SOUTHWEST TRAFFIC ENGINEERING, LLC

10 December 2020

David Laws
Division Manager - Permitting
Town of Oro Valley
11000 North La Canada Drive
Oro Valley, Arizona 85737

SUBJECT: ORO VALLEY VILLAGE CENTER
TANGERINE ROAD/ORACLE ROAD
REVISED TRIP GENERATION COMPARISON

Dear Mr. Laws,

Please find enclosed a brief revised trip generation comparison (TGC) regarding the Oro Valley Village Center project in Oro Valley, Arizona. The vicinity of the project is shown in **Figure 1**. The existing Oro Valley Village Shopping Center, which currently consists of 585,048 square feet of shopping center space, is being fully constructed to include 730 apartments, 43,000 square feet of shopping center space, 382 hotel rooms, 1.4 acres of public event space, 7,000 square feet of beer garden space, and a 9-hole miniature golf course, as shown in **Figure 2**.

This site was previously analyzed as 867,396 square feet of shopping center space in the approved *Oro Valley Marketplace Traffic Impact Analysis* (OVM TIA) dated 20 January 2006 and completed by **SWTE**.

The purpose of this TGC is to compare the trip generation associated with the new development plan to the development that was assumed and analyzed in the OVM TIA.

Trip Generation

Trip generation for the project was developed utilizing nationally agreed upon data contained in the Institute of Transportation Engineers (ITE) publication *Trip Generation, 10th Edition*, 2017. The complete trip generation calculations can be found attached to this TGC.

Trip generation for the existing shopping center with the proposed development was performed based on the following land uses:

- 585,048 square feet of existing shopping center space (Land Use Code 820 (LUC 820), Shopping Center)
- 43,000 square feet of proposed shopping center space (LUC 820, Shopping Center)
- 730 apartments (LUC 221, Multifamily Housing (Mid-Rise))
- 382 hotel rooms (LUC 310, Hotel)
- 1.4 acres of public event space (LUC 411, Public Park)
- 9-hole miniature golf course (LUC 431, Miniature Golf Course)
- 7,000 square feet of beer garden space (LUC 925, Drinking Place)

Specific trip generation rates are not provided by ITE for public event spaces. It was assumed that this space would operate similar to a public park and would generate a comparable number of trips on a weekday. Patrons and visitors of this space are expected to be largely made up of people that had other business at the shopping center. When this site does generate its own trips, it is expected to be primarily evening and/or weekend special events that do not occur during the peak hours.

ITE does not provide data for determining the daily traffic volumes generated by a Drinking Place or a Miniature Golf Course. For the purposes of this report, it was assumed that the highest peak hour is approximately 10% of the total daily volume.

Three vacant lots exist within the shopping center that currently do not have specific development plans. These lots were estimated to have a total of approximately 70,000 square feet of shopping center space and are included in the 585,048 square feet of existing shopping center space listed above.

The results are shown in **Table 1**.

Table 1 – Weekday Project Site Generated Trips
(Existing Site with Proposed Development)

Time Period	Shopping Center (LUC 820)	Public Park (LUC 411)	*Drinking Place (LUC 925)	Multifamily Housing (LUC 221)	Hotel (LUC 310)	*Mini Golf Course (LUC 431)	Total
Average Daily, Inbound (vtpd)	10,487	1	400	1,989	1,597	15	14,489
Average Daily, Outbound (vtpd)	10,487	1	400	1,989	1,597	15	14,489
Total Daily	**20,974**	**2**	**800**	**3,978**	**3,194**	**30**	**28,978**
AM Peak Hour, Inbound (vtph)	289	1	N/A	55	106	N/A	451
AM Peak Hour, Outbound (vtph)	177	0	N/A	186	74	N/A	437
Total AM Peak	**466**	**1**	**N/A**	**241**	**180**	**N/A**	**888**
PM Peak Hour, Inbound (vtph)	1,016	1	53	188	117	1	1,377
PM Peak Hour, Outbound (vtph)	1,101	0	27	111	113	2	1,353
Total PM Peak	**2,117**	**1**	**80**	**299**	**230**	**3**	**2,730**

vtpd - vehicle trips per day, vtph - vehicle trips per hour
*Weekday daily volume based on 10% peak hour assumption

The existing and proposed land uses shown in **Table 1** are expected to generate an estimated 888 vehicle trips during the weekday AM peak hour and 2,730 vehicle trips during the weekday PM peak hour.

In the OVM TIA, trip generation for the project was originally estimated using the ITE *Trip Generation, 7th Edition*, 2003 based on 867,396 square feet of shopping center space and ITE Land Use Code 820 (LUC 820), Shopping Center. In order to provide a consistent comparison between the OVM TIA trip generation and the trip generation for the new development plan, the OVM TIA trip generation was updated using the new publication *Trip Generation, 10th Edition*, 2017 based on the original square footage assumptions, as shown in **Table 2**.

Table 2 – Weekday Project Site Generated Trips (OVM TIA)

Time Period	867, 396 sqft Shopping Center (LUC 820)
Average Daily, Inbound (vtpd)	13,062
Average Daily, Outbound (vtpd)	13,062
Total Daily	**26,124**
AM Peak Hour, Inbound (vtph)	363
AM Peak Hour, Outbound (vtph)	222
Total AM Peak	**585**
PM Peak Hour, Inbound (vtph)	1,290
PM Peak Hour, Outbound (vtph)	1,398
Total PM Peak	**2,688**

vtpd - vehicle trips per day, vtph - vehicle trips per hour

As shown in **Table 2**, 867,396 square feet of shopping center space is expected to generate 585 weekday AM peak hour trips and 2,688 weekday PM peak hour trips.

The difference in trips between the existing shopping center with the proposed development, and the assumed land use from the OVM TIA are shown in **Table 3**.

Table 3 – Estimated Site Trip Generation Difference

Time Period	Existing Site with Proposed Development	OVM TIA	Total
Average Daily, Inbound (vtpd)	14,489	13,062	1,427
Average Daily, Outbound (vtpd)	14,489	13,062	1,427
Total Daily	**28,978**	**26,124**	**2,854**
AM Peak Hour, Inbound (vtph)	451	363	88
AM Peak Hour, Outbound (vtph)	437	222	215
Total AM Peak	**888**	**585**	**303**
PM Peak Hour, Inbound (vtph)	1,377	1,290	87
PM Peak Hour, Outbound (vtph)	1,353	1,398	-45
Total PM Peak	**2,730**	**2,688**	**42**

vtpd - vehicle trips per day, vtph - vehicle trips per hour
Red indicates a reduction

The proposed Oro Valley Village Center is expected to generate an additional 303 AM peak hour trips and 42 PM peak hour trips when compared to the assumed land use in the OVM TIA as outlined in **Table 3**.

Conclusion

When taking a closer look at the previously approved and new site plans, along with the trip generation comparison, the increase in daily trips and AM peak hour trips is driven by the change of development space in the northwest corner of the site. Originally this space was planned as office, a land use allowed (and calculated in the OVM TIA) under ITE LUC 820 Shopping Center. Daily trips would be expected to increase from office space to apartments, as is currently planned, since one resident of an apartment will generate more daily trips than one office worker during the day, as the office worker mostly stays at the office during the day. The traffic pattern during the AM peak would also change between office space and apartments as residents leave for jobs in the morning, where office trips lean to more inbound trips.

In the PM peak hour, this pattern reverses itself as the apartments see residents returning home and office workers leave the site. As noted in **Table 3**, the PM peak hour comparison shows an increase for inbound traffic and a slight decrease for outbound traffic, bringing about an overall increase of 42 vehicle trips during the PM peak hour.

With the PM peak hour of the site (both approved and new site) functioning as the controlling factor for traffic operations in the area showing a slight increase in traffic levels, the changes to the site are not expected to have a significant impact on the surrounding roadway network. Furthermore, five-lane Tangerine Road, five-lane Water Harvest Way, and seven-lane Oracle Road have been constructed to their ultimate width to accommodate the traffic volumes in this growing area.

Thank you again for your time and review of this TGC. If you have any questions regarding the TIS, please feel free to contact me at 602.266.7983.

Respectfully Submitted,

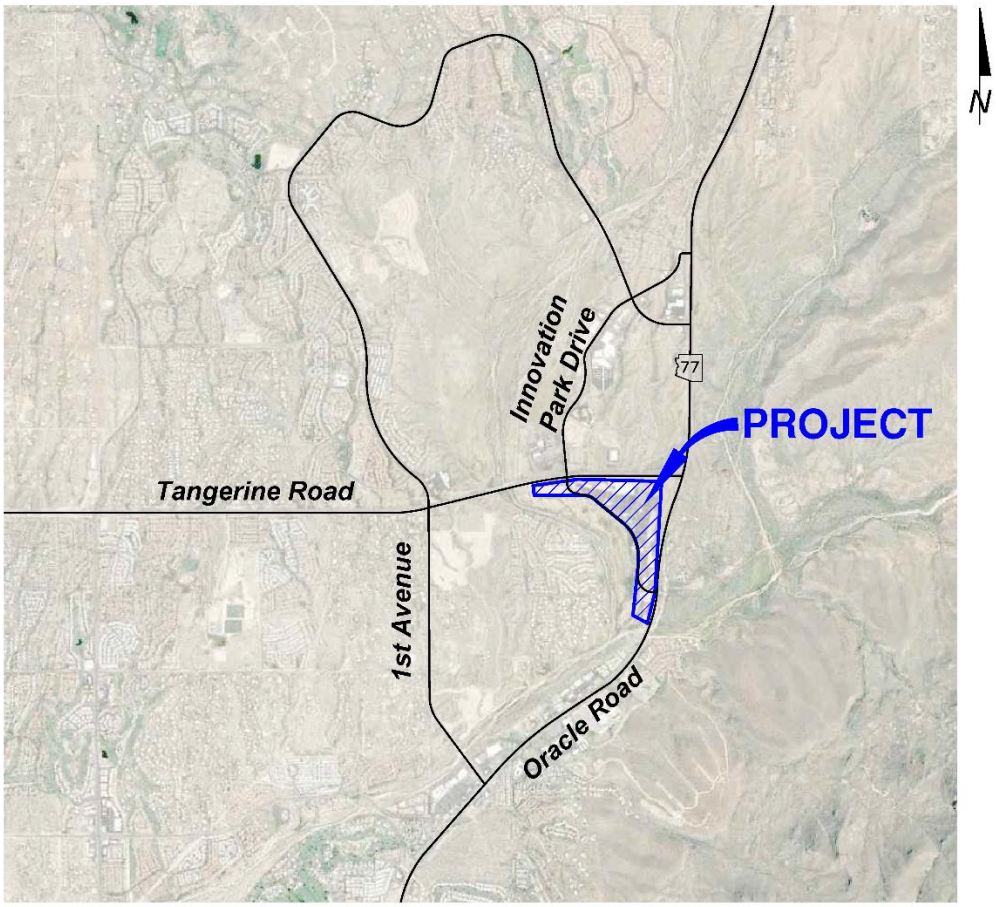
Andrew Smigielski, PE, PTOE, PTP
Southwest **T**raffic **E**ngineering, LLC
Senior Traffic Engineer

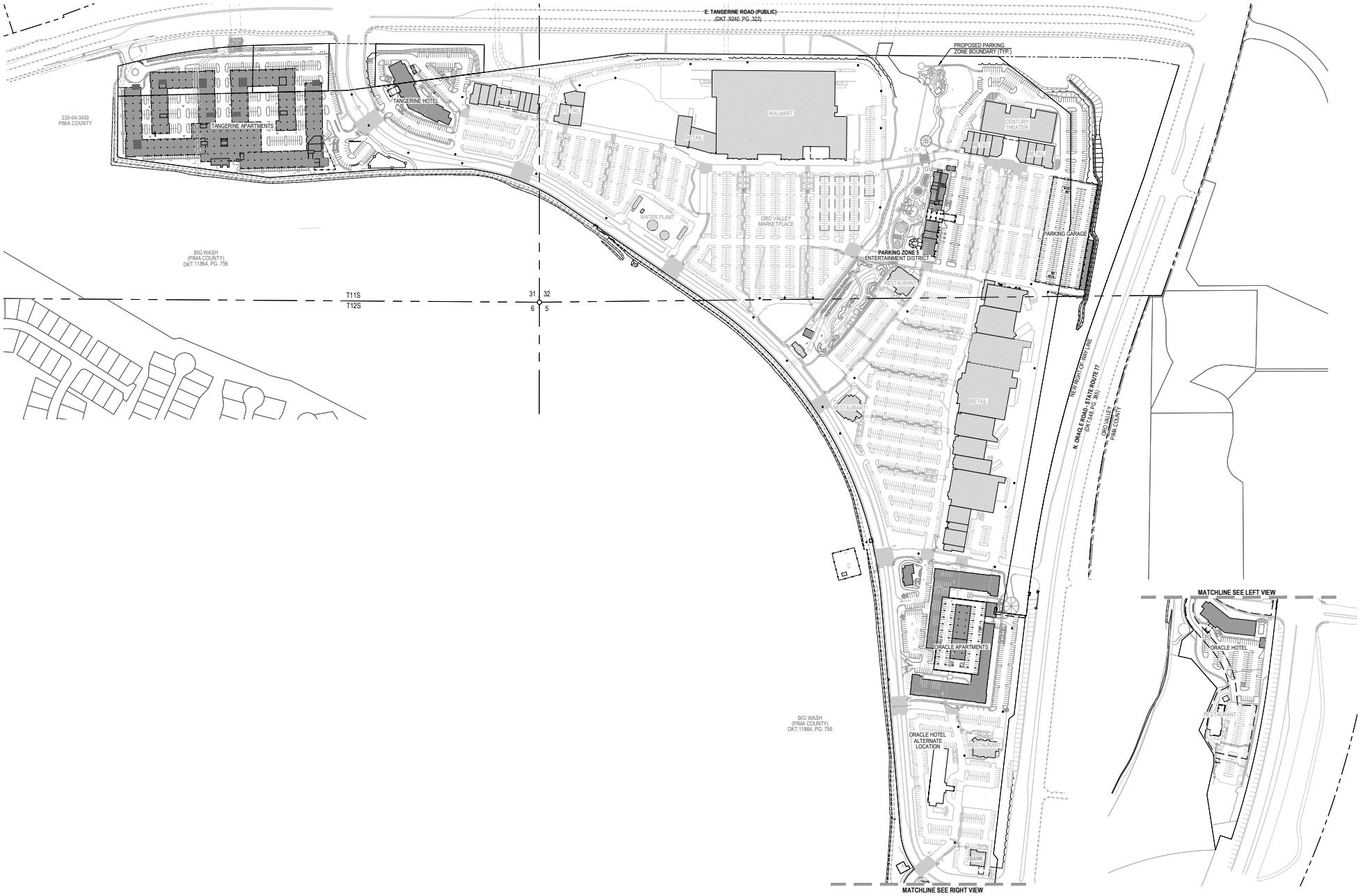
cc: James Horvath, Town West (by email)
David Little, The WLB Group (by email)

Attachments:

Figure 1 – Vicinity Map
Figure 2 –Site Plan
Trip Generation Calculations

Figure 1 – Vicinity Map





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0' 150' 300' 450'

FIGURE 2 - SITE PLAN

SCALE: 1"=150'

ORO VALLEY VILLAGE CENTER

LOTS 1 THRU 31 AND COMMON AREAS A, B & D
OF THE ORO VALLEY MARKETPLACE AMENDED FINAL PLAT
BOOK 62, PAGE 19, SEQUENCE NUMBER 20090270526

BEING A PORTION OF
SEC. 31 & 32 T11S R14E AND SEC. 5, T12S R14E, G&SRM
TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA

O:\18SO60W-T-03 - Town West\Resources\TIA\Fig 2 Site Plan.dwg Plotted: Dec 09, 2020

Shopping Center

LAND USE: 867,396 Square Feet Shopping Center

TRIP GENERATION CALCULATIONS ARE BASED ON THE INSTITUTE OF TRANSPORTATION ENGINEERS' TRIP GENERATION, 10TH EDITION. THE ITE LAND USE CODE IS Shopping Center (820), General Urban/Suburban

Weekday

Fitted Curve Ln(T) = 0.68Ln(X)+5.57
Where X = 867,396 sqft / 1,000 sqft

T = 26,124 VTPD

ENTER: (0.5)*(26124) = **13,062 VTPD**
EXIT: (0.5)*(26124) = **13,062 VTPD**

AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)

Fitted Curve T = 0.50(X)+151.78
Where X = 867,396 sqft / 1,000 sqft

T = 585 VPH

ENTER: (0.62)*(585) = **363 VPH**
EXIT: (0.38)*(585) = **222 VPH**

PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)

Fitted Curve Ln(T) = 0.74Ln(X)+2.89
Where X = 867,396 sqft / 1,000 sqft

T = 2,688 VPH

ENTER: (0.48)*(2688) = **1,290 VPH**
EXIT: (0.52)*(2688) = **1,398 VPH**

*where, T = trip ends

TRIP GENERATION SUMMARY

WEEKDAY	**26,124 VTPD**
AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)	**585 VPH**
PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)	**2,688 VPH**

Public Park (LUC 411)

LAND USE: 1.4 Acre Public Park

TRIP GENERATION CALCULATIONS ARE BASED ON THE INSTITUTE OF TRANSPORTATION ENGINEERS' TRIP GENERATION, 10TH EDITION. THE ITE LAND USE CODE IS Public Park (411), General Urban/Suburban

Weekday

Average Rate = 0.78 Trips per Acres

T = 0.78 Trips x 1.4 Acre

T = 2 VTPD

ENTER: (0.5)*(2) = **1 VTPD**

EXIT: (0.5)*(2) = **1 VTPD**

AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)

Average Rate = 0.02 Trips per Acres

T = 0.02 Trips x 1.4 Acre

T = 1 VPH

ENTER: (0.59)*(1) = **1 VPH**

EXIT: (0.41)*(1) = **0 VPH**

PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)

Average Rate = 0.11 Trips per Acres

T = 0.11 Trips x 1.4 Acre

T = 1 VPH

ENTER: (0.55)*(1) = **1 VPH**

EXIT: (0.45)*(1) = **0 VPH**

*where, T = trip ends

TRIP GENERATION SUMMARY

WEEKDAY	**2 VTPD**
AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)	**1 VPH**
PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)	**1 VPH**

Drinking Place (LUC 925)

LAND USE: 7,000 Square Feet Drinking Place

TRIP GENERATION CALCULATIONS ARE BASED ON THE INSTITUTE OF TRANSPORTATION ENGINEERS' TRIP GENERATION, 10TH EDITION. THE ITE LAND USE CODE IS Drinking Place (925), General Urban/Suburban

PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)

Average Rate = 11.36 Trips per 1000 Square Feet

T = 11.36 Trips x 7000 sqft / 1000

T = 80 VPH

ENTER: (0.66)*(80) = **53 VPH**

EXIT: (0.34)*(80) = **27 VPH**

*where, T = trip ends

TRIP GENERATION SUMMARY

WEEKDAY	**0 VTPD**
AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)	**0 VPH**
PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)	**80 VPH**

Shopping Center

LAND USE: 628,048 Square Feet Shopping Center

TRIP GENERATION CALCULATIONS ARE BASED ON THE INSTITUTE OF TRANSPORTATION ENGINEERS' TRIP GENERATION, 10TH EDITION. THE ITE LAND USE CODE IS Shopping Center (820), General Urban/Suburban

Weekday

Fitted Curve Ln(T) = 0.68Ln(X)+5.57
Where X = 628048 sqft / 1000 sqft

T = 20,974 VTPD

ENTER: (0.5)*(20974) = **10,487 VTPD**
EXIT: (0.5)*(20974) = **10,487 VTPD**

AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)

Fitted Curve T = 0.50(X)+151.78
Where X = 628048 sqft / 1000 sqft

T = 466 VPH

ENTER: (0.62)*(466) = **289 VPH**
EXIT: (0.38)*(466) = **177 VPH**

PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)

Fitted Curve Ln(T) = 0.74Ln(X)+2.89
Where X = 628048 sqft / 1000 sqft

T = 2,117 VPH

ENTER: (0.48)*(2117) = **1,016 VPH**
EXIT: (0.52)*(2117) = **1,101 VPH**

*where, T = trip ends

TRIP GENERATION SUMMARY

WEEKDAY	**20,974 VTPD**
AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)	**466 VPH**
PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)	**2,117 VPH**

Multifamily Housing (Mid-Rise) (LUC 221)

TRIP GENERATION CALCULATIONS ARE BASED ON THE INSTITUTE OF TRANSPORTATION ENGINEERS' TRIP GENERATION, 10TH EDITION.
THE ITE LAND USE CODE IS
Multifamily Housing (Mid-Rise) (221), General Urban/Suburban

Weekday

Fitted Curve T=5.45(X) - 1.75
Where X = 730 Dwelling Units
T = 3,978 VTPD
ENTER: (0.5)*(3978) = **1,989 VTPD**
EXIT: (0.5)*(3978) = **1,989 VTPD**

AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)

Fitted Curve LN(T)=0.98 Ln(X) - 0.98
Where X = 730 Dwelling Units
T = 241 VPH
ENTER: (0.23)*(241) = **55 VPH**
EXIT: (0.77)*(241) = **186 VPH**

PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)

Fitted Curve LN(T)=0.96 Ln(X) - 0.63
Where X = 730 Dwelling Units
T = 299 VPH
ENTER: (0.63)*(299) = **188 VPH**
EXIT: (0.37)*(299) = **111 VPH**

*where, T = trip ends

TRIP GENERATION SUMMARY

WEEKDAY	**3,978 VTPD**
AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)	**241 VPH**
PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)	**299 VPH**

Hotel

LAND USE: 382 Rooms Hotel

TRIP GENERATION CALCULATIONS ARE BASED ON THE INSTITUTE OF TRANSPORTATION ENGINEERS' TRIP GENERATION, 10TH EDITION. THE ITE LAND USE CODE IS
Hotel (310), General Urban/Suburban

Weekday

Average Rate = 8.36 Trips per Rooms (Rooms)
T = 8.36 Trips x 382 Rooms

		T =	**3,194 VTPD**
ENTER:	(0.5)*(3194) =		**1,597 VTPD**
EXIT:	(0.5)*(3194) =		**1,597 VTPD**

AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)

Average Rate = 0.47 Trips per Rooms (Rooms)
T = 0.47 Trips x 382 Rooms

		T =	**180 VPH**
ENTER:	(0.59)*(180) =		**106 VPH**
EXIT:	(0.41)*(180) =		**74 VPH**

PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)

Average Rate = 0.6 Trips per Rooms (Rooms)
T = 0.6 Trips x 382 Rooms

		T =	**230 VPH**
ENTER:	(0.51)*(230) =		**117 VPH**
EXIT:	(0.49)*(230) =		**113 VPH**

*where, T = trip ends

TRIP GENERATION SUMMARY

WEEKDAY	**3,194 VTPD**
AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)	**180 VPH**
PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)	**230 VPH**

Miniature Golf Course

LAND USE: 9 Holes Miniature Golf Course

TRIP GENERATION CALCULATIONS ARE BASED ON THE INSTITUTE OF TRANSPORTATION ENGINEERS' TRIP GENERATION, 10TH EDITION. THE ITE LAND USE CODE IS Miniature Golf Course (431)

PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)

Average Rate = 0.33 Trips per Hole (Hole)

T = 0.33 Trips x 9 Hole

T = 3 VPH

ENTER: (0.33)*(3) = **1 VPH**

EXIT: (0.67)*(3) = **2 VPH**

*where, T = trip ends

TRIP GENERATION SUMMARY

WEEKDAY	**0 VPD**
AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)	**0 VPH**
PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)	**3 VPH**