TOWN BOARD/CAC

PUBLIC WORKS – DEVELOPMENT REVIEW

Topics of Discussion

- Technical Drainage Study (30.04.08) - How we determine when one is required
- Traffic Impact Analysis (30.04.08) - How we determine what is required

30.04.08
PUBLIC WORKS
DEVELOPMENT
STANDARDS

B. Technical Impact Analysis

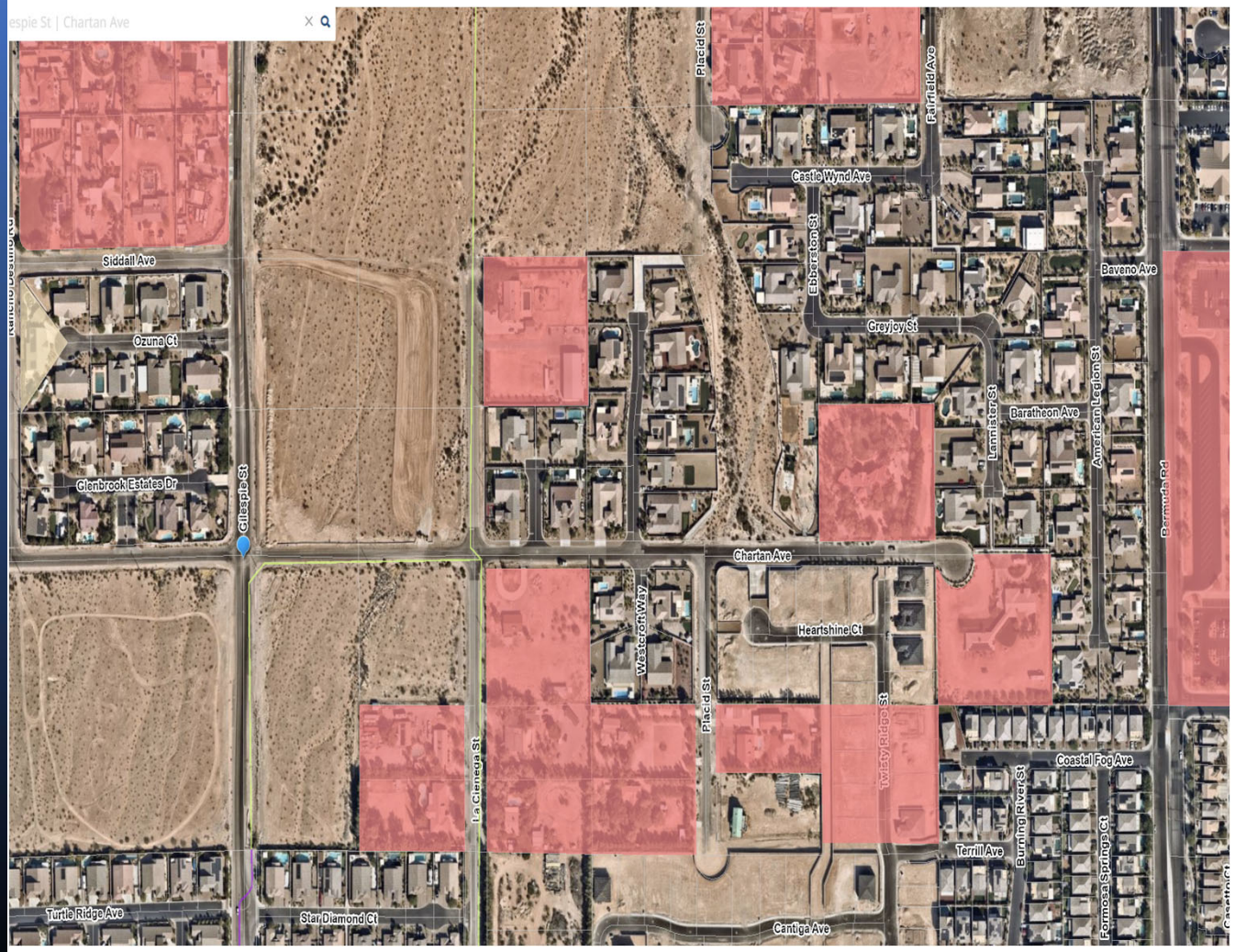
A complete and accurate technical impact analysis prepared by a Nevada licensed professional engineer shall be submitted as required by this Title, or as a condition of the approval of any application. The technical impact analysis shall be conditionally accepted or approved prior to the submission of a Final Map Technical Review or Parcel Map Technical Review or prior to the issuance of building improvements for the improvement.

When a drainage study is required.

- Full offsite improvements
- Washes
- Within a flood zone
- Next to a regional facility
- Elevations/Contours
- Vacation and Abandonment of the public right-of-way/easements

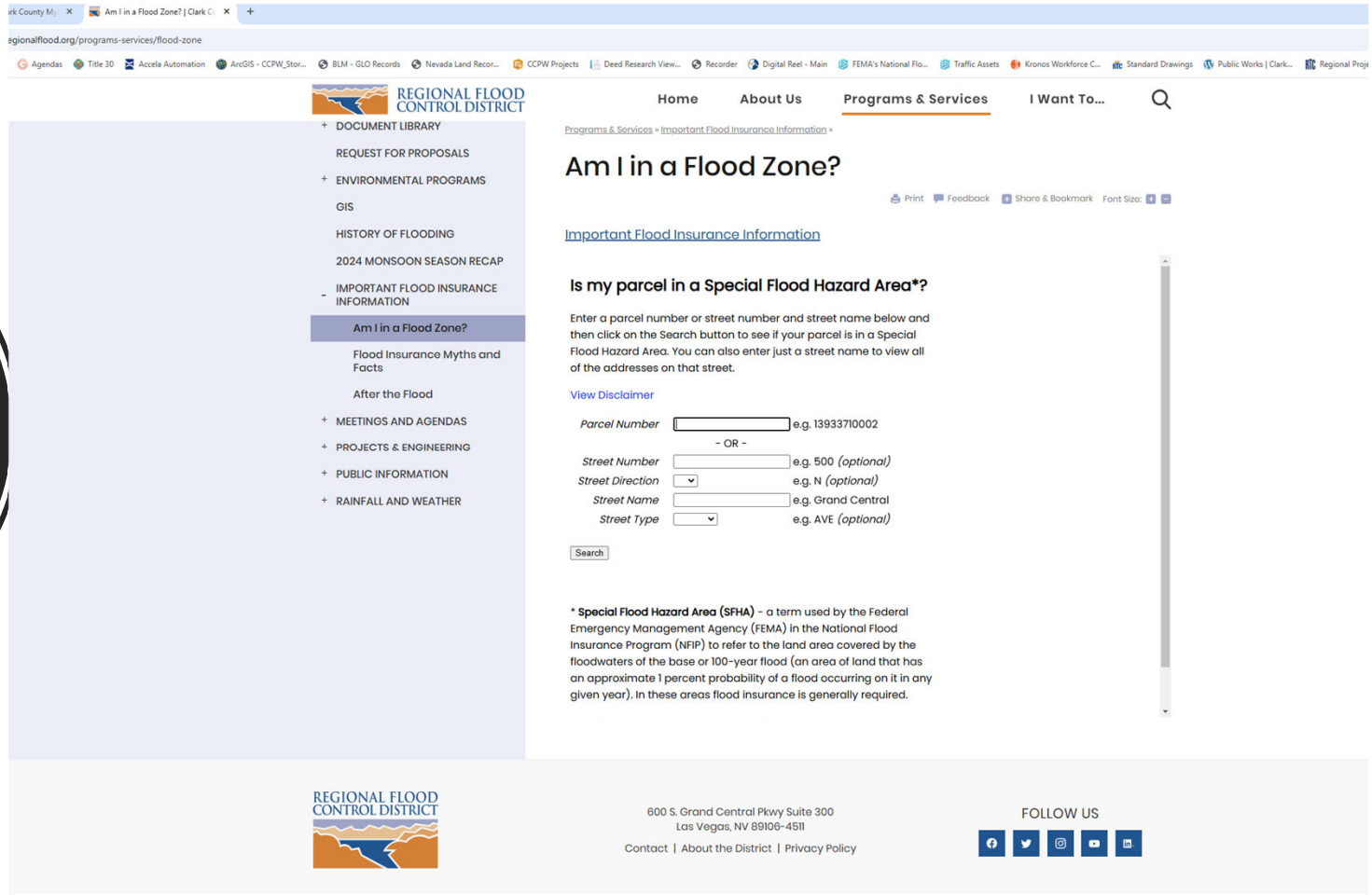
Offsite improvements

Regional Facilities

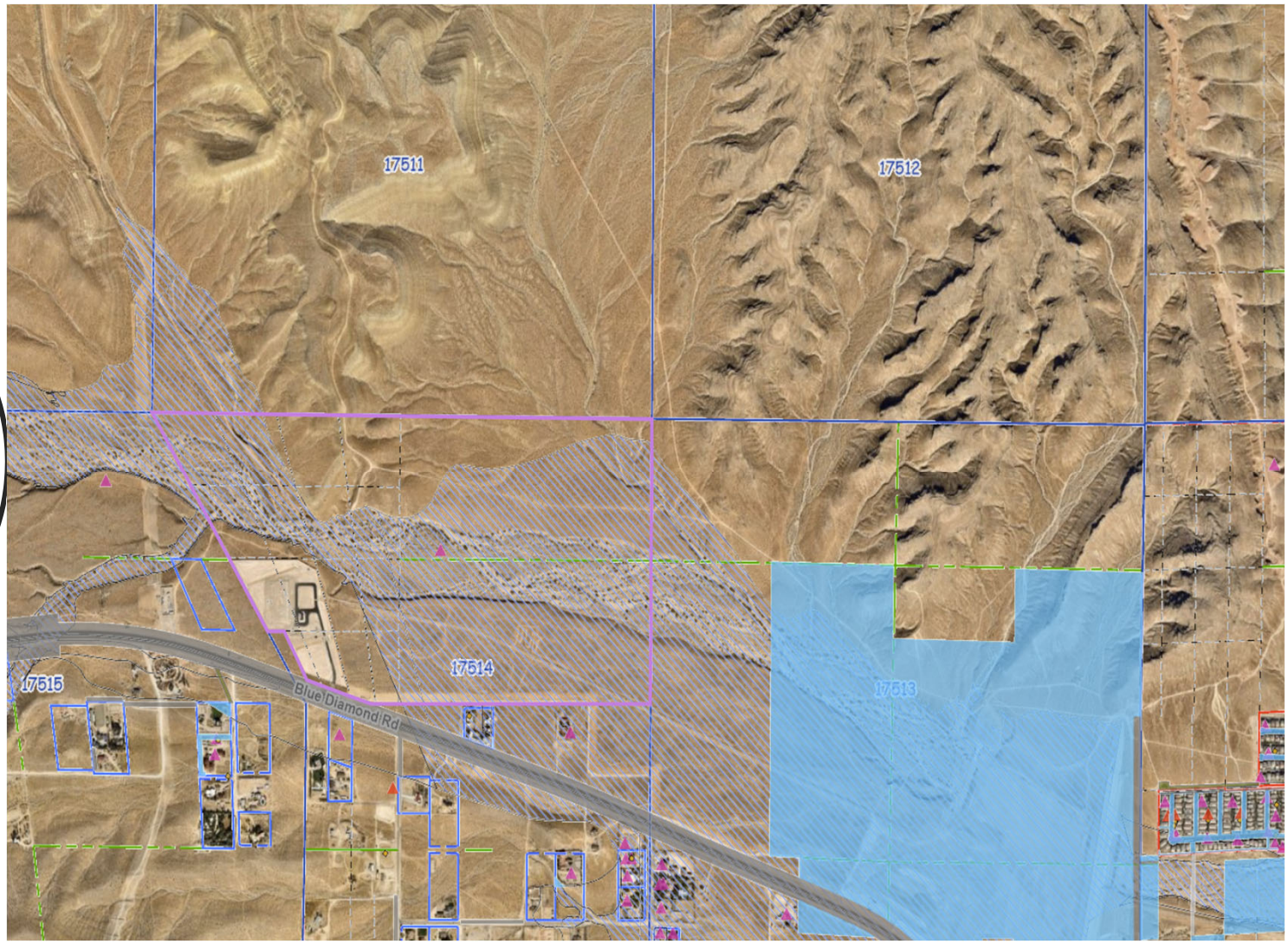


Elevations / Contours

Clark County Regional Flood Control District



Flood Zone



104 PURPOSE

The purpose of the MANUAL is to provide a minimum standard for analysis and design of storm drainage facilities within the CCRFCD. Provision of the minimum standard assures that all drainage facilities are consistent in design and construction, and provides an integrated system which acts to protect the public health, safety, comfort, convenience, welfare, property and commerce.

Traffic Impact Analysis 30.04.08

Traffic Impact Analysis

i. When Required

A traffic impact analysis shall be required when:

(a) A development is anticipated to generate a minimum of 20 total trips in a peak hour, as defined by the most recent version of the Institute of Transportation Engineers Reference Book, Trip Generation, and its most recent updates, or by a trip generation study acceptable to the County; or

(b) Imposed by the Commission or Board as a condition of approval of any tentative map or land use application approved pursuant to the requirements of this Title.

ii. Exception

If a traffic impact analysis is required, and the development is anticipated to generate between 20 and 300 total trips in a peak hour, the developer shall provide necessary traffic mitigation improvements as determined by the Director of Public Works and pay a traffic mitigation fee, as described in the County's fee schedule, in lieu of submitting a traffic impact analysis, unless the Director of Public Works requires a traffic impact analysis. These funds shall be set aside in a special account for purposes of constructing traffic mitigation related to developments.

Traffic Impact Analysis
Multi-Family Housing

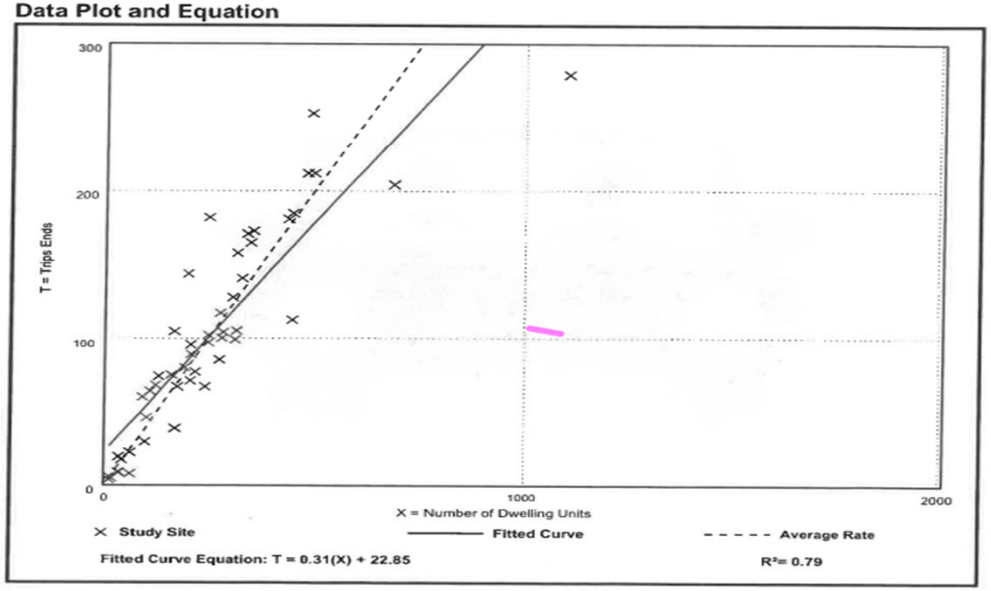
Multifamily Housing (Low-Rise)
Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 49
Avg. Num. of Dwelling Units: 249
Directional Distribution: 24% entering, 76% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.40	0.13 - 0.73	0.12

Data Plot and Equation



Fitted Curve Equation: T = 0.31(X) + 22.85

R^2= 0.79

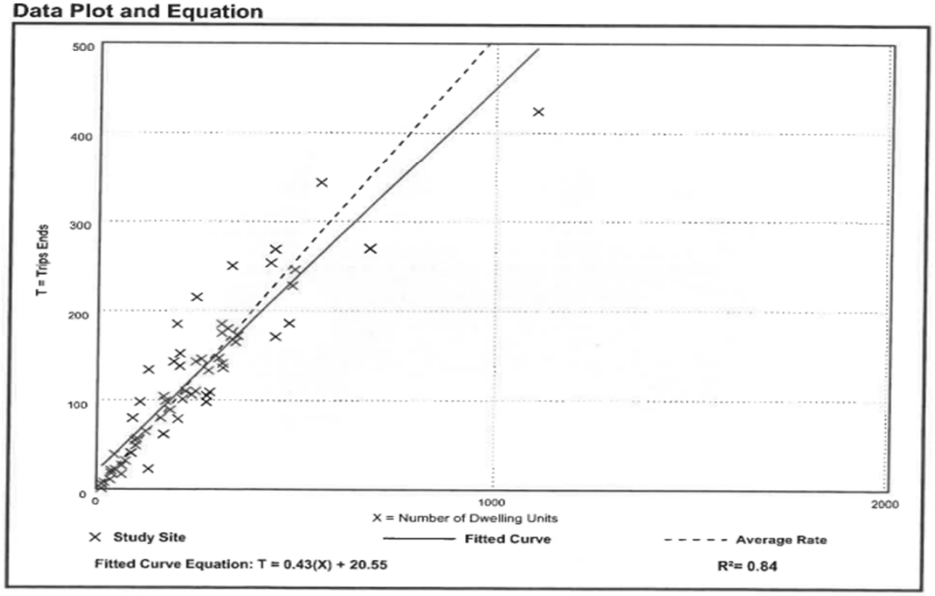
Multifamily Housing (Low-Rise)
Not Close to Rail Transit (220)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 59
Avg. Num. of Dwelling Units: 241
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.51	0.08 - 1.04	0.15

Data Plot and Equation



2.0 Trip Generation

The 11th Edition of the Institute of Transportation Engineers' (ITE) Trip Generation Manual was used to estimate the number of vehicle trips that could be generated by the project. This manual is a standard reference used by municipalities and public agencies throughout the United States. The trip generation characteristics included in the manual are summarized by general land use type and are based on actual trip generation studies performed at numerous locations in areas of various populations.

Trip generation for the LVB and Erie Apartments project is based on average rates for Low-Rise Multifamily Housing (ITE Land Use Code 220) and is summarized in **Table 1**. Calculations are provided in **Appendix A.**

Table 1 – LVB and Erie Apartments Trip Generation

ITE Code	Land Use	Size	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
220	Multifamily Housing (Low Rise)	422 du	41	128	169	136	80	216

Institute of Transportation Engineers (ITE) Trip Generation, 11th Edition

The project is anticipated to generate 169 AM peak hour and 216 PM peak hour primary trips.

3.0 Traffic Mitigation Fee Calculation

The project mitigation fee is based on the current Clark County guidelines for developments anticipated to generate between 50 and 300 trips during either the AM or PM peak hour. The project, as currently proposed, is anticipated to generate 169 AM and 216 PM peak hour primary vehicle trips. Using the higher of the AM or PM peak hour trip generation, the mitigation fee is calculated as follows:

Mitigation Fee = $150.00 x (Larger of AM /PM Peak Hour Trips)

Mitigation Fee = $150.00 x (216 Trips)

Mitigation Fee = $32,400

The mitigation fee calculated in this letter is intended to completely satisfy the obligation of the developer in the cost of current and future signal and/or roadway improvements associated with the project.

4.0 Queuing Analysis

The approximate 175-foot distance to the gate and the 96-foot distance to the callbox as depicted in the Site Map in **Appendix C** and the trip generation from **Table 1** were used to analyze gate queuing. The methodology outlined in Chapter 8 of the Institute of Transportation Engineers' (ITE) Transportation and Land Development Manual – Drive-in Facilities was used to estimate the anticipated storage needs.

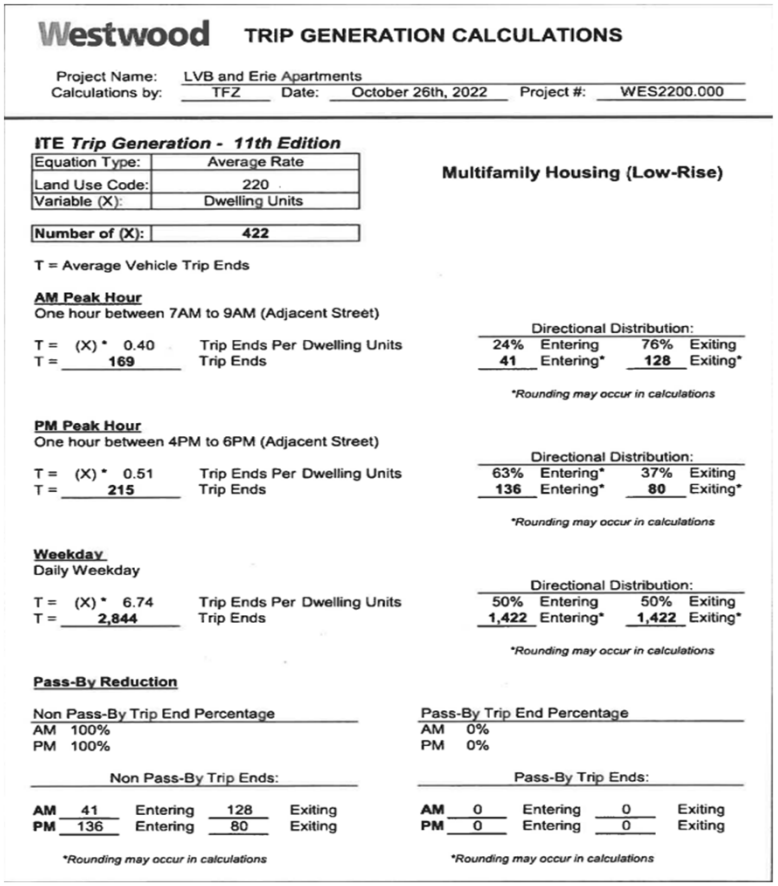
Queue storage was calculated using the ITE methodology with a 95% confidence interval and a wait time at the gate of 30 seconds for visitors and 20 seconds for residents. This methodology is consistent with the current requirements for gated queue analysis from Clark County. 70% of the inbound peak hour volume was assumed to consist of residents at the gate located on the project driveway. **The provided queue storage to the gate and to the callbox are sufficient to store anticipated traffic volumes at the driveway access.** Detailed gate queue calculations are provided in **Appendix C** with a summary of the results provided in **Table 2**.

Table 2 – LVB and Erie Apartments Gated Queue Analysis

Variable	Project Driveway
Residential Traffic	70%
Visitor Traffic	30%
Peak Hour Inbound Vehicles (Total)	136
Peak Hour Inbound Vehicles (Resident)	95
Peak Hour Inbound Vehicles (Visitors)	41
Provided Vehicle Storage (Resident)	***175 ft***
Desired Vehicle Storage (Resident)	***68 ft***
Provided Vehicle Storage (Visitor)	***96 ft***
Desired Vehicle Storage (Visitor)	***50 ft***

APPENDIX A

Trip Generation Calculations



Westwood **TRIP GENERATION CALCULATIONS**

Project Name: LVB and Erie Apartments
Calculations by: TFZ Date: October 26th, 2022 Project #: WES2200.000

ITE *Trip Generation - 11th Edition*

Equation Type:	Average Rate
Land Use Code:	220
Variable (X):	Dwelling Units
Number of (X):	**422**

Multifamily Housing (Low-Rise)

T = Average Vehicle Trip Ends

AM Peak Hour
One hour between 7AM to 9AM (Adjacent Street)

T = (X) * 0.40 Trip Ends Per Dwelling Units
T = **169** Trip Ends

Directional Distribution:
24% Entering 76% Exiting
41 Entering* **128** Exiting*

*Rounding may occur in calculations

PM Peak Hour
One hour between 4PM to 6PM (Adjacent Street)

T = (X) * 0.51 Trip Ends Per Dwelling Units
T = **215** Trip Ends

Directional Distribution:
63% Entering* 37% Exiting
136 Entering* **80** Exiting*

*Rounding may occur in calculations

Weekday
Daily Weekday

T = (X) * 6.74 Trip Ends Per Dwelling Units
T = **2,844** Trip Ends

Directional Distribution:
50% Entering 50% Exiting
1,422 Entering* **1,422** Exiting*

*Rounding may occur in calculations

Pass-By Reduction

Non Pass-By Trip End Percentage
AM 100%
PM 100%

Pass-By Trip End Percentage
AM 0%
PM 0%

Non Pass-By Trip Ends:
AM 41 Entering 128 Exiting
PM 136 Entering 80 Exiting

*Rounding may occur in calculations

Pass-By Trip Ends:
AM 0 Entering 0 Exiting
PM 0 Entering 0 Exiting

*Rounding may occur in calculations

APPENDIX B

Queuing Analysis

Westwood **GATED QUEUING ANALYSIS**

Project Name: LVB and Erie Apartments
Calculations By: TFZ Date: 10/26/2022 Project #: WES2200.000

ITE Transportation and Land Development, Chapter 8 - Drive-In Facilities

Storage = (((ln P(x>M) - ln Qm) / ln p) - 1) x Average Length of Vehicle

M = Queue length (ft) exceeded p (%) of the time
N = Number of service channels (Lanes)
Q = Service rate per channel (Veh/Hr)
p = Demand Rate/Service Rate = q/NQ = Utilization Factor
q = Demand rate off the system (Veh/Hr)
Qm = Relationship between queue length, number of channels and utilization factor
Utilization Factor (if N = 1, Qm = p)
P(x > M) = Percentage of time Queue Length exceeded

Wait Time= 30 Seconds

$41/(1)(120)$

N = 1 Service Channel
Q = 120 Veh/Hr
P(x > M) = 5%
Length = 25 Ft (Average Vehicle Length)
136 Vehicles per hour from Trip Generation (PM Inbound)
1 Storage Lanes
30% Percentage of Visitor Traffic at Gate

q = 41 vehicles per hour per lane **VISITORS**

p = 0.34 = q/NQ (where N=1) Qm = 0.34 **VISITORS**

M = Storage {[ln 0.05 - ln (0.34)] / ln (0.34) -1} * 25 **VISITORS**

M = Storage = 19 ft **VISITORS**

SL = Desirable Storage Per Lane= **50** ft **TO THE CALLBOX**

Clark County

Westwood **GATED QUEUING ANALYSIS**

Project Name: LVB and Erie Apartments
Calculations By: TFZ Date: 10/26/2022 Project #: WES2200.000

ITE Transportation and Land Development, Chapter 8 - Drive-In Facilities

Storage = (((ln P(x>M) - ln Qm) / ln p) - 1) x Average Length of Vehicle

M = Queue length (ft) exceeded p (%) of the time
N = Number of service channels (Lanes)
Q = Service rate per channel (Veh/Hr)
p = Demand Rate/Service Rate = q/NQ = Utilization Factor
q = Demand rate off the system (Veh/Hr)
Qm = Relationship between queue length, number of channels and utilization factor
Utilization Factor (if N = 1, Qm = p)
P(x > M) = Percentage of time Queue Length exceeded

Wait Time= 20 Seconds

N = 1 Service Channel
Q = 180 Veh/Hr
P(x > M) = 5%
Length = 25 Ft (Average Vehicle Length)
136 Vehicles per hour from Trip Generation (PM Inbound)
1 Storage Lanes
70% Percentage of Resident Traffic at Gate

q = 95 vehicles per hour per lane **RESIDENTS**

p = 0.53 = q/NQ (where N=1) Qm = 0.53 **RESIDENTS**

M = Storage {[ln 0.05 - ln (0.53)] / ln (0.53) -1} * 25 **RESIDENTS**

M = Storage = 68 ft **RESIDENTS**

SL = Desirable Storage Per Lane= **68** ft **TO THE GATE**

Clark County

Traffic Impact Analysis

Single-Family Detached Housing

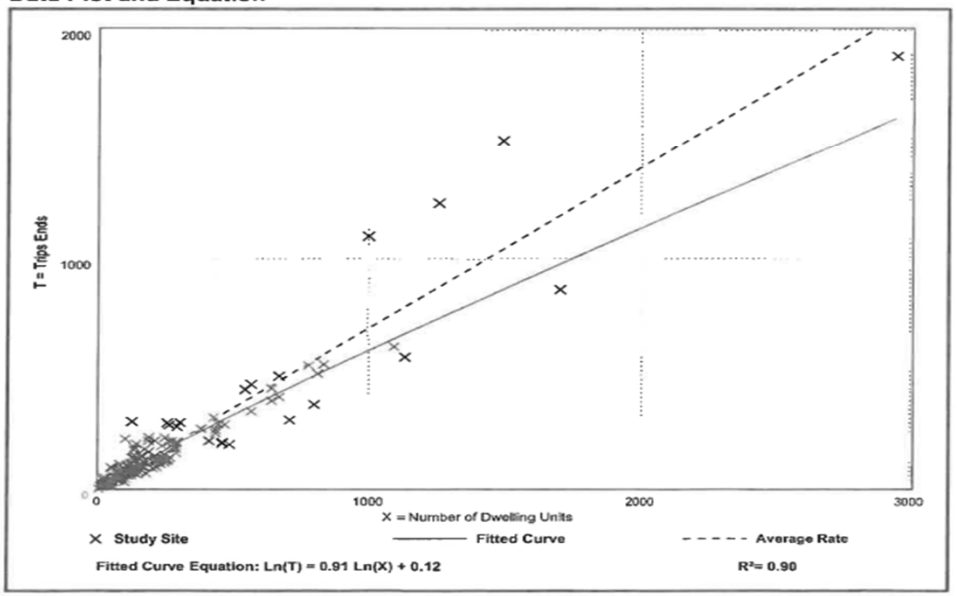
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 192
Avg. Num. of Dwelling Units: 226
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.70	0.27 - 2.27	0.24

Data Plot and Equation



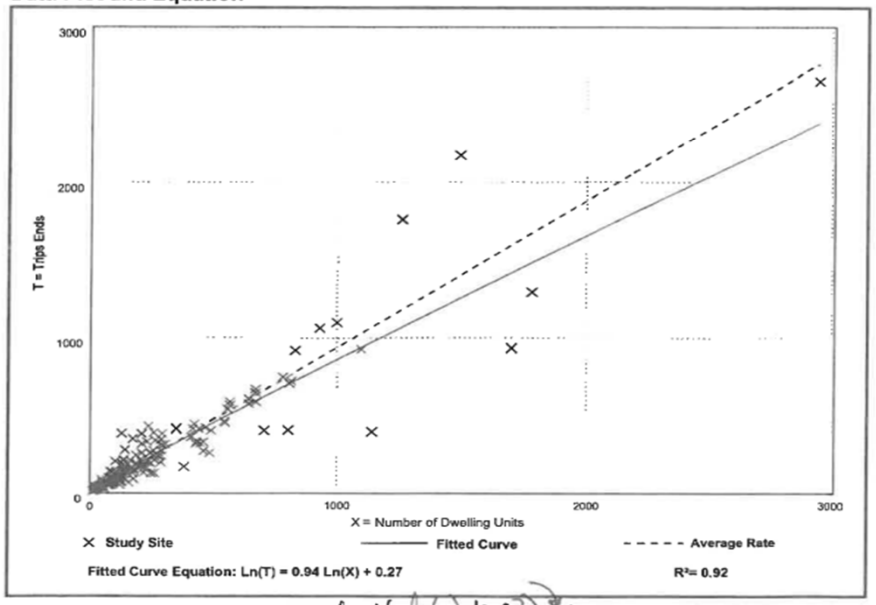
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 208
Avg. Num. of Dwelling Units: 248
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.94	0.35 - 2.98	0.31

Data Plot and Equation



solve (.94(ln(x) + .27)) (answer)
Large Answer to C (answer)

GCW
ENGINEERS | SURVEYORS

764-A231A

July 20, 2023

Kent Chang, PE
Clark County Public Works – Development Review Div.
500 South Grand Central Parkway
Las Vegas, NV 89155

Re: **Traffic Mitigation Letter for Cimarron and Patrick Phase 3 SFD – Pulte Homes; APN 163-33-201-018**

Dear Mr. Chang:

This is to serve as a Traffic Mitigation Letter (TML) for the subject Project. The Project consists of a non-gated 95-unit single family detached housing subdivision on 9.53-acres of land which calculates to a density of 9.97 units/acre. The subject parcel are located on the northeast corner of Tomsik Street and Patrick Lane.

Per Code 210 – Single-Family Detached Housing of ITE's *Trip Generation* (11th Edition), the project can be expected to generate 67 (17 in & 50 out) AM peak hour trips and 91 (57 in & 34 out) PM peak hour trips as shown in **Table 1**. This results in a traffic mitigation of $13,650.00 (91 trips x $150) that is in addition to the $750 fee required for this submittal.

Table 1. Project Trip Generation

Use	ITE Code	Indep. Variable	Trip Rates					Trip Generation		
			Daily	AM Peak		PM Peak		Daily	AM Peak	PM Peak
				Rate	Enter/ Exit	Rate	Enter/ Exit		In / Out	In / Out
Single-Family Detached Housing	210	95 Du	9.43	0.70	25% / 75%	0.94	63% / 37%	896	17 / 50	57 / 34
Grand Totals		**95 Du**							**67**	**91**

As shown on the attached site plan, 31 homes will have driveways facing Tomsik Street and gain access from Oquendo Road to the north or Patrick Lane on the south. The remaining 64 homes will take access from Swift Lariat. Swift Lariat is approximately 230-feet east of and parallel to Tomsik Street. The proximity of Swift Lariat to Tomsik Street and Cimarron Road is not considered a significant conflict due to the low volumes and speeds.

Thank you for your cooperation and attention to this matter. Please let me know if there are any questions or if additional information is needed.

1555 South Rainbow Boulevard
Las Vegas, Nevada 89146
O 702.804.2000
F 702.804.2299
info@gcwengineering.com
gcwengineering.com

Traffic Impact Analysis
Fine Dining Restaurant

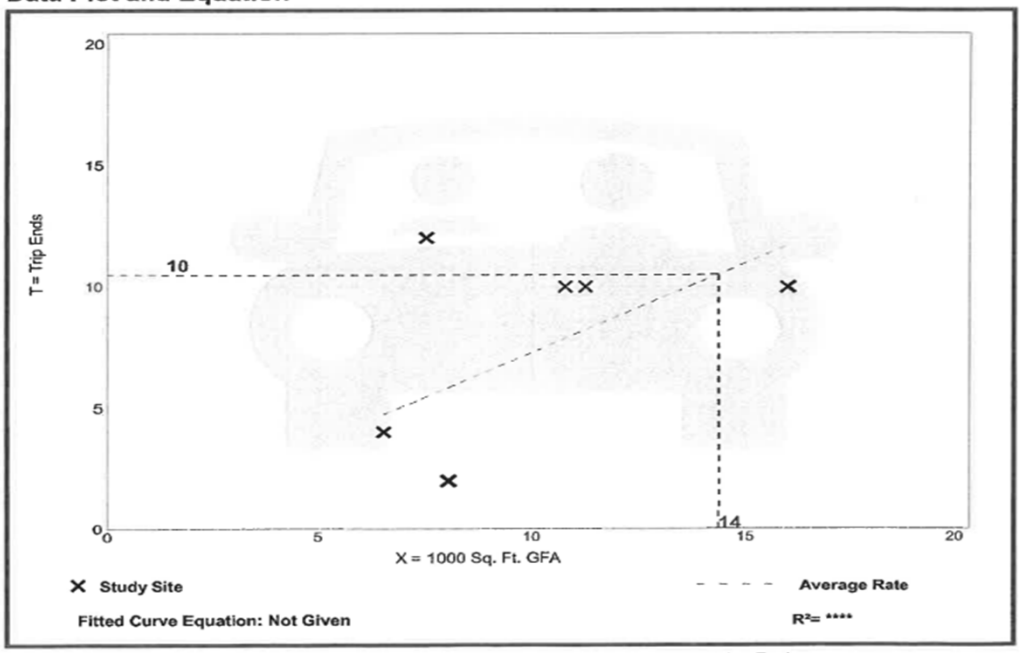
Fine Dining Restaurant
(931)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 7
Avg. 1000 Sq. Ft. GFA: 10
Directional Distribution: Not Available

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.73	0.25 - 1.60	0.42

Data Plot and Equation



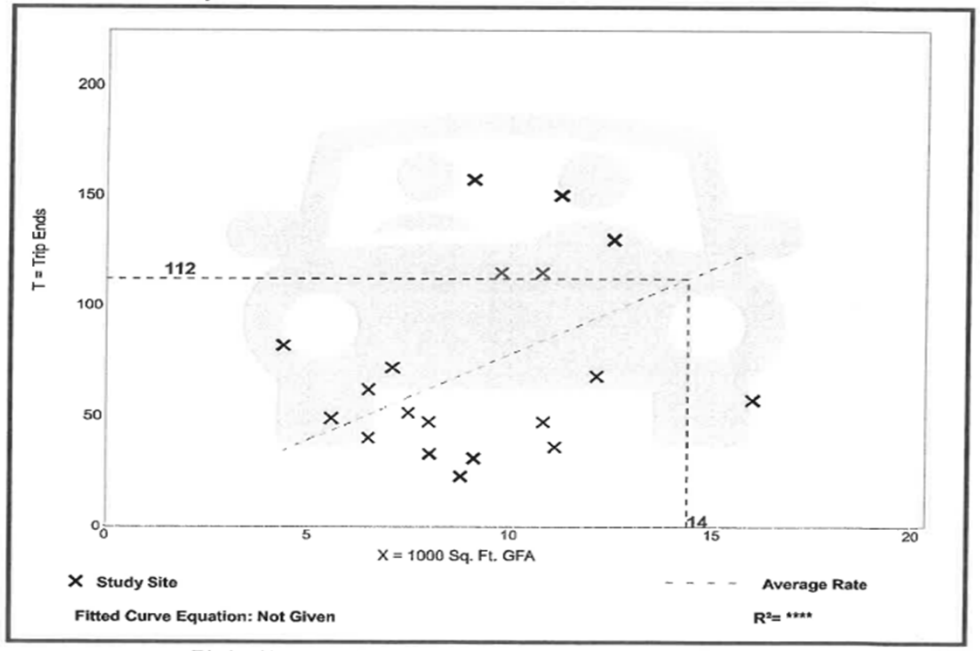
Fine Dining Restaurant
(931)

Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 19
Avg. 1000 Sq. Ft. GFA: 9
Directional Distribution: 67% entering, 33% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
7.80	2.62 - 18.68	4.49

Data Plot and Equation



TRIP GENERATION ITE CODE 931 FINE DINING RESTAURANT 11,791 SQUARE FEET	
AM PEAK HOUR	
Average Rate = 0.73 trips per 1000 square feet T = (11.791) (0.73) T = 8.6 or **9 Trips**	
50% Entering 5 Trips	50% Exiting 4 Trips
PM PEAK HOUR	
Average Rate = 7.8 trips per 1000 square feet T = (11.791) (7.8) T = 91.9 or **92 Trips**	
67% Entering 62 Trips	34% Exiting 30 Trips

The cost participations are based upon $150 per trip during the project's peak hour. Based upon 92 PM peak hour trips the project's cost participation is $13,800 (92 * 150 = 13,800).

Traffic Impact Analysis

Traffic Study Scope depends on the type and location of the proposed development and the surrounding area. The scope required in a Traffic Study is, but not limited to, dependent on variables involved with the development:

Analyze intersections that are both signalized and unsignalized.

- Analysis should include existing and future conditions: counting cars and current lane configurations for current conditions and projection of future numbers (ITE Manual and Projection) and proposed lane configurations and controls.

Unsignalized intersections would have to be analyzed to determine if a traffic signal would be warranted.

Signalized intersections are analyzed to see if modifications to the current lane design are required.

Depending on the type of development, mitigation measures would have to address any failures, including:

- Right turn lanes or the addition or right turn lanes
- Left turn storage
- LOS (Level of Service) of intersection or pedestrian (sidewalk)
- Porte Cochere

The mitigation measures are based on the projected numbers calculated and added to the existing conditions. Recommendations to mitigate any poor or exacerbated conditions are made.

Developer contributions are collected based on percentages calculated depending on the recommendations and improvements proposed (left turn lane(s) or signalizing intersection).

Example