Kimley»Horn

MEMORANDUM

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From: Hiron Fernando, P.E.
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PRELIMINARY
Kimley»Horn
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Engineer HIRON M. FERNANDO
P.E. No. 123288 Date 12/21/2022

Date: December 21st, 2022

Subject: Trip Generation Memorandum - Up Campus 19th Street Project (the "Project")

Introduction

The purpose of this project is to document and evaluate the projected vehicular trips that will be associated with the proposed Project. The proposed development is an off-campus mixed-use student apartment, which is walking distance to the Texas Tech University campus. The development also includes a retail store on the first floor and is located along the south side of 19th Street, between Boston Avenue, from the west, and University Avenue, from the east in Lubbock, TX as shown in **Figure 1**. This memorandum documents and evaluates the total projected site generated trips for the proposed development, along with a comparison of vehicle miles traveled and its impact on the roadway network, and an analysis of the hourly variation over a typical day. Also, this memorandum conducts a traffic operations analysis on the surrounding network of the Project. The Project consists of 600 bedrooms and 3,000 Sq. Ft ground floor retail area. The residential space is separated into two sections: Building A and an area of Detached Homes. Building A is south of 19th Street and has 565 beds along with a parking garage with 481 parking spaces. The Detached Homes include 35 beds in 7 homes with parking in individual garages that face the main alley between 19th Street and 20th Street.

Executive Summary

The location of the proposed Up Campus development plays a large role in limiting the potential traffic impact on the surroundings. Since it will be located within 0.7 miles of the Texas Tech University campus and is a walkable/bikeable distance, it is expected for many trips during the peak school times to be non-vehicular trips.

Based on the analysis presented in this memo, the proposed Up Campus development can be incorporated into the surrounding roadway network. Below are further details to be considered:

1. Due to the close proximity to the Texas Tech University campus, it is expected that many students will walk, bike, or take the bus to campus, rather than driving. The ITE trip generation land use code that was used in this study is very conservative. It can be realistically assumed that fewer vehicles than what is shown on Exhibit A2 will use the roadway facilities on a typical weekday.
2. The standard ITE land use code LUC 225 that was used in **Table 1A** and **Table 4A** is conservative in estimating trip generation (at 3.57). As seen from the collected counts from the Tuscaloosa project, the standard ITE LUC 225 trip rate is higher than observed demand and very conservative over the expected trips for a "next to campus" land use. Due to the actual observed rate being 1.49 trips per bed, it is expected for the subject project to generate less trips than shown in ITE rates. To be conservative, our LOS analysis uses the higher ITE rate. **Table 4A** and **Table 4B** show that in either scenario, the subject project would potentially have 4 to 20 times less roadway VMT impact than other student properties in Lubbock.
3. Due to the proposed site peaking outside of the traditional AM peak hour, there will be less direct impact to the roadway network during this time.
4. This development has the lowest VMT per bed of the similar sized projects surveyed in the vicinity. This will lower the total vehicle emissions, degradation of roadway, and help reduce congestion by taking vehicles off the roadway in total and during peak hours.
5. The results of traffic operations analysis show that the addition of the Project to the existing roadway network will not have a significant impact on the existing traffic operations at 19th Street and University Avenue.

Trip Generation

Site-generated traffic estimates are determined through a process known as trip generation. Rates and equations are applied to the proposed land use to estimate traffic generated by the development during a specific time interval. The acknowledged source for trip generation rates is the 11th edition of *Trip Generation Manual* published by the Institute of Transportation Engineers (ITE). ITE has established trip rates in nationwide studies of similar land uses. The trips indicated are one-way trips or *trip ends*, where one vehicle entering and exiting the site is counted as one inbound trip and one outbound trip. The one-way trips associated with this development are illustrated in **Table 1A.** Also, **Table 1B** shows the trips generated using the observed rate from an existing Up Campus project in Tuscaloosa, Alabama.

Table 1A – Up Campus Project Trip Generation (ITE Rate)

Land Uses	Amount	Units	ITE Code	Daily One-Way Trips	AM Peak Hour One-Way Trips			PM Peak Hour One-Way Trips		
					IN	OUT	TOTAL	IN	OUT	TOTAL
Off-Campus Student Apartment (Low-Rise)	600	Bedrooms	225	2,142	27	45	72	72	72	144
Strip Retail Plaza (<40k)	3,000	Sq. Ft. GFA	822	163	4	3	7	10	10	20
Development Totals										
Total Net New External Vehicle Trips:				**2,305**	**31**	**48**	**79**	**82**	**82**	**164**

Trip Generation rates based on *ITE's Trip Generation Manual*, 11th Edition.

Table 1B – Up Campus Project Trip Generation (Observed Rate)

Land Uses	Amount	Units	Observed Rate / ITE Code	Daily One-Way Trips	AM Peak Hour One-Way Trips			PM Peak Hour One-Way Trips		
					IN	OUT	TOTAL	IN	OUT	TOTAL
Off-Campus Student Apartment (Low-Rise)	600	Bedrooms	1.49	894	11	19	30	30	30	60
Strip Retail Plaza (<40k)	3,000	Sq. Ft. GFA	822	163	4	3	7	10	10	20
Development Totals										
Total Net New External Vehicle Trips:				**1,057**	**15**	**22**	**37**	**40**	**40**	**80**

Trip Generation rates for "Strip Retail Plaza" based on *ITE's Trip Generation Manual*, 11th Edition.

Proposed Site Access and Trip Distribution

The subject development will be served by a right-in/right-out driveway along 19th Street (Drive 1) for which TxDOT has given preliminary approval. There will also be three driveways along the alley between 19th Street and 20th Street. There are two service drives in the back of Building A (one for residential trash-loading and one for retail trash-loading) along the alley. For the 7 Detached Homes north of 20th Street, there are 7 garages that have access to the alley. This access point is identified as Drive 2 and is displayed in the Exhibits located in the **Attachments**.

The distribution of the site-generated traffic volumes into and out of the site driveways and onto the street system was based on the area street system characteristics, existing traffic patterns, relative residential density, and the locations of the proposed driveway access to/from the site. **Table 2** displays the general directional distribution percentages assumed for the site. For this analysis, it was assumed that 88% of trips use Drive 1 and 7% of trips use Drive 2 (garages facing the alley) to enter to/exit from the proposed development. The other 5% trips are generated by the vehicles with service purposes, such as the retail trucks and trash trucks which will use the service drives located in the alley.

Figure 1 – Site Vicinity

Map

Table 2 - General Directional Distribution

Direction	Percent From/To
North (via University Avenue)	15%
North (via Boston Avenue)	25%
South (via University Avenue)	5%
South (via Boston Avenue)	15%
East (via 19th Street)	10%
West (via 19th Street)	30%

Exhibit A1 shows the corresponding inbound and outbound traffic assignment percentages. **Exhibit A2** shows the site-generated weekday AM and PM peak hour turning movements. These volumes were obtained by multiplying the trip generation by the traffic assignment percentages.

Hourly Variation of Generated Trips

The bar chart shown in **Figure 2** illustrates the hourly distribution of the vehicular trips from 7:00 AM to 10:00 PM computed by the hourly distribution factors by the ITE Trip Generation Manual, 11th Edition. These volumes were obtained by multiplying the daily trips by the hourly distribution factors for the ITE land use code 225. As shown in **Figure 2**, the proposed development site traffic peaks at 11 AM and 5 PM. The morning peak hour is outside the traditional peak hour of 7-8 AM. This is a result of the land use being student apartment units; most students travel to class outside the traditional peak hours. As a result of this offset peak hour, the school traffic will not have an outsized impact on the AM peak hour commuter traffic.

Trip Generation and Vehicle Miles Traveled Analysis

The memo titled *"Trip & Parking Generation Rate Development Tuscaloosa"* by Sain Associates provides trip volumes for a student housing development (481 beds) located about 2 blocks from the University of Alabama at Tuscaloosa. Therefore, this development is similar to the location of the Subject Project in Lubbock, TX. The observed trip rate for the Tuscaloosa site was 1.49 trips per bed, resulting in 894 equivalent total trips per day for a similar sized student housing development. However, using the trip rate from the ITE Trip Generation land use code 225 results in 2,142 trips per day, which is over half the trips computed by the developer's observed trip rate. Therefore, the trip rate and land use code used for this analysis is very conservative. **Table 3** shows the comparison between the daily trips for the Project in Lubbock, TX and the observed rate from the development in Tuscaloosa, AL.

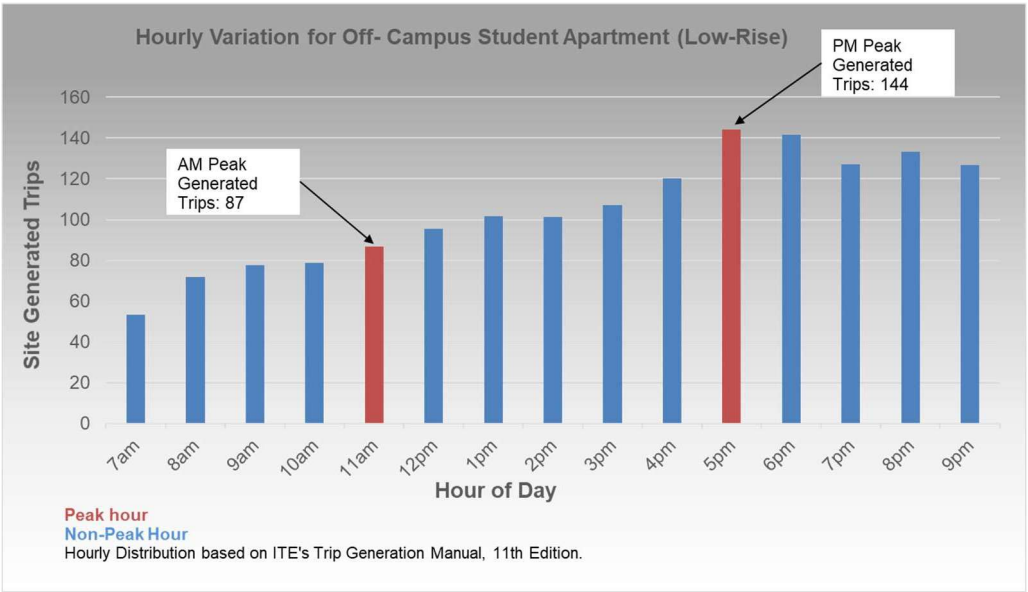


Figure 2 – Hourly Vehicular Trips for a Typical Weekday

Table 3 – Trip Generation (ITE Rate vs. Observed Rate)

Project	Beds*	Trip Rate	Average Trips per Weekday
Up Campus @ Lubbock, TX (Subject Project)	600	3.57	2,142
Up Campus @ Tuscaloosa, AL	600	1.49	894

** The Up Project in Alabama has 481 beds. All numbers have been adjusted to reflect 600 equivalent beds.*

The Attachments also include Student Housing Trip Generation and Vehicle Miles Traveled for the proposed Project as compared to the other student housing properties and apartments occupied by students in Lubbock. All these student properties are located at least 2.3 miles (with many properties at 4-5 miles away) from the on-campus parking lots located between the University Administration Building (in the west) and Student Union Building (in the east).

In this trip generation memorandum, the very conservative ITE trip rate of 3.57 was used for VMT calculation. As can be seen from **Table 4A**, there is almost a 90% decrease in the vehicle miles traveled per bed for the trips generated by the Up Campus proposed development versus the VMT per bed for the furthest residential off-campus property. Using the more realistic trip rate of 1.49 the VMT per bed decreases by 95.6%, which can be seen from **Table 4B**.

Table 4A – Trip Generation and Vehicle Miles Traveled (Subject Project vs. Other Developments) Using ITE Trip Rate (3.57)

Project	Beds	Trip Rate	Average Trips per Weekday	Average Driving Distance (use Parking Lot R07)	Vehicle Miles Traveled (VMT) per Weekday	VMT per Bed per Weekday	% Decrease in VMT Bed vs. Farthest Property
Up Campus @ Lubbock, TX (Subject Project)	600	3.57	2,142	0.7	1,499	2.5	-89.5%
Hunters Way	441	3.97	1,751	6.0	10,505	23.8	0.0%
Driftwood	128	3.97	508	5.1	2,592	20.2	-15.0%
Wildwood Lubbock	1005	3.97	3,990	4.3	17,156	17.1	-28.3%
The Avenue @ Lubbock	788	3.97	3,128	4.2	13,139	16.7	-30.0%
The Republic @ Lubbock	853	3.97	3,386	3.1	10,498	12.3	-48.3%
Boston Creek	572	3.97	2,271	2.3	5,223	9.1	-61.7%
Capstone Cottages	969	3.97	3,847	3.7	14,234	14.7	-38.3%
The One @ Lubbock	737	3.97	2,926	5.1	14,922	20.2	-15.0%

**ITE Land Use Code 225 was used for all comparison projects*

Table 4B – Trip Generation and Vehicle Miles Traveled (Subject Project vs. Other Developments) Using Observed Trip Rate (1.49)

Project	Beds	Trip Rate	Average Trips per Weekday	Average Driving Distance (use Parking Lot R07)	Vehicle Miles Traveled (VMT) per Weekday	VMT per Bed per Weekday	% Decrease in VMT Bed vs. Farthest Property
Up Campus @ Lubbock, TX (Subject Project)	600	1.49	894	0.7	626	1.0	-95.6%
Hunters Way	441	3.97	1,751	6.0	10,505	23.8	0.0%
Driftwood	128	3.97	508	5.1	2,592	20.2	-15.0%
Wildwood Lubbock	1005	3.97	3,990	4.3	17,156	17.1	-28.3%
The Avenue @ Lubbock	788	3.97	3,128	4.2	13,139	16.7	-30.0%
The Republic @ Lubbock	853	3.97	3,386	3.1	10,498	12.3	-48.3%
Boston Creek	572	3.97	2,271	2.3	5,223	9.1	-61.7%
Capstone Cottages	969	3.97	3,847	3.7	14,234	14.7	-38.3%
The One @ Lubbock	737	3.97	2,926	5.1	14,922	20.2	-15.0%

**ITE Land Use Code 225 was used for all comparison projects*

Development of 2025 Background and Total Traffic

In order to obtain 2025 background traffic, the existing traffic counts and historic counts[1] near the site were compared to find expected growth trends within the study area. Based on the historic growth in the area, an annual growth rate of 1% was assumed for the background traffic through 2025. To calculate the 2025 background traffic, the existing 2022 traffic was grown by 1% annually for three years. The existing approach volumes were determined using TxDOT's STARS database and in conjunction with information provided by the City of Lubbock.

Site traffic volumes were then added to the background volumes to represent the estimated total (background plus site-generated) traffic conditions for the 2025 study year after completion of the proposed development.

[1] *Through TxDOT's Statewide Traffic Analysis and Reporting System (STARS)*

Levels of Service Operation Analysis

Kimley-Horn conducted a traffic operations analysis to determine potential capacity deficiencies in the 2022 and 2025 study years at the study intersections. The acknowledged source for determining overall capacity is the current edition of the *Highway Capacity Manual.* Capacity analysis results are listed in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion). **Table 5** shows the definition of level of service for signalized and unsignalized intersections.

Table 5 – Level of Service Definitions

Level of Service	Signalized Intersection Average Total Delay (sec/veh)	Unsignalized Intersection Average Total Delay (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

As can be seen from **Table 6,** for the existing 2022 traffic volumes, the intersection of 19th Street at University Avenue perform at LOS D during both AM and PM peak hours. After the addition of 3 years of 1% background traffic to the network, the intersection still performs at LOS D. Finally, after the addition of site-generated traffic to 2025 background traffic, the intersection still operates at LOS D. This shows that the traffic volumes generated by the Project will not have a significant impact on the traffic operations of the intersection of 19th Street at University Avenue.

Table 6 also shows that Drive 1 operates favorably at LOS A after the addition of Project's site traffic to the existing roadway network. This indicates the traffic generated by the new Up Campus Project will not have a significant impact on the operation of Drive 1.

Table 6 – Traffic Operational Results – Weekday AM& PM Peak Hours

INTERSECTION	Peak Hour	2022 Existing Traffic		2025 Background Traffic		2025 Background plus Site Traffic	
		DELAY (SEC/VEH)	LOS	DELAY (SEC/VEH)	LOS	DELAY (SEC/VEH)	LOS
19th Street at University Avenue	AM	38.3	D	39.0	D	39.6	D
	PM	36.2	D	37.2	D	37.8	D
19th Street at Drive 1	AM	-	-	-	-	0.4	A
	PM	-	-	-	-	0.6	A
- No movements in Time Period				Signalized		Unsignalized	

Summary

The location of the proposed Up Campus development plays a large role in limiting the potential traffic impacts to the surroundings, and since the Site is located 1 block from the Texas Tech University south entrance at Boston Avenue, it is easily walkable and bikeable. For less common vehicle trips to campus, the Site is located about 0.7 miles from Lot R07 near the center of the Texas Tech University.

END

Attachments:

Exhibit A1: Trip Distribution and Traffic Assignment
Exhibit A2: Site-Generated Traffic Volumes
Up Campus Conceptual Site Plan
Student Housing Trip Generation and Vehicle Miles Traveled for multiple residential developments

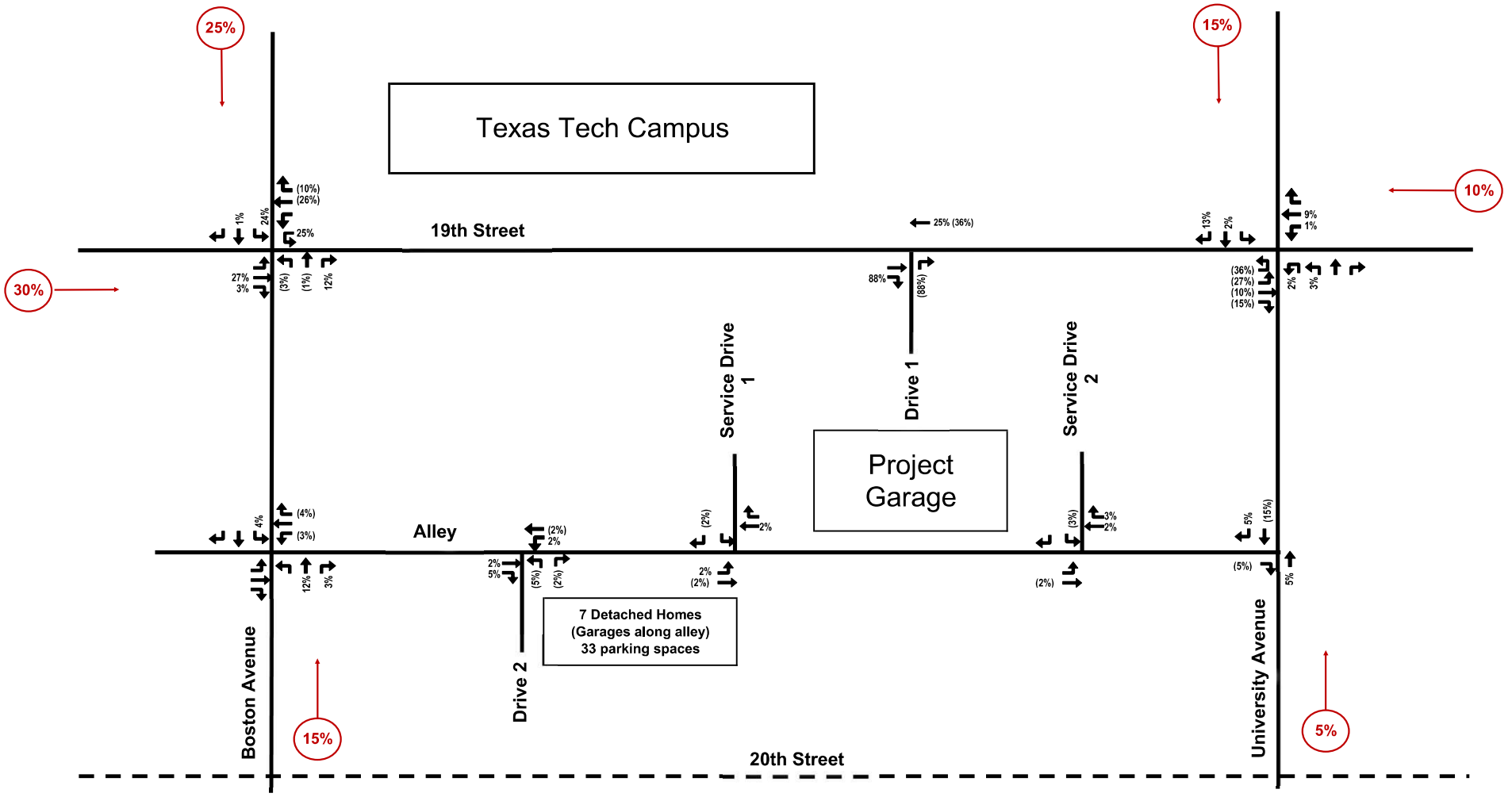


EXHIBIT A1

Trip Distribution and Traffic Assignment

Up Campus Project

Kimley»Horn

LEGEND:
X% (Y%)
X% = Percentage of Inbound Site-Generated Traffic
(Y%) = Percentage of Outbound Site-Generated Traffic

North

Not To Scale

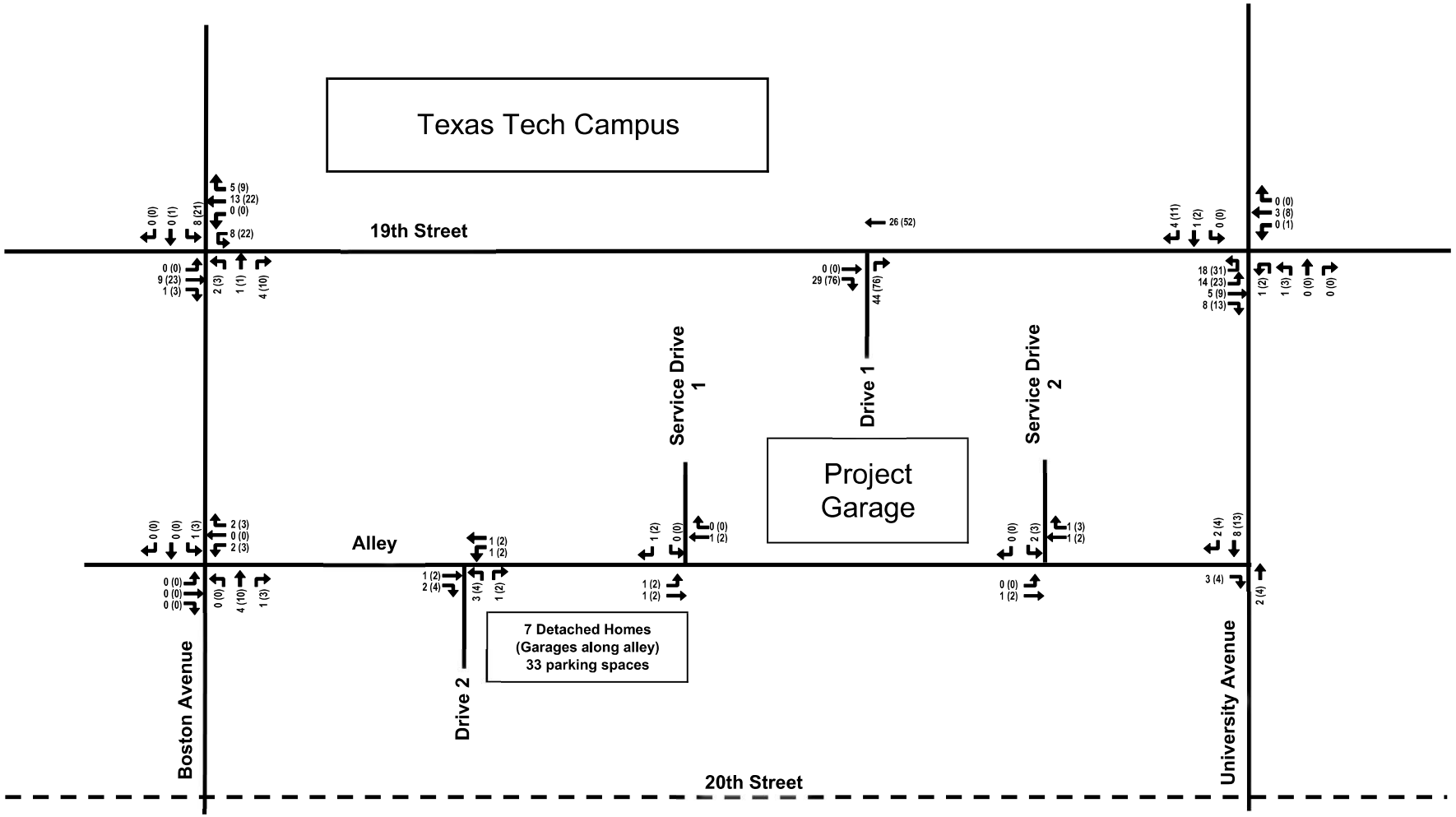


EXHIBIT A2

Site-Generated Traffic Volumes

Up Campus Project

Kimley»Horn

LEGEND:
X (Y)
X = Weekday AM Peak Hour Turning Movements
Y = Weekday PM Peak Hour Turning Movements
Volumes may not sum from point to point due to rounding and presence of smaller driveways not included in analysis.

North

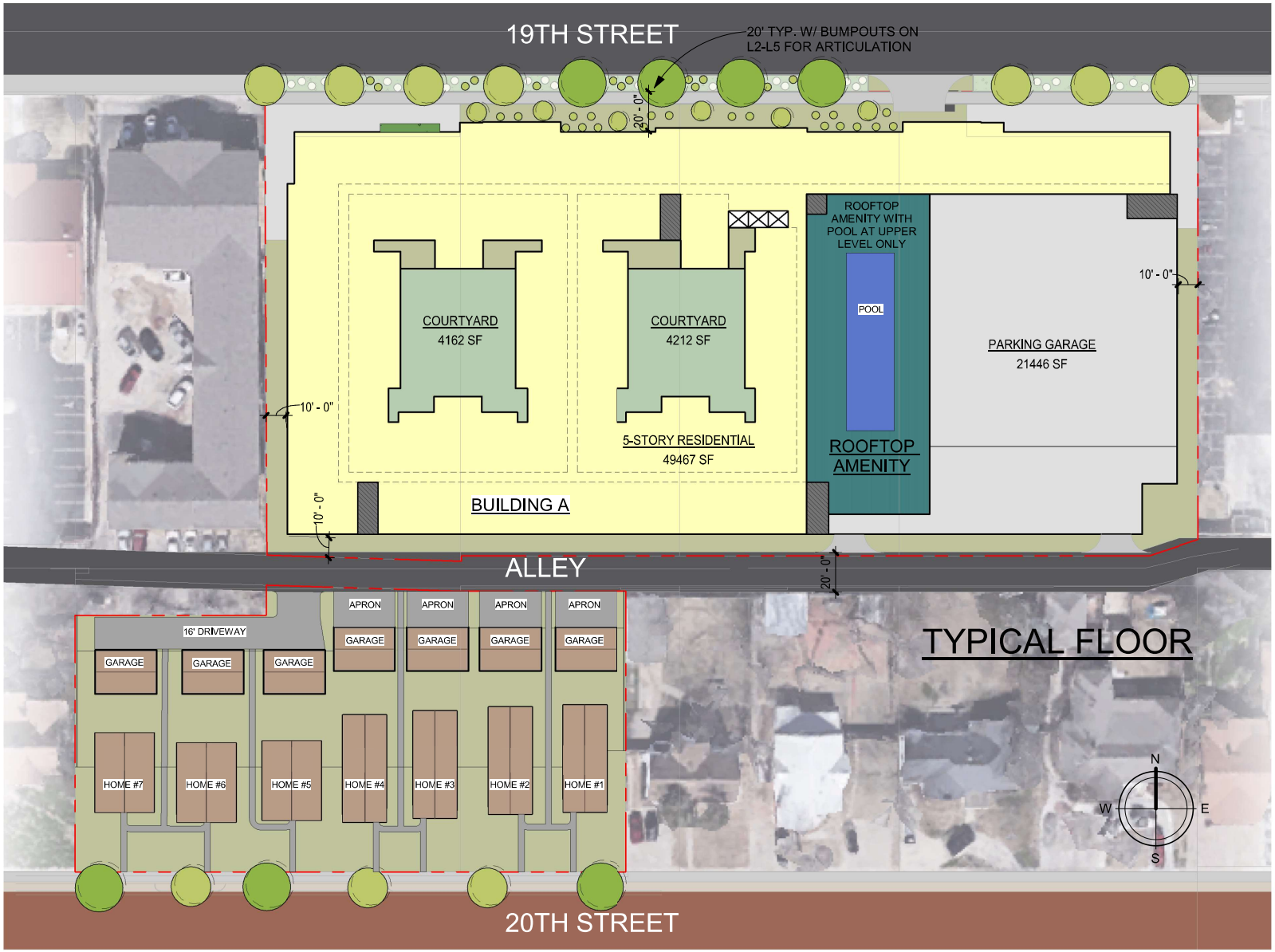
Not To Scale

PD-CA

MULTIFAMILY APARTMENT BUILDING A ON 19TH ST

PD-A1

DETACHED HOMES ON 20TH ST

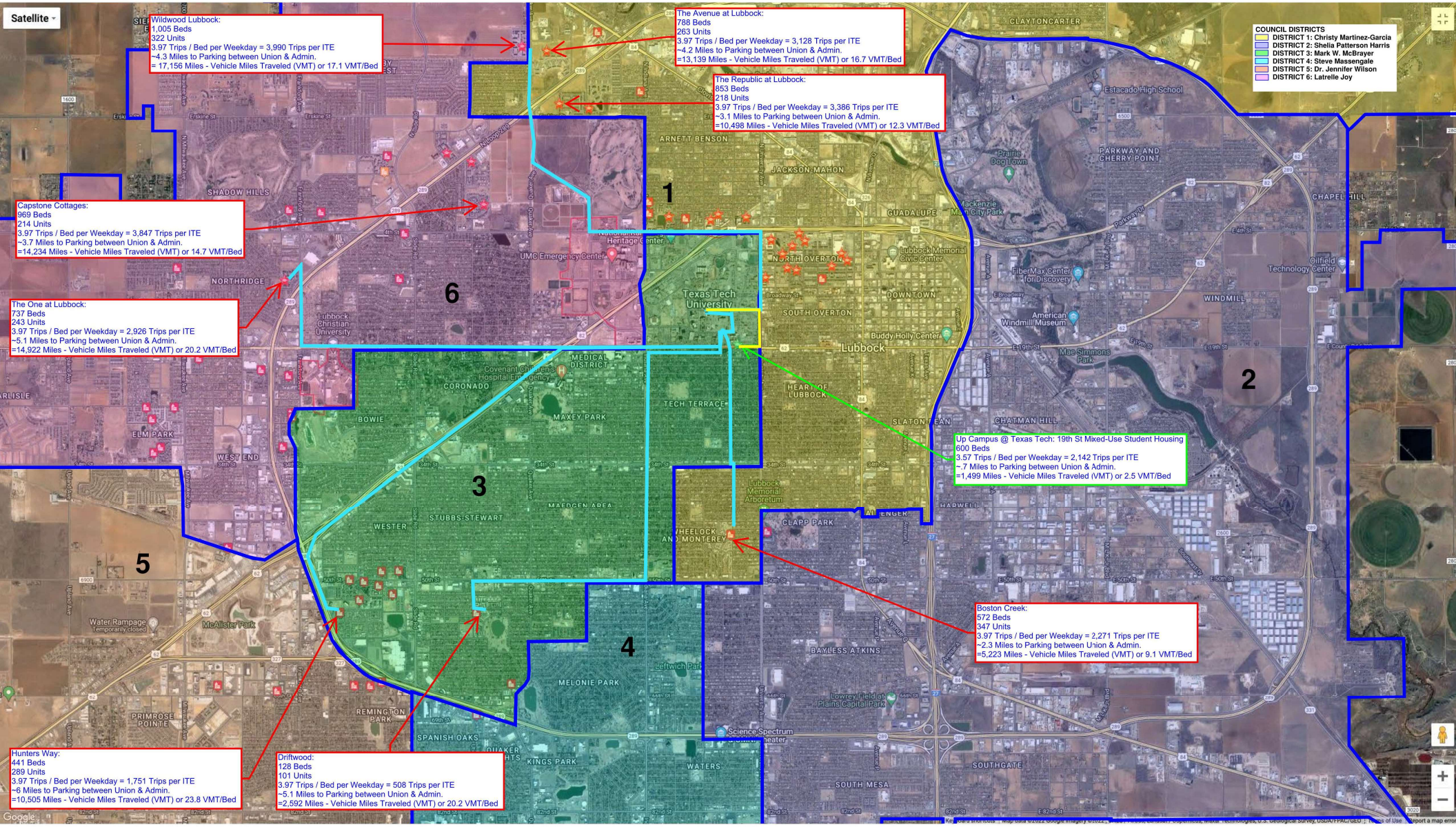


dwell design studio | UP CAMPUS STUDENT LIVING

Concept Site Plan - Typical Floor

19TH STREET MIXED-USE STUDENT HOUSING | Lubbock, TX

December 20, 2022


Satellite
Wildwood Lubbock:
1,005 Beds
322 Units
3.97 Trips / Bed per Weekday = 3,990 Trips per ITE
~4.3 Miles to Parking between Union & Admin.
= 17,156 Miles - Vehicle Miles Traveled (VMT) or 17.1 VMT/Bed
The Avenue at Lubbock:
788 Beds
263 Units
3.97 Trips / Bed per Weekday = 3,128 Trips per ITE
~4.2 Miles to Parking between Union & Admin.
=13,139 Miles - Vehicle Miles Traveled (VMT) or 16.7 VMT/Bed
The Republic at Lubbock:
853 Beds
218 Units
3.97 Trips / Bed per Weekday = 3,386 Trips per ITE
~3.1 Miles to Parking between Union & Admin.
=10,498 Miles - Vehicle Miles Traveled (VMT) or 12.3 VMT/Bed
COUNCIL DISTRICTS
DISTRICT 1: Christy Martinez-Garcia
DISTRICT 2: Shelia Patterson Harris
DISTRICT 3: Mark W. McBrayer
DISTRICT 4: Steve Massengale
DISTRICT 5: Dr. Jennifer Wilson
DISTRICT 6: Latrelle Joy
Capstone Cottages:
969 Beds
214 Units
3.97 Trips / Bed per Weekday = 3,847 Trips per ITE
~3.7 Miles to Parking between Union & Admin.
=14,234 Miles - Vehicle Miles Traveled (VMT) or 14.7 VMT/Bed
The One at Lubbock:
737 Beds
243 Units
3.97 Trips / Bed per Weekday = 2,926 Trips per ITE
~5.1 Miles to Parking between Union & Admin.
=14,922 Miles - Vehicle Miles Traveled (VMT) or 20.2 VMT/Bed
Up Campus @ Texas Tech: 19th St Mixed-Use Student Housing
600 Beds
3.57 Trips / Bed per Weekday = 2,142 Trips per ITE
~.7 Miles to Parking between Union & Admin.
=1,499 Miles - Vehicle Miles Traveled (VMT) or 2.5 VMT/Bed
Boston Creek:
572 Beds
347 Units
3.97 Trips / Bed per Weekday = 2,271 Trips per ITE
~2.3 Miles to Parking between Union & Admin.
=5,223 Miles - Vehicle Miles Traveled (VMT) or 9.1 VMT/Bed
Hunters Way:
441 Beds
289 Units
3.97 Trips / Bed per Weekday = 1,751 Trips per ITE
~6 Miles to Parking between Union & Admin.
=10,505 Miles - Vehicle Miles Traveled (VMT) or 23.8 VMT/Bed
Driftwood:
128 Beds
101 Units
3.97 Trips / Bed per Weekday = 508 Trips per ITE
~5.1 Miles to Parking between Union & Admin.
=2,592 Miles - Vehicle Miles Traveled (VMT) or 20.2 VMT/Bed
1
2
3
4
5
6
Lubbock
Texas Tech University
Google