



City of Franklin

Road Impact Fee Study Update

Technical Memorandum
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Road Impact Fee Study Update

Introduction

To address transportation infrastructure costs associated with new growth, the City of Franklin implemented a roadway impact fee and is currently in the process of updating the impact fee technical study. The draft technical report summarizing results of this study was published by Duncan Associates in June 2023¹. As part of the update study, the City of Franklin retained Benesch to review the Duncan study approach and key impact fee variables. The review concluded that the overall approach of the study complied with impact fee legal requirements and included certain adjustments to the demand, cost, and credit data. This technical memorandum presents the results of this review and resulting road impact fee rates.

Demand Component

As part of this update and based on the request from the City, the Single Family Detached land use was tiered by square footage and a Single Family Attached land use (also tiered) was added to the road impact fee study. Additional details for the tiering analysis are included in Appendix A. The remaining elements of the demand component are from the Duncan study and were not reviewed in detail. Table 1 presents the demand variables used for each land use included in the City's impact fee schedule.

¹ *City of Franklin Road Impact Fee Study, June 2023, Duncan Associates*

Table 1: Travel Demand by Land Use

ITE Code	Land Use Type	Unit	Daily Trips/Unit ⁽¹⁾	% Primary Trips	Arterials		Collectors	
					Trip Length	Daily VMT	Trip Length	Daily VMT
210	Single Family Det <1,500 sf	du	4.18	100%	3.41	14.25	0.70	2.93
210	Single Family Det 1,500-2,999 sf	du	4.79	100%	3.41	16.33	0.70	3.35
210	Single Family Det 3,000 sf or more	du	5.35	100%	3.41	18.24	0.70	3.75
215	Single Family Att <1,500 sf	du	3.42	100%	3.41	11.66	0.70	2.39
215	Single Family Att 1,500-2,999 sf	du	3.92	100%	3.41	13.37	0.70	2.74
215	Single Family Att 3,000 sf or more	du	4.37	100%	3.41	14.90	0.70	3.06
220	Multi-Family	du	3.37	100%	3.41	11.49	0.70	2.36
240	Mobile Home Park	site	3.56	100%	3.41	12.14	0.70	2.49
253	Congregate Care Facility	du	1.10	100%	3.71	4.08	0.76	0.84
310/320	Hotel/Motel	room	2.83	100%	2.63	7.44	0.54	1.53
Retail/Commercial								
820	Shopping Center/Gen. Retail	1,000 sf	18.50	43%	2.76	21.96	0.57	4.53
930	Restaurant, Sit-Down	1,000 sf	53.60	38%	2.76	56.22	0.57	11.61
934	Restaurant, Fast Food	1,000 sf	233.74	30%	0.92	64.51	0.19	13.32
Office/Institutional								
710	Office, General	1,000 sf	5.42	75%	3.67	14.92	0.76	3.09
610	Hospital	1,000 sf	5.38	75%	3.71	14.97	0.76	3.07
620	Nursing Home	1,000 sf	3.37	75%	3.71	9.38	0.76	1.92
560	Church	1,000 sf	3.80	75%	2.49	7.10	0.51	1.45
520/522/525	Elem/Sec. School	1,000 sf	9.94	24%	2.49	5.94	0.51	1.22
Industrial								
140	Manufacturing	1,000 sf	2.37	95%	3.67	8.26	0.76	1.71
130	Industrial Park	1,000 sf	1.68	95%	3.67	5.86	0.76	1.21
770	Business Park	1,000 sf	6.22	95%	3.67	21.69	0.76	4.49
150	Warehouse	1,000 sf	0.85	95%	3.67	2.96	0.76	0.61
151	Mini-Warehouse	1,000 sf	0.72	95%	3.67	2.51	0.76	0.52

Source: City of Franklin Road Impact Fee Study, June 2023, Duncan Associates

1) Source: Appendix A, Table A-5 for Single Family Detached and Table A-10 for Single Family Attached

Cost Component

The cost component measures the cost of providing transportation infrastructure in the City of Franklin. Local governments provide additional roadway capacity through a combination of improvements, such as new roads, lane additions, intersection improvements, etc. Impact fees should reflect this cost as accurately as possible. As shown in Table 2, historical and future improvements in the City of Franklin have, or will include, a combination of new roads, lane additions and intersection improvements and costs vary by type of improvement.

Benesch reviewed cost per capacity figures by type of projects, timing of projects (historical vs. future estimates) and used a weighted average of these projects to estimate the cost of providing additional transportation capacity.

To supplement this analysis, Benesch conducted a review of cost estimates provided by the City. Benesch estimates for these projects were in line with the City's estimates.

Finally, the City staff confirmed that this combination of projects represent "typical" projects that the City builds. In other words, the sample projects do not include outlier projects that are unlikely to occur frequently and have higher costs due to conditions specific to the improvement or the location of the improvement.

Table 2: Cost per Vehicle-Mile of Capacity

Project Name	Miles	Project/Rd Class	Capacity		New VMC	Total Eligible Cost	Cost/VMC
			Exist	Imprvd			
Carothers Parkway (S. Carothers Rd - Long Ln.)	2.73	Arterial / New 2 Ln Roadway	0	16,800	45,864	\$17,627,425	\$384
Hillsboro Rd. (Independence Square - Hillsboro Rd.)	0.83	Arterial / Widen From 2 Ln. to 3 Ln.	16,800	21,000	3,486	\$12,624,371	\$3,621
Mack Hatcher Pkwy (NW)	2.63	Expressway / New 2 Lane Roadway	0	24,100	63,383	\$61,068,723	\$963
Franklin Rd. (Harpeth River - Industrial Court)	0.61	Arterial / Widen From 2 Ln. to 3 Ln.	16,800	21,000	2,562	\$11,806,135	\$4,608
Jordan Road (Aspen Grove Dr. - Mallory Ln.)	0.26	Collector / From 2 to 3 Lanes	7,300	9,100	468	\$4,469,402	\$9,550
Columbia Ave (Mack Hatcher - Downs Blvd.)	1.22	Arterial / Widen From 3 to 5 Lanes	21,000	47,400	32,208	\$26,177,688	\$813
Long Ln. and Old Peytonsville Rd. Connector	1.33	Collector / New 2 Lane Collector	0	7,300	9,709	\$33,300,237	\$3,430
Mallory and Liberty Pike Intersection Project	0.65	Arterial / Widen from 4/3 Lns to 4 Ln.	28,128	37,900	6,352	\$15,917,660	\$2,506
McEwen Drive Phase IV	1.36	Arterial / Widen From 2 Ln. to 4 Ln.	16,800	37,900	28,696	\$33,068,461	\$1,152
McEwen Drive Phase V (Wilson Pike to COF Limits)	1.01	Arterial / New 2 Ln Roadway	0	16,800	16,968	\$18,935,930	\$1,116
Carlisle Ln (SR96W-Mack Hatcher Pkwy)	0.82	Collector / Widen From 2 Ln. to 3 Ln.	7,300	9,100	1,476	\$12,504,000	\$8,472
Peytonsville Rd & Pratt Ln Int Improvements	0.40	Collector / Widen From 2 Ln. to 3 Ln.	7,300	9,100	720	\$10,972,866	\$15,240
Church St (Columbia to 1st Ave S)	0.42	Collector / Widen From 2 Ln. to 2 Ln.	7,300	9,100	756	\$8,476,400	\$11,212
Goose Creek Bypass Extension (Peytonsville Rd. to Long Ln.)	1.15	Arterial / New 4 Ln.	0	37,900	43,585	\$23,570,000	\$541
Carothers Parkway Ext. (Long Ln. to Future Goose Creek Bypass)	0.33	Arterial / New 4 Ln.	0	37,900	12,507	\$8,311,000	\$665
Aspen Grove Dr & Seaboard Ln Intersection Improvements	0.12	Collector / New 2 Ln. Collector	0	7,300	876	\$3,274,000	\$3,737
Carothers Pkwy (Falcon Creek Sub-SR96)	1.04	Arterial / Widen from 2 Ln. to 4 Ln.	16,800	37,900	21,944	\$24,209,164	\$1,103
Lewisburg Pike (Mack Hatcher Pkwy - Donaldson Creek)	0.79	Arterial / Widen from 2 Ln. to 4 Ln.	16,800	37,900	16,669	\$17,147,000	\$1,029
N Royal Oaks Blvd (Alexander Plz-Liberty)	0.61	Arterial / Widen from 3 Ln. to 4 Ln.	21,000	37,900	10,309	\$12,726,000	\$1,234
Carothers Pkwy (Long Ln - Falcon Creek Subd)	2.74	Arterial / Widen from 2 Ln. to 4 Ln.	16,800	37,900	57,814	\$15,250,000	\$264
Boyd Mill Ave (Downs Blvd - SR96W)	0.84	Collector / Widen From 2 Ln. to 3 Ln.	7,300	9,100	1,512	\$10,119,000	\$6,692
Clovercroft Rd (SR96 - Oxford Glen Dr)	1.40	Collector / Widen From 2 Ln. to 5 Ln.	7,300	18,100	15,120	\$20,790,000	\$1,375
West Main St (Natchez St to Downs Blvd)	0.71	Arterial / Widen from 2 Ln. to 3 Ln.	16,800	21,000	2,982	\$15,251,000	\$5,114
Columbia Ave (Downs Blvd to Fowlkes St)	0.72	Arterial / Widen from 2 Ln. to 3 Ln.	16,800	21,000	3,024	\$15,015,260	\$4,965
Mack Hatcher SE Widening	3.14	Arterial / Widen from 2 Ln. to 4 Ln.	16,800	37,900	66,254	\$51,040,000	\$770
Total	28.35				465,244	\$483,651,722	\$1,040

Source: City of Franklin and the *City of Franklin Road Impact Fee Study, June 2023*, Duncan Associates

Credit Component

In addition to the State and Federal revenue credits included in the Duncan study, a credit for outstanding road debt service payments was also included in this update. As shown in Table 3, only the non-impact fee portion of the debt service is eligible for the road impact fee credit calculation, which was calculated at approximately \$1.70 million per year.

Table 4 summarizes the State and Federal funding and debt service credit for the City of Franklin road impact fee calculations.

Table 3: Outstanding Road Debt Issues

Purpose	Principal	Interest	Total	Impact Fee Portion	Gen. Fund Portion	Years Remaining	Annual Non-IF
Bonds 2012 - \$22.5 million (various - Refunding)	\$4,335,000	\$280,810	\$4,615,810	\$4,615,810	\$0	4	-
Bonds 2017	\$10,539,175	\$4,189,635	\$14,728,810	\$0	\$14,728,810	14	\$1,052,058
Bonds 2019A - Refunding	\$7,299,040	\$3,100,955	\$10,399,995	\$0	\$10,399,995	16	\$650,000
Bonds 2019B - Refunding	\$5,880,270	\$1,232,020	\$7,112,290	\$7,112,290	\$0	6	-
Bonds 2019C - Refunding	\$12,104,400	\$3,507,315	\$15,611,715	\$15,611,715	\$0	9	-
Bonds 2019D - Taxable Refunding Bonds	\$834,200	\$51,907	\$886,107	\$886,107	\$0	4	-
Total	\$40,992,085	\$12,362,642	\$53,354,727				\$1,702,058

Source: City of Franklin

Table 4: State/Federal/Debt Funding Credit

Item	Arterials	Collectors	All Major Roads
Total State/Federal Capacity Funding, 2016-2028	\$125,801,585	\$0	\$125,801,585
÷ Years	13	13	13
Annual State/Federal Capacity Funding	\$9,677,045	\$0	\$9,677,045
Total Annual Debt Service	\$1,702,058	\$1,702,058	\$1,702,058
Total Annual State/Federal/Debt Funding	\$11,379,103	\$1,702,058	\$11,379,103
÷ Daily Vehicle-Miles of Travel (VMT)	1,029,084	212,310	1,241,394
Average Annual Funding per VMT	\$11.06	\$8.02	\$9.17
× Net Present Value Factor (20 Years)	14.47	14.47	14.47
State/Federal/Debt Funding Credit per VMT	\$160	\$116	\$133

Source: Table 3 for Total Annual Debt Service. All other variables are from the *City of Franklin Road Impact Fee Study, June 2023*, Duncan Associates

Road Impact Fee Calculation

Table 5 summarizes the updated cost and credit variables previously presented and the resulting net cost per daily VMT for each road classification.

Table 5: Net Cost per Vehicle-Mile of Travel

Item	Arterials	Collectors	All Major Roads
Average Cost per VMT	\$1,040	\$1,040	\$1,040
- State/Federal Funding Credit per VMT	-\$160	-\$116	-\$133
Net Cost per Daily VMT	\$880	\$924	\$907

Source: Table 2 and Table 4

Table 6 calculates road impact fee rates for the City of Franklin using the demand, cost, and credit data presented in this technical memorandum.

Table 6: Updated Net Cost Schedule

Land Use Type	Dev't Unit	VMT/Unit		Net Cost/VMT		Net Cost/Unit		Total
		Arterial	Collect.	Arterial	Collect.	Arterial	Collect.	
Single Family Det <1,500 sf	Dwelling	14.25	2.93	\$880	\$924	\$12,543	\$2,704	\$15,247
Single Family Det 1,500-2,999 sf	Dwelling	16.33	3.35	\$880	\$924	\$14,374	\$3,098	\$17,472
Single Family Det 3,000 sf or more	Dwelling	18.24	3.75	\$880	\$924	\$16,054	\$3,460	\$19,514
Single Family Att <1,500 sf	Dwelling	11.66	2.39	\$880	\$924	\$10,263	\$2,212	\$12,475
Single Family Att 1,500-2,999 sf	Dwelling	13.37	2.74	\$880	\$924	\$11,763	\$2,535	\$14,298
Single Family Att 3,000 sf or more	Dwelling	14.90	3.06	\$880	\$924	\$13,113	\$2,827	\$15,940
Multi-Family	Dwelling	11.49	2.36	\$880	\$924	\$10,111	\$2,181	\$12,292
Mobile Home Park	Site	12.14	2.49	\$880	\$924	\$10,683	\$2,301	\$12,984
Congregate Care Facility	Dwelling	4.08	0.84	\$880	\$924	\$3,590	\$776	\$4,366
Hotel/Motel	Room	7.44	1.53	\$880	\$924	\$6,547	\$1,414	\$7,961
Retail/Commercial								
Shopping Ctr/Gen. Retail	1,000 sq ft	21.96	4.53	\$880	\$924	\$19,325	\$4,186	\$23,511
Restaurant, Quality	1,000 sq ft	56.22	11.61	\$880	\$924	\$49,474	\$10,728	\$60,202
Restaurant, Fast Food	1,000 sq ft	64.51	13.32	\$880	\$924	\$56,769	\$12,308	\$69,077
Office/Institutional								
Office/General	1,000 sq ft	14.92	3.09	\$880	\$924	\$13,130	\$2,855	\$15,985
Hospital	1,000 sq ft	14.97	3.07	\$880	\$924	\$13,174	\$2,837	\$16,011
Nursing Home	1,000 sq ft	9.38	1.92	\$880	\$924	\$8,254	\$1,774	\$10,028
Church	1,000 sq ft	7.10	1.45	\$880	\$924	\$6,248	\$1,340	\$7,588
Elementary/Sec. School	1,000 sq ft	5.94	1.22	\$880	\$924	\$5,227	\$1,127	\$6,354
Industrial								
Manufacturing	1,000 sq ft	8.26	1.71	\$880	\$924	\$7,269	\$1,580	\$8,849
Industrial Park	1,000 sq ft	5.86	1.21	\$880	\$924	\$5,157	\$1,118	\$6,275
Business Park	1,000 sq ft	21.69	4.49	\$880	\$924	\$19,087	\$4,149	\$23,236
Warehouse	1,000 sq ft	2.96	0.61	\$880	\$924	\$2,605	\$564	\$3,169
Mini-Warehouse	1,000 sq ft	2.51	0.52	\$880	\$924	\$2,209	\$480	\$2,689

Source: Table 1 for VMT/Unit and Table 5 for Net Cost per VMT

Appendix A
Single Family Tiering Analysis

Single Family Residential Trip Generation Rate Tiering

As part of this study, the single family residential land use was separated in “single family detached” and “single family attached” land use and trip generation rate tiering was included to ensure equity by the size of a home. To facilitate this, an analysis was completed on the comparative relationship between housing size and household travel behavior. This analysis utilized data from the 2017 National Household Travel Survey (NHTS) and the 2021 American Housing Survey (AHS) to examine overall trip-making characteristics of households in the United States.

Single Family Detached

Table A-1 presents travel variables being utilized in the calculated road impact fee schedule for the single family (detached) land use. The 2017 NHTS database was used to assess average annual household vehicle miles of travel (VMT) for various annual household income levels. In addition, the 2021 AHS database was used to compare median annual family/household incomes with housing unit size. It is important to recognize that the use of the income variable in each of these databases is simply to provide a convenient linking mechanism between household VMT from the NHTS and housing unit size from the AHS.

Table A-1
Calculated Single Family Detached Trip Characteristics

Calculated Values Excluding Tiering	Trip Rate	Assessable Trip Length	Daily VMT
Single Family (Detached)	9.42	3.41	32.12

Source: City of Franklin Road Impact Fee Study, June 2023, Duncan Associates

The results of the NHTS and AHS analyses are included in Tables A-2 and A-3. First, the data shown in Table A-2 indicates that the average income in the U.S. for families/households living in housing units smaller than 1,500 square feet in size (\$51,697) is lower than the overall average income for the U.S. (\$66,289). In Table A-3, annual average household VMT was calculated from the NHTS database for several different income levels and ranges related to the resulting AHS income data in Table A-2.

Table A-2
Annual Income by Housing Size

2021 AHS Average Income Data by Housing Size	Annual Income ⁽¹⁾
Less than 1,500 sf	\$51,697
1,500 to 2,499 sf	\$74,416
1,500 to 2,999 sf	\$76,628
3,000 sf or more	\$93,260
Average of All Houses	\$66,289

Source: American Housing Survey for the United States in 2021

1) Weighted average of annual income for each tier

Table A-3
NHTS VMT Annual VMT by Income Category

2017 NHTS Travel Data by Annual HH Income	Annual VMT/HH	Days	Daily VMT	Ratio to Mean	Normalized to 1.054
Total (All Homes)	19,167	365	52.51	1.000	-
Average of \$51,697	17,934	365	49.13	0.936	0.888
Average of \$74,416	20,191	365	55.32	1.054	1.000
Average of \$76,628	20,546	365	56.29	1.072	1.017
Average of \$93,260	22,926	365	62.81	1.196	1.135

Source: 2017 National Household Travel Survey Database, Federal Highway Administration

To calculate a corresponding trip rate for the new tiers it was necessary to rely on comparative ratios. As an example, consider the \$51,697 annual income category. First, it was determined that the average annual household VMT for this income level is 17,934 miles. This figure was then compared to the overall average annual VMT per household in the U.S. and normalized to the average of the \$74,416 (20,191 miles) category to derive a ratio of 0.888. It should be noted that the \$74,416 (1,500 square feet to 2,499 square feet) category is not an impact fee tier, but rather the estimated average homes size that corresponds with the trip rate data shown in Table A-1.

Next, the normalized ratio was applied to the daily VMT for the average single family detached housing unit size (less than 1,500 square feet) to generate a daily VMT of 28.52 for the tier, as shown in Table A-4. This daily VMT figure was then divided by the proposed assessable trip length of 3.41 miles to obtain a trip generation rate of 8.36 trips per day.

Table A-4
Trip Generation Rate by Single Family Detached Land Use Tier

Estimation of Trip Rate by Tier	Trip Rate ⁽¹⁾	Assessable Trip Length ⁽²⁾	Daily VMT ⁽³⁾	Ratio to Mean ⁽⁴⁾
Single Family (Detached)				
Less than 1,500 sf	8.36	3.41	28.52	0.888
1,500 to 2,499 sf	9.42	3.41	32.12	1.000
1,500 to 2,999 sf	9.58	3.41	32.67	1.017
3,000 sf or more	10.69	3.41	36.46	1.135

- 1) Daily VMT (Item 3) divided by assessable trip length (Item 2) for each tier
- 2) Source: Table A-1
- 3) Ratio to the mean (Item 4) multiplied by the total daily VMT for the 1,500 to 2,499 sq tier
- 4) Source: Table A-3

Table A-5 illustrates the impact that the trip generation rate tiers have on the City’s calculated roadway impact fee rates for the single family (detached) land use.

Table A-5
Net Impact Fee by Single Family Detached Land Use Tier

Impact of Tiering on Fee Schedule	Trip Rate ⁽¹⁾	Trip Rate Adjusted ⁽²⁾	Assessable Trip Length ⁽³⁾	Daily VMT ⁽⁴⁾	Net Fee ⁽⁵⁾
Single Family (Detached)					
Less than 1,500 sf	8.36	4.18	3.41	14.25	\$15,247
1,500 to 2,999 sf	9.58	4.79	3.41	16.33	\$17,472
3,000 sf or more	10.69	5.35	3.41	18.24	\$19,514

- 1) Source: Table A-4tem 1)
- 2) Trip rate (Item 1) divided by two to reflect that every trip has an origin and destination
- 3) Source: Table A-1
- 4) Trip rate adjusted (Item 2) multiplied by the assessable trip length (Item 3)
- 5) Source: Table 6

Single Family Attached

Tables A-6 through A-10 present a similar tiering analysis for the single family attached land use.

Table A-6
Calculated Single Family Attached Trip Characteristics

Calculated Values Excluding Tiering	Trip Rate	Assessable Trip Length	Daily VMT
Single Family (Attached)	7.20	3.41	24.55

Source: Institute of Transportation Engineers (ITE) 11th Edition Handbook and the *City of Franklin Road Impact Fee Study, June 2023*, Duncan Associates

Table A-7
Annual Income by Housing Size

2021 AHS Average Income Data by Housing Size	Annual Income ⁽¹⁾
Less than 1,500 sf	\$51,697
1,000 to 1,999 sf	\$63,985
1,500 to 2,999 sf	\$76,628
3,000 sf or more	\$93,260
Average of All Houses	\$66,289

Source: American Housing Survey for the United States in 2021

1) Weighted average of annual income for each tier

Table A-8
NHTS VMT Annual VMT by Income Category

2017 NHTS Travel Data by Annual HH Income	Annual VMT/HH	Days	Daily VMT	Ratio to Mean	Normalized to 0.985
Total (All Homes)	19,167	365	52.51	1.000	-
Average of \$51,697	17,934	365	49.13	0.936	0.950
Average of \$63,985	18,877	365	51.72	0.985	1.000
Average of \$76,628	20,546	365	56.29	1.072	1.088
Average of \$93,260	22,926	365	62.81	1.196	1.214

Source: 2017 National Household Travel Survey Database, Federal Highway Administration

Table A-9
Trip Generation Rate by Single Family Attached Land Use Tier

Estimation of Trip Rate by Tier	Trip Rate ⁽¹⁾	Assessable Trip Length ⁽²⁾	Daily VMT ⁽³⁾	Ratio to Mean ⁽⁴⁾
Single Family (Attached)				
Less than 1,500 sf	6.84	3.41	23.32	0.950
1,000 to 1,999 sf	7.20	3.41	24.55	1.000
1,500 to 2,999 sf	7.83	3.41	26.71	1.088
3,000 sf or more	8.74	3.41	29.80	1.214

1) Daily VMT (Item 3) divided by assessable trip length (Item 2) for each tier

2) Source: Table A-6

3) Ratio to the mean (Item 4) multiplied by the total daily VMT for the 1,000 to 1,999 sq tier

4) Source: Table A-8

Table A-10
Net Impact Fee by Single Family Attached Land Use Tier

Impact of Tiering on Fee Schedule	Trip Rate ⁽¹⁾	Trip Rate Adjusted ⁽²⁾	Assessable Trip Length ⁽³⁾	Daily VMT ⁽⁴⁾	Net Fee ⁽⁵⁾
<i>Single Family (Attached)</i>					
Less than 1,500 sf	6.84	3.42	3.41	11.66	\$12,475
1,500 to 2,999 sf	7.83	3.92	3.41	13.37	\$14,298
3,000 sf or more	8.74	4.37	3.41	14.90	\$15,940

1) Source: Table A-9, Item 1

2) Trip rate (Item 1) divided by two to reflect that every trip has an origin and destination

3) Source: Table A-6

4) Trip rate adjusted (Item 2) multiplied by the assessable trip length (Item 3)

5) Source: Table 6