	1	0	1.5	3	350	5	0.000350	0.001750	
	3.B	57	37	5	0	1.5	14	1,750	5	0.001750	0.008750	
	3.C	155	117	43	0	1.5	118	15,050	5	0.015050	0.075250	
	3.D	76	65	1	0	1.5	3	350	5	0.000350	0.001750	
	3.E	242	180	1	0	1.5	3	350	5	0.000350	0.001750	
	Totals	2,092	1,135	231	0		635	80,850		0.080850	0.404250	
FUTURE PLANNING USING THE EXISTING PROP. DENSITY OVER THE UNDEVELOPED ACREAGE												
Area Number	Description	Total Undeveloped Acreage	Prop. Density (Units/Acre)	No. Of Estimated Developed Lots	Est. Total Developed Lots In Area	Est. Population In Area 2.75/unit	Est. Total Population In Area	Ave. Flow (GPD)	Peaking Factor	Total Average Flow (MGD)	Total Peak Flow (MGD)	
1*	Hunter Rd, Columbia Pk, and Snowbird Hollow Rd	452	1.5	678	767	1,865	2,110	268,555	3.25	0.268555	0.872804	
	1.A	272	1.5	408	477	1,122	1,312	166,950	3.25	0.166950	0.542588	
	1.B	180	1.5	270	290	743	798	101,605	3.25	0.101605	0.330216	
2*	Goose Creek Bypass	199	1.5	298	389	819	1,069	136,115	3.25	0.136115	0.442374	
	2.A	51	1.5	77	137	210	375	47,775	3.25	0.047775	0.155269	
	2.B	34	1.5	51	59	140	162	20,650	3.25	0.020650	0.067113	
	2.C	114	1.5	170	193	469	532	67,690	3.25	0.067690	0.219993	
3*	Tom Anderson Rd	484	1.5	726	777	1,996	2,136	271,898	3.25	0.271898	0.883667	
	3.A	85	1.5	128	129	351	353	44,975	3.25	0.044975	0.146169	
	3.B	37	1.5	56	61	154	168	21,333	3.25	0.021333	0.069331	
	3.C	117	1.5	176	219	483	601	76,475	3.25	0.076475	0.248544	
	3.D	65	1.5	98	99	268	271	34,475	3.25	0.034475	0.112044	
	3.E	180	1.5	269	270	741	744	94,640	3.25	0.094640	0.307580	
	Totals	1,135		1,702	1,933	4,681	5,316	676,568		0.676568	2.198844	

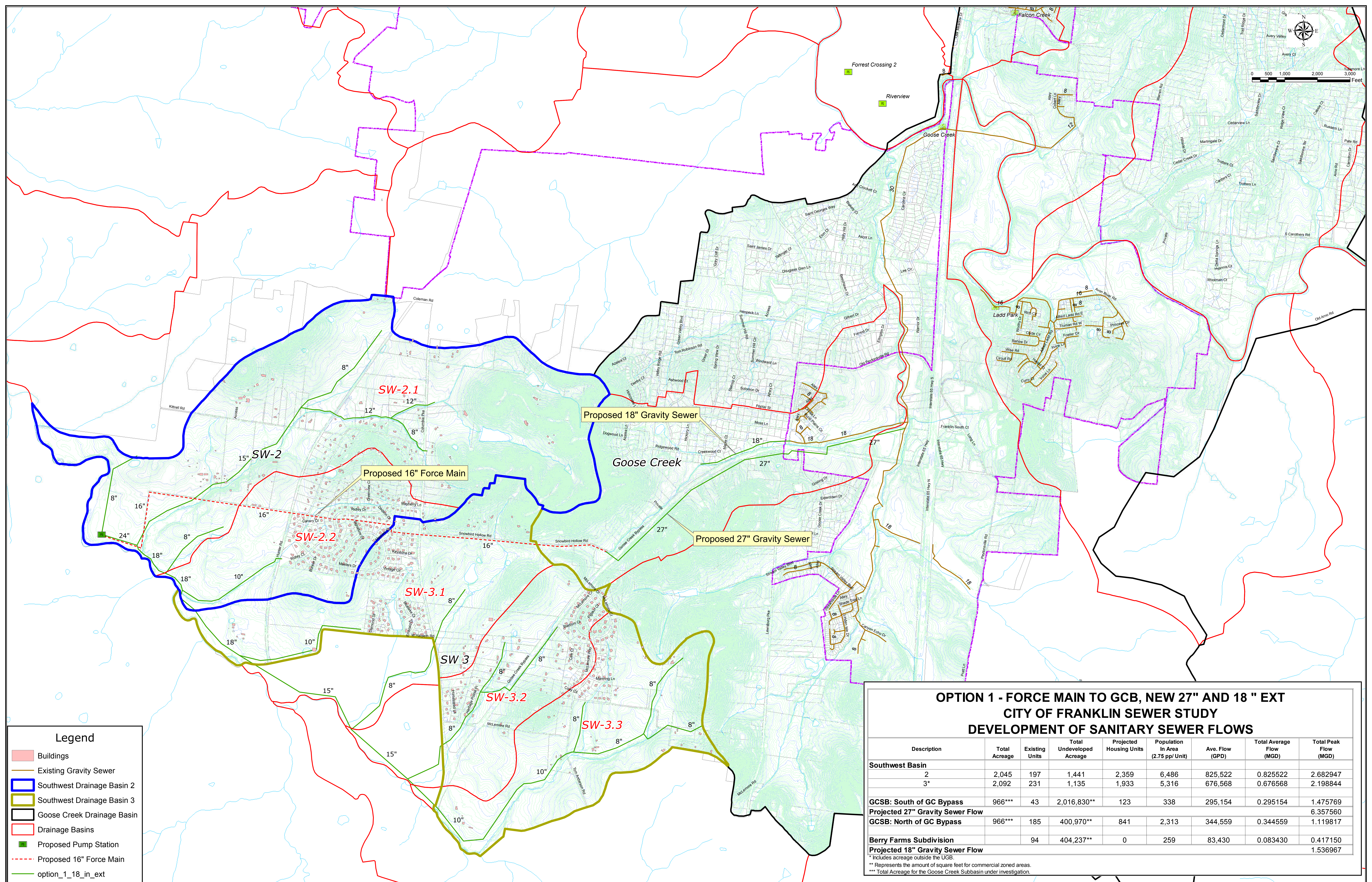
* Includes acreage outside the UGB.



Legend

- █ Southwest Drainage Basin 2
- █ Southwest Drainage Basin 3
- █ Goose Creek Drainage Basin
- █ Drainage Basins
- Index Contour
- Minor Contour
- Streams
- Parcels
- Franklin City Limits
- █ Buildings

Franklin Water Management Department
Southwest Basins 2 & 3 Study



Legend

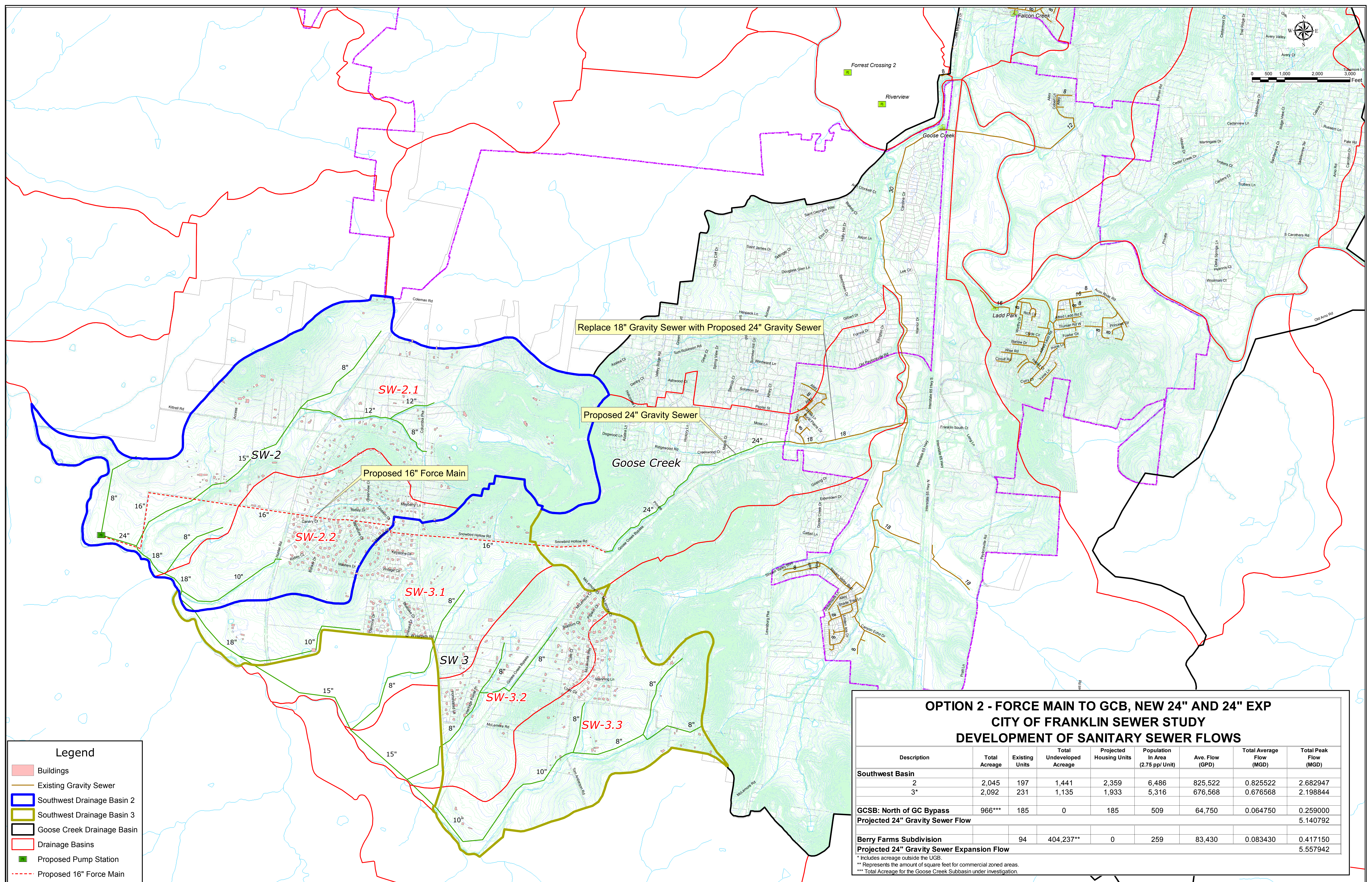
- Buildings
- Existing Gravity Sewer
- Southwest Drainage Basin 2
- Southwest Drainage Basin 3
- Goose Creek Drainage Basin
- Drainage Basins
- Proposed Pump Station
- Proposed 16" Force Main
- option_1_18_in_ext
- Proposed Gravity Sewer
- Streams
- Franklin City Limits
- Index Contour
- Minor Contour
- Existing Pump Station

**OPTION 1 - FORCE MAIN TO GCB, NEW 27" AND 18 " EXT
CITY OF FRANKLIN SEWER STUDY
DEVELOPMENT OF SANITARY SEWER FLOWS**

Description	Total Acreage	Existing Units	Total Undeveloped Acreage	Projected Housing Units	Population In Area (2.75 ppl/ Unit)	Ave. Flow (GPD)	Total Average Flow (MGD)	Total Peak Flow (MGD)
Southwest Basin								
2	2,045	197	1,441	2,359	6,486	825,522	0.825522	2.682947
3*	2,092	231	1,135	1,933	5,316	676,568	0.676568	2.198844
GCSB: South of GC Bypass								
	966***	43	2,016,830**	123	338	295,154	0.295154	1.475769
Projected 27" Gravity Sewer Flow								
GCSB: North of GC Bypass								
	966***	185	400,970**	841	2,313	344,559	0.344559	1.119817
Berry Farms Subdivision								
		94	404,237**	0	259	83,430	0.083430	0.417150
Projected 18" Gravity Sewer Flow								
								1.536967

* Includes acreage outside the UGB.
** Represents the amount of square feet for commercial zoned areas.
*** Total Acreage for the Goose Creek Subbasin under investigation.

*Franklin Water Management Department
Southwest Basins 2 & 3 Study*



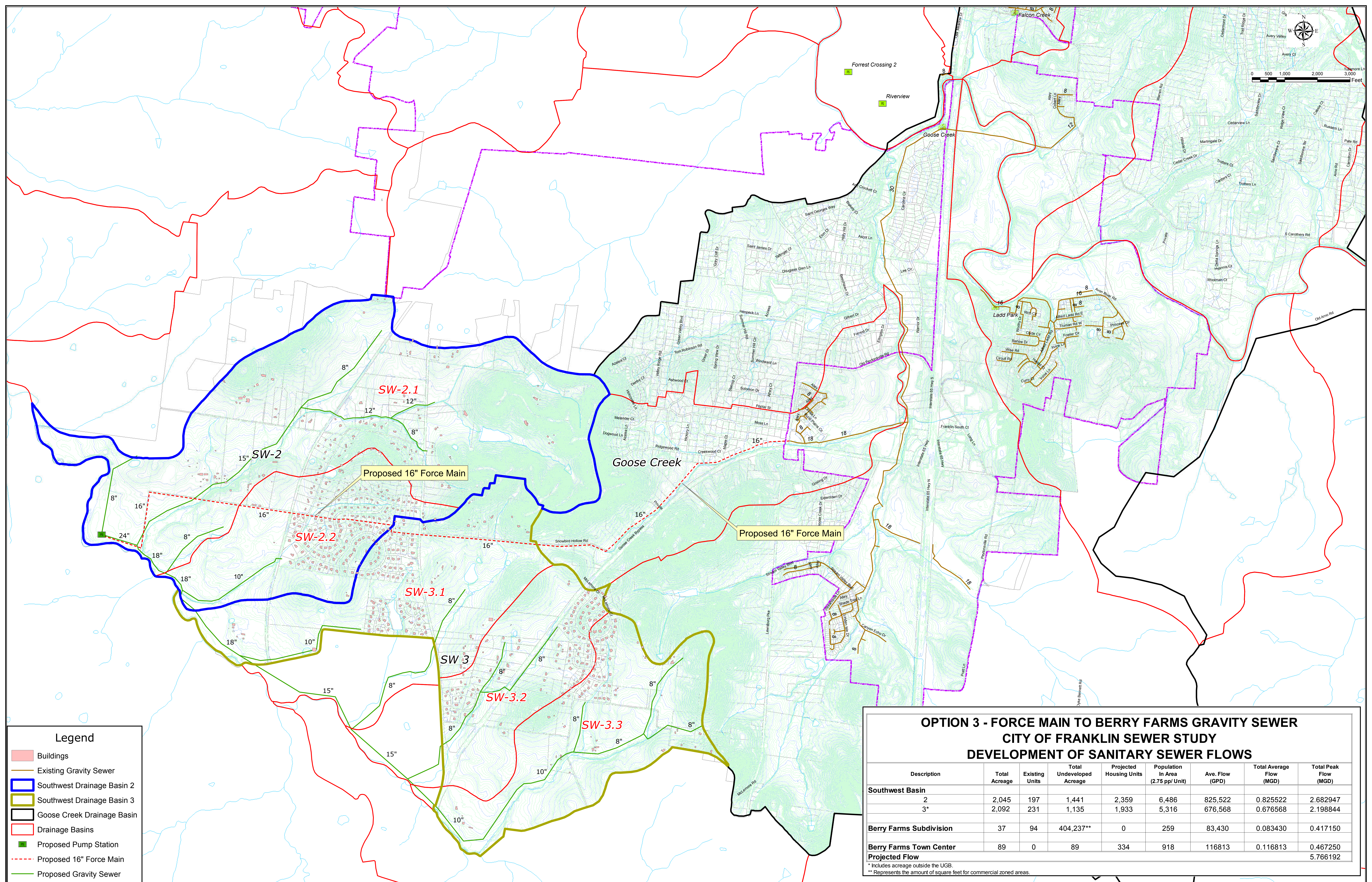
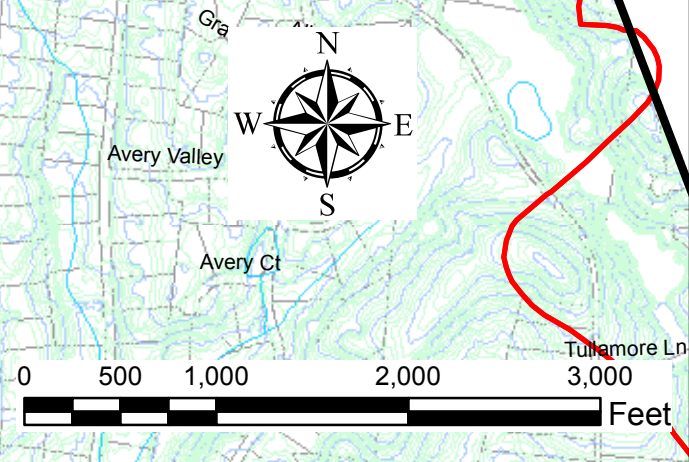
**OPTION 2 - FORCE MAIN TO GCB, NEW 24" AND 24" EXP
 CITY OF FRANKLIN SEWER STUDY
 DEVELOPMENT OF SANITARY SEWER FLOWS**

Description	Total Acreage	Existing Units	Total Undeveloped Acreage	Projected Housing Units	Population In Area (2.75 ppl/Unit)	Ave. Flow (GPD)	Total Average Flow (MGD)	Total Peak Flow (MGD)
Southwest Basin								
2	2,045	197	1,441	2,359	6,486	825,522	0.825522	2.682947
3*	2,092	231	1,135	1,933	5,316	676,568	0.676568	2.198844
GCSB: North of GC Bypass								
	966***	185	0	185	509	64,750	0.064750	0.259000
Projected 24" Gravity Sewer Flow								5.140792
Berry Farms Subdivision								
		94	404,237**	0	259	83,430	0.083430	0.417150
Projected 24" Gravity Sewer Expansion Flow								5.557942

* Includes acreage outside the UGB.
 ** Represents the amount of square feet for commercial zoned areas.
 *** Total Acreage for the Goose Creek Subbasin under investigation.

- Legend**
- Buildings
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 - Southwest Drainage Basin 2
 - Southwest Drainage Basin 3
 - Goose Creek Drainage Basin
 - Drainage Basins
 - Proposed Pump Station
 - Proposed 16" Force Main
 - Proposed Gravity Sewer
 - Streams
 - Franklin City Limits
 - Index Contour
 - Minor Contour
 - Existing Pump Station

*Franklin Water Management Department
 Southwest Basins 2 & 3 Study*



Legend

- Buildings
- Existing Gravity Sewer
- Southwest Drainage Basin 2
- Southwest Drainage Basin 3
- Goose Creek Drainage Basin
- Drainage Basins
- Proposed Pump Station
- Proposed 16" Force Main
- Proposed Gravity Sewer
- Streams
- Franklin City Limits
- Index Contour
- Minor Contour
- Parcels
- Existing Pump Station

**OPTION 3 - FORCE MAIN TO BERRY FARMS GRAVITY SEWER
CITY OF FRANKLIN SEWER STUDY
DEVELOPMENT OF SANITARY SEWER FLOWS**

Description	Total Acreage	Existing Units	Total Undeveloped Acreage	Projected Housing Units	Population In Area (2.75 pp/Unit)	Ave. Flow (GPD)	Total Average Flow (MGD)	Total Peak Flow (MGD)
Southwest Basin								
2	2,045	197	1,441	2,359	6,486	825,522	0.825522	2.682947
3*	2,092	231	1,135	1,933	5,316	676,568	0.676568	2.198844
Berry Farms Subdivision	37	94	404,237**	0	259	83,430	0.083430	0.417150
Berry Farms Town Center	89	0	89	334	918	116,813	0.116813	0.467250
Projected Flow								5.766192

* Includes acreage outside the UGB.
** Represents the amount of square feet for commercial zoned areas.

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Southwest Basins 2 & 3 Study*