Traffic Impact Analysis

ENFIELD

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EXECUTIVE SUMMARY

PROJECT DESCRIPTION

The Enfield development is proposed to be in the southwest quadrant of the intersection of FM 973 and Gregg Lane within the City of Manor's Full Purpose Jurisdiction, Texas. The development is proposed to be comprised of residential and commercial mixed-use land uses and to have three access points along Gregg Lane and two access points along FM 973. The proposed land uses are shown in **Table ES-1**. This Traffic Impact Analysis (TIA) includes an evaluation of existing conditions (2021) and future build-out conditions (2026).

Table ES-1: Proposed Land Uses

ITE Code	Description	Quantity
210	Single Family Detached Housing	382 DU
820	Shopping Center	79.5 KSF
820	Shopping Center	40.3 KSF

The proposed site plan included 382 units of single family detached housing and 11-acres of commercial land use. A floor area ratio (FAR) of 0.25 was applied to determine the square footage of the commercial development within the land allotted.

SITE TRAFFIC

Entering and exiting volumes for the Enfield development were calculated using information from ITE's Trip Generation Manual, 10th Edition[1] and are shown in **Table ES-2**. The trips shown in **Table ES-2** are the net site generated trips for the attributed site developments for the AM and PM peak hour(s). No internal capture trips were anticipated for the site. Per ITE methodology, 0% (AM Peak) and 34% (PM Peak) of the shopping center were assumed to be pass-by trips. The net primary trips are determined by subtracting internal and pass-by trips for each land use. No internal capture trips are anticipated for this development.

Table ES-2: Adjusted ITE Trip Generation

ITE Code	Description	Quantity	ADT	AM Peak		PM Peak	
				Enter	Exit	Enter	Exit
210	Single Family Detached Housing	382 DU	3,568	69	207	232	136
820	Shopping Center	79.5 KSF	4,988	119	73	145	157
820	Shopping Center	40.3 KSF	3,146	107	65	88	95
		Total	11,702	295	345	465	388

TRIP DISTRIBUTION

For the Enfield development, trip distribution percentages were estimated based on existing count data and the proposed site location. The distribution was calculated for each major entry and exit point to the study network by calculating the proportion of total existing traffic entering or exiting the site at each point. Future site traffic was distributed using these estimated percentages. Trip distribution percentages are shown in Figure 21 and distribution calculations are provided in Appendix F.

Trip distributions between the driveways were developed separately between residential and commercial land uses and were based on the proximity to intended land uses. However, it should be noted that the overall network distribution remains the same between residential and commercial land uses. It should also be noted that Driveway 4 and Driveway 5 are right-in only driveways that provide access to the commercial land uses of the development.

KEY FINDINGS

The TIA identified several improvements based on the operational, signal warrant, and queuing analyses. The improvements recommended as a result of this study as well as the developer's pro rata share for improvement costs are presented in Table ES-3. A detailed discussion on improvements and considerations can be found in the Proposed Improvements section of the report.

Table ES-3: Engineer's Opinion of Probable Cost for Recommended Improvements in Build-Out (2026)

ID	Location	Improvement	Construction Subtotal	Developer's Pro Rata Share %	Developer's Construction Cost
101	FM 973 & Gregg Ln	Modify Signal Timings	$5,600.00	100.0%	$5,600.00
		Restripe NB left-turn bay	$2,650.00	100.0%	$2,650.00
		Add SB right-turn bay	$227,900.00	12.7%	$28,850.00
102	Tinajero Way & FM 973	Restripe NB striped median for left-turn bay	$2,700.00	100.0%	$2,700.00
		Install Signal Hardware for Eastbound Approach	$56,150.00	100.0%	$56,150.00
103	Suncrest Rd & FM 973	Install Signal	$617,900.00	16.7%	$103,100.00
		Add NB right-turn bay	$123,100.00	0.0%	$0.00
		Add SB left-turn bay	$148,400.00	4.3%	$6,400.00
104	Shadowglen Trace/Suncrest Rd & FM 973	Modify Signal Timings	$5,600.00	100.0%	$5,600.00
		Add WB left-turn bay	$130,350.00	0.0%	$0.00
		Add WB right-turn bay	$140,450.00	0.0%	$0.00
		Add NB right-turn bay	$227,900.00	0.0%	$0.00
		Add SB left-turn bay	$209,850.00	11.1%	$23,300.00
105	FM 973 & US 290	Add EB left-turn bay to create dual lefts	$343,600.00	16.3%	$56,150.00
		Addition of a NB receiving/transition lane	$90,300.00	16.9%	$15,250.00
		Add NB right-turn bay	$172,500.00	0.0%	$0.00
106	Fuchs Grove Rd & Gregg Ln	Install Signal	$617,900.00	5.6%	$34,850.00
		Add WB right-turn bay	$114,700.00	5.7%	$6,600.00
		Add NB right-turn bay	$123,100.00	16.7%	$20,500.00
		Add SB left-turn bay	$156,850.00	8.5%	$13,350.00
107	Fuchs Grove Rd & Gregg Manor Rd	Add SB right-turn bay	$143,600.00	8.3%	$11,950.00
		Add WB right-turn bay	$142,400.00	6.7%	$9,500.00
203	Driveway 3 & Gregg Ln	Add EB right-turn bay	$120,450.00	100.0%	$120,450.00
N/A	Gregg Ln between FM 973 & Driveway 3	Expand Cross-Section	$1,631,400.00	12.7%	$207,400.00
N/A	Gregg Ln between Driveway 3 & Fuchs Grove Rd	Expand Cross-Section*	$741,850.00	8.2%	$60,900.00
		Total	**$6,297,200.00**		**$791,250.00**

**A segment of the Gregg Lane cross-section is to be expanded by others as part of a bridge reconstruction project.*

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INTRODUCTION AND BACKGROUND

The Enfield development is proposed to be in the southwest quadrant of the intersection of FM 973 and Gregg Lane within the City of Manor's Full Purpose Jurisdiction, Texas. The development is proposed to be comprised of residential and commercial land uses. The location of the proposed development with respect to the area roadway network is shown in Figure 1. Figure 5 through Figure 11 show the existing study intersection geometries as well as nearby above ground utilities. The proposed site plan with site driveways labeled can be found in Figure 2 . Driveway dimensions are included in Appendix N. The proposed land use is shown in Table 1.

Table 1: Proposed Land Uses

ITE Code	Description	Quantity
210	Single Family Detached Housing	382 DU
820	Shopping Center	79.5 KSF
820	Shopping Center	40.3 KSF

The proposed site plan included 382 units of single family detached housing and 11-acres of commercial land use. A floor area ratio (FAR) of 0.25 was applied to determine the square footage of the commercial development within the land allotted.

The following background projects are currently planned or under construction within the study area according to Travis County:

- Compass Rose Charter School
- Gregg Manor Tract
- Shadowglen Development
- Manor Wolf/Palomino
- Stonewater/Stonewater North
- KB Homes Subdivision

The location of these projects as well as existing land uses around the proposed site can be found in Figure 4. Figure 5 through Figure 11 show the existing study intersection geometries as well as nearby above ground utilities.

PURPOSE

The purpose of this study is to evaluate the traffic impacts of the site on the adjacent roadway network. This Traffic Impact Analysis (TIA) includes an evaluation of existing conditions (2021) and future build-out conditions (2026). Based on analysis results, recommendations will be identified to ensure that the intersections within the study area operate at an adequate level of service (LOS). The TIA was conducted on behalf of:

Jake Muse

Monarch Ranch at Manor, LLC

Phone: (662) 513-4194

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METHODOLOGY

Traffic Impact Analysis Process

The following information provides a summary of the technical analysis used for this TIA. The methodology in this report follows the TxDOT and Travis County requirements. The study methodology is as follows:

1. Obtain four-hour turning movement counts during the weekday AM (7-9) and PM (4-6) peak periods at the following intersection:
    a. FM 973 & Gregg Lane (Collected May 20, 2021)
    b. FM 973 & Tinajero Way (Collected May 20, 2021)
    c. FM 973 & Suncrest Road (Collected May 20, 2021)
    d. FM 973 & Shadowglen Trace/Suncrest Road (Collected May 20, 2021)
    e. FM 973 & US 290 (Collected May 20, 2021)
    f. Fuchs Grove Road & Gregg Manor Road (Collected May 20, 2021)

2. Obtain 12-hour (7 AM – 7 PM) turning movement counts during the weekday AM (7-9) and PM (4-6) peak periods at the following intersection:
    a. Fuchs Grove Road & Gregg Lane (Collected May 20, 2021)

3. Develop existing year (2021) base volumes based on the steps outlined in the following Volume Development section.

4. Inventory the study intersections and note their respective intersection geometry, number of travel lanes, pavement markings, and intersection traffic control.

5. Evaluate existing AM and PM peak LOS (based on 6th Edition Highway Capacity Manual) at all intersections identified in Task 1 and Task 2.

6. Determine background traffic within the study area using existing volume counts and traffic growth rates determined from historical traffic counts obtained from the TxDOT, and using site trips from background projects near the study area.

7. Calculate the site-generated traffic for the proposed development using ITE Trip Generation Rates from the 10th Edition.

8. Determine trip distribution percentages for site generated traffic based on existing count data, site access locations and roadway geometries.

9. Assign total (background + site) traffic onto the roadway network located within the study area based on trip distribution percentages determined in Task 8.

10. Perform intersection analyses for the study peak period to determine intersection level-of-service (LOS) for the intersections identified in Task 1 and Task 2 and future intersections.

11. Analyze the results of Task 10 to determine the impacts of the development and accompanying traffic on surrounding study area roadways. Identify appropriate mitigation measures (geometric and/or operational improvements), which would be required in order to accommodate site generated traffic.

12. Determine probable cost of anticipated improvements from Task 11.

Volume Development

Due to the COVID-19 pandemic, traffic patterns and magnitudes are abnormal within the study area because fewer people are commuting to work and many children are not traveling to school. Therefore, May 2021 turning movement counts in conjunction with Texas Department of Transportation (TxDOT) historical counts were used to estimate existing year (2021) peak hour turning movement volumes at the study intersections. The methodology for developing the turning movement counts is as follows:

1. Obtain four-hour turning movement counts during the weekday AM (7-9) and PM (4-6) peak periods at the following intersection:

    a. FM 973 & Gregg Lane (Collected May 20, 2021)
    b. FM 973 & Tinajero Way (Collected May 20, 2021)
    c. FM 973 & Suncrest Road (Collected May 20, 2021)
    d. FM 973 & Shadowglen Trace/Suncrest Road (Collected May 20, 2021)
    e. Fm 973 & US 290 (Collected May 20, 2021)
    f. Fuchs Grove Road & Gregg Manor Road (Collected May 20, 2021)

2. Collect 12-hour turning movement counts during the weekday, to be used for signal warrants, at the following intersection:

    a. Fuchs Grove Road & Gregg Lane (Collected May 20, 2021)

3. Obtain TxDOT historical counts from the online Traffic Count Database System (TCDS) for Station ID 227H31, located north of US 290 on FM 973.

4. Grow all counts to an adjusted existing base year (2021) based on a 6.3% growth rate derived from TxDOT historical count data (STARS IDs 227H31, 227H37, and 227H32)

5. Compare turning movement counts at FM 973 and US 290 to historical counts from Task 3 to determine impacts of the COVID-19 pandemic on travel patterns within the study area.

6. Develop COOVID-19 AM peak and PM peak adjustment factors to apply to count data from Task 1 and Task 2 to estimate pre-pandemic conditions.

7. Apply AM and PM COVID-19 adjustment factors to 2021 collected counts listed in Task1 and Task 2 to produce adjusted turning movement volumes.

Raw count data for existing base year (2021) data can be found in Appendix C. The COVID-19 adjustment factor applied to the collected traffic data was 1.02 in the AM peak and 1.16 in the PM peak. Calculations can be found in Appendix F. Existing conditions traffic volumes with and without the COVID-19 adjustment factor are found in Figure 12 and Figure 13. Existing Condition Volumes are tabulated in Table 2 and Table 3.

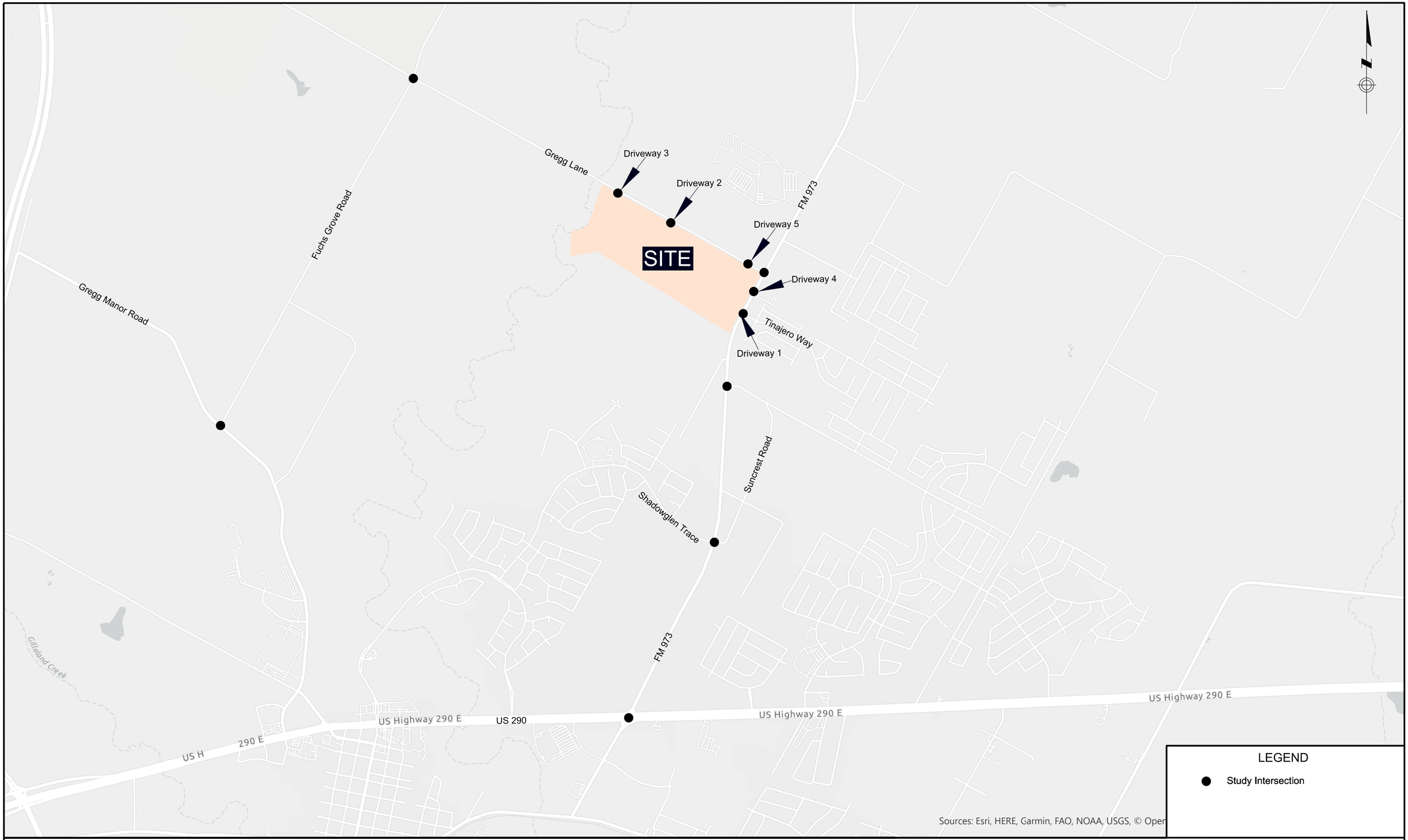

Figure 1: Study Area

SEC Planning, LLC

Land Planning + Landscape Architecture + Community Branding

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LOTTING PLAN F
MONARCH RANCH

BLACKBURN GROUP

MANOR, TEXAS

Figure 2: Site Plan

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Base mapping compiled from best available information. All map data should be considered as preliminary, in need of verification, and subject to change. This land plan is conceptual in nature and does not represent any regulatory approval. Plan is subject to change.

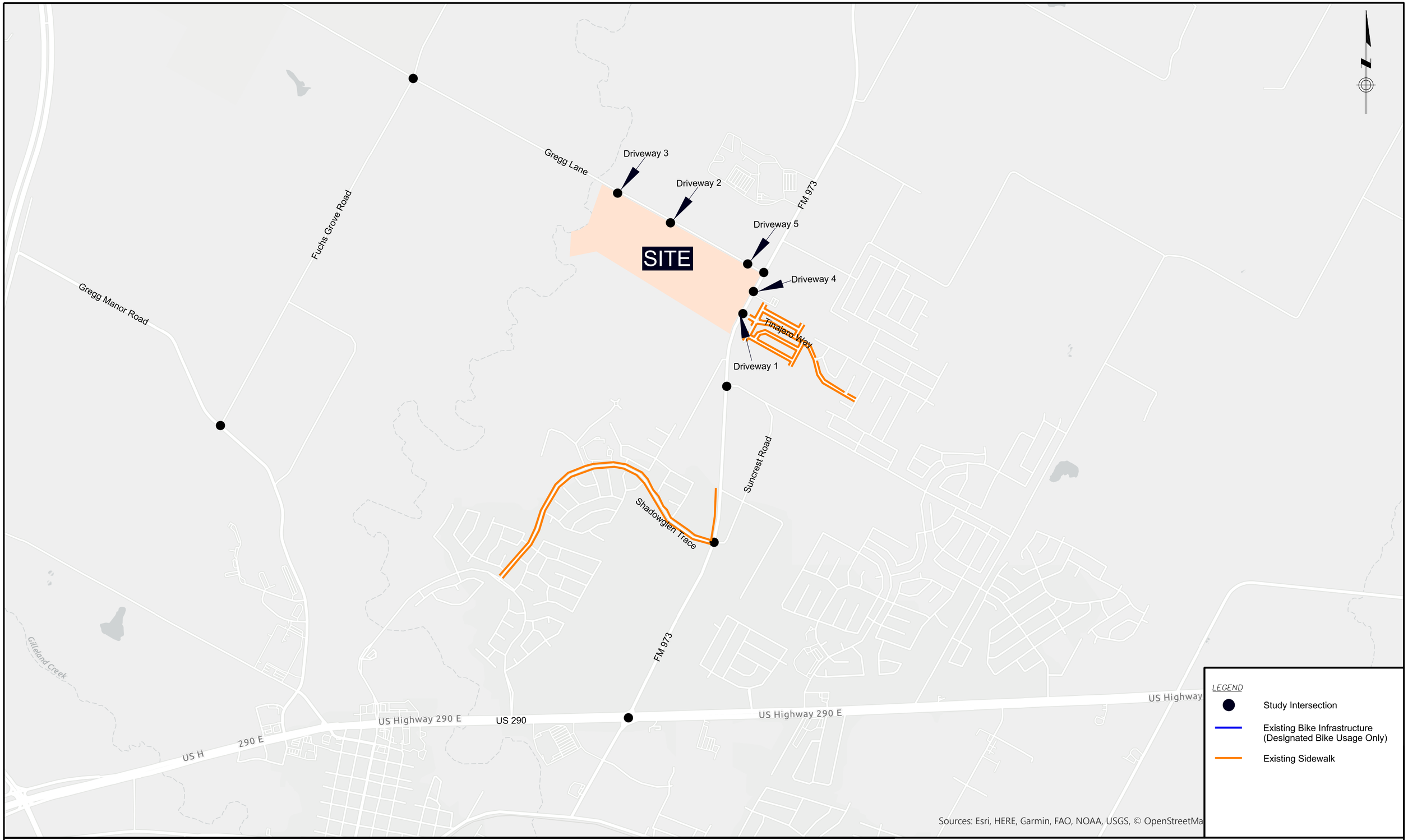

Figure 3: Site Location and Existing Bike, Transit and Pedestrian Infrastructure

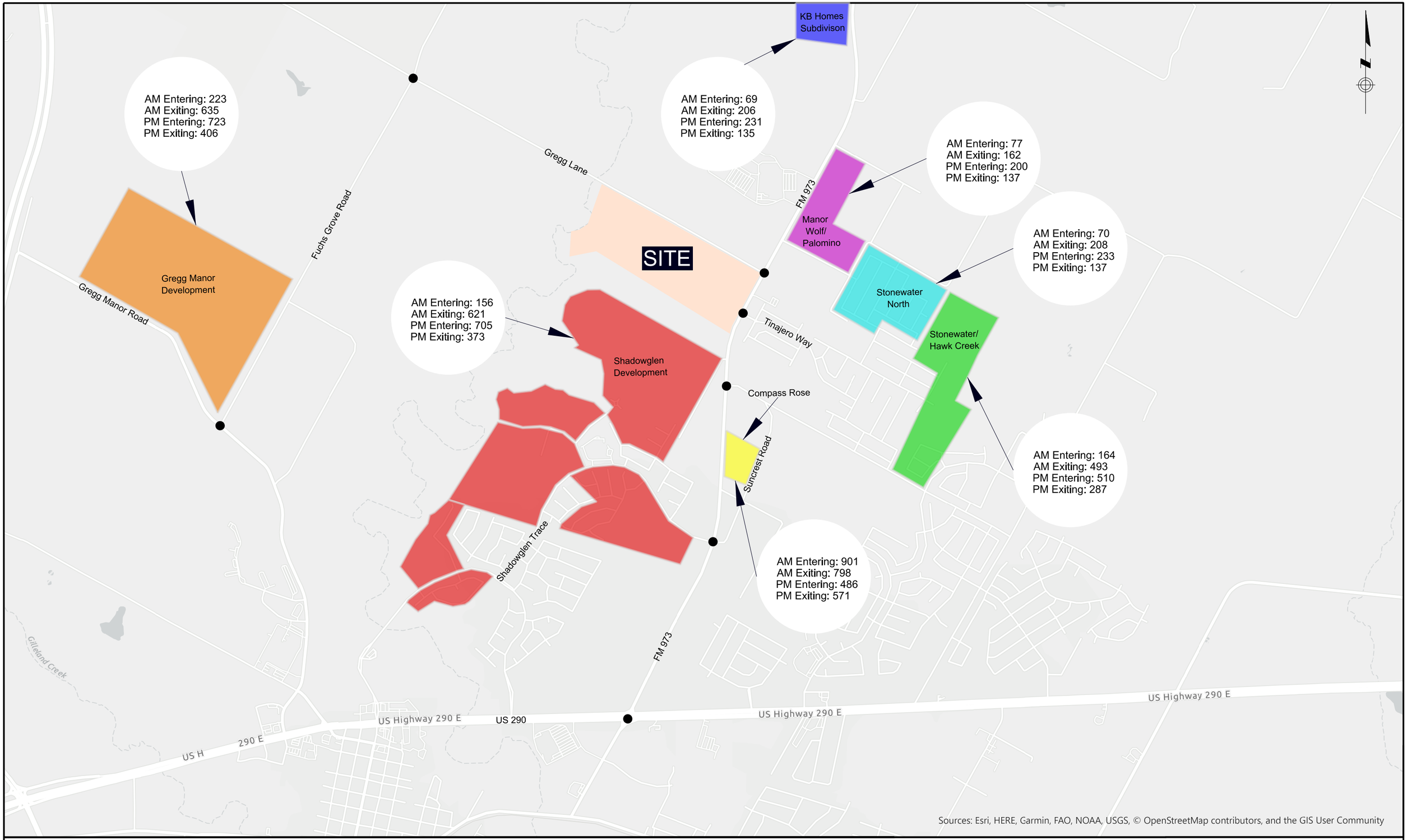

Figure 4: Background Projects

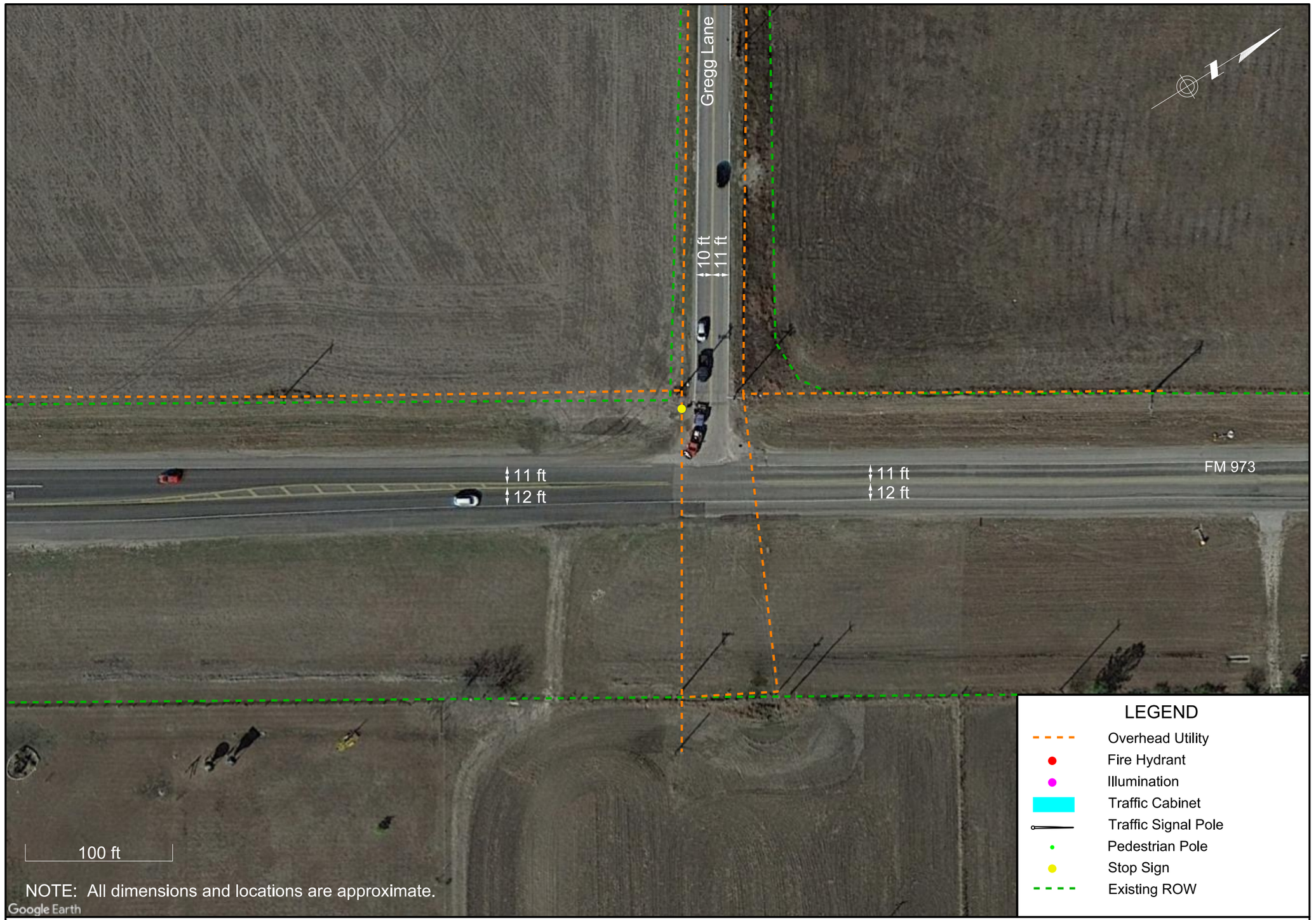

Figure 5: FM 973 at Gregg Lane

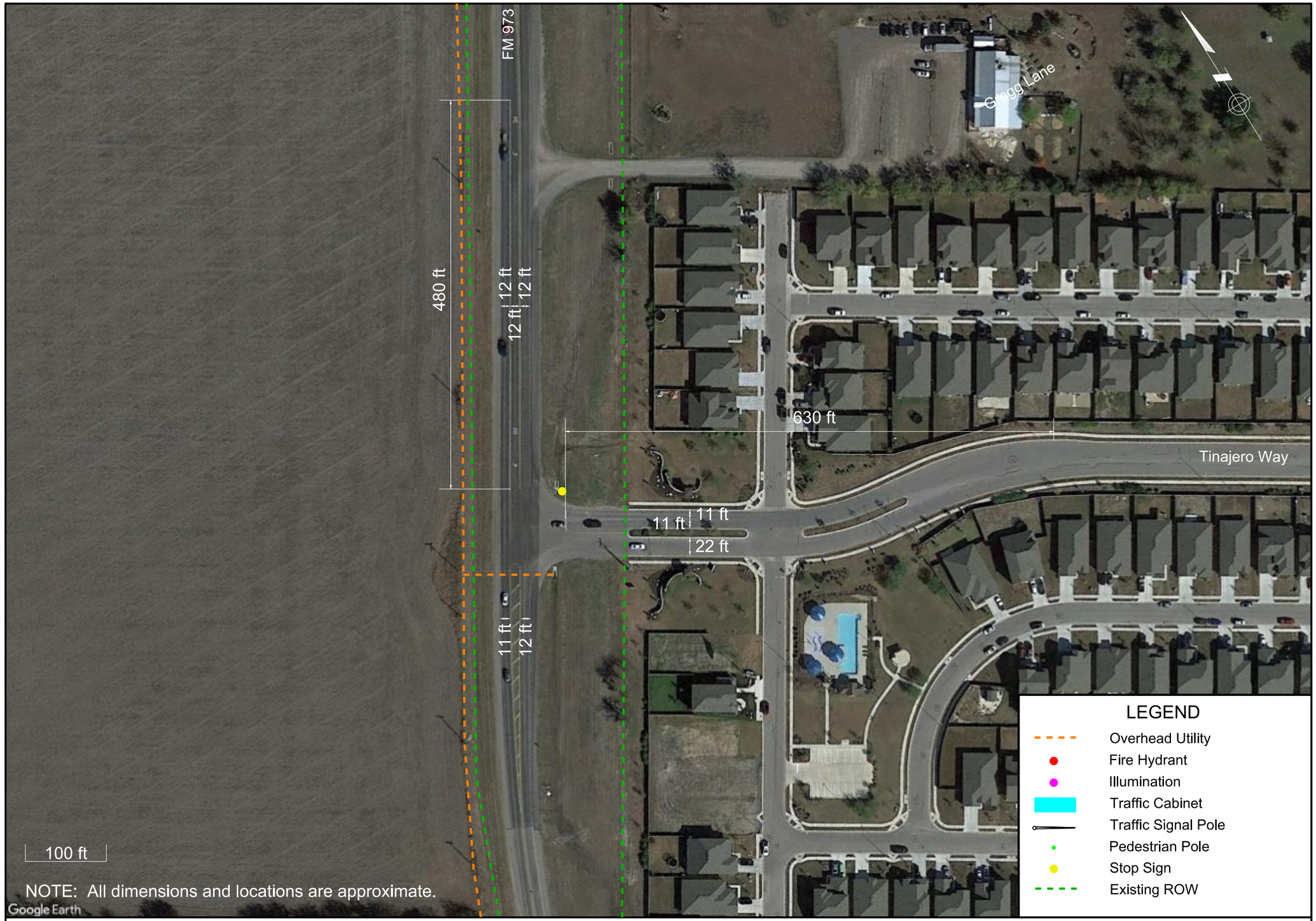

Figure 6: FM 973 at Tinajero Way

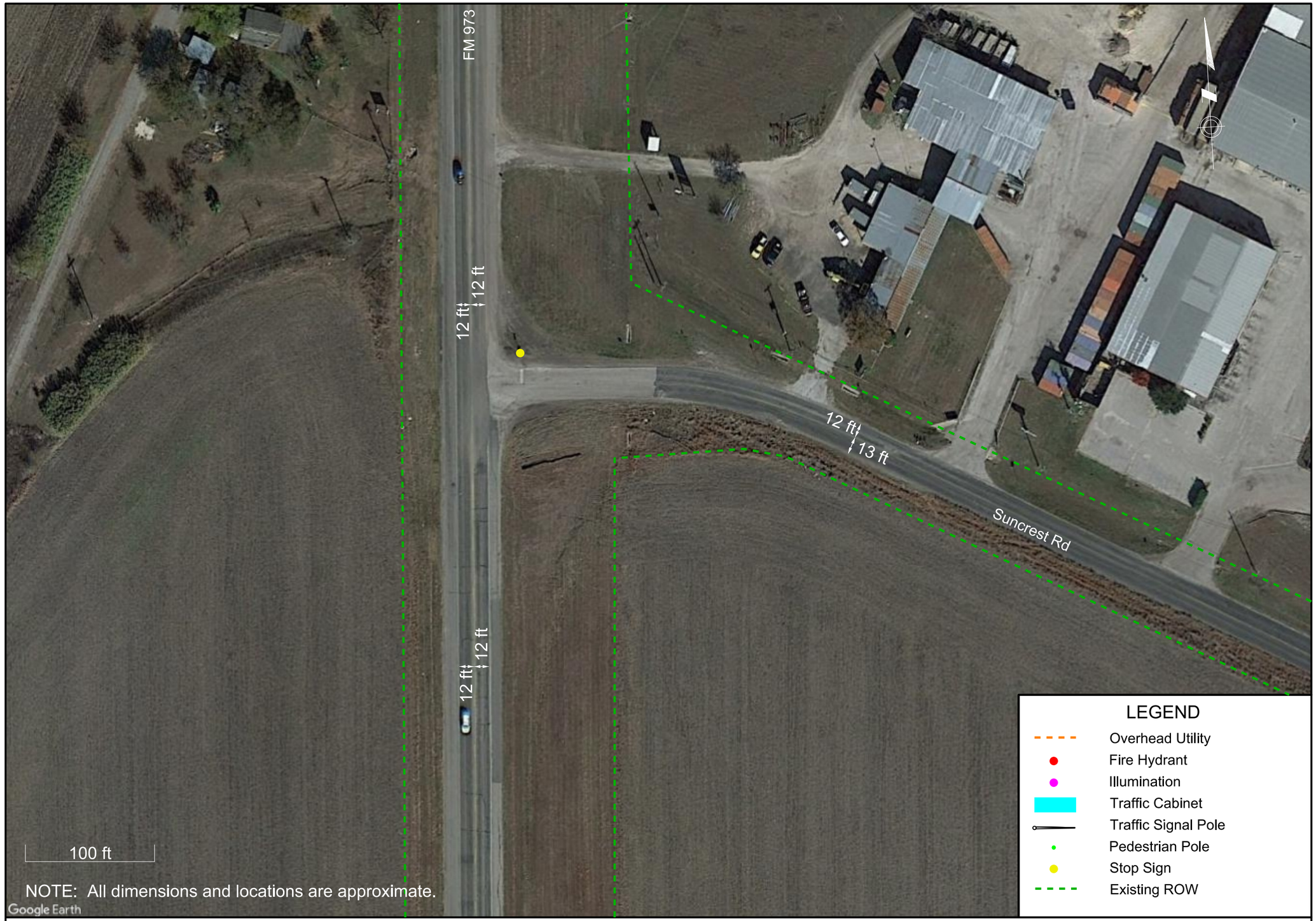

Figure 7: FM 973 at Suncrest Road

Figure 8: FM 973 at Shadowglen Trace/Suncrest Road

Figure 9: US 290 at FM 973

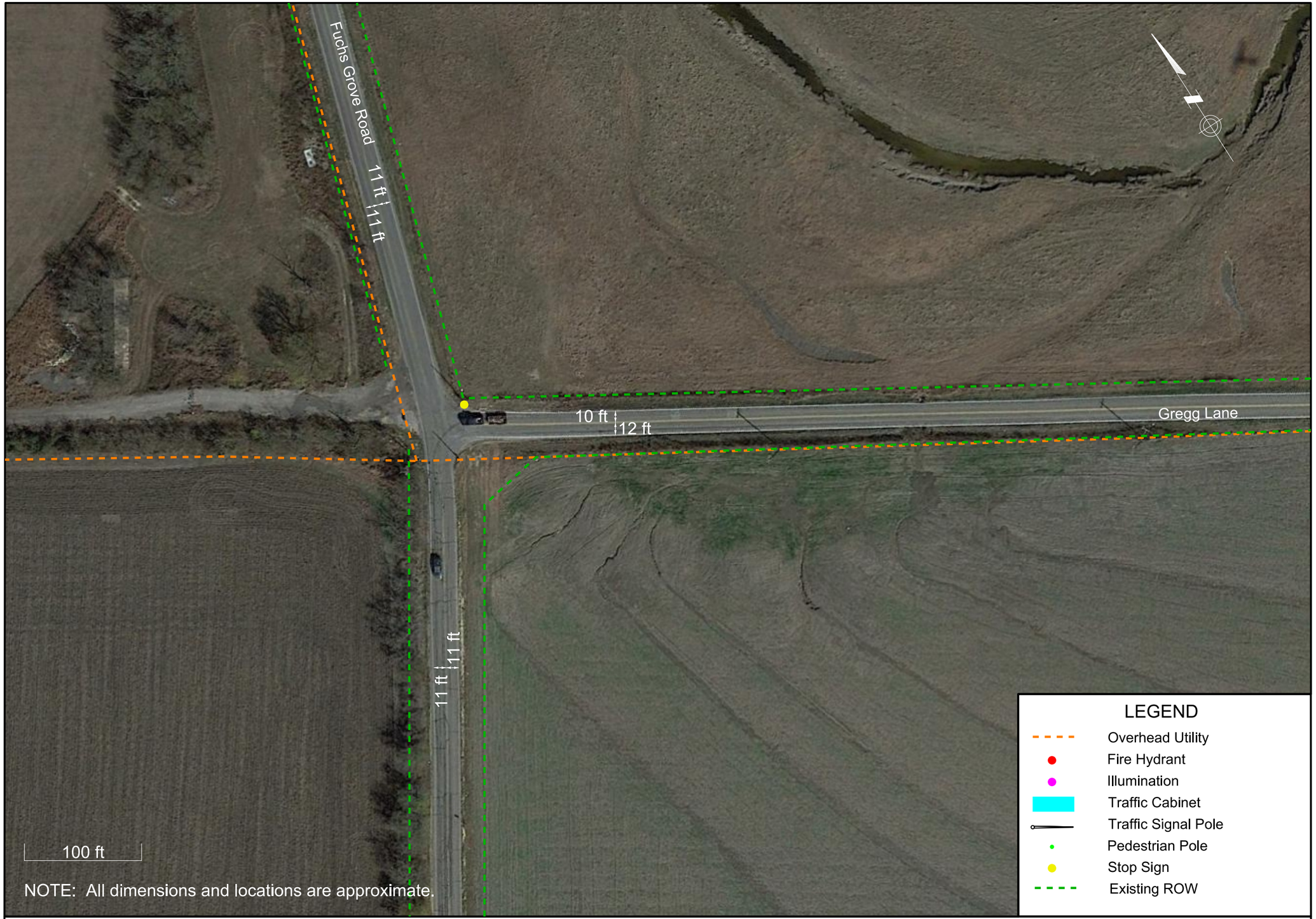

Figure 10: Gregg Lane at Fuchs Grove Road

Figure 11: Fuchs Grove Road at Gregg Manor Road

EXISTING OPERATING CONDITIONS

EXISTING THOROUGHFARE SYSTEM

The following provides a description of the major transportation facilities within the study area:

FM 973

FM 973 is a north/south minor arterial within Travis and Williamson Counties, beginning at the intersection with US 79 and ending at the intersection with US 183. Within the study area, FM 973 is a two-lane roadway with a posted speed limit of 65 mph. From just south of the intersection with Gregg Lane to just north of Manor Senior High School, FM 973 includes a center two-way left-turn lane (TWLTL). For the purpose of this study, the cross section is expected to remain unchanged for the foreseeable future.

Gregg Lane

Gregg Lane is a northwest/southeast minor collector within Travis County, beginning at the intersection with E Howard Lane and ending at the intersection with Cameron Road. Within the study area, Gregg Lane is a two-lane roadway with a posted speed limit of 50 mph. For the purpose of this study, the cross section is expected to remain unchanged for the foreseeable future.

Tinajero Way

Tinajero Way is a northwest/southeast local roadway serving the Stonewater residential development within Travis County, beginning at the intersection with FM 973 and ending at the intersection with Almodine Road. Within the study area, Tinajero Way is a two-lane roadway with sidewalks on either side, a 10-foot raised grassy median, and a posted speed limit of 30 mph. For the purpose of this study, the cross section is expected to remain unchanged for the foreseeable future.

Suncrest Road

Suncrest Road is a local roadway within Travis County, beginning at the intersection with FM 973 and ending at the intersection with FM 973 approximately 0.65 miles south, where it turns into Shadowglen Trace. Within the study area, Suncrest Road is a two-lane roadway with no posted speed limit. A prima facie speed limit of 30 mph was used for this analysis. For the purpose of this study, the cross section is expected to remain unchanged for the foreseeable future.

Shadowglen Trace

Shadowglen Trace is a northwest/southeast local roadway serving the Shadowglen residential development within Travis County, beginning at the intersection with FM 973 and ending at the intersection with Lexington Street. Within the study area, Shadowglen Trace is a four-lane roadway with sidewalks on either side and a posted speed limit of 35 mph. For the purpose of this study, the cross section is expected to remain unchanged for the foreseeable future.

Fuchs Grove Road

Fuchs Grove Road is a north/south roadway beginning at the intersection of Gregg Manor Road and ends at the intersection with Cameron Road. Within the study area, Fuchs Grove Road is a two-lane undivided roadway with a posted speed limit of 50 mph and a posted speed limit of 40 mph.

US 290

US Highway 290 is an east/west principal roadway within Travis County, beginning at the intersection with Mopac Expressway and ending at the intersection with SH 130. Within the study area, US 290 is a four-lane divided roadway with a 60-foot median and a posted speed limit of 65 mph. For the purpose of this study, the cross section is expected to remain unchanged for the foreseeable future.

Gregg Manor Road

Gregg Manor Road is a east/west major collector roadway beginning at the intersection of Gregg Manor Road and ends at the intersection with Cameron Road. Within the study area, Gregg Manor Road is a two-lane undivided roadway with a posted speed limit of 50 mph.

EXISTING INTERSECTIONS

The existing roadway network within the study area includes five un-signalized intersections and two signalized intersections.

FM 973 & Gregg Lane

This three-legged intersection is unsignalized. FM 973 is uncontrolled while Gregg Lane is stop-controlled. The northbound approach along FM 973 has a through lane and a two-way-left-turn-lane. The southbound approach along FM 973 has a shared through-right lane and a two-way-left-turn-lane. The eastbound approach along Gregg Lane has one shared lane for all movements.

FM 973 & Tinajero Way

This three-legged intersection is unsignalized. FM 973 is uncontrolled while Tinajero Way is stop-controlled. The northbound approach along FM 973 has one shared lane for all movements. The southbound approach along FM 973 has a left-turn bay as part of a two-way left-turn lane and a through lane. The westbound approach along Tinajero Way has a left-turn lane and a right-turn lane.

FM 973 & Suncrest Road (North)

This three-legged intersection is unsignalized. FM 973 is uncontrolled while Suncrest Road is stop-controlled. The northbound approach along FM 973 has one shared lane for all movements. The southbound approach along FM 973 has one shared lane for all movements. The westbound approach along Suncrest Road has one shared lane for all movements.

FM 973 & Shadowglen Terrace/Suncrest Road (South)

This four-legged intersection is signalized. The northbound and southbound approaches along FM 973 have a left-turn bay and a shared through-right lane. The eastbound approach along Shadowglen Terrace has a left-turn lane and a right-turn lane. The westbound approaches along Suncrest Road one shared lane for all movements.

FM 973 & US 290

This four-legged intersection is signalized. The northbound approach along FM 973 has a left-turn bay, a through lane and a channelized right-turn bay. The southbound approach along FM 973 has a shared left-through lane and a channelized right-turn bay. The eastbound approach along US 290 has a left-turn bay, two through lanes and a shared through-right lane with a channelized right turn. The westbound approach along US 290 has a left-turn bay, two through lanes and a channelized right-turn bay.

Fuchs Grove Road & Gregg Lane

This three-legged intersection is unsignalized. Fuchs Grove Road is uncontrolled while Gregg Lane is stop-controlled. The northbound approach along Fuchs Grove Road has one shared lane for all movements. The southbound approach along Fuchs Grove Road has one shared lane for all movements. The westbound approach along Gregg Lane has one shared lane for all movements.

Gregg Manor Road & Fuchs Grove Road

This three-legged intersection is unsignalized. Gregg Manor Road is uncontrolled while Fuchs Grove Road is stop-controlled. The southbound approach along Fuchs Grove Road has one shared lane for all movements. The eastbound approach along Gregg Manor Road has one shared lane for all movements. The westbound approach along Gregg Manor Road has one shared lane for all movements.

Table 2: Existing Condition AM Volumes

Intersection		NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR
Existing Volumes without COVID-19 Adjustment Factor																	
101	Gregg lane at FM 973	-	420	275	-	-	-	509	97	-	10	-	103	-	-	-	-
102	Tinajero Way at FM 973	-	0	561	44	1	25	574	0	-	0	0	0	1	131	0	130
103	Suncrest Rd at FM 973	-	-	368	30	-	56	648	-	-	-	-	-	1	59	-	206
104	Shadowglen Trace/Suncrest Rd at FM 973	1	86	287	10	-	2	587	85	1	102	25	101	-	144	81	3
105	US 290 at FM 973	-	101	130	103	-	32	108	667	17	152	864	66	8	149	1344	75
106	Gregg Lane at Fuchs Grove Rd	-	-	61	35	-	83	117	-	-	-	-	-	-	217	-	296
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	169	-	177	-	39	79	-	-	-	105	56
Existing Volumes with COVID-19 Adjustment Factor																	
101	Gregg lane at FM 973	-	426	279	-	-	-	517	98	-	10	-	105	-	-	-	-
102	Tinajero Way at FM 973	-	0	570	45	1	25	583	0	-	0	0	0	1	133	0	132
103	Suncrest Rd at FM 973	-	-	374	30	-	57	658	-	-	-	-	-	1	60	-	209
104	Shadowglen Trace/Suncrest Rd at FM 973	1	87	291	10	-	2	596	86	1	104	25	103	-	146	82	3
105	US 290 at FM 973	-	103	132	105	-	32	110	677	17	154	877	67	8	151	1365	76
106	Gregg Lane at Fuchs Grove Rd	-	-	62	36	-	84	119	-	-	-	-	-	-	220	-	301
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	172	-	180	-	40	80	-	-	-	107	57

Table 3: Existing Condition PM Volumes

Intersection		NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR
Existing Volumes without COVID-19 Adjustment Factor																	
101	Gregg lane at FM 973	-	195	480	-	-	-	402	42	-	52	-	334	-	-	-	-
102	Tinajero Way at FM 973	-	0	630	133	0	88	654	0	-	0	0	0	0	83	0	47
103	Suncrest Rd at FM 973	-	-	669	33	-	196	522	-	-	-	-	-	0	16	-	75
104	Shadowglen Trace/Suncrest Rd at FM 973	2	100	596	49	-	4	436	84	2	88	51	62	-	39	22	0
105	US 290 at FM 973	-	146	182	198	-	57	81	392	23	448	2061	121	15	167	1182	101
106	Gregg Lane at Fuchs Grove Rd	-	-	131	108	-	284	73	-	-	-	-	-	-	39	-	196
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	87	-	43	-	150	158	-	-	-	68	96
Existing Volumes with COVID-19 Adjustment Factor																	
101	Gregg lane at FM 973	-	225	555	-	-	-	465	49	-	60	-	386	-	-	-	-
102	Tinajero Way at FM 973	-	0	728	154	0	102	756	0	-	0	0	0	0	96	0	54
103	Suncrest Rd at FM 973	-	-	773	38	-	227	603	-	-	-	-	-	0	18	-	87
104	Shadowglen Trace/Suncrest Rd at FM 973	2	116	689	57	-	5	504	97	2	102	59	72	-	45	25	0
105	US 290 at FM 973	-	169	210	229	-	66	94	453	27	518	2382	140	17	193	1366	117
106	Gregg Lane at Fuchs Grove Rd	-	-	151	125	-	328	84	-	-	-	-	-	-	45	-	227
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	101	-	50	-	173	183	-	-	-	79	111

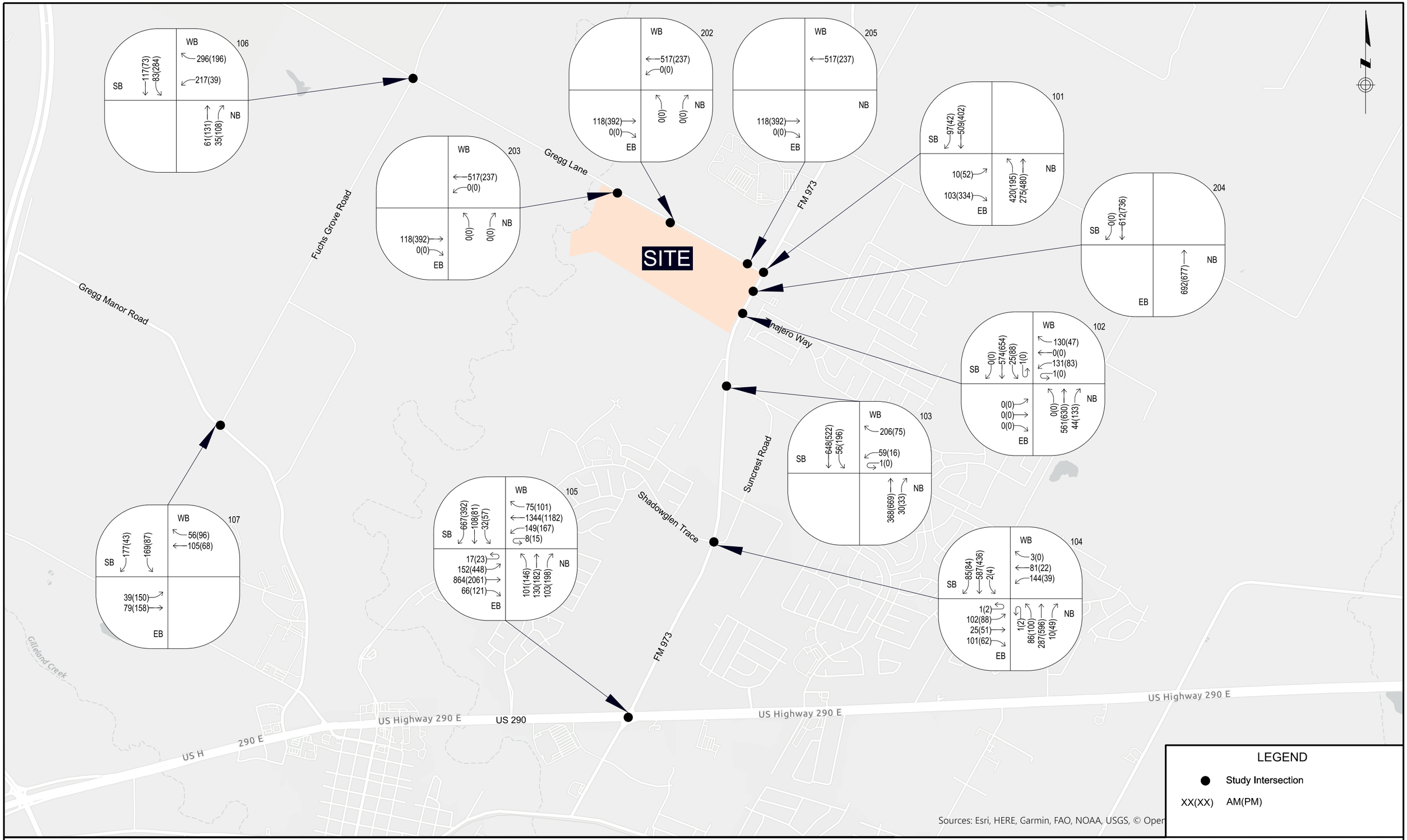

Figure 12: Existing without COVID-19 Adjustment Factor Volumes

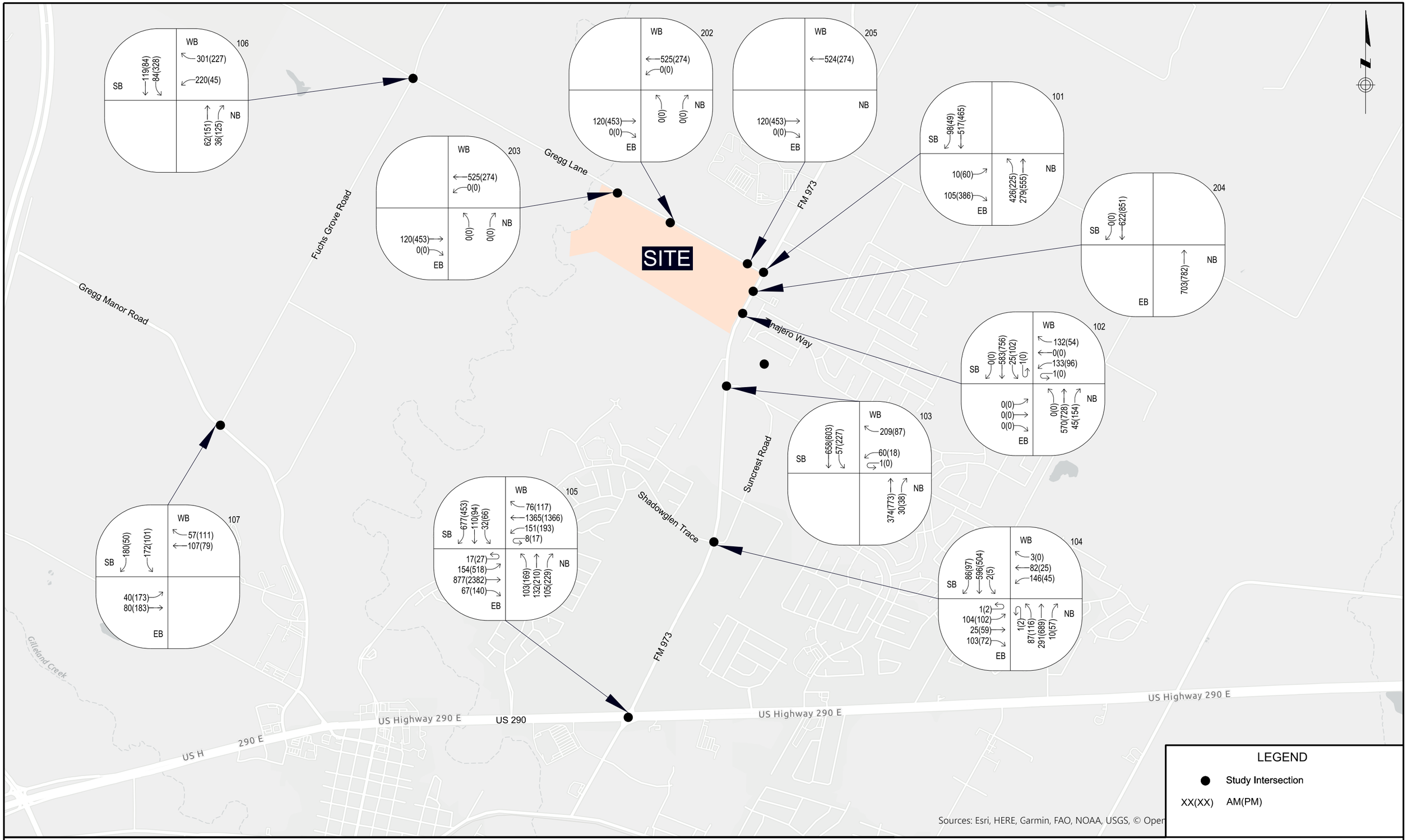

Figure 13: Existing with COVID-19 Adjustment Factor Volumes

NO-BUILD OPERATING CONDITIONS

PUBLIC INFRASTRUCTURE IMPROVEMENTS

The Travis County 2045 Transportation Plan was consulted to identify planned public infrastructure improvements to roadways and intersections within the study area. TxDOT plans to signalize the intersections of FM 973 at Gregg Lane and FM 973 at Tinajero Way prior to 2026 build-out year. Therefore, the signalization of these intersections was incorporated in the No-Build analysis. Coordination and funding email of the signalization of these intersections is documented in Appendix B. In addition, there is a planned roadway improvement project to reconstruct the Gregg Lane bridge over Wilbarger Creek just east of the Enfield development. This project will also improve a portion of the Gregg Lane roadway cross-section.

BACKGROUND TRAFFIC

A technical approach for estimating future travel demand was utilized in evaluating the roadway system in and around the proposed development. Information used to develop the projection of future traffic for this area is documented in the following sections of the report.

Existing and projected traffic volumes using the roadway system without the proposed project are commonly called background, or no-build, traffic. For the proposed Enfield development, background traffic was based upon traffic counts collected in 2021. A 6.3% growth rate was then applied to existing traffic. The growth rate was determined using counts from 2015 to 2019 from the online TxDOT TCDS. For each of the three TCDS counts considered, growth rates were calculated between each combination of years between 2015 and 2019 (e.g., 2015 – 2016, 2015 – 2017, 2015 – 2018, 2015 – 2019, 2016 – 2017, 2016 – 2018, etcetera). Then, outlier growth rates were removed from each set of calculated growth rates. For the purposes of this study, an outlier growth rate was considered any growth rate less than -3% and greater than 12%. The remaining growth rates were then averaged for each count station, and then averaged across count stations to arrive at the final calculated growth rate of 6.3%. The growth rate calculation is shown in Appendix F.

A growth rate calculated between 2015 and 2019 was considered. This calculated growth rate averaged 11.6% which was considerably high for the area. 2020 data was available, but the AADTs were considerably lower than that in 2019 due to the atypical traffic patterns during the COVID-19 pandemic and therefore were not used. The 6.3% used in this analysis is higher than other developments near the Enfield project area. Furthermore, the background projects included contribute to the total growth, therefore, the calculated 6.3% represents both a conservative and reasonable growth rate given these conditions. Approval of the growth rate can be found in an email in Appendix B.

The anticipated build out year is 2026. Thus, existing traffic was grown over a five-year period for 2021 counts to calculate background (2026) volumes. AM and PM peak hour intersection volumes for no-build (2026) conditions with and without background project traffic can be found in Appendix F.

When computing background traffic, consideration must be taken to include projected traffic from sites that have not yet been completed but are estimated to be completed by the Build-Out date. It was determined by Travis County that the following seven projects should be considered:

- Gregg Manor Tract (Travis County)
- Compass Rose Charter School (Travis County)
- Shadowglen (City of Manor)

- Manor Wolf Development (City of Manor)
- Palomino (City of Manor)
- Stonewater/Stonewater North (City of Manor)
- KB Homes Subdivision (City of Manor)

The following section provides a description of available information and assumptions made as part of this study for each background project. Background project information provided by the City and County can be found in **Appendix F.** AM and PM peak hour intersection volumes for each background project as well as distribution calculations can be found in **Appendix F**.

Gregg Manor Tract (Travis County)

The Gregg Manor Tract TIA was provided by Travis County. The Greg Manor Tract development land use consists of single-family homes. The volumes provided in the Gregg Manor Tract TIA were used directly for available study intersections. For study intersection that were not included in the Gregg Manor Tract TIA, trips were estimated using available intersection volumes and distributions derived as part of this study to route trips through adjacent study intersections. This development is anticipated to have a build-out year of 2028. Because the Enfield development has a build-out year of 2026, a portion of the site traffic was evaluated in this analysis. Site traffic based on an average build rate per year (total number of site traffic divided by the difference between build-out year and base year) was incorporated to the background traffic.

Compass Rose Charter School (Travis County)

The Compass Rose Charter School TIA was provided by Travis County. The Compass Rose Charter School land use consists of an elementary school. The volumes provided in the Compass Rose Charter School TIA were used directly for available study intersections. For study intersection that were not included in the Compass Rose TIA, trips were estimated using available intersection volumes and distributions derived as part of this study to route trips through adjacent study intersections. This development is planned to be built in two phases with the first phase having a build-out year of 2022 and the last phase having a build-out year of 2027. Because the Enfield development has a build-out year of 2026, site traffic was interpolated between the two phases and incorporated to the background traffic.

Shadowglen (City of Manor)

The Shadowglen TIA was provided by the City of Manor. The Shadowglen development land use consists of multi-family housing, retail stores, a shopping center, a convenience store with a gas station, a church, and a hotel. The volumes provided in the Shadowglen TIA were used directly for available study intersections. For study intersection that were not included in the Shadowglen TIA, trips were estimated using available intersection volumes and distributions derived as part of this study to route trips through adjacent study intersections. This development is planned to be built in four phases with the last phase having a build-out year of 2022. Because the Enfield development has a build-out year of 2026, a portion of the site traffic, based off the number of completed units shown in aerial imagery, was incorporated to the background traffic.

Palomino/Manor Wolf Development (City of Manor)

The Palomino/Manor Wolf TIA was provided by City of Manor. The Palomino/Manor Wolf development land use consists of single-family homes, a shopping center, and a gas station with a convenience store. The volumes provided in the Manor Wolf TIA were used directly for available study intersections. For study intersection that

were not included in the Manor Wolf TIA, trips were estimated using available intersection volumes and distributions derived as part of this study to route trips through adjacent study intersections. This development is anticipated to have a build-out year of 2023. Because the Enfield development has a build-out year of 2026, all site traffic from this development was incorporated to the background traffic.

Stonewater/Stonewater North (City of Manor)

The Stonewater/Stonewater North TIA was provided by City of Manor. The Stonewater/Stonewater North development land use consists of single-family homes. The Stonewater/Stonewater North development is anticipated to have a build-out year before the Enfield build-out year of 2026, and completion of the project was confirmed using aerial imagery. Traffic produced by the Stonewater/Stonewater North development are included in the existing traffic, therefore no site traffic was incorporated to the background traffic.

KB Homes Subdivision (City of Manor)

The KB Homes Subdivision land use and site information was provided by the City of Manor. The KB Homes development land use consists of 380 single-family homes with its primary access points north of the project area along FM 973. The KB Homes Subdivision is assumed to have a build-out year before the Enfield build-out year of 2026. Traffic produced by the KB Homes Subdivision was developed using a trip generation and are included in the background traffic. Trips were routed through study intersections using trip distribution percentages developed as a part of this study.

Table 4: No-Build Condition AM Volumes

Intersection		NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR
Background (Existing with Growth Rate Applied)																	
101	Gregg lane at FM 973	-	578	379	-	-	-	702	133	-	14	-	143	-	-	-	-
102	Tinajero Way at FM 973	-	0	774	61	1	34	791	0	-	0	0	0	1	181	0	179
103	Suncrest Rd at FM 973	-	-	508	41	-	77	893	-	-	-	-	-	1	81	-	284
104	Shadowglen Trace/Suncrest Rd at FM 973	1	118	395	14	-	3	809	117	1	141	34	140	-	198	111	4
105	US 290 at FM 973	-	140	179	143	-	43	149	919	23	209	1190	91	11	205	1853	103
106	Gregg Lane at Fuchs Grove Rd	-	-	84	49	-	114	162	-	-	-	-	-	-	299	-	409
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	233	-	244	-	54	109	-	-	-	145	77
Compass Rose Background Project																	
101	Gregg lane at FM 973	-	22	44	-	-	-	50	0	-	0	-	25	-	-	-	-
102	Tinajero Way at FM 973	-	0	66	22	0	0	75	0	-	0	0	0	0	25	0	0
103	Suncrest Rd at FM 973	-	-	88	368	-	100	0	-	-	-	-	-	0	0	-	0
104	Shadowglen Trace/Suncrest Rd at FM 973	0	0	223	0	-	0	0	0	0	74	0	0	-	199	66	188
105	US 290 at FM 973	-	0	25	0	-	58	19	123	0	81	0	0	0	0	0	117
106	Gregg Lane at Fuchs Grove Rd	-	-	0	15	-	10	0	-	-	-	-	-	-	13	-	9
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	6	-	7	-	6	0	-	-	-	0	8
Gregg Manor Background Project																	
101	Gregg lane at FM 973	-	38	0	-	-	-	0	7	-	1	-	9	-	-	-	-
102	Tinajero Way at FM 973	-	0	35	0	0	0	9	0	-	0	0	0	0	0	0	3
103	Suncrest Rd at FM 973	-	-	33	0	-	0	9	-	-	-	-	-	0	0	-	2
104	Shadowglen Trace/Suncrest Rd at FM 973	0	0	29	0	-	0	8	1	0	2	0	0	-	0	0	2
105	US 290 at FM 973	-	0	3	0	-	2	1	5	0	11	0	0	0	0	0	15
106	Gregg Lane at Fuchs Grove Rd	-	-	220	10	-	0	20	-	-	-	-	-	-	45	-	0
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	95	-	0	-	0	35	-	-	-	35	35
Shadowglen Background Project																	
101	Gregg lane at FM 973	-	11	3	-	-	-	5	0	-	0	-	4	-	-	-	-
102	Tinajero Way at FM 973	-	0	14	1	0	0	9	0	-	0	0	0	0	0	0	0
103	Suncrest Rd at FM 973	-	-	15	5	-	0	9	-	-	-	-	-	0	0	-	0
104	Shadowglen Trace/Suncrest Rd at FM 973	0	18	0	0	-	0	0	9	0	2	0	63	-	0	0	0
105	US 290 at FM 973	-	0	0	0	-	82	43	9	0	4	10	1	0	0	3	11
106	Gregg Lane at Fuchs Grove Rd	-	-	0	2	-	2	0	-	-	-	-	-	-	6	-	5
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	3	-	4	-	1	0	-	-	-	0	1
Wolf Palomino Background Project																	
101	Gregg lane at FM 973	-	0	45	-	-	-	0	0	-	7	-	0	-	-	-	-
102	Tinajero Way at FM 973	-	0	42	0	0	3	92	0	-	0	0	0	0	0	0	3
103	Suncrest Rd at FM 973	-	-	36	0	-	9	83	-	-	-	-	-	0	0	-	6
104	Shadowglen Trace/Suncrest Rd at FM 973	0	0	33	0	-	0	80	3	0	3	0	0	-	0	0	0
105	US 290 at FM 973	-	0	4	0	-	23	7	49	0	12	0	0	0	0	0	17
106	Gregg Lane at Fuchs Grove Rd	-	-	0	4	-	3	0	-	-	-	-	-	-	0	-	0
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	0	-	0	-	2	0	-	-	-	0	2
KB Homes Background Project																	
101	Gregg lane at FM 973	-	0	54	-	-	-	158	0	-	0	-	0	-	-	-	-
102	Tinajero Way at FM 973	-	0	51	0	0	1	157	0	-	0	0	0	0	0	0	4
103	Suncrest Rd at FM 973	-	-	44	0	-	4	153	-	-	-	-	-	0	0	-	7
104	Shadowglen Trace/Suncrest Rd at FM 973	0	0	41	0	-	0	142	10	0	3	0	0	-	0	0	0
105	US 290 at FM 973	-	0	5	0	-	41	13	88	0	15	0	0	0	0	0	21
106	Gregg Lane at Fuchs Grove Rd	-	-	4	0	-	0	22	-	-	-	-	-	-	0	-	0
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	10	-	12	-	2	0	-	-	-	0	2
No-Build (Background + Background Projects)																	
101	Gregg lane at FM 973	-	649	525	-	-	-	915	140	-	22	-	181	-	-	-	-
102	Tinajero Way at FM 973	-	0	982	84	1	38	1133	0	-	0	0	0	1	206	0	189
103	Suncrest Rd at FM 973	-	-	724	414	-	190	1147	-	-	-	-	-	1	81	-	299
104	Shadowglen Trace/Suncrest Rd at FM 973	1	136	721	14	-	3	1039	140	1	225	34	203	-	397	177	194
105	US 290 at FM 973	-	140	216	143	-	249	232	1193	23	332	1200	92	11	205	1856	284
106	Gregg Lane at Fuchs Grove Rd	-	-	308	80	-	129	204	-	-	-	-	-	-	363	-	423
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	347	-	267	-	65	144	-	-	-	180	125

Table 5: No-Build Condition PM Volumes

Intersection		NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR
Background (Existing with Growth Rate Applied)																	
101	Gregg lane at FM 973	-	305	753	-	-	-	631	67	-	81	-	524	-	-	-	-
102	Tinajero Way at FM 973	-	0	988	209	0	138	1026	0	-	0	0	0	0	130	0	73
103	Suncrest Rd at FM 973	-	-	1049	52	-	308	818	-	-	-	-	-	0	24	-	118
104	Shadowglen Trace/Suncrest Rd at FM 973	3	157	935	77	-	7	684	132	3	138	80	98	-	61	34	0
105	US 290 at FM 973	-	229	285	311	-	90	128	615	37	703	3233	190	23	262	1854	159
106	Gregg Lane at Fuchs Grove Rd	-	-	205	170	-	445	114	-	-	-	-	-	-	61	-	308
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	137	-	68	-	235	248	-	-	-	107	151
Compass Rose Background Project																	
101	Gregg lane at FM 973	-	16	31	-	-	-	26	0	-	0	-	13	-	-	-	-
102	Tinajero Way at FM 973	-	0	47	16	0	0	40	0	-	0	0	0	0	13	0	0
103	Suncrest Rd at FM 973	-	-	63	238	-	53	0	-	-	-	-	-	0	0	-	0
104	Shadowglen Trace/Suncrest Rd at FM 973	0	0	121	0	-	0	0	0	0	40	0	0	-	142	47	115
105	US 290 at FM 973	-	0	14	0	-	74	12	56	0	69	0	0	0	0	0	38
106	Gregg Lane at Fuchs Grove Rd	-	-	0	7	-	6	0	-	-	-	-	-	-	8	-	8
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	6	-	3	-	5	0	-	-	-	0	3
Gregg Manor Background Project																	
101	Gregg lane at FM 973	-	13	0	-	-	-	0	2	-	3	-	32	-	-	-	-
102	Tinajero Way at FM 973	-	0	13	0	0	1	31	0	-	0	0	0	0	0	0	0
103	Suncrest Rd at FM 973	-	-	13	0	-	1	30	-	-	-	-	-	0	0	-	0
104	Shadowglen Trace/Suncrest Rd at FM 973	0	0	12	0	-	1	28	1	0	1	0	0	-	0	0	0
105	US 290 at FM 973	-	0	1	0	-	15	2	11	0	7	0	0	0	0	0	4
106	Gregg Lane at Fuchs Grove Rd	-	-	65	35	-	0	185	-	-	-	-	-	-	15	-	0
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	45	-	0	-	0	80	-	-	-	60	130
Shadowglen Background Project																	
101	Gregg lane at FM 973	-	27	21	-	-	-	9	0	-	0	-	17	-	-	-	-
102	Tinajero Way at FM 973	-	0	48	5	0	0	26	0	-	0	0	0	0	0	0	0
103	Suncrest Rd at FM 973	-	-	56	25	-	0	26	-	-	-	-	-	0	0	-	0
104	Shadowglen Trace/Suncrest Rd at FM 973	0	80	0	0	-	0	0	26	0	1	0	52	-	0	0	0
105	US 290 at FM 973	-	0	0	0	-	37	6	8	0	17	10	1	0	0	14	51
106	Gregg Lane at Fuchs Grove Rd	-	-	0	9	-	8	0	-	-	-	-	-	-	15	-	12
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	10	-	4	-	6	0	-	-	-	0	3
Wolf Palomino Background Project																	
101	Gregg lane at FM 973	-	0	117	-	-	-	0	0	-	21	-	0	-	-	-	-
102	Tinajero Way at FM 973	-	0	112	0	0	5	74	0	-	0	0	0	0	0	0	5
103	Suncrest Rd at FM 973	-	-	99	0	-	9	65	-	-	-	-	-	0	0	-	13
104	Shadowglen Trace/Suncrest Rd at FM 973	0	0	94	0	-	0	60	5	0	5	0	0	-	0	0	0
105	US 290 at FM 973	-	0	11	0	-	31	5	24	0	54	0	0	0	0	0	30
106	Gregg Lane at Fuchs Grove Rd	-	-	0	12	-	9	0	-	-	-	-	-	-	0	-	0
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	0	-	0	-	8	0	-	-	-	0	4
KB Homes Background Project																	
101	Gregg lane at FM 973	-	0	185	-	-	-	109	0	-	0	-	0	-	-	-	-
102	Tinajero Way at FM 973	-	0	180	0	0	2	107	0	-	0	0	0	0	0	0	5
103	Suncrest Rd at FM 973	-	-	175	0	-	6	101	-	-	-	-	-	0	0	-	5
104	Shadowglen Trace/Suncrest Rd at FM 973	0	0	167	0	-	0	96	4	0	7	0	0	-	0	0	0
105	US 290 at FM 973	-	0	19	0	-	50	8	38	0	95	0	0	0	0	0	53
106	Gregg Lane at Fuchs Grove Rd	-	-	17	0	-	0	8	-	-	-	-	-	-	0	-	0
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	5	-	2	-	11	0	-	-	-	0	6
No-Build (Background + Background Projects)																	
101	Gregg lane at FM 973	-	361	1107	-	-	-	775	69	-	105	-	586	-	-	-	-
102	Tinajero Way at FM 973	-	0	1388	230	0	146	1304	0	-	0	0	0	0	143	0	83
103	Suncrest Rd at FM 973	-	-	1455	315	-	377	1040	-	-	-	-	-	0	24	-	136
104	Shadowglen Trace/Suncrest Rd at FM 973	3	237	1329	77	-	8	868	168	3	192	80	150	-	203	81	115
105	US 290 at FM 973	-	229	330	311	-	297	161	752	37	945	3243	191	23	262	1868	335
106	Gregg Lane at Fuchs Grove Rd	-	-	287	233	-	468	307	-	-	-	-	-	-	99	-	328
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	203	-	77	-	265	328	-	-	-	167	297

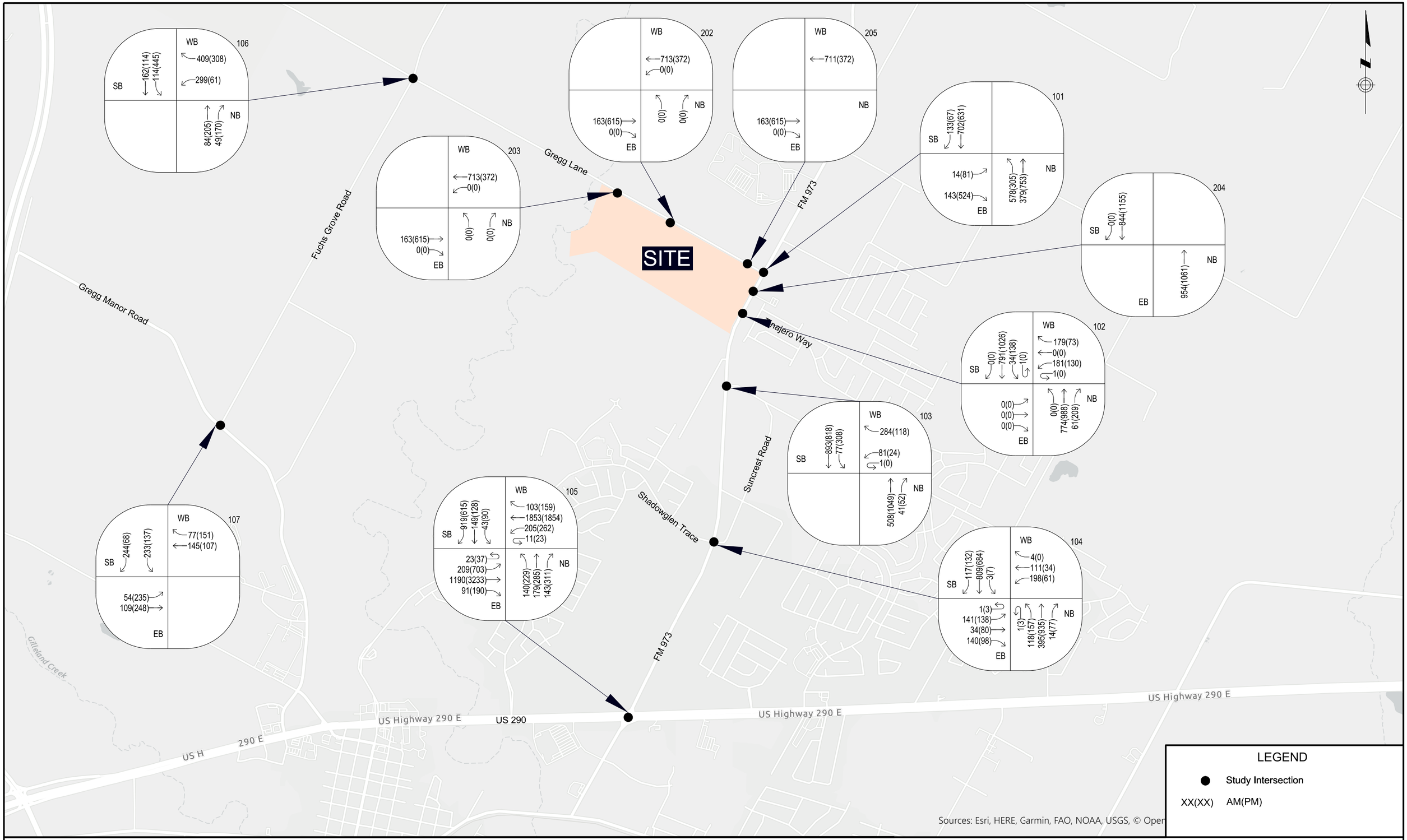

Figure 14: Background (2026) Peak Hour Volumes

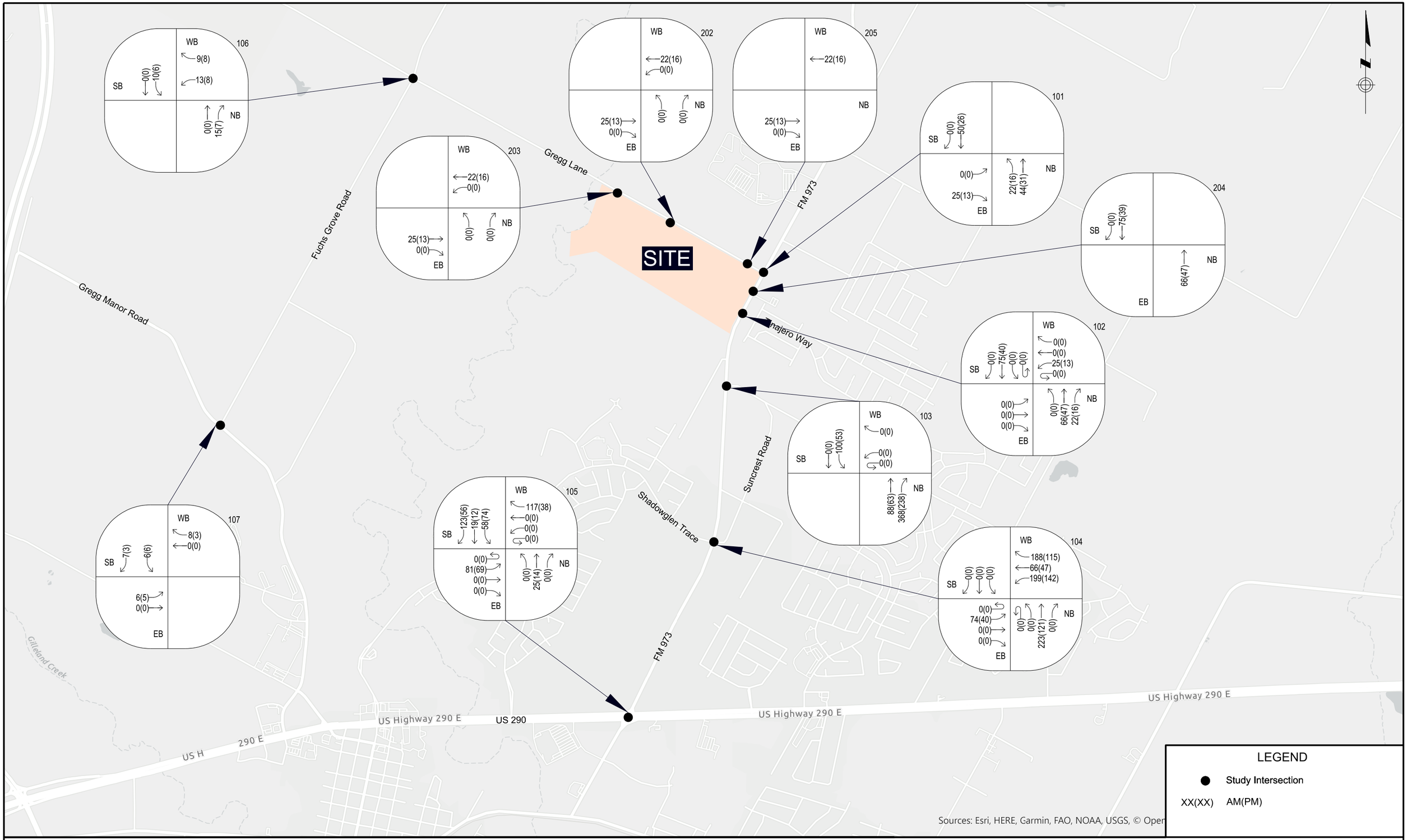

Figure 15: Compass Rose Background Project (2026) Peak Hour Volumes

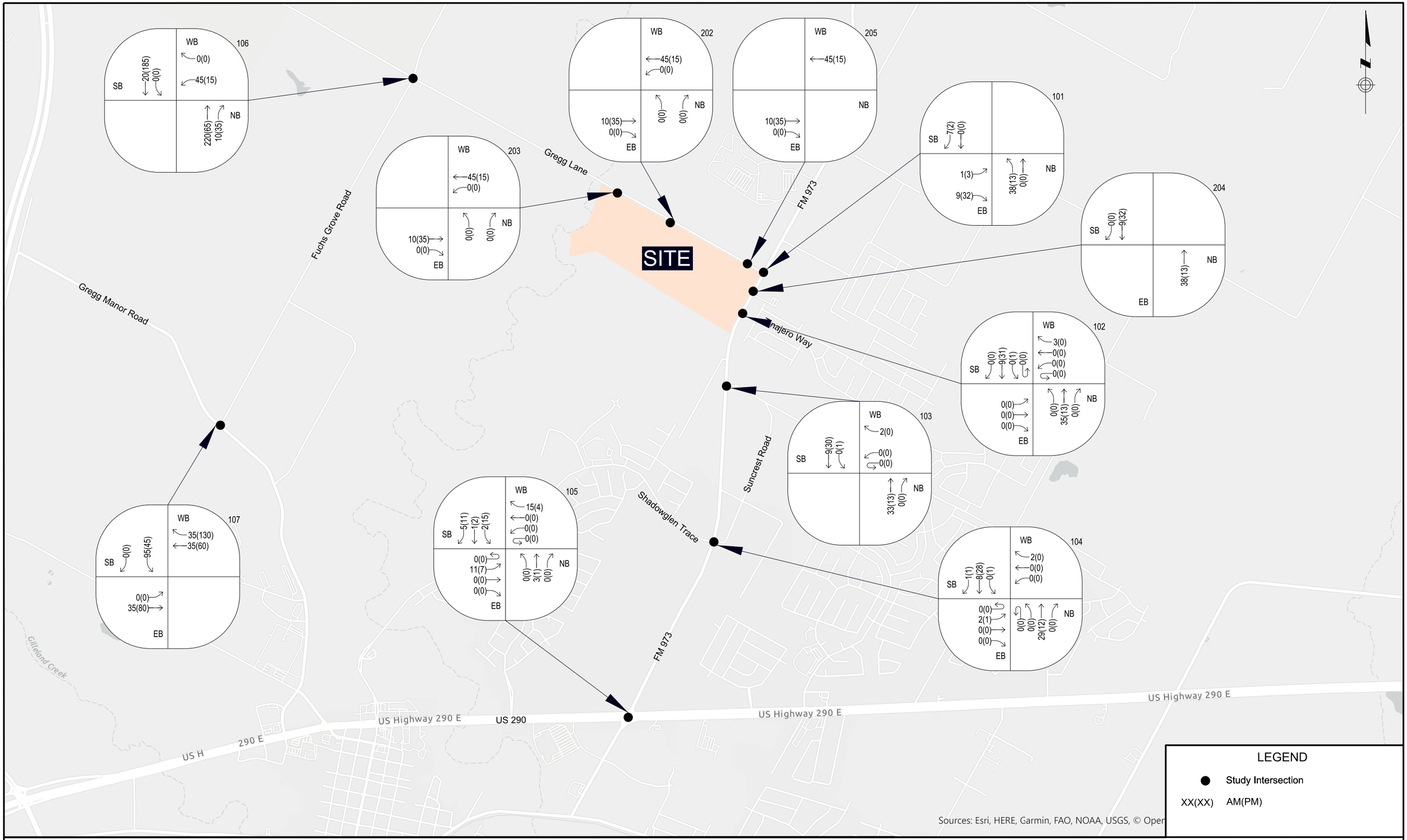

Figure 16: Gregg Manor Background Project (2026) Peak Hour Volumes

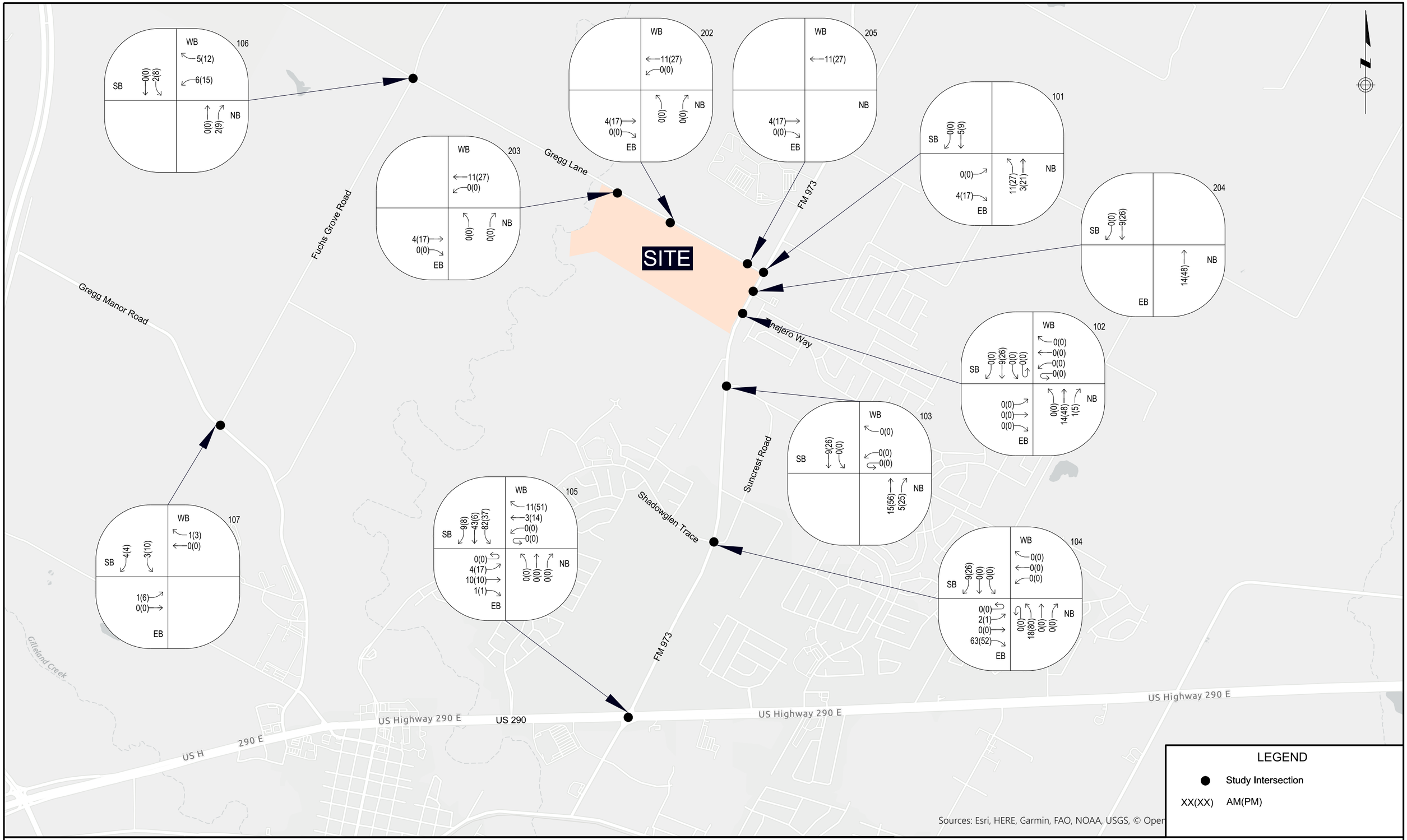

Figure 17: Shadowglen Background Project (2026) Peak Hour Volumes

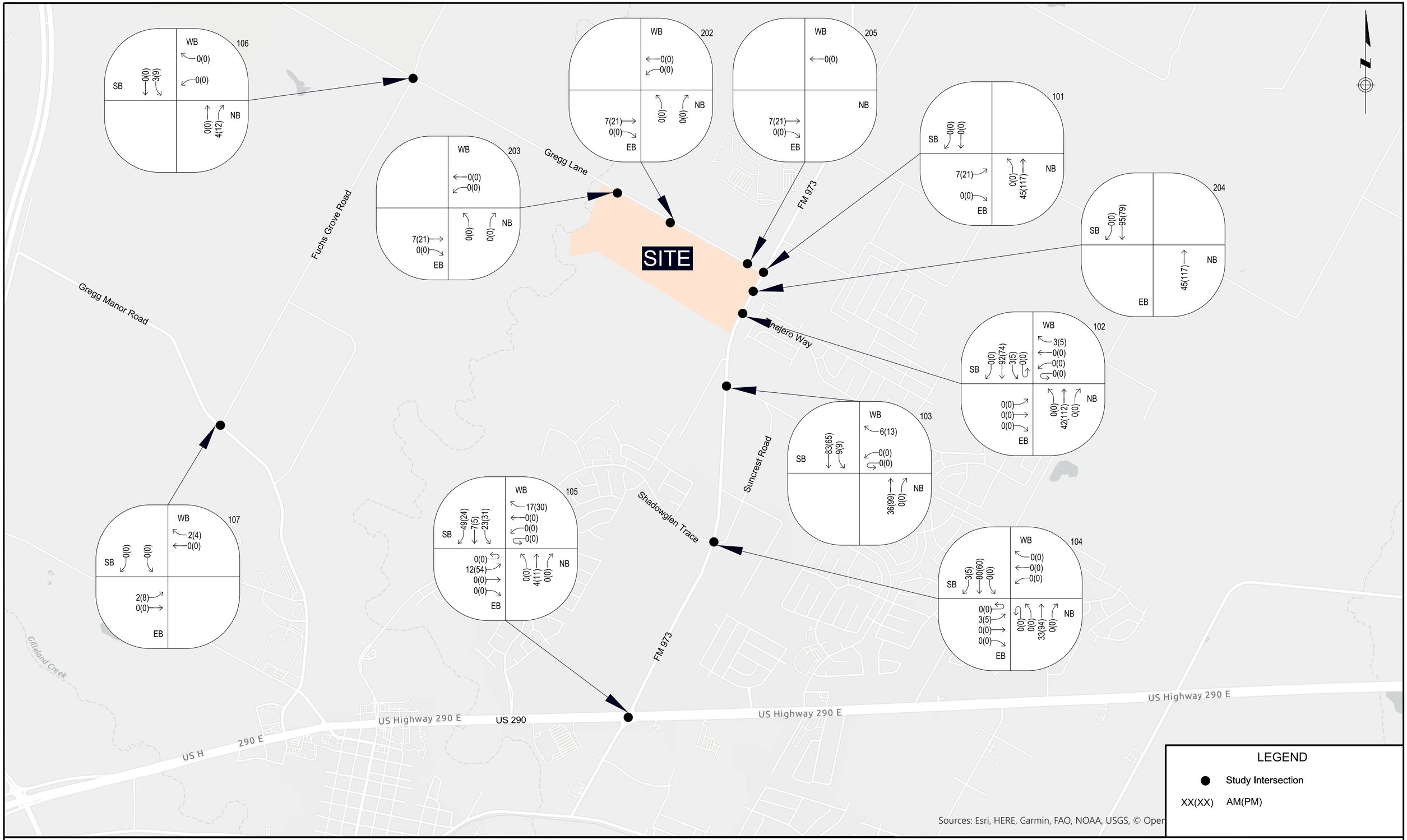

Figure 18: Wolf Palomino Background Project (2026) Peak Hour Volumes

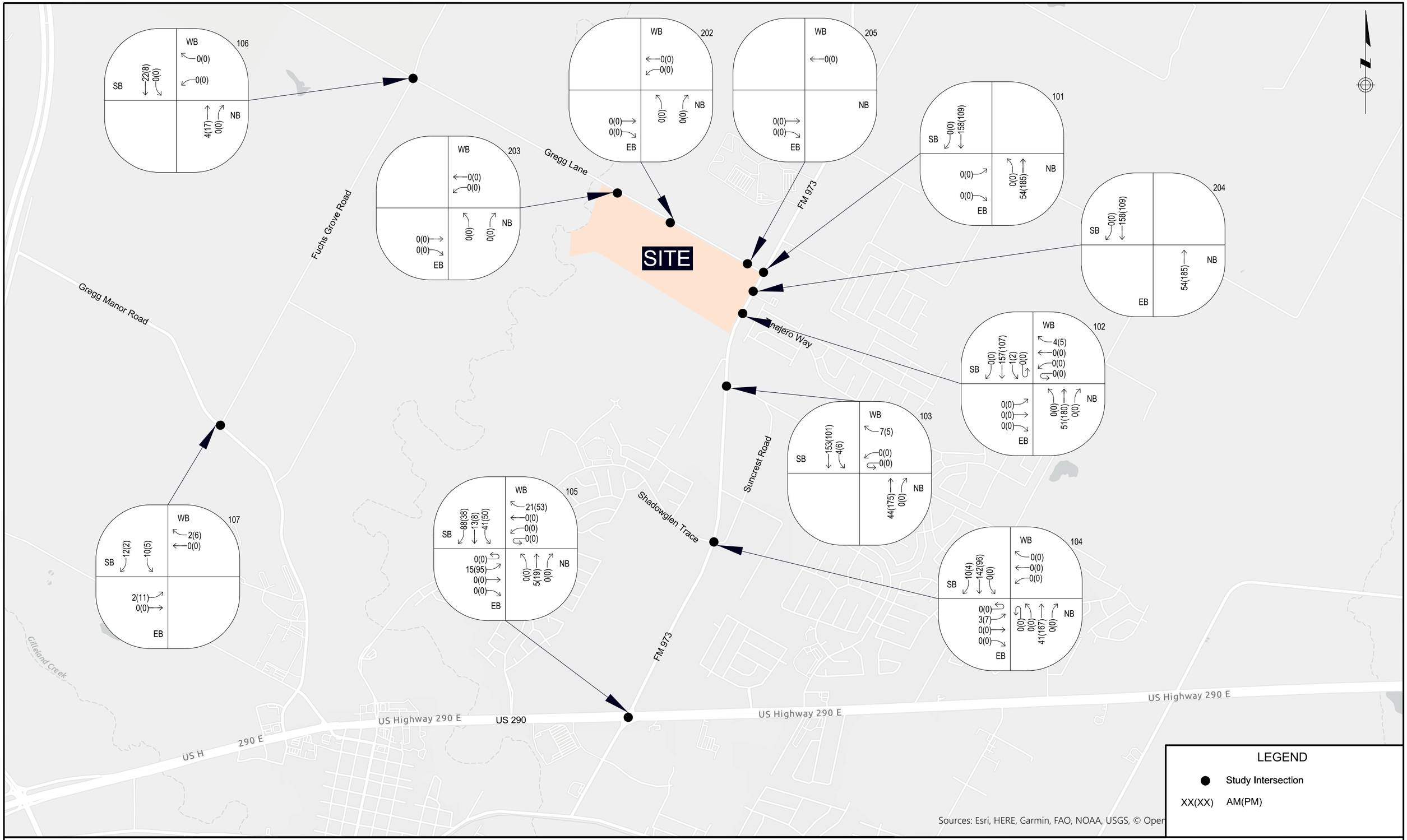

Figure 19: KB Homes Subdivision Background Project (2026) Peak Hour Volumes

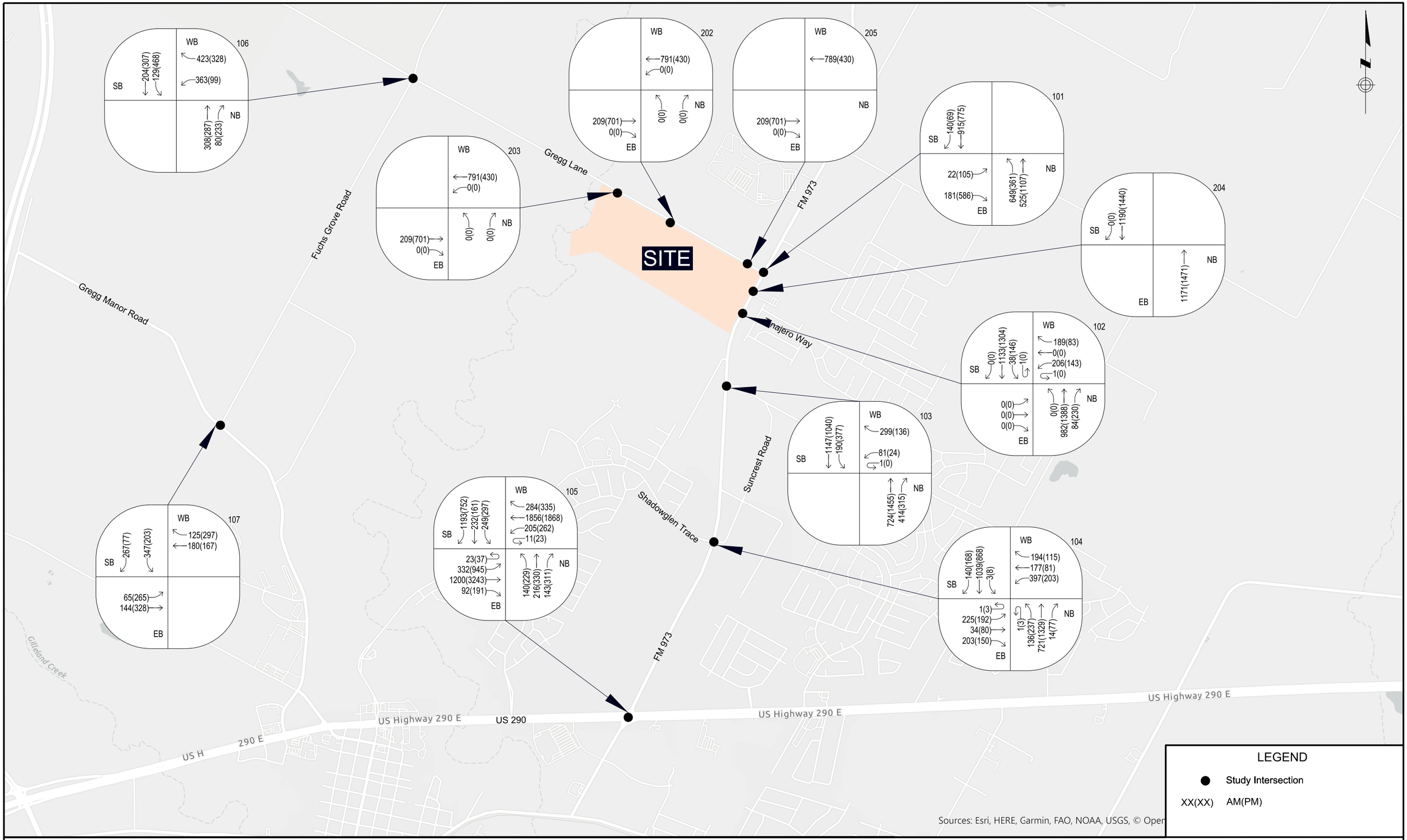

Figure 20: No-Build (2026) Peak Hour Volumes

TRIP GENERATION AND DISTRIBUTION

SITE TRAFFIC

Entering and exiting volumes for the Enfield development were calculated using information from ITE's Trip Generation Manual, 10th Edition(1) and are shown in **Table 6** and provided in **Appendix E**. The trips shown in **Table 6** are the site generated trips for the attributed site developments for the AM and PM peak hour(s).

Table 6: Unadjusted ITE Trip Generation

ITE Code	Description	Quantity	ADT	AM Peak		PM Peak	
				Enter	Exit	Enter	Exit
210	Single Family Detached Housing	382 DU	3,568	69	207	232	136
820	Shopping Center	79.5 KSF	5,144	119	73	220	238
820	Shopping Center	40.3 KSF	3,240	107	65	133	144
		Total	**11,952**	**295**	**345**	**585**	**518**

Trips generated by the site are different from total site trips that add to the adjacent roadway. Pass-by and internal capture trips can account for a significant portion of a site's generated traffic and are removed from site traffic per ITE methodology. Internal capture trips are trips that use only internal roadways traveling from one land use to another within the site. Pass-by trips are attracted to the site from traffic passing on the adjacent street. Primary trips, made for the specific purpose of visiting the development, are considered new traffic added to the street system. The net primary trips are determined by subtracting internal and pass-by trips for each land use. No internal capture trips are anticipated for this development.

Adjustments for pass-by trips are shown in **Table 7** and were removed from the unadjusted trips shown in **Table 6.** Per ITE methodology, 34% of the retail site trips were assumed to be pass-by trips. Pass-by trips were not anticipated for the AM peak hour.

Table 7: Pass-By Trips

ITE Code	Description	Quantity	AM Peak		PM Peak	
			Enter	Exit	Enter	Exit
210	Single Family Detached Housing	382 DU	0	0	0	0
820	Shopping Center	79.5 KSF	0	0	75	81
820	Shopping Center	40.3 KSF	0	0	45	49
		Total	0	0	120	130

Table 8 shows the adjusted trips, or primary trips, for the full build-out of the development. The reported volumes are for the peak generation during the peak hour of the adjacent street.

Table 8: Adjusted ITE Trip Generation

ITE Code	Description	Quantity	ADT	AM Peak		PM Peak	
				Enter	Exit	Enter	Exit
210	Single Family Detached Housing	382 DU	3,568	69	207	232	136
820	Shopping Center	79.5 KSF	4,988	119	73	145	157
820	Shopping Center	40.3 KSF	3,146	107	65	88	95
		Total	11,702	295	345	465	388

Table 9: Site AM Volumes

Intersection		NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR
	Site Traffic AM																
101	Gregg lane at FM 973	-	38	15	-	-	-	30	5	-	4	-	62	-	-	-	-
102/201	Tinajero Way/Driveway 1 at FM 973	-	186	30	0	0	0	55	14	-	23	1	207	0	0	15	0
103	Suncrest Rd at FM 973	-	-	188	0	-	6	256	-	-	-	-	-	0	0	-	29
104	Shadowglen Trace/Suncrest Rd at FM 973	0	0	174	0	-	0	238	17	0	13	0	0	-	0	0	0
105	US 290 at FM 973	-	0	20	0	-	69	22	147	0	63	0	0	0	0	0	92
106	Gregg Lane at Fuchs Grove Rd	-	-	0	16	-	12	0	-	-	-	-	-	-	37	-	25
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	17	-	19	-	7	0	-	-	-	0	9
202	Driveway 2 at Gregg Lane	-	15	-	17	-	-	-	-	-	-	58	4	-	15	28	-
203	Driveway 3 at Gregg Lane	-	39	-	43	-	-	-	-	-	-	20	8	-	21	23	-
204	Driveway 4 at FM 973	-	-	53	-	-	-	70	22	-	-	-	-	-	-	-	-
205	Driveway 5 at Gregg Lane	-	-	-	-	-	-	-	-	-	-	66	9	-	-	43	-

Table 10: Site PM Volumes

Intersection		NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR
	Site Traffic PM																
101	Gregg lane at FM 973	-	117	29	-	-	-	23	10	-	4	-	48	-	-	-	-
102/201	Tinajero Way/Driveway 1 at FM 973	-	347	15	0	0	1	14	23	-	140	5	296	0	-2	12	0
103	Suncrest Rd at FM 973	-	-	351	0	-	17	290	-	-	-	-	-	0	0	-	11
104	Shadowglen Trace/Suncrest Rd at FM 973	0	0	337	0	-	1	276	13	0	15	0	0	-	0	0	0
105	US 290 at FM 973	-	0	38	0	-	145	23	108	0	192	0	0	0	0	0	106
106	Gregg Lane at Fuchs Grove Rd	-	-	0	35	-	26	0	-	-	-	-	-	-	22	-	20
107	Gregg Manor Rd at Fuchs Grove Rd		-	-	-	-	15	-	7	-	23	0	-	-	-	0	12
202	Driveway 2 at Gregg Lane	-	8	-	12	-	-	-	-	-	-	52	14	-	49	77	-
203	Driveway 3 at Gregg Lane	-	26	-	30	-	-	-	-	-	-	35	26	-	69	16	-
204	Driveway 4 at FM 973	-	-	155	-	-	-	38	33	-	-	-	-	-	-	-	-
205	Driveway 5 at Gregg Lane	-	-	-	-	-	-	-	-	-	-	52	12	-	-	127	-

TRIP DISTRIBUTION

Trip distribution takes into account where vehicles generated by the site are going to or coming from based on the roadway network. As primary site trips are those trips which leave an origin, travel to the site, and then return to the origin, site trips were distributed based on probable origins of the site trips. For this development, the distribution percentages were estimated based on existing count data and the proposed site location. The distribution was calculated for each major entry and exit point to the study network by calculating the proportion of total existing traffic entering or exiting the site at each point.

Trip distributions at the driveways were developed separately for residential and commercial land uses and were based on the proximity to intended land uses. However, it should be noted that the overall network distribution remains the same between residential and commercial land uses. It should be noted that Driveway 4 and Driveway 5 are right-in only driveways that were assumed to primarily provide access to the commercial land uses of the development. Therefore, it was assumed that no residential site traffic would utilize Driveway 4 and Driveway 5. It was assumed that proposed internal commercial driveways would be accessible from all proposed driveways along the existing network and provide an exit for commercial traffic. Exhibits showing the internal commercial driveways can be found in **Appendix N.**

Site trips entering to and exiting from the residential units of the development primarily use Driveways 1, 2 and 3. It was assumed that most site trips on traveling along FM 973 will use Driveway 1 to access residential units in the development. Residential site trips entering from and exiting to Fuchs Grove Road were assumed to primarily use Driveway 3, the westernmost driveway along Gregg Lane. No residential site trips were assumed to use Driveways 4 and 5 due to these driveways primarily serving as access to the commercial land use within the development.

Driveway 1, Driveway 4, and Driveway 5 provide primary access to commercial land uses within the development. Driveway 4 and Driveway 5 are right-in only driveways, therefore, all site trips entering the site via Driveway 4 and Driveway 5 will exit via Driveways 1, 2 and/or 3 by access of internal driveways, shown in **Appendix N**. Commercial site trips entering from and exiting to FM 973 north of the development were assumed to use Driveway 1 and Driveway 4 along FM 973. Commercial site trips entering from and exiting to FM 973 south of the development were assumed to use Driveway 1 along FM 973. Commercial site trips entering from Fuchs Grove Road were assumed to primarily use Driveway 5, and trips exiting towards Fuchs Grove Road were assumed to primarily use Driveway 3. Some commercial trips were assumed to use Driveway 2 to bypass traffic at other driveways.

Next, future site traffic was distributed using these percentages. The trip distribution percentages shown in **Figure 21** were applied to the site generated traffic. AM and PM peak hour intersection volumes are shown in **Figure 22**. Distribution calculations can be found in **Appendix F.**

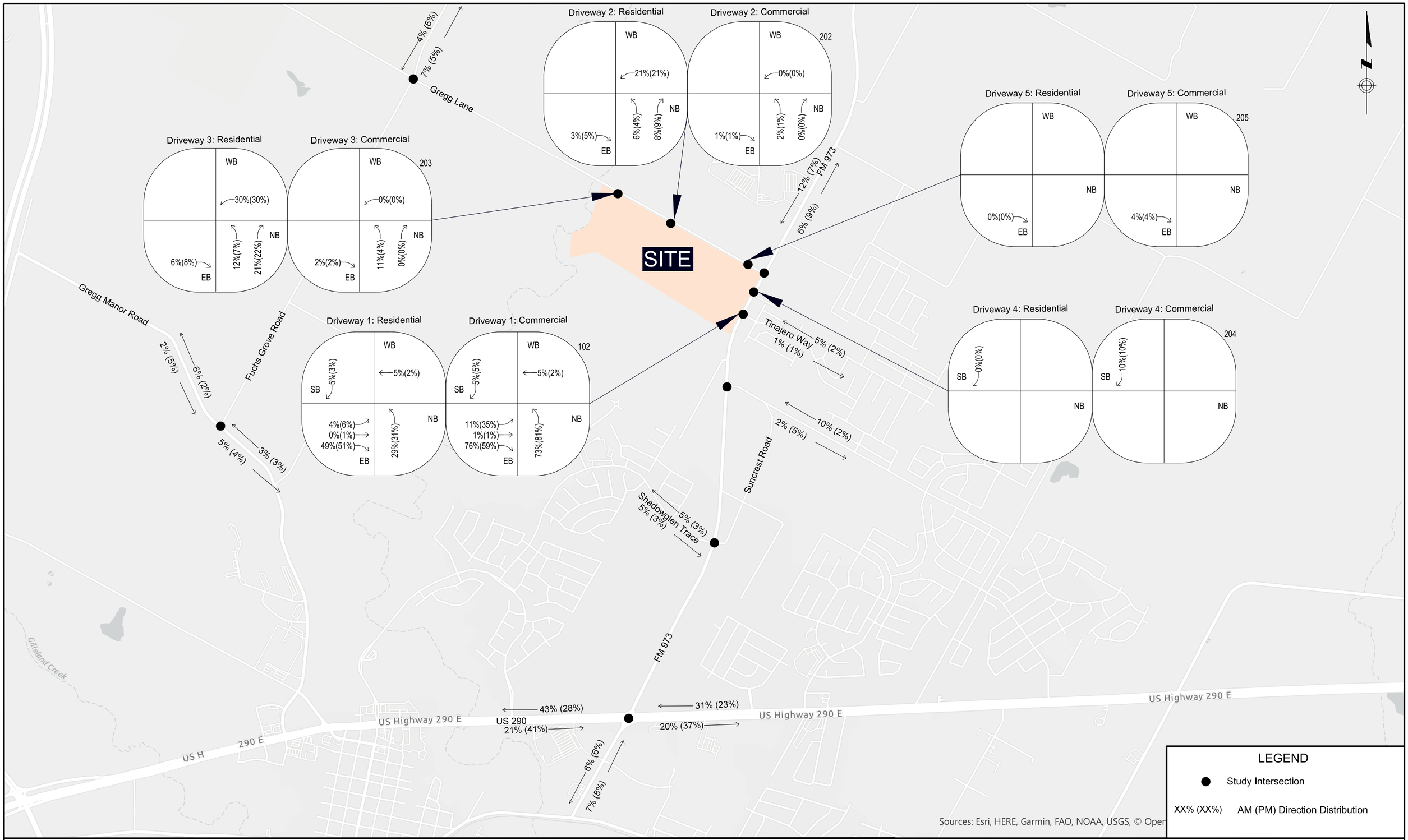

Figure 21: Trip Distribution

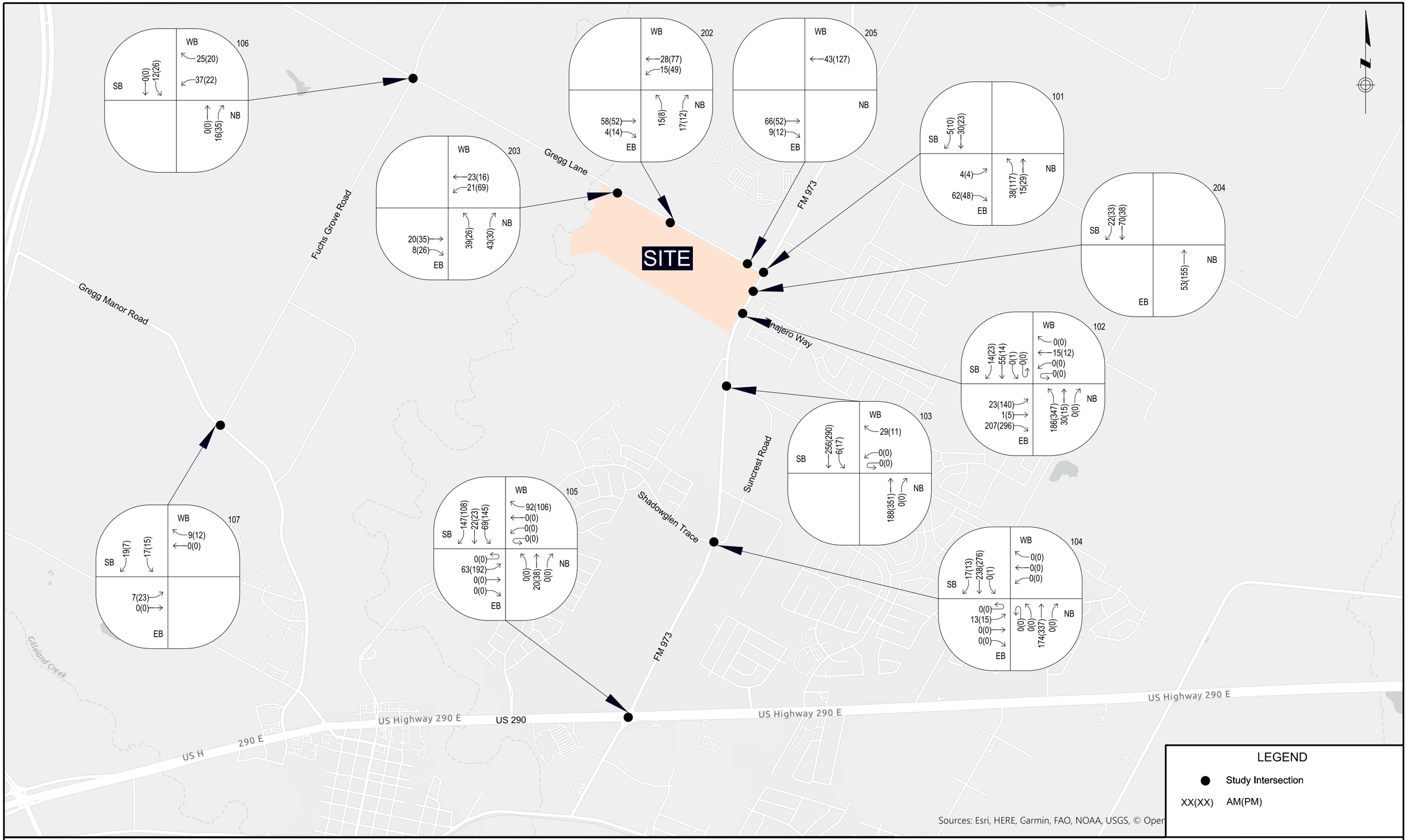

Figure 22: Site Traffic

BUILD (SITE + FORECASTED) OPERATING CONDITIONS

SITE ACCESS

Based on the current site plan as shown in **Figure 2**, the Enfield development is anticipated to have five access points. Three access points will be along Gregg Lane and two access points will be along FM 973. Primary access will be from Driveway 1 at FM 973, which will be constructed as the west leg of the existing intersection of FM 973 at Tinajero Way. Secondary access will be from Driveway 2, Driveway 3, and Driveway 5 on Gregg Lane, located west of FM 973, and from Driveway 4 on FM 973, located just south of Gregg Lane. Driveway 1, Driveway 2, and Driveway 3 are proposed to be full-access. Driveway 4 and Driveway 5 are proposed to be right-in access only.Two full-access driveways along FM 973 for the commercial tract north of Tinajero Way were proposed, however, TxDOT did not approve of this. However, a single right-in only driveway access, Driveway 4, was approved by TxDOT. Discussion of this matter is documneted in **Appendix B**. Exhibits for the driveways can be found in **Appendix N.**

The trip assignment assumptions for each access point were based on the site layout of homes and internal street networks depicted in the site plan. These access point percentages were determined separately for residential and commercial land uses to reflect differences in trip patterns and can be seen in **Appendix F**. It should be noted that the overall network distribution is the same between residential and commercial land uses.

PROJECTED CONDITIONS

The projected background traffic was combined with the proposed site generated traffic to perform the intersection analyses for the build-out year conditions (2026). Intersection analyses have been performed based on the HCM[(2)] Chapters Nineteen (19) and Twenty (20) procedures using Synchro version 11. Projected peak hour turning volumes for Site and Build are illustrated in **Figure 22** and **Figure 23**, respectively. Trip generation and trip distribution information can be found in **Table 8** and **Figure 21**, respectively.

Table 11: Build AM Volumes

Intersection		NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR
Build AM Traffic																	
101	Gregg lane at FM 973	-	687	541	-	-	-	945	145	-	26	-	243	-	-	-	-
102/201	Tinajero Way/Driveway 1 at FM 973	-	186	1012	84	1	38	1188	14	-	23	1	207	1	206	15	189
103	Suncrest Rd at FM 973	-	-	912	414	-	196	1403	-	-	-	-	-	1	81	-	327
104	Shadowglen Trace/Suncrest Rd at FM 973	1	136	895	14	-	3	1278	158	1	238	34	203	-	397	177	194
105	US 290 at FM 973	-	140	235	143	-	319	255	1339	23	395	1200	92	11	205	1856	376
106	Gregg Lane at Fuchs Grove Rd	-	-	308	96	-	141	204	-	-	-	-	-	-	400	-	448
107	Gregg Manor Rd at Fuchs Grove Rd	-	-	-	-	-	364	-	286	-	72	144	-	-	-	180	135
202	Driveway 2 at Gregg Lane	-	15	-	17	-	-	-	-	-	-	267	4	-	15	819	-
203	Driveway 3 at Gregg Lane	-	39	-	43	-	-	-	-	-	-	229	8	-	21	814	-
204	Driveway 4 at FM 973	-	-	1224	-	-	-	1260	22	-	-	-	-	-	-	-	-
205	Driveway 5 at Gregg Lane	-	-	-	-	-	-	-	-	-	-	275	9	-	-	832	-

Table 12: Build PM Volumes

Intersection		NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR
Build PM Traffic																	
101	Gregg lane at FM 973	-	478	1136	-	-	-	798	79	-	109	-	634	-	-	-	-
102/201	Tinajero Way/Driveway 1 at FM 973	-	347	1403	230	0	147	1318	23	-	140	5	296	0	141	12	82
103	Suncrest Rd at FM 973	-	-	1806	315	-	394	1330	-	-	-	-	-	0	24	-	148
104	Shadowglen Trace/Suncrest Rd at FM 973	3	237	1666	77	-	9	1145	181	3	207	80	150	-	203	81	115
105	US 290 at FM 973	-	229	369	311	-	442	184	860	37	1138	3243	191	23	262	1868	441
106	Gregg Lane at Fuchs Grove Rd	-	-	287	268	-	494	307	-	-	-	-	-	-	121	-	348
107	Gregg Manor Rd at Fuchs Grove Rd		-	-	-	-	219	-	84	-	288	328	-	-	-	167	309
202	Driveway 2 at Gregg Lane	-	8	-	12	-	-	-	-	-	-	753	14	-	49	507	-
203	Driveway 3 at Gregg Lane	-	26	-	30	-	-	-	-	-	-	736	26	-	69	446	-
204	Driveway 4 at FM 973	-	-	1625	-	-	-	1478	33	-	-	-	-	-	-	-	-
205	Driveway 5 at Gregg Lane	-	-	-	-	-	-	-	-	-	-	753	12	-	-	557	-

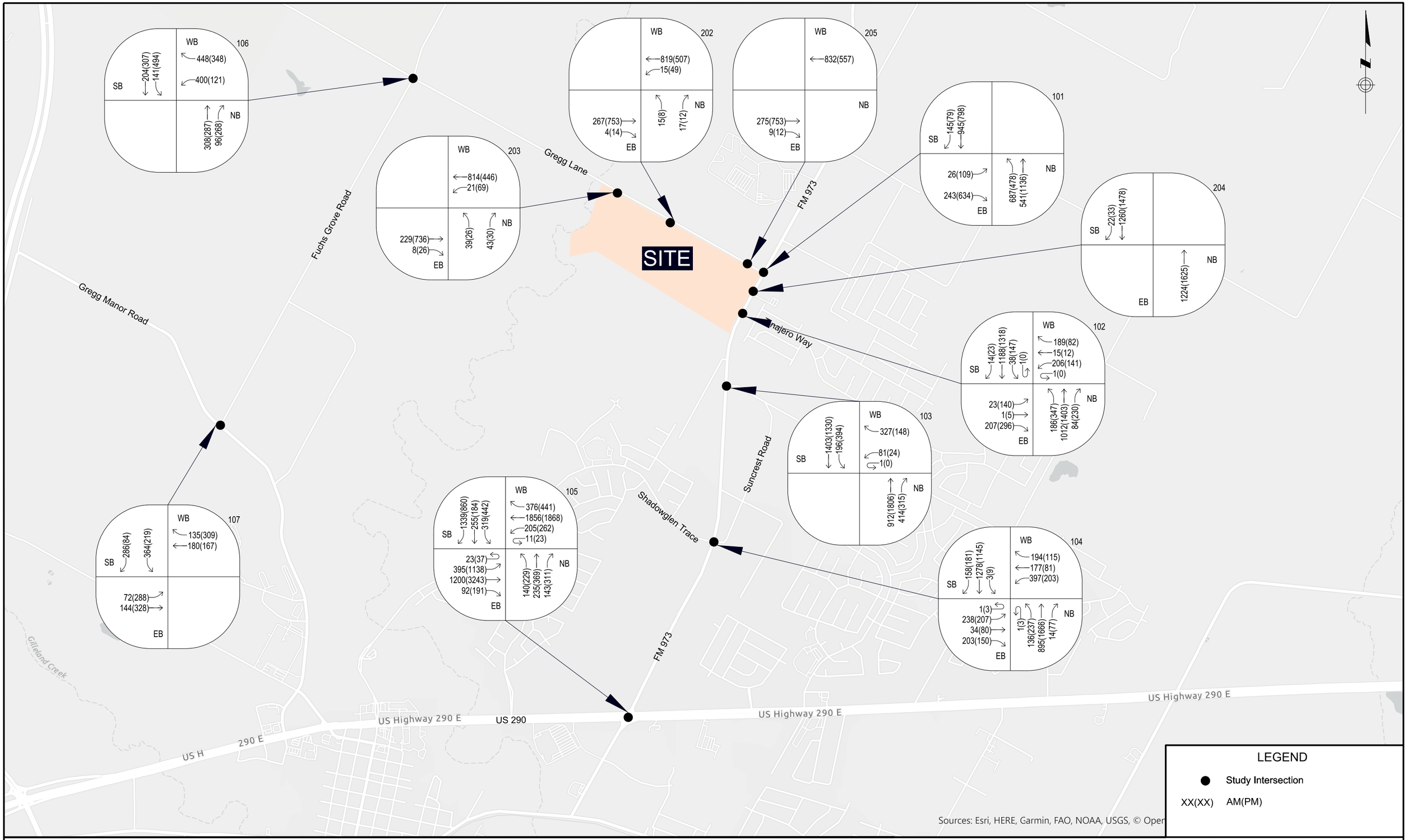

Figure 23: Build (2026) Peak Hour Volumes

MITIGATED (BUILD WITH MITIGATIONS) OPERATING CONDITIONS

Improvements were considered at study intersections to operational issues identified in the Build (site + forecasted) condition. Recommended improvements are listed below. Further details can be found in the Recommendations and Mitigations section.

- 101 – FM 973 and Gregg Lane
  - Restripe northbound left-turn bay
  - Add southbound right-turn bay (565 ft storage + 150 ft taper)
  - Modify signal timings
- 102/201 – FM 973 and Tinajero Way/Driveway 1
  - Install signal hardware for eastbound approach
  - Add northbound left-turn bay (565 ft storage + 150 ft taper)
- 103 – FM 973 and Suncrest Road (North)
  - Install traffic signal
  - Add northbound right-turn bay (565 ft storage + 150 ft taper)
  - Add southbound left-turn bay (565 ft storage + 150 ft taper)
- 104 – FM 973 and Shadowglen Trace/Suncrest Road
  - Add westbound left-turn bay (250 ft storage + 50 ft taper)
  - Add westbound right-turn bay (250 ft storage + 50 ft taper)
  - Add northbound right-turn bay (565 ft storage + 150 ft taper)
  - Add southbound left-turn bay (565 ft storage + 150 ft taper)
  - Modify signal timings
- 105 – FM 973 and US 290
  - Add eastbound left-turn bay to create dual-lefts (1100 ft storage + 150 ft taper)
  - Add northbound receiving lane (150 ft storage with a 780 ft taper)
  - Add northbound right-turn bay (565 ft storage + 150 ft taper)
- 106 – Fuchs Grove Road and Gregg Lane
  - Install traffic signal
  - Add westbound right-turn bay (315 ft storage + 100 ft taper)
  - Add northbound right-turn bay (315 ft storage + 100 ft taper)
  - Add southbound left-turn bay (315 ft storage + 100 ft taper)

- 107 – Fuchs Grove Road and Gregg Manor Road
    - Add southbound right-turn bay (315 ft storage + 100 ft taper)
    - Add westbound right-turn bay (315 ft storage + 100 ft taper)
- 203 – Driveway 3 and Gregg Lane
    - Add eastbound right-turn bay (315 ft storage + 100 ft taper)
- Gregg Lane between FM 973 and Driveway 3
    - Expand cross-section
- Gregg Lane between Driveway 3 and Fuchs Grove Road
    - Expand cross-section

INTERSECTION CAPACITY ANALYSIS

LEVEL OF SERVICE

The HCM 6th Edition[2] uses LOS as the method by which the quality of traffic flow is described. LOS describes operational conditions in six levels based upon speed and travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. These six levels are given the letters 'A' through 'F' and are given different descriptions and defining criteria depending on the roadway element analyzed.

LOS criteria for traffic signals are based on the average control delay per vehicle. Control delay includes deceleration and acceleration delay, queue move-up time, and stopped delay. Thus, if the average control delay for vehicles at an intersection is fifty-five seconds or less, the intersection is defined as operating at a LOS 'D' or better. Control delay of fifty-five through eighty seconds represents LOS 'E', and values greater than eighty seconds define LOS 'F'. For signalized intersection operation, LOS 'A' represents very low delay; most vehicles do not stop at all. With LOS 'B', more vehicles stop than LOS 'A', increasing the average delay. Under LOS 'C', the number of vehicles stopping is significant; however, many still pass through the intersection without stopping. LOS 'D' describes conditions where congestion is readily apparent with many vehicles stopping and individual cycle failures are noticeable. LOS 'E' generally describes operations with poor progression, long cycle lengths and frequent cycle failures. LOS 'F' describes unacceptable operations which include many cycle failures caused by arrival flow rates exceeding intersection capacity.

Stop controlled intersections are analyzed in a similar manner; however, LOS is based on total delay per vehicle. The values that define LOS for stop-controlled intersections are more restrictive than those for signalized intersections. Total delay includes both stopped delay and time spent in the queue waiting to enter the intersection. Two-way stop-controlled intersections with the minor street average total delay greater than thirty-five seconds identifies LOS 'E' or worse. The criteria for signalized and stop-controlled intersections are shown in Table 13.

Table 13: LOS Criteria for Signalized and Stop-Controlled Intersections

LOS	Average Control Delay – Signalized Intersections (sec/veh)	Average Total Delay – Stop Controlled Intersections (sec/veh)
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

For this study, the criterion for minimum acceptable LOS for future conditions is a LOS 'D' or better.

SYNCHRO CALIBRATION

To ensure that the existing count data are capturing demand, field observations were made to check that observed queues approximately match those shown in **Table 4** and **Table 5** for stop-controlled and signalized approaches.

Further, field observations were used to observe certain signalized intersection characteristics which the Transportation Research Board (TRB) refers to as calibration parameters, such as sneakers per cycle, stored passenger car length, probability of pedestrians pushing button, deceleration rate, acceleration rate, distance between stored cars, and critical gap for permitted left turns, in order to ensure appropriate calibration of the Synchro models. It was found that all of these characteristics exhibited the standard values and were not required to be modified to reflect existing conditions accurately.

It should be noted that adjusted counts due to the pandemic were used to better reflect normal traffic patterns pre-pandemic. Theses COVID-19 Adjustment factors are 1.02 and 1.16 for the AM and PM peak hours, respectively.

METHODOLOGY

Intersection analyses have been performed based on the HCM[2] Chapters Nineteen (19) and Twenty (20) procedures using Synchro version 11. The Synchro software, which implements intersection geometric characteristics, volume inputs, and traffic control information, was used to evaluate capacity for each scenario analyzed. The No-Build scenario includes 2026 grown traffic and background projects. The Build scenario adds site traffic to the background traffic volumes. In the Build w/ Mitigation scenario, proposed improvements to the study intersections are modeled with the Synchro software to improve intersection capacity. These improvements, or mitigation measures, are proposed to improve projected operations to an LOS D or better for each movement. For movements where this is not feasible, improvements are proposed to achieve an LOS result better than or equal to the No-Build scenario.

Peak hour factors and truck percentages were developed per movement based on collected count data, found in **Appendix C**. The results from this analysis are presented in **Table 14** and **Table 15**. Analysis worksheets are provided in **Appendix G**. The existing signal timing plans are included in **Appendix D.**

Table 14: AM Peak Projected Levels of Service

ID	Intersection	Type of Control	Approach	Movement	Existing (2021)				No-Build (2026)			Build (2026)			Build w/ Mitigation			Proposed Turn Bay Length (ft)
					LOS (Delay)	V/C Ratio	95th% Queue Length+ (ft)	Existing Turn Bay Length (ft)	LOS(Delay)	V/C Ratio	95th% Queue Length+ (ft)	LOS(Delay)	V/C Ratio	95th% Queue Length+ (ft)	LOS(Delay)	V/C Ratio	95th% Queue Length+ (ft)	
101	FM 973 & Gregg Lane	Unsignalized (Signalized in No-Build)	Intersection	-	A (6.4)	-	-	-	F (132.1)	-	-	F (145.1)	-	-	F (91.7)	-	-	-
			Eastbound	Left	C (22.3)	0.441	44	-	C (31.6)	0.84	21	D (43.5)	0.94	27	E (70.1)	0.44	48	-
				Right				-							C (24.3)	0.83	19	-
			Northbound	Left	B (14.2)	0.566	72	355	F (141.5)	1.22	#715	F (163.6)	1.29	m92	F (118.3)	1.16	#849	-
				Thru				-	A (2.5)	0.37	78	A (2.3)	0.38	m20	A (2.2)	0.37	78	-
			Southbound	Thru	-(-)	-	-	-	F (209.7)	1.39	#1256	F (229.6)	1.44	#1311	F (156.5)	1.26	#1255	-
				Right				-							A (3.2)	0.21	27	715
102	FM 973 & Tinejaro Way	Unsignalized (Signalized in No-Build)	Intersection	-	D (25.9)	-	-	-	D (51.2)	-	-	F (5251.7)	-	-	F (84.9)	-	-	-
			Eastbound	Left	-	-	-	-	-	-	-	D (37.1)	0.18	39	D (37.1)	0.18	39	-
				Thru/Right	-	-	-	-	-	-	-	C (26.2)	0.58	148	B (11.0)	0.48	80	-
			Westbound	Left	F (198.2)	1.23	232	-	D (50.7)	0.84	160	F (197.0)	1.31	#456	F (197.0)	1.31	#456	-
				Thru/Right	C (17.5)	0.394	38	655	B (13.5)	0.55	54	B (18.3)	0.59	69	B (17.6)	0.58	66	-
			Northbound	Left	-(-)	-		-	E (73.7)	1.08	#965	F (13491.2)	31.02	#2104	D (41.2)	0.9	m89	715
				Thru/Right				-							D (48.1)	1.05	m#913	-
			Southbound	Left	-(-)	-		630	A (8.3)	0.27	16	A (2.3)	0.18	m3	C (20.5)	0.34	15	-
				Thru/Right				-	D (40.2)	0.99	#891	B (19.2)	0.99	m75	F (126.6)	1.21	#1276	-
103	FM 973 & Suncrest Road (North)	Unsignalized (Signalized in Build with Improvements)	Intersection	-	B (13.6)	-	-	-	E (49.9)	-	-	F (85.8)	-	-	E (74.1)	-	-	-
			Westbound	Left/Right	F (64.9)	0.921	188	-	F (354.3)	1.681	580	F (665.7)	2.366	798	F (165.8)	1.27	#363	-
			Northbound	Thru	-(-)	-		-	-(-)	-		-(-)	-		C (28.0)	0.88	#807	-
				Right				-							A (2.4)	0.49	9	715
			Southbound	Left	A (8.5)	0.063	4	-	C (17.7)	0.453	46	C (23.5)	0.558	66	C (27.4)	0.92	m72	715
				Thru				-							F (105.2)	1.2	m#451	-
104	FM 973 & Shadowglen Trace/ Suncrest Road (North)	Signalized	Intersection	-	E (67.3)	-	-	-	F (542.2)	-	-	F (579.1)	-	-	F (263.9)	-	-	-
			Eastbound	Left	E (77.8)	0.8	163	-	F (236.6)	1.39	#388	F (263.6)	1.45	#412	F (217.6)	1.34	#394	-
				Thru/Right	B (11.2)	0.42	30	-	C (32.2)	0.73	125	D (35.2)	0.74	134	C (31.5)	0.7	129	-
			Westbound	Left	F (164.8)	1.2	#387	-	F (1458.6)	4.19	#1504	F (1458.6)	4.19	#1504	F (674.5)	2.42	#744	300
				Thru				-							F (112.7)	1	#274	-
				Right				-							C (24.5)	0.71	75	300
			Northbound	Left	C (33.4)	0.64	62	795	F (86.1)	0.96	#150	F (86.1)	0.96	#150	F (86.1)	0.96	#150	-
				Thru	B (16.4)	0.31	231		C (32.8)	0.8	#828	E (55.3)	0.98	#1155	D (51.1)	0.96	#1117	-
				Right				-							A (0.1)	0.02	0	715
			Southbound	Left	B (11.5)	0.01	3	785	B (12.3)	0.06	4	B (13.3)	0.1	4	B (13.3)	0.1	4	715
				Thru	E (62.5)	0.99	#888	-	F (380.9)	1.78	#1883	F (549.0)	2.16	#2387	F (430.3)	1.89	#2033	-
				Right				-							A (6.7)	0.25	52	-

ID	Intersection	Type of Control	Approach	Movement	Existing (2021)				No-Build (2026)			Build (2026)			Build w/ Mitigation			Proposed Turn Bay Length (ft)
					LOS (Delay)	V/C Ratio	95th% Queue Length+ (ft)	Existing Turn Bay Length (ft)	LOS(Delay)	V/C Ratio	95th% Queue Length+ (ft)	LOS(Delay)	V/C Ratio	95th% Queue Length+ (ft)	LOS(Delay)	V/C Ratio	95th% Queue Length+ (ft)	
105	FM 973 & US 290	Signalized	Intersection	-	E (74.2)	-	-	-	F (251.3)	-	-	F (309.7)	-	-	F (236.7)	-	-	-
			Eastbound	Left/Thru	F (143.1)	1.02	#394	1140	F (545.8)	2.1	#940	F (704.8)	2.47	#1121	F (201.9)	1.28	#457	1250
				Right	C (23.4)	0.39	286	-	C (26.4)	0.54	427	C (26.4)	0.54	427	C (26.4)	0.54	427	-
			Westbound	Left	F (158.7)	1.08	#366	975	F (286.9)	1.47	#543	F (286.9)	1.47	#543	F (286.9)	1.47	#543	-
				Thru	D (43.1)	0.89	829	-	F (136.8)	1.21	#1538	F (136.8)	1.21	#1538	F (136.8)	1.21	#1538	-
				Right	A (1.2)	0.09	12	335	B (14.7)	0.34	187	B (18.6)	0.45	286	B (18.6)	0.45	286	-
			Northbound	Left	F (136.8)	0.93	#226	345	F (223.4)	1.27	#343	F (223.4)	1.27	#343	F (223.4)	1.27	#343	-
				Thru	F (454.9)	1.88	#636	-	F (877.5)	2.86	#1010	F (949.6)	3.03	#1066	F (453.9)	1.87	#631	-
				Right				-							C (27.6)	0.67	64	715
			Southbound	Left	F (140.5)	0.98	#352	535	F (1183.0)	3.56	#1468	F (1511.2)	4.29	#1767	F (1511.2)	4.29	#1767	-
				Thru/Right	A (1.1)	0.48	0	-	A (5.8)	0.85	0	B (14.7)	0.95	#66	B (14.7)	0.95	#66	-
106	Fuchs Grove Road & Gregg Lane	Unsignalized (Signalized in Build with Improvements)	Intersection	-	D (27.5)	-	-	-	F (450.6)	-	-	F (569.4)	-	-	B (14.9)	-	-	-
			Westbound	Left	E (44.0)	0.932	258	-	F (889.2)	2.905	1672	F (1105.1)	3.382	1916	C (23.3)	0.71	#241	-
				Right				-							A (9.2)	0.7	59	415
			Northbound	Thru	-(-)	-		-	-(-)	-		-(-)	-		C (22.8)	0.64	176	-
				Right				-							A (4.7)	0.24	18	415
			Southbound	Left	A (7.7)	0.077	6	-	A (8.9)	0.157	12	A (9.0)	0.175	12	B (12.8)	0.47	55	415
				Thru				-							B (10.9)	0.4	74	-
107	Greg Manor Road & Fuchs Grove Road	Unsignalized	Intersection	-	B (11.3)	-	-	-	F (202.1)	-	-	F (245.9)	-	-	F (68.2)	-	-	-
			Eastbound	Left/Thru	A (7.9)	0.049	4	-	A (8.5)	0.094	6	A (8.6)	0.106	8	A (8.6)	0.106	8	-
			Westbound	Thru/Right	-(-)	-		-	-(-)	-		-(-)	-		-(-)	-		415
			Southbound	Left	C (20.5)	0.657	98	-	F (389.6)	1.795	960	F (469.1)	1.973	1100	F (205.4)	1.352	470	415
				Right				-							B (12.9)	0.413	40	-
202	Gregg Ln & Driveway 2	Unsignalized	Intersection	-	-	-	-	-	-	-	-	A (0.6)	-	-	A (0.5)	-	-	-
			Eastbound	Thru/Right	-	-	-	-	-	-	-	-(-)	-		-(-)	-		-
			Westbound	Left/Thru	-	-	-	-	-	-	-	A (7.9)	0.013	0	A (7.9)	0.013	0	415
			Northbound	Left/Right	-	-	-	-	-	-	-	C (17.5)	0.108	8	B (13.7)	0.078	6	-
203	Gregg Ln & Driveway 3	Unsignalized	Intersection	-	-	-	-	-	-	-	-	A (1.4)	-	-	A (1.4)	-	-	-
			Eastbound	Left/Thru	-	-	-	-	-	-	-	-(-)	-		-(-)	-		415
			Westbound	Thru/Right	-	-	-	-	-	-	-	A (7.8)	0.017	2	A (7.8)	0.017	2	415
			Northbound	Left	-	-	-	-	-	-	-	D (27.5)	0.210	16	D (26.9)	0.206	16	-
				Right	-	-	-	-	-	-	-	A (9.9)	0.060	4	A (9.8)	0.059	4	-
204	FM 973 & Driveway 4	Unsignalized	Intersection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Southbound	Thru/Right	-	-	-	-	-	-	-	-	-	-	-	-	-	-
205	Gregg Ln & Driveway 5	Unsignalized	Intersection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Eastbound	Thru/Right	-	-	-	-	-	-	-	-	-	-	-	-	-	-

 # Indicates the 95th percentile volume exceeds capacity; queue may be longer.
+ The queue length is denoted from the 95th percentile vehicle queue and assumes each vehicle is 20 feet.
~ Turn bay is part of a center two-way left-turn lane.

Table 15: PM Peak Projected Levels of Service

ID	Intersection	Type of Control	Approach	Movement	Existing (2021)				No-Build (2026)			Build (2026)			Build w/ Mitigation			
					LOS (Delay)	V/C Ratio	95th% Queue Length+ (ft)	Existing Turn Bay Length (ft)	LOS(Delay)	V/C Ratio	95th% Queue Length+ (ft)	LOS(Delay)	V/C Ratio	95th% Queue Length+ (ft)	LOS(Delay)	V/C Ratio	95th% Queue Length+ (ft)	Proposed Turn Bay Length (ft)
101	FM 973 & Gregg Lane	Unsignalized (Signalized in No-Build)	Intersection	-	E (40.9)	-	-	-	F (108.1)	-	-	F (150.7)	-	-	E (58.8)	-	-	-
			Eastbound	Left	F (146.2)	1.218	420	-	F (133.2)	1.23	#322	F (172.2)	1.32	#366	D (39.9)	0.48	109	-
				Right				-							D (51.7)	1.02	#354	-
			Northbound	Left	A (10.0)	0.263	22	355	C (29.1)	0.97	m109	F (162.0)	1.28	#365	C (28.5)	0.93	m223	-
				Thru				-	C (28.0)	1.01	m226	D (51.3)	1.03	#680	B (14.2)	0.89	m376	-
			Southbound	Thru/Right	-(-)	-	-	-	F (215.6)	1.41	#694	F (241.3)	1.47	#729	F (153.3)	1.25	#885	-
								-							A (4.6)	0.17	12	715
102	FM 973 & Tinejaro Way	Unsignalized (Signalized in No-Build)	Intersection	-	C (20.8)	-	-	-	F (127.6)	-	-	F (4989.2)	-	-	F (170.3)	-	-	-
			Eastbound	Left	-	-	-	-	-	-	-	F (404.8)	1.74	#254	F (404.8)	1.74	#254	-
				Thru/Right	-	-	-	-	-	-	-	F (128.6)	1.15	#326	E (73.0)	1.00	#272	-
			Westbound	Left	F (380.7)	1.48	172	-	F (88.0)	0.93	#153	F (368.3)	1.66	#259	F (368.3)	1.66	#259	-
				Thru/Right	C (17.4)	0.212	16	655	B (13.1)	0.48	21	B (12.0)	0.41	22	B (10.7)	0.4	17	-
			Northbound	Left	-(-)	-		-	F (242.9)	1.49	#1142	F (10506.8)	24.29	#2689	F (185.2)	1.30	#404	715
				Thru/Right				-							F (206.6)	1.40	#1572	-
			Southbound	Left	B (10.7)	0.155	10	630	B (10.8)	0.58	m7	B (11.6)	0.57	33	C (30.5)	0.87	m44	-
				Thru/Right				-	B (14.6)	0.98	m113	C (30.5)	0.98	#1073	F (125.8)	1.24	m#811	-
103	FM 973 & Suncrest Road (North)	Unsignalized (Signalized in Build with Improvements)	Intersection	-	C (15.5)	-	-	-	F (78.7)	-	-	F (149.2)	-	-	F (161.6)	-	-	-
			Westbound	Left/Right	F (202.8)	1.156	166	-	F (669.1)	2.246	366	F (1536.2)	4.069	482	C (31.8)	0.8	#81	-
			Northbound	Thru	-(-)	-		-	-(-)	-		-(-)	-		F (310.2)	1.64	#1872	-
				Right				-							A (4.6)	0.52	17	715
			Southbound	Thru	B (12.4)	0.353	32	-	F (392.4)	1.761	586	F (778.6)	2.603	792	F (234.9)	1.43	#465	715
				Right				-							C (22.3)	0.95	#1085	-
104	FM 973 & Shadowglen Trace/ Suncrest Road (North)	Signalized	Intersection	-	D (35.9)	-	-	-	F (46 1.4)	-	-	F (554.8)	-	-	F (295.0)	-	-	-
			Eastbound	Left	E (76.8)	0.83	199	-	F (239.7)	1.39	#411	F (268.0)	1.46	#439	F (221.7)	1.35	#421	-
				Thru/Right	A (1.4)	0.22	0	-	B (11.6)	0.44	63	B (12.4)	0.44	67	B (11.3)	0.42	64	-
			Westbound	Left	E (67.0)	0.63	99	-	F (1209.4)	3.63	#1021	F (1209.4)	3.63	#1021	F (276.9)	1.48	#322	300
				Thru				-							E (62.3)	0.56	114	-
				Right				-							F (194.5)	1.33	0	300
			Northbound	Left	B (15.3)	0.42	80	795	F (168.1)	1.22	#404	F (168.1)	1.22	#404	F (168.1)	1.22	#404	-
				Thru	C (28.7)	0.81	#935		F (320.7)	1.65	#2245	F (494.2)	2.04	#2898	F (449.7)	1.94	#2714	-
				Right				-							A (1.2)	0.1	9	715
			Southbound	Left	B (11.4)	0.05	6	785	B (14.1)	0.13	9	B (14.4)	0.15	10	B (14.4)	0.15	10	715
				Thru	D (35.0)	0.78	#695	-	F (251.4)	1.48	#1556	F (426.6)	1.88	#2105	F (290.4)	1.57	#1690	-
				Right				-							A (4.4)	0.28	36	-

ID	Intersection	Type of Control	Approach	Movement	Existing (2021) LOS (Delay)	Existing (2021) V/C Ratio	Existing (2021) 95th% Queue Length+ (ft)	Existing Turn Bay Length (ft)	No-Build (2026) LOS(Delay)	No-Build (2026) V/C Ratio	No-Build (2026) 95th% Queue Length+ (ft)	Build (2026) LOS(Delay)	Build (2026) V/C Ratio	Build (2026) 95th% Queue Length+ (ft)	Build w/ Mitigation LOS(Delay)	Build w/ Mitigation V/C Ratio	Build w/ Mitigation 95th% Queue Length+ (ft)	Proposed Turn Bay Length (ft)
105	FM 973 & US 290	Signalized	Intersection	-	F (138.8)	-	-	-	F (392.7)	-	-	F (502.7)	-	-	F (358.5)	-	-	-
			Eastbound	Left/Thru	F (186.8)	1.27	#1154	1140	F (610.4)	2.28	#2357	F (805.7)	2.73	#2880	F (234.3)	1.41	#1200	1250
				Right	D (51.6)	0.98	#1190	-	F (186.6)	1.33	#2071	F (186.6)	1.33	#2071	F (186.6)	1.33	#2071	-
			Westbound	Left	F (253.2)	1.38	#562	975	F (449.2)	1.87	#797	F (449.2)	1.87	#797	F (449.2)	1.87	#797	-
				Thru	F (86.0)	1.03	#1054	-	F (229.6)	1.41	#1695	F (229.6)	1.41	#1695	F (229.6)	1.41	#1695	-
				Right	A (9.4)	0.2	62	335	C (34.1)	0.58	354	D (44.4)	0.76	540	D (44.4)	0.76	540	-
			Northbound	Left	F (158.7)	1.07	#415	345	F (279.8)	1.44	#598	F (279.8)	1.44	#598	F (279.8)	1.44	#598	-
				Thru	F (735.0)	2.54	#1187	-	F (1266.5)	3.75	#1768	F (1383.1)	4.01	#1880	F (579.1)	2.18	#990	-
				Right				-							F (154.6)	1.2	#530	715
			Southbound	Left	F (309.1)	1.5	#395	535	F (1496.7)	4.26	#1202	F (2196)	5.82	#1633	F (2196)	5.82	#1633	-
				Thru/Right	A (0.5)	0.32	0	-	A (1.3)	0.53	0	A (1.7)	0.6	0	A (1.7)	0.6	0	-
106	Fuchs Grove Road & Gregg Lane	Unsignalized (Signalized in Build with Improvements)	Intersection	-	B (14.7)	-	-	-	F (925.5)	-	-	F (1747.6)	-	-	B (15.8)	-	-	-
			Westbound	Left	E (40.7)	0.803	144	-	F (3616.6)	8.749	1246	F (6561.6)	15.149	1442	C (33.8)	0.55	110	-
				Right				-							A (8.7)	0.64	61	415
			Northbound	Thru	-(-)	-		-	-(-)	-		-(-)	-		C (28.8)	0.68	224	-
				Right				-							A (5.2)	0.47	38	415
			Southbound	Left	A (9.3)	0.311	26	-	B (13.9)	0.575	76	C (15.5)	0.63	92	B (19.3)	0.82	245	415
				Thru				-							A (5.7)	0.31	96	-
107	Greg Manor Road & Fuchs Grove Road	Unsignalized	Intersection	-	A (7.7)	-	-	-	F (243.9)	-	-	F (347.9)	-	-	F (155.0)	-	-	-
			Eastbound	Left/Thru	A (8.4)	0.16	12	-	B (11.0)	0.343	30	B (11.4)	0.378	36	B (11.4)	0.378	36	-
			Westbound	Thru/Right	-(-)	-		-	-(-)	-		-(-)	-		-(-)	-		415
			Southbound	Left	D (25.3)	0.535	60	-	F (1120.7)	3.308	718	F (1544.5)	4.228	830	F (962.3)	2.925	540	415
				Right				-							B (10.3)	0.146	10	-
202	Gregg Ln & Driveway 2	Unsignalized	Intersection	-	-	-	-	-	-	-	-	A (0.7)	-	-	A (0.6)	-	-	-
			Eastbound	Thru/Right	-	-	-	-	-	-	-	-(-)	-		-(-)	-		-
			Westbound	Left/Thru	-	-	-	-	-	-	-	A (9.8)	0.067	4	A (9.8)	0.067	4	415
			Northbound	Left/Right	-	-	-	-	-	-	-	C (24.3)	0.105	6	C (17.0)	0.068	4	-
203	Gregg Ln & Driveway 3	Unsignalized	Intersection	-	-	-	-	-	-	-	-	A (1.7)	-	-	A (1.6)	-	-	-
			Eastbound	Left/Thru	-	-	-	-	-	-	-	-(-)	-		-(-)	-		415
			Westbound	Thru/Right	-	-	-	-	-	-	-	A (9.9)	0.093	6	A (9.9)	0.093	6	415
			Northbound	Left	-	-	-	-	-	-	-	E (41.6)	0.224	16	E (39.2)	0.212	16	-
				Right	-	-	-	-	-	-	-	C (15.4)	0.086	6	C (15.2)	0.085	6	-
204	FM 973 & Driveway 4	Unsignalized	Intersection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Southbound	Thru/Right	-	-	-	-	-	-	-	-	-	-	-	-	-	-
205	Gregg Ln & Driveway 5	Unsignalized	Intersection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Eastbound	Thru/Right	-	-	-	-	-	-	-	-	-	-	-	-	-	-

 # Indicates the 95th percentile volume exceeds capacity; queue may be longer.
+ The queue length is denoted from the 95th percentile vehicle queue and assumes each vehicle is 20 feet.
~ Turn bay is part of a center two-way left-turn lane.

ADDITIONAL ANALYSIS

QUEUING ANALYSIS

The projected 95th percentile queues at the study intersections were evaluated against existing storage lengths to ensure that queues do not back up and significantly interfere with the operations of adjacent intersections or driveways. As indicated by Table 14 and Table 15, the recommended improvements are anticipated to reduce the majority of queues when compared to No-Build conditions. Projected 95th percentile queues are not anticipated to significantly impact the operations of adjacent intersections or driveways. Turn-bay extensions were recommended for movements in which 95th percentile queues are anticipated to exceed existing storage lengths. The lengths of recommended turn-bays were also based on storage. A detailed list of recommendations can be found in the Recommendations and Mitigations section.

ROADWAY SIZING ANALYSIS

In addition to the intersection LOS analysis, a roadway sizing analysis was performed for Gregg Lane as well as the three proposed driveways and all connecting internal roadways within the Enfield development, using projected daily volumes within the study area. Daily volumes were determined by dividing Build (2026) PM peak hour volumes by a factor of 0.09. Projected volumes along Gregg Lane and all connecting internal roadways are projected to be as follows:

- Gregg Lane between FM 973 and Driveway 3: 14,333 vehicles per day
- Gregg Lane between Driveway 3 and Fuchs Grove Road: 13,694 vehicles per day
- Driveway 1: 9,156 vehicles per day
- Driveway 2: 922 vehicles per day
- Driveway 3: 1,678 vehicles per day
- Driveway 4: 367 vehicles per day
- Driveway 5: 133 vehicles per day
- All connecting internal roadways: <1,000 vehicles per day

Based on the cross-sections of the existing thoroughfare and the proposed cross-sections of the Enfield development as well as in accordance with the City of Austin Transportation Criteria Manual[6] the following roadway classifications are appropriate:

- Gregg Lane should be classified as a two-lane undivided minor arterial street from Fuchs Grove Road to Driveway 3.
- Gregg Lane should be classified as a three-lane divided minor arterial street with a two-way-left-turn-lane from FM 973 to Driveway 3
- Driveway 1 should be classified as a neighborhood collector
- Driveway 2 should be classified as a local roadway
- Driveway 3 should be classified as residential collector
- Driveway 4 should be classified as a local roadway
- Driveway 5 should be classified as a local roadway

- All connecting internal roadways should be classified as local roadways

Typical cross-sections for local roadways, two-lane undivided minor arterial streets, and primary, neighborhood, and residential collectors as well as right-of-way dedication along Gregg Lane are provided in Appendix M. The existing cross-section for Gregg Lane currently includes 22 feet of pavement while the proposed cross-section for a two-lane undivided minor arterial street includes 30 feet of pavement. This cross-section correlates with Figure 1-34 in the City of Austin Transportation Criteria Manual. The cross-section on Gregg Lane from FM 973 to Driveway 3 is proposed to be expanded to a three-lane primary collector with a two-way-left-turn-lane. This cross-section is proposed to include three 12-foot lanes plus 4-foot shoulders for a total width of 44 feet. The two-way left-turn lane would accommodate westbound lefts into the Enfield development.

Per the CAMPO 2045 Regional Transportation Plan, proposed roadway improvements within the study area indicated that sidewalks would be built in the area. Therefore, this was considered in the analysis and the cross section with curb & gutter (1-34a) was chosen for Gregg Lane.

It should also be noted that a planned bridge reconstruction project proposes to expand approximately 2,590 feet of Gregg Lane between Driveway 3 and Fuchs Grove Road to a cross-section that meets the criteria of a two-lane undivided minor arterial. Therefore, the cost for expanding that section of Gregg Lane is not included in this study. The total length of improvement for this section is therefore 5,840 minus 2,590 which equals 3,250 feet.

All connecting internal roadways are anticipated to provide adequate capacity to facilitate the projected daily volumes. Site driveway specifications are provided in Appendix N.

TURN BAY ANALYSIS

The proposed access points, Driveway 1 and Driveway 4, are located on a TxDOT facility, FM 973. However, the proposed access point, Driveway 1, was not considered for analysis because it is anticipated that Driveway 1 will be signalized in a TxDOT background project. Due to the anticipated signal at this intersection, Driveway 1 will be analyzed operationally, therefore, movement operations and 95th percentile queue will be evaluated in consideration for any proposed mitigations at this intersection. The proposed access points were evaluated against the criteria in the TxDOT Access Management Manual to determine the need for right-turn deceleration and/or acceleration lane(s) to accommodate the full build-out of the development. Per the Access Management Manual, the minimum threshold volumes are 200 vehicles per hour (vph) for egress (acceleration lane) and 50 vph for ingress (deceleration lane). The volumes are shown in Table 16.

Table 16: Auxiliary Lane Threshold Evaluation

TxDOT Volume Threshold Criteria* (vph)		Right Turn Projected Volumes to or from Property	
		Acceleration	Deceleration
		Right-turn egress >200 vph	For speed limit >45 mph where right-turn ingress volumes is >50 vph
		Exiting	Entering
FM 973 at Driveway 4	AM	0	22
	PM	0	33

**TxDOT Criteria obtained from TxDOT Access Management Manual. Table 2-3 (Auxiliary Lane Threshold)[4]*

As indicated in **Table 16,** the FM 973 at Driveway 4 does not meet the minimum threshold for consideration of a southbound right-turn acceleration lane in the AM and PM peak hour for the intersection. Therefore, a right-turn acceleration lane should not be considered.

The projected opposing volumes, advancing volumes, and percentage of left-turns from the advancing volumes at the study driveway were evaluated using the criteria contained in Table 3-11 of the TxDOT Roadway Design Manual[5]. The criteria contained in Table 3-11 that pertains to the proposed driveway is shown in Table 17. The criteria for a 60 mph design speed was used.

Table 17: Guide for Left-Turn Lane on Two-Lane Highways

60 mph Design Speed				
Opposing Volume (vph)	Advancing Volume (vph)			
	5% Left Turns	10% Left Turns	15% Left Turns	20% Left Turns
800	230	170	125	115
600	290	210	160	140
400	365	270	200	175
200	450	330	250	215
100	505	370	275	240

The projected opposing volumes, advancing volumes, and percentage of left-turns from the advancing volumes for the study driveway are shown in **Table 18.**

Table 18: Left-Turn Lane Threshold Evaluation

Intersection	AM Peak			PM Peak		
	Opposing Volume	% Left-Turn	Advancing Volume	Opposing Volume	% Left-Turn	Advancing Volume
FM 973 at Driveway 1/Tinajero Way	1242	15%	1282	1488	18%	1980

As indicated in **Table 18**, the study driveway exceeds the minimum volume threshold for consideration of a northbound left-turn deceleration lane in both the AM and PM peak hours. Therefore, a northbound left-turn deceleration lane should be considered.

The proposed access points to the development were evaluated against the criteria in the National Cooperative Highway Research Program (NCHRP) Report 457 to determine the need for right-turn deceleration and/or acceleration lane(s) to accommodate the full build-out of the development.

NCHRP guidance for consideration of a left-turn bay is based on major-road turning movement volume for the peak hour of the average day and the major-road posted speed. Opposing and advancing volumes are compared against the percent of left-turns and the speed limit to determine if the data fall above or below the threshold for consideration of a left-turn bay. Driveway 4 and Driveway 5 are not evaluated because they are proposed to have right-in only access. Volumes for the build-out year (2026) are presented in Table 19. Analysis worksheets are provided in Appendix H.

Table 19: NCHRP Report 457 – Left-Turn Bay Warrant Analysis

Variable	Gregg Lane & Driveway 2		Gregg Lane & Driveway 3	
	AM Peak	PM Peak	AM Peak	PM Peak
85th Percentile Speed, mph:	50	50	50	50
Percent of Left-Turns in Advancing Volume (V_A), %:	2	9	3	13
Advancing Volume (V_A), veh/h:	834	556	835	515
Opposing Volume (V_O), veh/h:	271	767	237	762
Limiting Advancing Volume (V_A), veh/h	826	232	729	194
Guidance for Determining the Need for a Major-Road Left-Turn Bay	Warranted	Warranted	Warranted	Warranted

As shown in Table 19 the traffic volumes are anticipated to warrant a left-turn bay at Driveway 2 and Driveway 3. Left turn bays along Gregg Lane will be accommodated by the proposed expansion of Gregg Lane to include a two-way-left-turn-lane (TWLTL).

NCHRP guidance for consideration of a right-turn bay is based on major-road turning and through movement volumes for the peak hour of the average day and the major-road posted speed. Right-turning volumes are compared against the threshold for consideration of a right-turn bay. Volumes for the build-out year (2026) are presented in Table 20. Analysis worksheets are provided in Appendix H.

Table 20: NCHRP Report 457 – Right-Turn Bay Warrant Analysis

Variable	Gregg Lane & Driveway 2		Gregg Lane & Driveway 3		Gregg Lane & Driveway 5	
	AM Peak	PM Peak	AM Peak	AM Peak	AM Peak	AM Peak
Major-Road Speed, mph:	50	50	50	50	50	50
Major-Road Volume (One Direction), veh/h;	271	767	237	762	284	765
Right-Turn Volume, veh/h:	4	14	8	26	9	12
Limiting Right-Turn Volume, veh/h:	51	14	60	15	48	15
Guidance for Determining the Need for a Major-Road Right-turn Bay	Not Warranted	Not Warranted	Not Warranted	Warranted	Not Warranted	Not Warranted

As indicated in Table 20, Driveway 3 is anticipated to warrant a westbound right-turn bay. Based on Table 9-20 in the AASHTO Greenbook (2018), a 415-ft right-turn bay is recommended for Gregg Lane at Driveway 3.

SIGHT DISTANCE ANALYSIS

Stopping Sight Distance

A sight distance study was performed to ensure that adequate stopping sight distance is available at the intersection of FM 973 and Suncrest Road and the intersection of Fuchs Grove Road and Gregg Lane due to the recommendation of signalization under build-out (2026) conditions.

Stopping sight distance is the distance required for a driver to detect an object in the roadway and brake to avoid a potential collision. The minimum stopping sight distance for a roadway with a design speed of 50 mph is 425 feet and 645 feet for a roadway with a design speed of 65 mph.

The measured stopping sight distance for each approach can be found in Table 21. Stopping sight distance figures are presented in Appendix J. It should be noted that measured sight distances consider both vertical and horizontal sight obstructions.

Table 21: Stopping Sight Distance Summary

Intersection	Approach (Both Travel Lanes)	Back of Queue Length	Speed (mph)	Design Sight Distance (ft)	Measured Stopping Sight Distance from Back of Queue (ft)
Suncrest Road & FM 973	Westbound	363 ft (AM) 81 ft (PM)	30	200	>200
	Northbound	807 ft (AM) 1872 ft (PM)	65	645	>645
	Southbound	451 ft (AM) 1085 ft (PM)	65	645	>645
Fuchs Grove Road & Gregg Lane	Westbound	241 ft (AM) 110 ft (PM)	50	425	>425
	Northbound	176 ft (AM) 224 ft (PM)	50	425	>425
	Southbound	74 ft (AM) 245 ft (PM)	50	425	>425

As indicated by Table 21, the measured stopping sight distance meets the minimum sight distance on all approaches for the intersection of FM 973 and Suncrest Road and the intersection of Fuchs Grove Road and Gregg Lane.

Intersection Sight Distance

Intersection sight distance is the minimum required line of sight for a driver approaching an intersection. On the major road, the driver should have an unobstructed view of the entire intersection for this distance. The driver on the minor street approach should have a line of sight along the intersecting roadway which permits the driver to anticipate and avoid a potential collision. Intersection sight distance was analyzed for vehicles turning from the minor roadway (the proposed Driveway 1, the proposed Driveway 2 and proposed Driveway 3) onto FM 973 and Gregg Lane as well as for vehicles turning left from the major roadway to the minor roadway. Driveway 4 was not

considered for this analysis as access to Driveway 4 is right-in only; therefore, there will be no sight distance concerns.

Sight triangles are the area along the intersection's approach legs which should be clear of obstructions that might block a driver's view. Sight triangles were evaluated against AASHTO criteria for Driveway 1 on FM 973, a TxDOT facility, finding that a minimum sight distance for Case B1, B2, and F1 are 765 ft, 625 ft, and 525 ft, respectively. Sight triangles were evaluated against City of Austin TCM criteria for Driveway 2 and Driveway 3, finding that a minimum sight distance of 1000 ft is needed based on Case III, Condition A of Table 1-1.

The results of the sight distance analysis are shown in **Table 22**, and the intersection sight distance is illustrated in **Appendix J.**

Table 22: Intersection Sight Distance at Driveway 1, Driveway 2, and Driveway 3

Location	Case	Speed (mph)	AASHTO/City Of Austin Design Sight Distance (ft)	Measured Sight Distance (ft)
FM 973 at Tinajero Way/Driveway 1	Left Turn from Minor Road	65	765*	>765 (looking north) >765 (looking south)
	Right Turn from Minor Road	65	625*	>625 (looking north)
	Left Turn from Major Road	65	525*	>525 (looking north)
Gregg Lane at Driveway 2	Left Turn from Minor Road	50	1000	>1000 (looking east) >1000 (looking west)
	Right Turn from Minor Road	50	1000	>1000 (looking east)
	Left Turn from Major Road	50	1000	>1000
Gregg Lane at Driveway 3	Left Turn from Minor Road	50	1000	>1000 (looking east) >1000 (looking west)
	Right Turn from Minor Road	50	1000	>1000 (looking east)
	Left Turn from Major Road	50	1000	>1000
**Measured against AASHTO Criteria*				

As indicated by **Table 22**, the measured intersection sight distance meets the minimum sight distance recommended by the City of Austin TCM and AASHTO.

SIGNAL WARRANT ANALYSIS

A signal warrant analysis was completed at the following intersections under Existing (2021) conditions, No-Build (2026) conditions, and Build-Out (2026) conditions:

- Fuchs Grove Road & Gregg Lane
- FM 973 & Suncrest Road (North)

The signal warrant analysis was conducted in accordance with Chapter 4C of the Texas Manual on Uniform Traffic Control Devices (TMUTCD)[6]. Future year volumes for the intersections were estimated using the existing base year (2021) volumes, trip generation for applicable background projects, trip generation for the Enfield development, nearby historical TxDOT TCDS count data, and hourly distribution at nearby historical counts from TCDS.

As stated in the TMUTCD, traffic control signals should not be installed unless one or more of the signal warrants are met. The results from the signal warrant analysis are presented in Table 23. Analysis worksheets are provided in Appendix G.

Table 23: Signal Warrant Analysis

Intersection	Warrant Met? (Y/N)		
	Warrant 1	Warrant 2	Warrant 7
Existing (2021) Conditions			
Fuchs Grove Rd & Gregg Ln	N	Y	N
FM 973 & Suncrest Rd (North)	Y	Y	N
No-Build (2026) Conditions			
Fuchs Grove Rd & Gregg Ln	Y	Y	N
FM 973 & Suncrest Rd (North)	Y	Y	N
Build Out (2026) Conditions			
Fuchs Grove Rd & Gregg Ln	Y	Y	N
FM 973 & Suncrest Rd (North)	Y	Y	N

As indicated in Table 23, the intersection of Fuchs Grove Road with Gregg Lane meets Warrant 2 under Existing (2021) conditions and is anticipated to meet Warrant 1 and Warrant 2 under No-Build (2026) and Build-Out (2026) conditions. Warrants 1 through 9 are discussed below:

Warrant 1 – Eight Hour Vehicular Volume

Applicable information from the projected traffic volume data is provided in Appendix K and indicates whether minimum volume thresholds are met per TMUTCD Table 4C-1. Since the major street at each study intersection has a posted speed limit that exceeds the 40 mph threshold indicated in the warrant, the 70 percent column may be

used in place of the 100 percent column in the A and B condition analysis and the 56 percent column may be used in place of the 80 percent column in the A and B combination condition analysis.

Warrant 2 – Four-Hour Vehicular Volume

Applicable information from the projected traffic volume data is provided in Appendix K and indicates whether minimum volume thresholds are met per TMUTCD Figure 4C-1 or 4C-2. Since the major street at the study intersection has a posted speed limit that exceeds the 40 mph threshold in the warrant, Figure 4C-2 applies.

Warrant 3 – Peak Hour

This warrant is not applicable to the study intersection as it does not represent an unusual case, such as high-occupancy facilities that attract or discharge large numbers of vehicles over a short period of time.

Warrant 4 – Pedestrian Volume

No pedestrian activity was observed at the intersection of Fuchs Grove Road and Gregg Lane during AM (7-9) and PM (4-6) peak hours. Therefore, this warrant is not considered applicable.

Warrant 5 – School Crossing

There was no hour during the day when a minimum of 20 school children crossed at either study intersection. Warrant 5 is considered not met.

Warrant 6 – Coordinated Signal System

This warrant is considered not applicable at study intersections.

Warrant 7 – Crash Experience

Crash data from the past five years (2017-2021) were pulled for the study intersections. There was one reported crash in the year of 2017 at the intersection of Fuchs Grove Road with Gregg Lane. There were two reported crashes in the year of 2018 at the intersection of Fuchs Grove Road with Gregg Lane. There were four reported crashes in the year of 2019 at the intersection of Fuchs Grove Road with Gregg Lane. There were three reported crashes in the years of 2020 to 2021 at the intersection of Fuchs Grove Road with Gregg Lane. As five or more crashes susceptible to correction by a traffic signal occurring within 12 months of each other have not been reported at the study intersection, Condition 2 of Warrant 7 is considered not met for the study intersection under Existing, No-Build (2026), or Build-Out (2026) conditions. As Condition 2 is considered not met at each study intersection under Existing (2021), No-Build (2026), and Build-Out (2026) conditions, Warrant 7 is considered not met under Existing (2021), No-Build (2026), or Build-Out (2026) conditions as all three conditions of Warrant 7 must be met for Warrant 7 to be considered met. Crash data is available in Appendix K.

Warrant 8 – Roadway Network

Warrant 8 only applies to a common intersection of two or more major routes. The study intersection does not meet this criterion, so Warrant 8 is considered not applicable.

Warrant 9 – Intersection Near a Grade Crossing

This warrant is not applicable to the study intersection as there are no grade crossings nearby.

RECOMMENDATIONS AND MITIGATIONS

As indicated in Table 14 and Table 15, several intersections are anticipated to operate with an unacceptable LOS in at least one peak hour under 2026 No-Build and Build conditions. The following improvements are recommended in order to achieve similar LOS as the No-Build condition, an acceptable LOS, or to accommodate anticipated queues under 2026 build-out conditions:

- 101 – FM 973 and Gregg Lane
  - Restripe northbound left-turn bay
  - Add southbound right-turn bay (565 ft storage + 150 ft taper)
  - Modify signal timings
- 102/201 – FM 973 and Tinajero Way/Driveway 1
  - Install signal hardware for eastbound approach
  - Add northbound left-turn bay (565 ft storage + 150 ft taper)
- 103 – FM 973 and Suncrest Road (North)
  - Install traffic signal
  - Add northbound right-turn bay (565 ft storage + 150 ft taper)
  - Add southbound left-turn bay (565 ft storage + 150 ft taper)
- 104 – FM 973 and Shadowglen Trace/Suncrest Road
  - Add westbound left-turn bay (250 ft storage + 50 ft taper)
  - Add westbound right-turn bay (250 ft storage + 50 ft taper)
  - Add northbound right-turn bay (565 ft storage + 150 ft taper)
  - Add southbound left-turn bay (565 ft storage + 150 ft taper)
  - Modify signal timings
- 105 – FM 973 and US 290
  - Add eastbound left-turn bay to create dual-lefts (1100 ft storage + 150 ft taper)
  - Add northbound receiving lane (150 ft storage with a 780 ft taper)
  - Add northbound right-turn bay (565 ft storage + 150 ft taper)
- 106 – Fuchs Grove Road and Gregg Lane
  - Install traffic signal
  - Add westbound right-turn bay (315 ft storage + 100 ft taper)
  - Add northbound right-turn bay (315 ft storage + 100 ft taper)
  - Add southbound left-turn bay (315 ft storage + 100 ft taper)

- 107 – Fuchs Grove Road and Gregg Manor Road
    - Add southbound right-turn bay (315 ft storage + 100 ft taper)
    - Add westbound right-turn bay (315 ft storage + 100 ft taper)
- 203 – Driveway 3 and Gregg Lane
    - Add eastbound right-turn bay (315 ft storage + 100 ft taper)
- Gregg Lane between FM 973 and Driveway 2
    - Expand cross-section (1600 ft)
- Gregg Lane between Driveway 2 and Driveway 3
    - Expand cross-section (940 ft)
- Gregg Lane between Driveway 3 and Fuchs Grove Road
    - Expand cross-section (6150 ft)

Additional discussion on recommended improvements and other improvements considered for each intersection are as follows:

101 – FM 973 and Gregg Lane

As indicated in Table 14 and Table 15, the intersection of FM 973 with Gregg Lane is anticipated to operate at an unacceptable LOS under Build (2026) conditions. The improvements recommended at this intersection are anticipated to improve LOS and queues at the majority of approaches during both the AM and PM peak hours.

To mitigate traffic operations at this intersection, a southbound right-turn bay was added in the Build w/ Mitigation scenario. The dimension of this turn bay is based on TxDOT RDM criteria (**Table 24**). In addition, a restriping the northbound left-turn lane is proposed.

102 – FM 973 and Tinajero Way/Driveway 1

As indicated in Table 14 and Table 15, the intersection of FM 973 with Tinajero Way/Driveway 1 is anticipated to operate at an unacceptable LOS under Build (2026) conditions. Due to the addition of an additional leg at this intersection, the LOS for several movements worsens compared to No-Build conditions due to an increase in conflicting movements. The improvements recommended at this intersection are anticipated to improve LOS and queues at the majority of approaches during both the AM and PM peak hours.

To mitigate traffic operations at this intersection, a northbound left turn bay was added in the Build w/ Mitigation scenario. The dimensions of the turn bay are based on TxDOT RDM criteria (**Table 24**).

103 – FM 973 and Suncrest Road (North)

As indicated in Table 14 and Table 15, the intersection of FM 973 with Suncrest Road (North) is anticipated to operate at an unacceptable LOS under Build (2026) conditions. The improvements recommended at this intersection are anticipated to improve LOS and queues at the minor street approach during both the AM and PM peak hours.

To mitigate the unacceptable LOS at the stop-controlled minor street approach a signal was recommended in the Build w/ Mitigation scenario. The addition of a signal necessarily causes the northbound and southbound through

movements to incur delay where they were once uncontrolled. In addition, a northbound right turn bay and a southbound left turn bay are proposed and were dimensioned based on TxDOT RDM criteria (**Table 24**).

104 – FM 973 and Shadowglen Trace/Suncrest Road

As indicated in Table 14 and Table 15, the intersection of FM 973 with Shadowglen Trace/Suncrest Road is anticipated to operate at an unacceptable LOS under Build (2026) conditions. The improvements recommended at this intersection are anticipated to improve LOS and queues at the majority of approaches during both the AM and PM peak hours.

To mitigate traffic operations at this intersection, an eastbound right-turn bay was added in the Build w/ Mitigation scenario a northbound right turn bay and a southbound left turn bay are proposed and were dimensioned based on TxDOT RDM criteria (**Table 24**). In addition, westbound right turn and left turn bays are proposed. These were dimension based on AASHTO criteria (**Table 25**) but were lengthened so that they begin upstream of the horizontal curve on Suncrest Road.

105 – FM 973 and US 290

As indicated in Table 14 and Table 15, the intersection of FM 973 with US 290 is anticipated to operate at an unacceptable LOS under Build (2026) conditions. The improvements recommended at this intersection are anticipated to improve LOS and queues at the majority of approaches during both the AM and PM peak hours.

To mitigate traffic operations at this intersection, a second eastbound left-turn lane is proposed to make a dual left in the Build w/ Mitigation scenario. To accommodate dual left turns, a northbound receiving lane is proposed along FM 973. This receiving lane is proposed to provide 150 ft of storage before tapering down to existing. The taper length was determined using lane width multiplied by speed (12 ft * 65 mph = 780 ft) per TMUTCD criteria. In addition, a dedicated northbound right-turn bay is proposed and was dimensioned based on TxDOT RDM criteria (**Table 24**).

106 – Fuchs Grove Road and Gregg Lane

As indicated in Table 14 and Table 15, the intersection of Fuchs Grove Road with Gregg Lane is anticipated to operate at an unacceptable LOS under Build (2026) conditions. The improvements recommended at this intersection are anticipated to improve LOS and queues at the minor street approach during both the AM and PM peak hours.

To mitigate the unacceptable LOS at the stop-controlled minor street approach a signal was recommended in the Build w/ Mitigation scenario. The addition of a signal necessarily causes the northbound and southbound through movements to incur delay where they were once uncontrolled. In addition, a westbound right-turn bay, a northbound right-turn bay, and a southbound left-turn bay. These were dimensioned based on AASHTO criteria (**Table 25**).

107 – Fuchs Grove Road and Gregg Manor Road

As indicated in Table 14 and Table 15, the intersection of Fuchs Grove Road with Gregg Manor Road Lane is anticipated to operate at an unacceptable LOS under Build (2026) conditions. The improvements recommended at this intersection are anticipated to improve LOS and queues at the majority of approaches during both the AM and PM peak hours.

To mitigate traffic operations at this intersection, a southbound right-turn bay and a westbound right-turn bay were added in the Build w/ Mitigation scenario. The dimensions of these turn bays are based on AASHTO criteria (**Table 25**).

Design Standards

Turn bay deceleration lengths were determined using the design standards outlined in the TxDOT Roadway Design Manual (2021) for TxDOT roadways and the AASHTO Green Book (2018) for Travis County roadways. These standards are found in **Table 24** and **Table 25**.

Table 24: Deceleration Lane Lengths for TxDOT Roadways

Speed (mph)	Deceleration Length (ft)	Taper Length (ft)
30	*160*	*50*
35	*215*	*50*
40	*275*	*50*
45	*345*	*100*
50	*425*	*100*
55	*510*	*100*
60	*615*	*150*
65	*715*	*150*

TxDOT Criteria obtained from TxDOT Roadway Design Manual. Table 3-13.

Table 25: Deceleration Lane Lengths for Travis County Roadways

Speed (mph)	Deceleration Length **(ft)**
30	*150*
35	*205*
40	*265*
45	*340*
50	*415*
55	*505*
60	*600*
65	*700*
70	*815*

AASHTO Criteria obtained from AASHTO Green Book. Table 9-20.

All roadways with the exception of FM 973 and US 290 are Travis County facilities and use the design standards in **Table 25**. FM 973 and US 290 are TxDOT facilities and uses the design standards in **Table 24**.

OPINION OF PROBABLE COST FOR IMPROVEMENTS

To develop opinions of probable cost, the following parameters were used:

- Signal installations are estimated at $550,000 per intersection
- $5,000 per signal retiming if no signal head replacement is required
- $10,000 per signal retiming if a new or replacement signal head is required
- $2,000 for restriping a lane
- $400/linear foot for new 12-foot lanes

An engineer's opinion of probable cost for the recommended improvements for the Build-Out year analysis as well as the developer's pro-rata share cost are shown in Table 26. Figure 24 through Figure 29 show the proposed improvements. Pro rata calculations were based on the critical movement method described in Travis County's TIA Guidelines. A detailed cost estimate was developed for improvements that include the addition of turn lanes, restriping, and roadway widening. Cost estimates, detailed cost estimates, and pro rata calculations can be found in can be found in Appendix L. The Engineering News-Record (ENR) cost index was used to calculate the inflation rate from existing year (2021) to construction year (2026). This inflation rate was then applied to the 2021 bid prices used in cost estimate. The ENR cost index and inflation rate can be found in Appendix L.

Table 26: Engineer's Opinion of Probable Cost for Recommended Improvements in Build-Out (2026)

ID	Location	Improvement	Construction Subtotal	Developer's Pro Rata Share %	Developer's Construction Cost
101	FM 973 & Gregg Ln	Modify Signal Timings	$5,600.00	100.0%	$5,600.00
		Restripe NB left-turn bay	$2,650.00	100.0%	$2,650.00
		Add SB right-turn bay	$227,900.00	12.7%	$28,850.00
102	Tinajero Way & FM 973	Restripe NB striped median for left-turn bay	$2,700.00	100.0%	$2,700.00
		Install Signal Hardware for Eastbound Approach	$56,150.00	100.0%	$56,150.00
103	Suncrest Rd & FM 973	Install Signal	$617,900.00	16.7%	$103,100.00
		Add NB right-turn bay	$123,100.00	0.0%	$0.00
		Add SB left-turn bay	$148,400.00	4.3%	$6,400.00
104	Shadowglen Trace/Suncrest Rd & FM 973	Modify Signal Timings	$5,600.00	100.0%	$5,600.00
		Add WB left-turn bay	$130,350.00	0.0%	$0.00
		Add WB right-turn bay	$140,450.00	0.0%	$0.00
		Add NB right-turn bay	$227,900.00	0.0%	$0.00
		Add SB left-turn bay	$209,850.00	11.1%	$23,300.00
105	FM 973 & US 290	Add EB left-turn bay to create dual lefts	$343,600.00	16.3%	$56,150.00
		Addition of a NB receiving/transition lane	$90,300.00	16.9%	$15,250.00
		Add NB right-turn bay	$172,500.00	0.0%	$0.00
106	Fuchs Grove Rd & Gregg Ln	Install Signal	$617,900.00	5.6%	$34,850.00
		Add WB right-turn bay	$114,700.00	5.7%	$6,600.00
		Add NB right-turn bay	$123,100.00	16.7%	$20,500.00
		Add SB left-turn bay	$156,850.00	8.5%	$13,350.00
107	Fuchs Grove Rd & Gregg Manor Rd	Add SB right-turn bay	$143,600.00	8.3%	$11,950.00
		Add WB right-turn bay	$142,400.00	6.7%	$9,500.00
203	Driveway 3 & Gregg Ln	Add EB right-turn bay	$120,450.00	100.0%	$120,450.00
N/A	Gregg Ln between FM 973 & Driveway 3	Expand Cross-Section	$1,631,400.00	12.7%	$207,400.00
N/A	Gregg Ln between Driveway 3 & Fuchs Grove Rd	Expand Cross-Section*	$741,850.00	8.2%	$60,900.00
		Total	**$6,297,200.00**		**$791,250.00**

**A segment of the Gregg Lane cross-section is to be expanded by others as part of a bridge reconstruction project.*

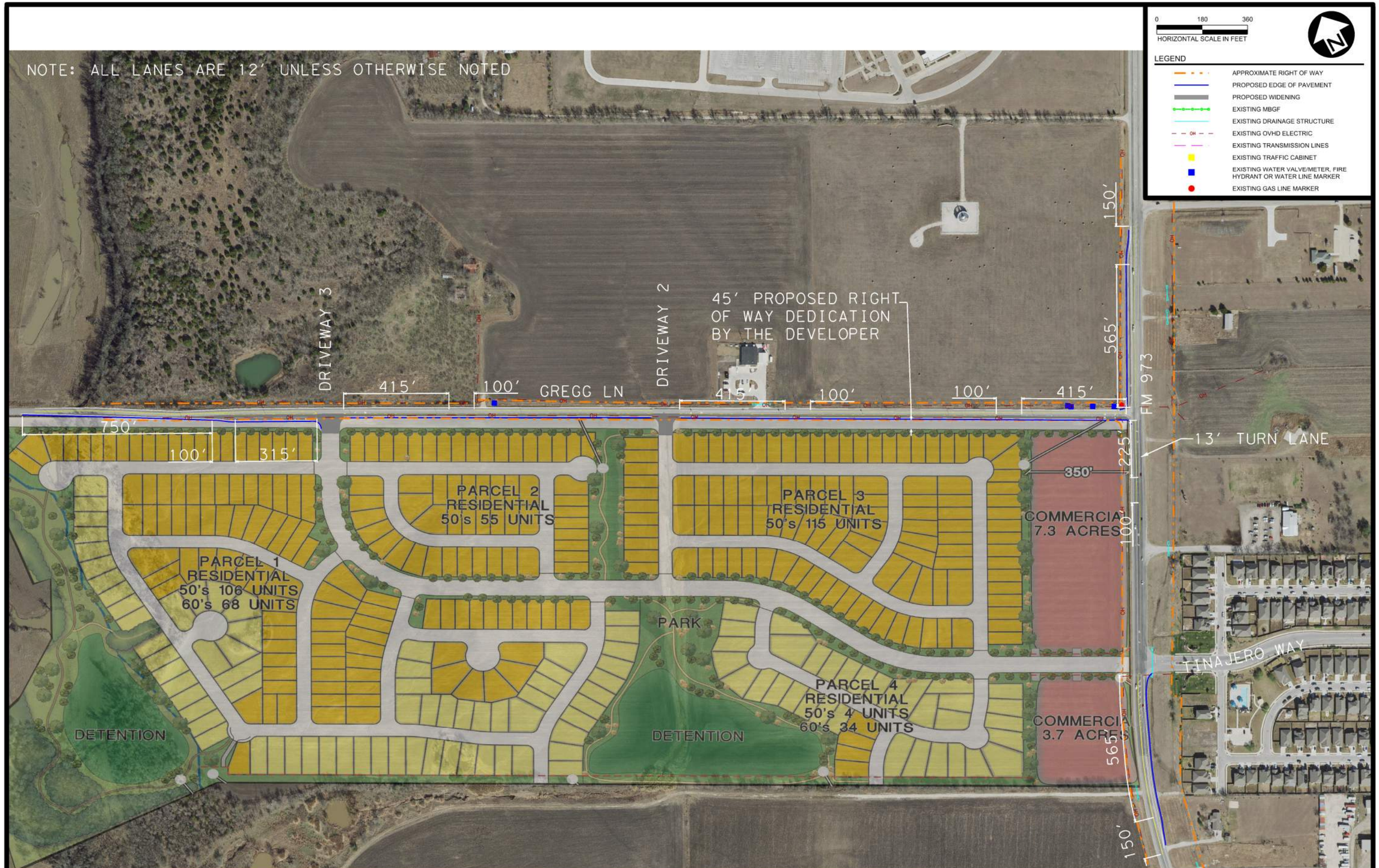

Figure 24: FM 973 at Gregg Lane/FM 973 at Tinajero Way/Gregg Lane at Driveway 2 & Driveway 3 Improvements

Figure 25: FM 973 at Suncrest Road Improvements

Figure 26: FM 973 at Shadowglen Trace/Suncrest Road Improvements

Figure 27: US 290 at FM 973 Improvements

Figure 28: Gregg Lane at Fuchs Grove Road Improvements

Figure 29: Fuchs Grove Road at Gregg Manor Road Improvements

CONCLUSIONS

The proposed Enfield development and its interaction with the surrounding roadway have been analyzed for build-out (2026) conditions. Improvements to accommodate No-Build and site traffic were made to satisfy LOS criteria. Based on these analyses, the development should be approved as planned in accordance with the recommendations shown in Table 27.

Table 27: Engineer's Opinion of Probable Cost for Recommended Improvements in Build-Out (2026)

ID	Location	Improvement	Construction Subtotal	Developer's Pro Rata Share %	Developer's Construction Cost
101	FM 973 & Gregg Ln	Modify Signal Timings	$5,600.00	100.0%	$5,600.00
		Restripe NB left-turn bay	$2,650.00	100.0%	$2,650.00
		Add SB right-turn bay	$227,900.00	12.7%	$28,850.00
102	Tinajero Way & FM 973	Restripe NB striped median for left-turn bay	$2,700.00	100.0%	$2,700.00
		Install Signal Hardware for Eastbound Approach	$56,150.00	100.0%	$56,150.00
103	Suncrest Rd & FM 973	Install Signal	$617,900.00	16.7%	$103,100.00
		Add NB right-turn bay	$123,100.00	0.0%	$0.00
		Add SB left-turn bay	$148,400.00	4.3%	$6,400.00
104	Shadowglen Trace/Suncrest Rd & FM 973	Modify Signal Timings	$5,600.00	100.0%	$5,600.00
		Add WB left-turn bay	$130,350.00	0.0%	$0.00
		Add WB right-turn bay	$140,450.00	0.0%	$0.00
		Add NB right-turn bay	$227,900.00	0.0%	$0.00
		Add SB left-turn bay	$209,850.00	11.1%	$23,300.00
105	FM 973 & US 290	Add EB left-turn bay to create dual lefts	$343,600.00	16.3%	$56,150.00
		Addition of a NB receiving/transition lane	$90,300.00	16.9%	$15,250.00
		Add NB right-turn bay	$172,500.00	0.0%	$0.00
106	Fuchs Grove Rd & Gregg Ln	Install Signal	$617,900.00	5.6%	$34,850.00
		Add WB right-turn bay	$114,700.00	5.7%	$6,600.00
		Add NB right-turn bay	$123,100.00	16.7%	$20,500.00
		Add SB left-turn bay	$156,850.00	8.5%	$13,350.00
107	Fuchs Grove Rd & Gregg Manor Rd	Add SB right-turn bay	$143,600.00	8.3%	$11,950.00
		Add WB right-turn bay	$142,400.00	6.7%	$9,500.00
203	Driveway 3 & Gregg Ln	Add EB right-turn bay	$120,450.00	100.0%	$120,450.00
N/A	Gregg Ln between FM 973 & Driveway 3	Expand Cross-Section	$1,631,400.00	12.7%	$207,400.00
N/A	Gregg Ln between Driveway 3 & Fuchs Grove Rd	Expand Cross-Section*	$741,850.00	8.2%	$60,900.00
		Total	**$6,297,200.00**		**$791,250.00**

**A segment of the Gregg Lane cross-section is to be expanded by others as part of a bridge reconstruction project.*

CERTIFICATION STATEMENT

I hereby certify that this report complies with applicable technical requirements of Travis County, the City of Manor, and TxDOT, and is complete and accurate to the best of my knowledge.

Alliance Transportation Group, LLC

Sydnie Fiocca, P.E.

Transportation Engineer