EXPERT ENGINEERING SCIENCES, INC.
CIVIL ENGINEERING • TRAFFIC ENGINEERING • LAND SURVEYING • ACCIDENT RECONSTRUCTION

File No:
5366-01.61

Left-turn Deceleration Lane Warrants Study

For:

Don Miller

Pine Tree Manufactured Home and RV Park
42144 N. Shore Drive,
Big Bear City, CA 92314

By:

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1. INTRODUCTION

1.1. Project/Property Data

Subject Project: Pine Tree Manufactured Home and RV Park Expansion Project
Project Location: 42144 N. Shore Drive (State Route 38), Big Bear City, CA 92314
Property APN: 0304-412-06
Owner: Miller Family Trust
Applicant: Don Miller
Applicant's Address: 3582 Durham Circle, Oceanside, CA 92056

1.2. Summary

This memorandum has been prepared pursuant to a request for a left-turn deceleration lane warrants analysis at the entrance of the Pine Tree Manufactured Home and RV Park located (Pine Tree Park, hereafter) on State Route 38 (SR 38) on the north shore of Big Bear Lake in an unincorporated area of San Bernardino County. The purpose of the study is to support the expansion of the park from 21 existing occupiable units to a proposed total of 53 occupiable units. The additional 32 occupiable units will be served by the property's existing driveway approach from SR 38. The warrants for left turns were provided by Caltrans District 8, and have been used to determine that the site will warrant an auxiliary left-turn lane at the time that the additional occupiable units are opened for occupancy.

2. PROJECT SITE

2.1. General Description

Pine Tree Park is located on the north shore of Big Bear Lake at the address indicated above. The driveway approach to the property is on the north side of North Shore Drive (State Route 38), east of Lakeview Lane. The asphalt driveway measures approximately 25 feet in width beyond the returns.

SR 38 in this area is a rural east-west 55-mph conventional highway that traverses the mountain communities located along the north shore of Big Bear Lake. The east terminus of the route is located at the Big Bear Lake Dam and its western terminus is at Interstate 10 in Redlands. In the local area, SR 38 is a parallel route to State Route 18, which carries a greater volume of traffic along the south shore of Big Bear Lake. SR 38 along the north shore of Big Bear Lake consists of a single general purpose lane in each direction separated by a painted double-yellow line median. Paved shoulders on both sides of the highway vary in width between 1-2 feet and more than 12 feet. Directly adjacent to the Pine Tree Park entrance, the south paved shoulder is approximately 30 feet wide and

the north shoulder is approximately 10.5 feet wide. For reference, see Figure 2.2 for a sketch of the entrance to Pine Tree Park.

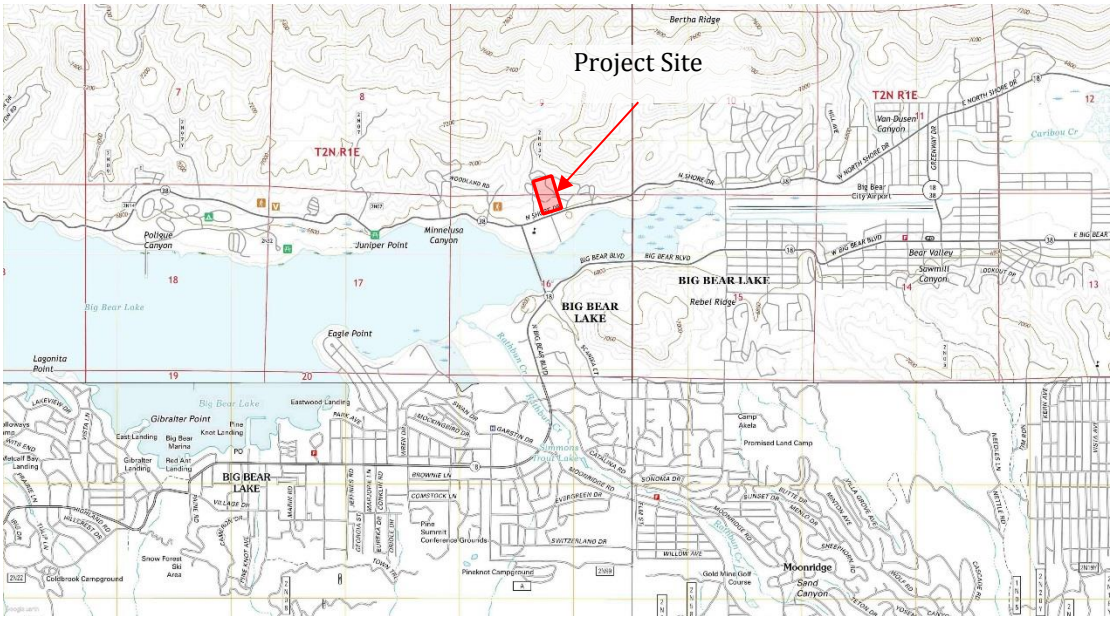

Figure 2.1 – Vicinity Map

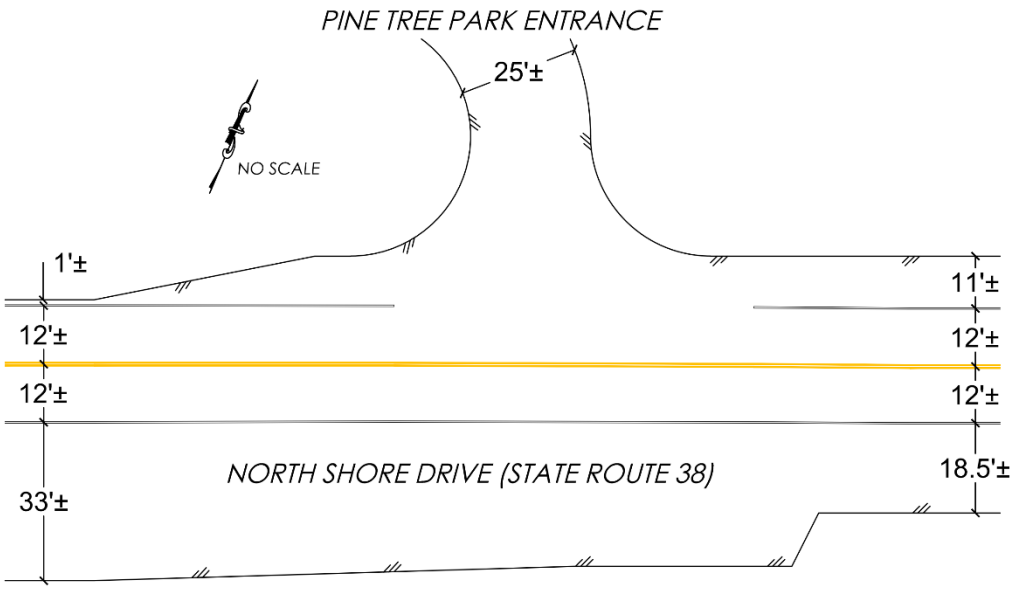

Figure 2.2 – Park Entrance Sketch

2.2. Site Plan

A preliminary site plan was provided by Don Miller that shows the project site and the existing entrance to the park (See Figure 3) as well as a second driveway approach. It is our understanding that the site plan is inaccurate with respect to the second driveway. Pursuant to comments from Caltrans during their initial review of the project, the second

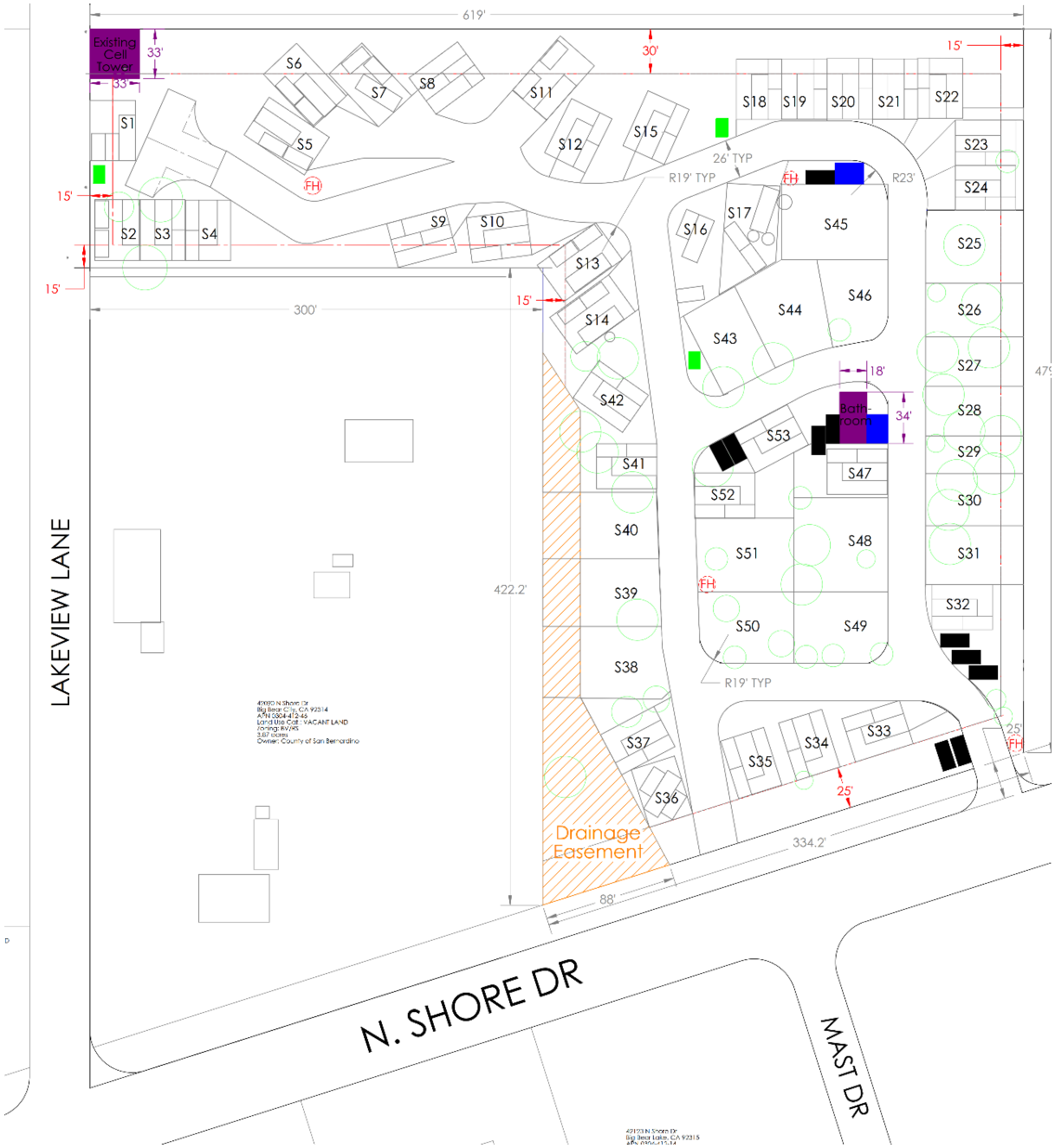

Figure 2.3 – Pine Tree Park Expansion Project Site Plan

driveway shown on the plan is to be moved to a position directly across from Mast Drive in order to avoid creating an intersection with offset north and south legs. Other than this discrepancy, the site plan is accepted as generally accurate with respect to the proposed expansion. It should be noted that the second driveway will not be used by general site traffic, but will be restricted to emergency vehicles in the event of a fire or other emergency.

The distance between the centerline of the subject driveway and the centerline of Mast Drive, measured along SR 38, is only about 150 feet. This does not allow sufficient room for a standard 120-foot left-turn deceleration lane bay taper for the eastbound approach to the driveway. Even if the minimum taper of 60 feet is used, there will likely be insufficient length remaining to queue two vehicles in the left-turn bay, especially if they are recreational vehicles. Although this memorandum is not intended to provide a design of a left-turn deceleration lane for Pine Tree Park, this fact must be considered in the feasibility of installing an eastbound left-turn deceleration lane at this location. A two-way left-turn lane between Mast Drive and the subject driveway is a preferable solution, and would allow for a full bay and taper to be installed west of Mast Drive. This would enhance safety for westbound vehicles turning left onto Mast Drive as well as eastbound traffic turning left into the park.

2.3. Safety Considerations

Please refer to Appendix A for observations regarding the safety of the subject driveway approach and its intersection with SR 38. Although these are not included in the warrants for left-turn deceleration lanes, they are always a principle consideration in the general practice of civil and traffic engineering.

3. EXISTING PEAK-HOUR TRAFFIC VOLUMES

Morning and evening peak-hour traffic volumes for the subject driveway were observed by National Data and Surveying Services (NDS) on Thursday, September 19, 2019. The raw data provided by NDS is included in the appendix hereto. The data indicates that the morning peak-hour begins at 7:45 a.m. and the evening peak-hour begins at 4:30 p.m. The traffic volumes most relevant to this study are eastbound left turns and eastbound through vehicles.

Table 3.1 below summarizes the peak-hour traffic volumes from the NDS data. Note that during the a.m. peak-hour there were no eastbound left-turning vehicles; however, there was one vehicle that made a U-turn. This analysis considers U-turns to be left turns because they represent essentially the same movement with respect to the left-turn lane warrants.

Peak	SB Left	SB Through	SB Right	SB U-turn	EB Left	EB Through	EB Right	EB U-Turn	WB Left	WB Through	WB Right	WB U-Turn	TOTAL
AM	1	0	2	0	0	190	0	1	0	267	1	1	463
PM	2	0	3	0	3	241	0	0	0	159	1	0	409

Table 3.1
Subject Driveway Peak-hour Traffic Volumes

4. ESTIMATED PROJECT TRAFFIC

4.1. ITE Trip Generation Rates

The 10th Edition of the Trip Generation Manual (2017) by the Institute of Transportation Engineers (ITE) was used to estimate the additional peak-hour traffic that will be created by the proposed expansion of the park. Land Use Category 240, Mobile Home Park, provided the trip generation rates and curve-fit equations. The relevant excerpts from the Trip Generation Manual are included in the appendix to this memorandum. It should be noted that the studies used to support these trip generation rates included mobile home developments that are somewhat incongruent to Pine Tree Park in terms of their locations and their maximum occupancies.

According to the Trip Generation Manual, Land Use 240 was developed from 7 daily traffic studies and 8 peak-hour traffic studies, which represent small sample sizes. These studies were also conducted in general urban and suburban settings, which is inconsistent with the subject development's rural location. Lastly, the daily studies used sites with an average number of 111 occupied dwelling units and the peak-hour studies used sites with an average number of 149 occupied dwelling units. Therefore, the studies used to support the trip generation rates published by ITE were for developments that were, on average, more than twice as large as Pine Tree Park will be when it is fully developed. This suggests that the ITE trip generation rates probably overestimate the volume of traffic that will be generated by the project. Another observation that causes us to question the validity of the trip generation rates is the failure for the ITE rates to reasonably predict the current peak-hour traffic volumes. If the existing number of occupiable spaces is used in the ITE formulae, they predict 23 a.m. peak-hour trips; however the traffic counts show that no vehicles turned left into the park during the a.m. peak-hour. As the number of occupiable spaces decreases from the average sample size, the error in the ITE rates increases. These observations apply equally to the peak-hour and daily trip generation rates.

4.2. Peak-hour Traffic Volumes

The likelihood of overestimated traffic volumes notwithstanding, the peak-hour trip generation calculations for the subject driveway are summarized in Table 4.1.

Project Trips

ITE Land Use Number 240
Mobile Home Park
Units: 32 New Occupiable Spaces (21 Existing)

Blue Text = Outbound
Red Text = Inbound

ITE Peak-hour Trip Generation Rates		New Peak-hour Trips		ITE Peak-hour In-Out Distributions			
AM Peak Hour Rate*	PM Peak Hour Rate*	AM	PM	AM In	AM Out	PM In	PM Out
0.41	0.27	26	21	20%	80%	62%	38%

*ITE formulas used in leu of trip generation rate

AM $T_{AM} = 0.3x + 16.58$

PM $T_{PM} = 0.58x + 2.38$

x = Occupied Units

Table 4.1
Project Peak-Hour Trips and In-Out Distributions

4.2.1 Existing + Project Peak-hour Traffic Volumes

The existing traffic from the NDS data combined with the trip generation calculations represent the existing + project traffic for the proposed Pine Tree Park expansion. Table 4.2 below summarizes existing and project traffic and the traffic traveling in and out of the subject driveway, according to the Trip Generation Manual in-out distributions.

	AM Peak-Hour			PM Peak-Hour		
	In	Out	Total	In	Out	Total
Existing Trips	2	3	5	4	5	9
New Trips	5	21	26	13	8	21
Total	7	24	31	17	13	30

Table 4.2
Subject Driveway Existing + Project Traffic

4.2.2 Peak-hour Approach Distributions

In order to determine the volume of traffic that will turn left into the subject driveway during the peak-hours, the existing and project traffic were further distributed according to an analysis of the NDS data. Table 4.3 below shows the distribution of eastbound and westbound traffic entering the driveway via left and right turns per the traffic counts. Table 4.3 also shows the distribution of traffic exiting the driveway. The distributions of existing traffic were then applied to the total existing + project traffic from Table 3 to determine the estimated number of total peak-hour left turns. During the p.m. peak-hour, 13 eastbound vehicles per hour (vph) can be expected to turn left into the subject driveway.

	Existing Traffic				Project + Existing Traffic	
	AM	PM	AM	PM	AM	PM
SB Left	1	2	33%	40%	8	5
SB Right	2	3	67%	60%	16	8
EB Left	1	3	50%	75%	4	13
WB Right	1	1	50%	25%	3	4

Table 4.3
Existing Peak-hour Driveway Traffic, Existing Peak-hour Left-Right Distributions, and Project + Existing Peak-hour Driveway Traffic

4.3. Existing + Project Daily Traffic Volumes

Trip generation rates from the Trip Generation Manual and the total number of occupiable spaces were used to determine the approximate volume of daily traffic that the Pine Tree Park will generate after expansion under maximum occupancy. Although the ITE rates are somewhat high for the subject development's size and location, they provide a basis for estimating the volume of daily traffic that will be generated by the project.

4.3.1 Daily Inbound Traffic

In order to estimate the daily traffic volume that will turn left into the subject driveway from eastbound State Route 38, the total daily traffic was first distributed in accordance with the inbound-outbound distributions from the Trip Generation Manual (50%-50%). From these volumes, the inbound traffic was further divided into a.m. and p.m. traffic by estimating that 40% of the inbound traffic would occur between midnight and noon, while the remaining 60% would occur between noon and midnight. This is a potential source of error, but any error introduced by these estimates was determined to be irrelevant to the conclusions of this study because other considerations were found to supersede the daily traffic volumes. The daily traffic calculations are summarized in Table 4.4.

Daily Trip Generation Rate*	Total Daily Trips	In-Out Distribution		Distributed Daily Traffic		Daily Inbound Traffic (60-40 AM-PM Split)	
		In	Out	In	Out	AM in	PM in
6.49	451	50%	50%	226	225	90	136

*ITE formula used in leu of trip generation rate

$\ln T_{PM} = 0.65 \ln x + 3.53 \quad \rightarrow \quad T_{PM} = e^{0.65 \ln x + 3.53}$

x = Occupied Units

Table 4.4
Existing + Project Daily Traffic

4.3.2 Daily Eastbound Left Turns

In order to determine the daily volume of left-turning traffic at the Pine Tree Park driveway, the daily a.m. and p.m. inbound traffic volumes were further distributed in accordance with the percentages that were calculated previously for the peak-hour left-turn volumes (see Table 4.3). The previously used distributions are repeated in Table 4.5, which is a summary of the daily inbound traffic that is expected to approach the site from eastbound left turns and westbound right turns into the subject driveway. Note that although the numbers are not shown in red, all of the traffic summarized in Table 4.5 is daily *inbound* traffic only.

	Daily Inbound Approach Distributions		Daily Inbound Existing + Project Traffic		
	AM	PM	AM	PM	Totals
EB Left	50%	75%	45	102	147
WB Right	50%	25%	45	34	79
					226

Table 4.5
Daily Inbound Traffic Distributions and Volumes

5. LEFT-TURN DECELERATION LANE WARRANTS

The warrants for the installation of a left-turn deceleration lane or left-turn bay were provided by Caltrans from the District 8 Access Management Action Plan. There are two criteria used by District 8 to determine whether left-turn lanes are warranted. The first criteria considers the prevailing speed, the volume of left-turning traffic, and the volume of directional (through) traffic. The traffic volumes are in units of vehicles per hour (vph). These criteria are summarized in table 5.1 on the following page, which has been reproduced from the Caltrans Access Management Plan.

Criteria for Left-turn Deceleration Lanes on Rural Two-lane Highways.

Left Turn Volume[1] (vph)	LEFT TURN DECELERATION LANE			
	Minimum Directional Volume in Through Lane (vphpl)[2]			
	≤ 30 mph	35 to 40 mph	45 to 55 mph	>55 mph
< 5	Not Required	Not Required	Not Required	Not Required
5	400	220	120	60
10	240	140	80	40
13	192	116	68	16
15	160	100	60	Required
20	120	80	Required	Required
25	100	Required	Required	Required
≥ 26	Required	Required	Required	Required

Left Turn Deceleration Lanes Are Required on Rural Two-lane Highways for the following Left-turn Volumes:

- ≤ 30 mph: 26 vph or more
- 35 to 40 mph : 21 vph or more
- 45 to 55 mph: 16 vph or more
- > 55 mph: 11 vph or more

Notes:

1. *Use linear interpolation for left-turn volumes between 5 and 25 vph.*
2. *The directional volume in the through lane includes through vehicles and turning vehicles.*

Table 5.1
Criteria for the Installation of Left-turn Deceleration Lanes on Rural Highways

Caltrans' second criteria for the installation of a left-turn deceleration lane uses the Georgia DOT warrants for left-turn lanes, which consider the prevailing speed, the average daily traffic (ADT) and the daily volume of left-turning vehicles from the undivided highway. These criteria are shown in Table 5.2. It should be noted that according to the 2017 Traffic Volumes on California State Highways published by Caltrans, State Route 38 experienced an average of 5400 vehicles per day on the segment where the Pine Tree Park is located.

Georgia DOT Warrants (vehicles per day) for Left-Turn Lanes on[1] Undivided Roadways				
	2-Lane Roadways		> 2-Lane Roadways	
	Roadway ADT[2]		Roadway ADT	
Posted Speed	<6000	>6000	<10000	>10000
35 mph or less	300/day[3]	200/day	400/day	300/day
40 to 50 mph	250/day	175/day	325/day	250/day
55 mph or higher	200/day	150/day	250/day	200/day

[1]A left-turn deceleration lane must be constructed **at no cost to the Georgia DOT** (emphasis added) when the estimated left-turn volume in a 24-hour period exceeds the volume in the table.

[2] Average Daily Traffic on the roadway.

[3]Expected number of left turns from the roadway to the access connection in a 24-hour period.

Table 5.2
Georgia DOT Left-turn Lane Warrants for Undivided Roadways

6. ANALYSIS AND FINDINGS

When the existing + project traffic volumes are compared to the first set of criteria for left-turn deceleration lanes from the Caltrans Access Management Plan, the warrants are met for the installation of an eastbound left-turn deceleration lane. As mentioned above, the project will result in an average total of 13 eastbound left turns during the p.m. peak-hour and 4 eastbound left turns during the a.m. peak-hour. The warrants are not met for the a.m. peak hour.

For the p.m. peak-hour, at least 55 eastbound through vehicles are required to meet the warrants for a left-turn deceleration lane on a 55 mph rural highway[1] that has a left-turning volume of 13 vph. The NDS data shows that during the p.m. peak-hour, the eastbound directional traffic volume (eastbound through + eastbound left-turns) is 250 vph. This volume of directional traffic is sufficient to meet the warrants for a left-turn deceleration lane.

The comparison between the Georgia DOT warrants and the existing + project traffic volumes indicate that the project will not generate sufficient left-turning vehicles in a 24-hour period to meet the warrants for left-turn lanes on undivided roadways. Even when using trip generation rates that probably overestimate the daily traffic volumes for the Pine Tree Park, the number of daily left turns is estimated to be only 147 vehicles after the site

[1] Directional traffic as defined by the warrants includes eastbound through traffic plus eastbound turning traffic. Since there are 13 left-turning vehicles per hour, only 55 through vehicles per hour are required to meet the minimum of volume of 68 directional vehicles per hour.

is expanded. The minimum volume of left-turning traffic for requiring a left-turn lane on a 55 mph highway with an ADT of less than 6000 is 200 vehicles per day. Therefore, the overestimated traffic volumes are insufficient to meet the warrants for the installation of a left-turn deceleration lane.

7. CONCLUSION

The existing peak-hour traffic volumes combined with the trip generation volumes for the proposed expansion project indicate that when the project is completed and opened for business, the warrants for the installation of a left-turn deceleration lane will be met. The feasibility of the installation of a left-turn deceleration lane for the eastbound approach to the subject driveway is complicated by the existence of the intersection with Mast Drive within 150 feet of the subject driveway and the eventual emergency entrance/exit for Pine Tree Park, which will create a north leg to that intersection. Sufficient sight distance is available in both directions (assuming that the foliage within the Caltrans right-of-way is properly maintained – see appendix A) for the installation of an eastbound left-turn lane.

Although we have mentioned some of the more obvious considerations for the design of an eastbound left-turn deceleration lane, it should not be assumed that this study has developed a complete list of safety and operational factors that must be incorporated into the design of a left-turn lane. Other factors include whether the existing shoulders have the appropriate structural cross-section to accommodate highway traffic if the traffic lanes are widened. If Caltrans ultimately conditions the Pine Tree Park Expansion Project to install a left-turn lane, and if Caltrans does not elect to undertake the project themselves, a qualified consultant should be retained to provide the appropriate construction plans and specifications in accordance with Caltrans design standards.

Respectfully Submitted,
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APPENDICES

APPENDIX A - Traffic Safety Observations

A. Traffic Safety Observations

A.1. Sight Distance

A survey team from Expert Engineering Sciences visited the site on September 17, 2019 to record observations about the entrance to Pine Tree Park. At that time, corner and stopping sight distances were measured in accordance with the criteria set forth in chapters 200 and 400 of the latest edition of the Caltrans Highway Design Manual (HDM).

Table 201.1
Sight Distance Standards

Design Speed[1] (mph)	Stopping[2] (ft)	Passing (ft)
10	50	---
15	100	---
20	125	800
25	150	950
30	200	1,100
35	250	1,300
40	300	1,500
45	360	1,650
50	430	1,800
55	500	1,950
60	580	2,100
65	660	2,300
70	750	2,500
75	840	2,600
80	930	2,700

(1) See Topic 101 for selection of design speed.
(2) For sustained downgrades, refer to underlined standard in Index 201.3

Table A1
Table 201.1 from the 6th Edition of the Caltrans Highway Design Manual

Stopping sight distance was measured from a 3.5-foot high eye position in the center of each lane and it was determined that a 6-inch high object is continuously visible along both travel lanes of SR 38 in this area. The available sight distance was observed to be continuously greater than the minimum criteria for a 55 mph highway (500 feet) when the observer was positioned within 100 feet of the subject driveway centerline.

Caltrans' minimum corner sight distance criteria for private driveways on state highways require the same minimum unobstructed sight distances as for stopping sight distance. The criteria for stopping and corner sight distance (for private driveways) only differ in the manner in which the measurements are obtained. Corner sight distances along both lanes of SR 38 were measured using an eye positioned on the centerline of the subject driveway and 10 feet north of the north edge of the paved shoulder.

Along the eastbound lane of SR 38, the sight distance was measured to be approximately 746 feet, at which point the crest of a vertical curve began to obstruct visibility of approaching traffic. This exceeds the minimum corner sight distance criteria for private driveways. Along the westbound lane, the available sight distance was measured to be only about 177 feet, which does not meet the minimum corner sight distance criteria for private driveways. Visibility along the westbound lane from the subject driveway was obstructed by foliage growing between the right-of-way line and the north edge of pavement. It appears that if this area is maintained and the bushes are

removed, the minimum corner sight distance criteria will then be met along the westbound lane.

Photograph A1
View looking southwest from the centerline of the subject driveway, 10 feet north of the north edge of the paved shoulder prolongation. Photo shows the object (arrow) positioned in the center of the eastbound lane of SR 38 at a location 746 feet west of the centerline of the subject driveway.

Photograph A2
View looking southeast from the centerline of the subject driveway, 10 feet north of the north edge of the paved shoulder prolongation. Photo shows the object (arrow) positioned in the center of the westbound lane of SR 38 at a location 177 feet west of the centerline of the subject driveway. Photo shows that the available sight distance is obstructed by foliage growing within the Caltrans right-of-way.

A.2. Drop-off Condition

Another potentially dangerous condition was observed at the time of our field inspection that should be corrected immediately. Although this condition is largely irrelevant to the installation of a left-turn deceleration lane, nonetheless, it is a safety hazard and all registered engineers are bound by professional ethics to regard public safety as their highest duty.

Our crew observed that along the north edge of pavement of SR 38 west of the subject driveway, the dirt/gravel shoulder has eroded away from the asphalt and the lateral stability of the pavement has become compromised. In addition to creating a vertical drop of approximately 2-4 inches, the lack of a stable shoulder is causing the pavement edge to crumble and further reduce the width of the already narrow paved shoulder. At some locations, the shoulder has completely eroded away leaving no distance between the white edge line and the edge of pavement. Considering the potential for a serious accident that could result from a driver attempting to remount the edge drop-off, this situation should be brought to the attention of the Caltrans department responsible for maintaining the shoulder integrity along this segment of SR 38 so that it can be corrected.

Photograph A3
View looking west along the north pavement edge from the subject driveway. Note the crumbling pavement edge and the vertical difference between the paved roadway and the adjacent dirt shoulder.

APPENDIX B - Traffic Volumes Provided by National Data and Surveying Services

National Data & Surveying Services

Intersection Turning Movement Count

Location: Pine Tree RV Dwy & N Shore Dr
City: Big Bear
Control: No Control

Project ID: 19-06130-001
Date: 9/19/2019

Total

NS/EW Streets:	Pine Tree RV Dwy				Pine Tree RV Dwy				N Shore Dr				N Shore Dr				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
7:00 AM	0	0	0	0	0	0	2	0	1	10	0	0	0	55	0	0	68
7:15 AM	0	0	0	0	0	0	0	0	1	18	0	0	0	62	0	0	81
7:30 AM	0	0	0	0	0	0	0	0	0	12	0	0	0	65	0	0	77
7:45 AM	0	0	0	0	1	0	1	0	0	59	0	0	0	98	0	0	159
8:00 AM	0	0	0	0	0	0	1	0	0	79	0	0	0	57	0	0	137
8:15 AM	0	0	0	0	0	0	0	0	0	27	0	0	0	45	1	1	74
8:30 AM	0	0	0	0	0	0	0	0	0	25	0	1	0	67	0	0	93
8:45 AM	0	0	0	0	1	0	1	0	0	28	0	0	0	80	0	0	110
9:00 AM	0	0	0	0	1	0	1	0	1	26	0	0	0	40	0	0	69
9:15 AM	0	0	0	0	0	0	0	0	0	28	0	0	0	47	0	0	75
9:30 AM	0	0	0	0	0	0	0	0	0	21	0	0	0	52	1	0	74
9:45 AM	0	0	0	0	0	0	0	0	0	23	0	0	0	60	0	0	83
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	3	0	6	0	3	356	0	1	0	728	2	1	1100
APPROACH %'s :					33.33%	0.00%	66.67%	0.00%	0.83%	98.89%	0.00%	0.28%	0.00%	99.59%	0.27%	0.14%	
PEAK HR :	07:45 AM - 08:45 AM																TOTAL
PEAK HR VOL :	0	0	0	0	1	0	2	0	0	190	0	1	0	267	1	1	463
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.250	0.000	0.500	0.000	0.000	0.601	0.000	0.250	0.000	0.681	0.250	0.250	0.728
							0.375				0.604				0.686		

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:00 PM	0	0	0	0	0	0	0	0	0	46	0	0	0	38	2	0	86
4:15 PM	0	0	0	0	0	0	0	0	2	53	0	0	0	48	0	0	103
4:30 PM	0	0	0	0	1	0	1	0	0	48	0	0	0	41	0	0	91
4:45 PM	0	0	0	0	0	0	1	0	1	59	0	0	0	34	0	0	95
5:00 PM	0	0	0	0	1	0	1	0	1	72	0	0	0	40	1	0	116
5:15 PM	0	0	0	0	0	0	0	0	1	62	0	0	0	44	0	0	107
5:30 PM	0	0	0	0	0	0	0	0	0	45	0	0	0	34	1	0	80
5:45 PM	0	0	0	0	0	0	0	0	0	55	0	0	0	50	0	0	105
6:00 PM	0	0	0	0	0	0	1	0	1	31	0	0	0	39	1	0	73
6:15 PM	0	0	0	0	0	0	0	0	1	44	0	0	0	34	0	0	79
6:30 PM	0	0	0	0	0	0	0	0	0	41	0	0	0	27	1	0	69
6:45 PM	0	0	0	0	0	0	0	0	0	33	0	0	0	33	2	0	68
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	2	0	4	0	7	589	0	0	0	462	8	0	1072
APPROACH %'s :					33.33%	0.00%	66.67%	0.00%	1.17%	98.83%	0.00%	0.00%	0.00%	98.30%	1.70%	0.00%	
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	2	0	3	0	3	241	0	0	0	159	1	0	409
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.500	0.000	0.750	0.000	0.750	0.837	0.000	0.000	0.000	0.903	0.250	0.000	0.881
							0.625				0.836				0.909		

National Data & Surveying Services

Intersection Turning Movement Count

Location: Pine Tree RV Dwy & N Shore Dr
City: Big Bear
Control: No Control

Project ID: 19-06130-001
Date: 9/19/2019

Bikes

NS/EW Streets:	Pine Tree RV Dwy				Pine Tree RV Dwy				N Shore Dr				N Shore Dr				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
APPROACH %'s :									0.00%	100.00%	0.00%	0.00%					
PEAK HR :	07:45 AM - 08:45 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	4
APPROACH %'s :					0.00%	0.00%	100.00%	0.00%	100.00%	0.00%	0.00%	0.00%					
PEAK HR :	04:30 PM - 05:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

National Data & Surveying Services

Intersection Turning Movement Count

Location: Pine Tree RV Dwy & N Shore Dr
City: Big Bear

Project ID: 19-06130-001
Date: 9/19/2019

Pedestrians (Crosswalks)

NS/EW Streets:	Pine Tree RV Dwy		Pine Tree RV Dwy		N Shore Dr		N Shore Dr		
AM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	**07:45 AM - 08:45 AM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

PM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	**04:30 PM - 05:30 PM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

Pine Tree RV Dwy & N Shore Dr

Peak Hour Turning Movement Count

ID: 19-06130-001
City: Big Bear

Day: Thursday
Date: 09/19/2019

PEAK HOURS

AM: 07:45 AM - 08:45 AM
NOON: NONE
PM: 04:30 PM - 05:30 PM

COUNT PERIODS

AM: 07:00 AM - 10:00 AM
NOON: NONE
PM: 04:00 PM - 07:00 PM

SOUTHBOUND — Pine Tree RV Dwy

AM	2	0	1	0	1	AM
NOON	0	0	0	0	0	NOON
PM	3	0	2	0	4	PM
	0	1	0	0		

EASTBOUND — N Shore Dr

AM	NOON	PM	
270	0	162	⇦
1	0	0	↶ 0
0	0	3	↑ 0
190	0	241	→ 1
0	0	0	↷ 0
AM	NOON	PM	

WESTBOUND — N Shore Dr

PM	NOON	AM	
1	0	1	↶ 0
159	0	267	← 1
0	0	0	↶ 0
0	0	1	↶ 0
243	0	192	⇨
PM	NOON	AM	

NORTHBOUND — Pine Tree RV Dwy

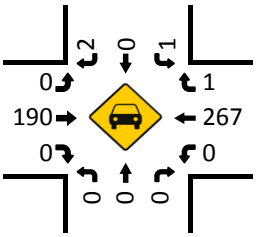
PM	0	0	0	0	0	PM
NOON	0	0	0	0	0	NOON
AM	0	0	0	0	0	AM
	0	0	0	0		

CONTROL

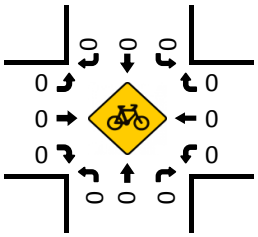
No Control

TEV	463	0	409
	AM	NOON	PM
PHF	0.73		0.88

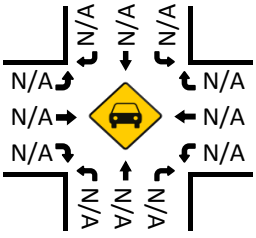
Total Vehicles (AM)



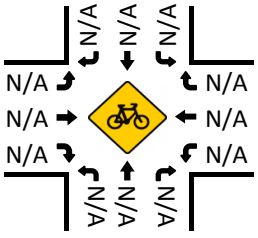
Bikes (AM)



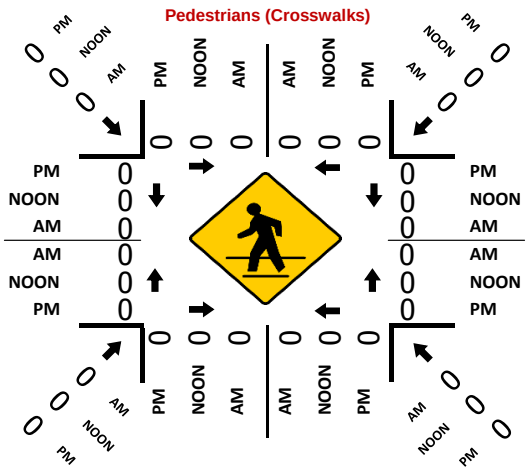
Total Vehicles (Noon)



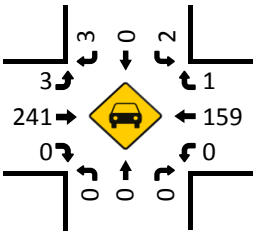
Bikes (NOON)



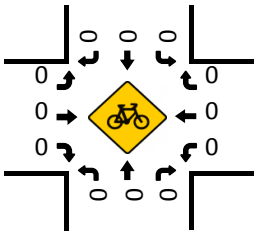
Pedestrians (Crosswalks)



Total Vehicles (PM)



Bikes (PM)



APPENDIX C - Excerpts from the 10th Edition of the Trip Generation Manual

Land Use: 240
Mobile Home Park

Description

A mobile home park generally consists of manufactured homes that are sited and installed on permanent foundations. It typically includes community facilities such as recreation rooms, swimming pools, and laundry facilities. Many mobile home parks restrict occupancy to adults.

Additional Data

The sites were surveyed in the 1980s and the 2000s in Delaware, Indiana, Oregon, and Virginia.

Source Numbers

155, 169, 252, 936

Mobile Home Park
(240)

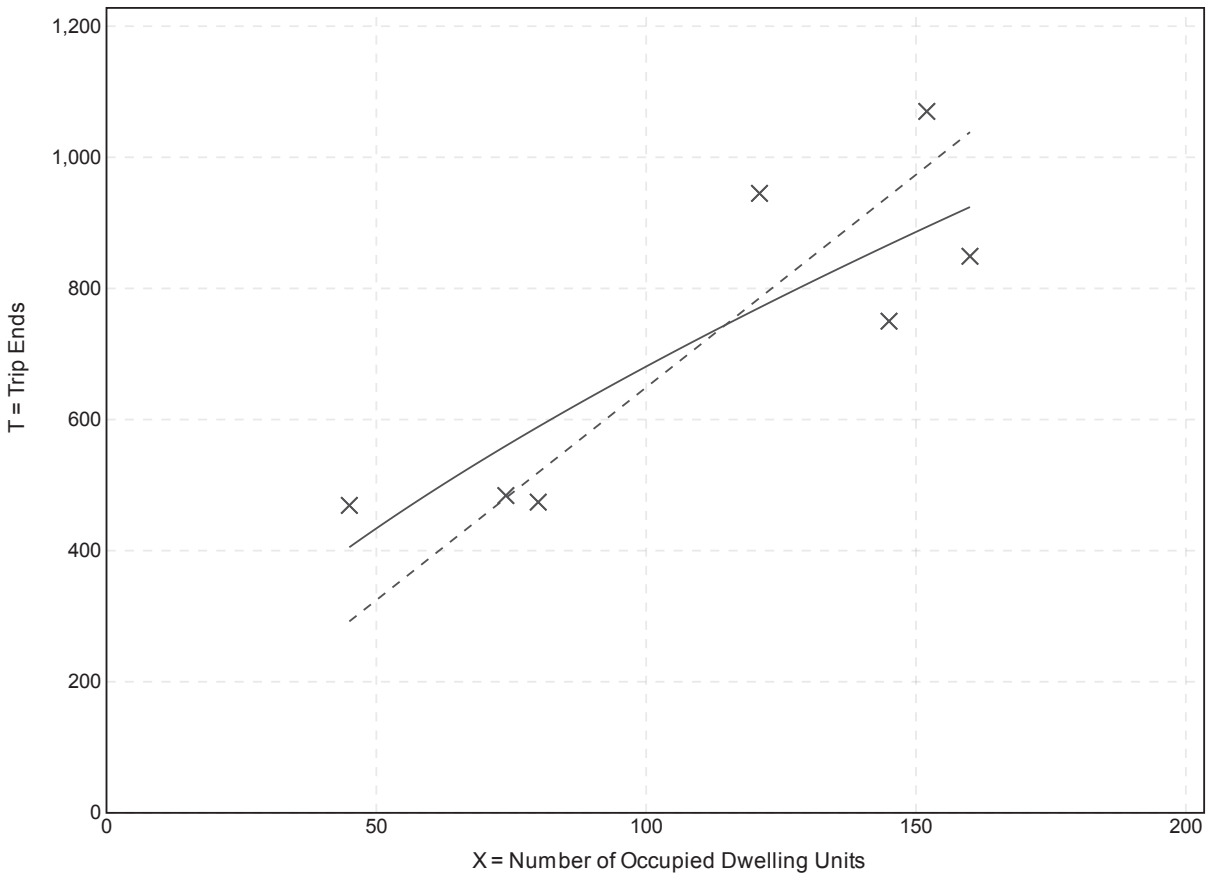
Vehicle Trip Ends vs: **Occupied Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 7
Avg. Num. of Occupied Dwelling Units: 111
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Occupied Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
6.49	5.17 - 10.42	1.48

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.65 Ln(X) + 3.53

R^2= 0.75

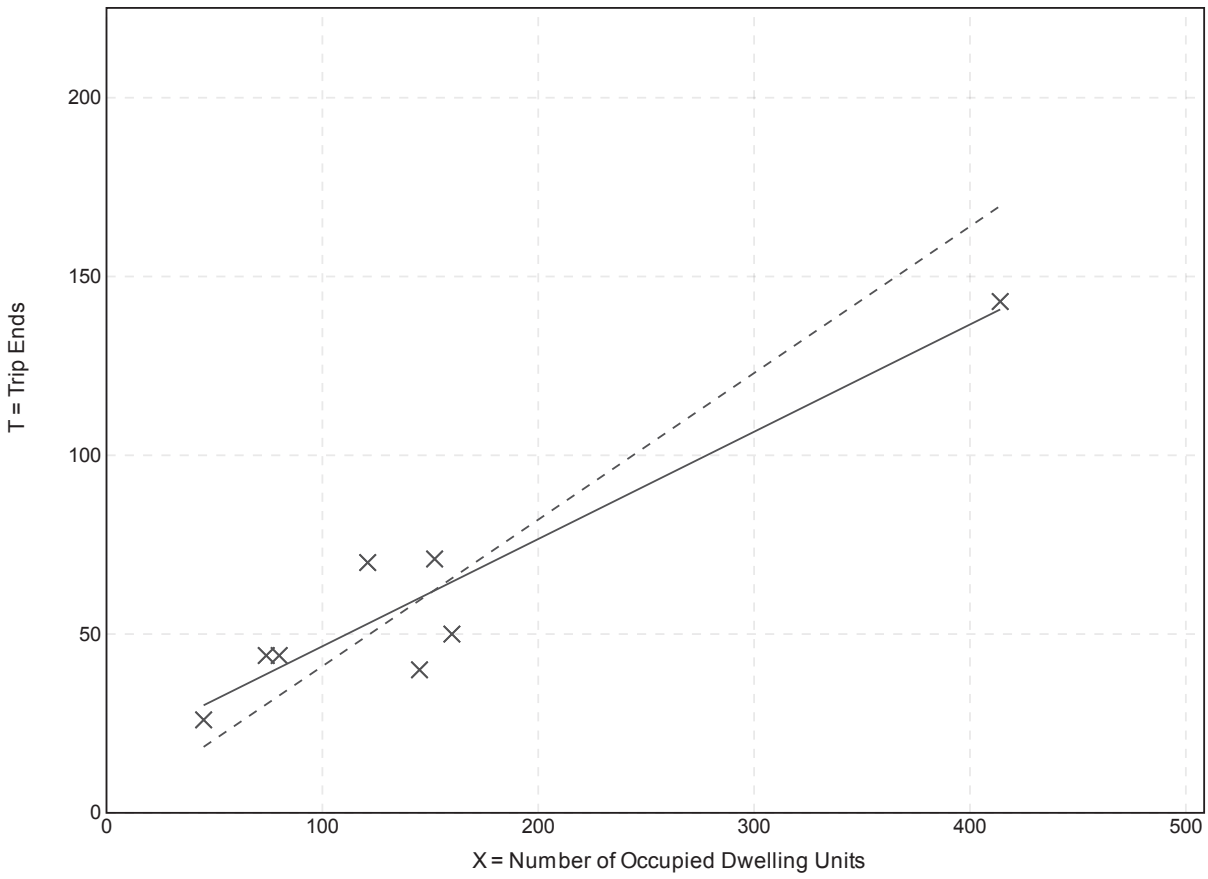
Mobile Home Park
(240)

Vehicle Trip Ends vs:	**Occupied 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:	8
Avg. Num. of Occupied Dwelling Units:	149
Directional Distribution:	20% entering, 80% exiting

Vehicle Trip Generation per Occupied Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.41	0.28 - 0.59	0.12

Data Plot and Equation



Fitted Curve Equation: T = 0.30(X) + 16.58

R^2= 0.89

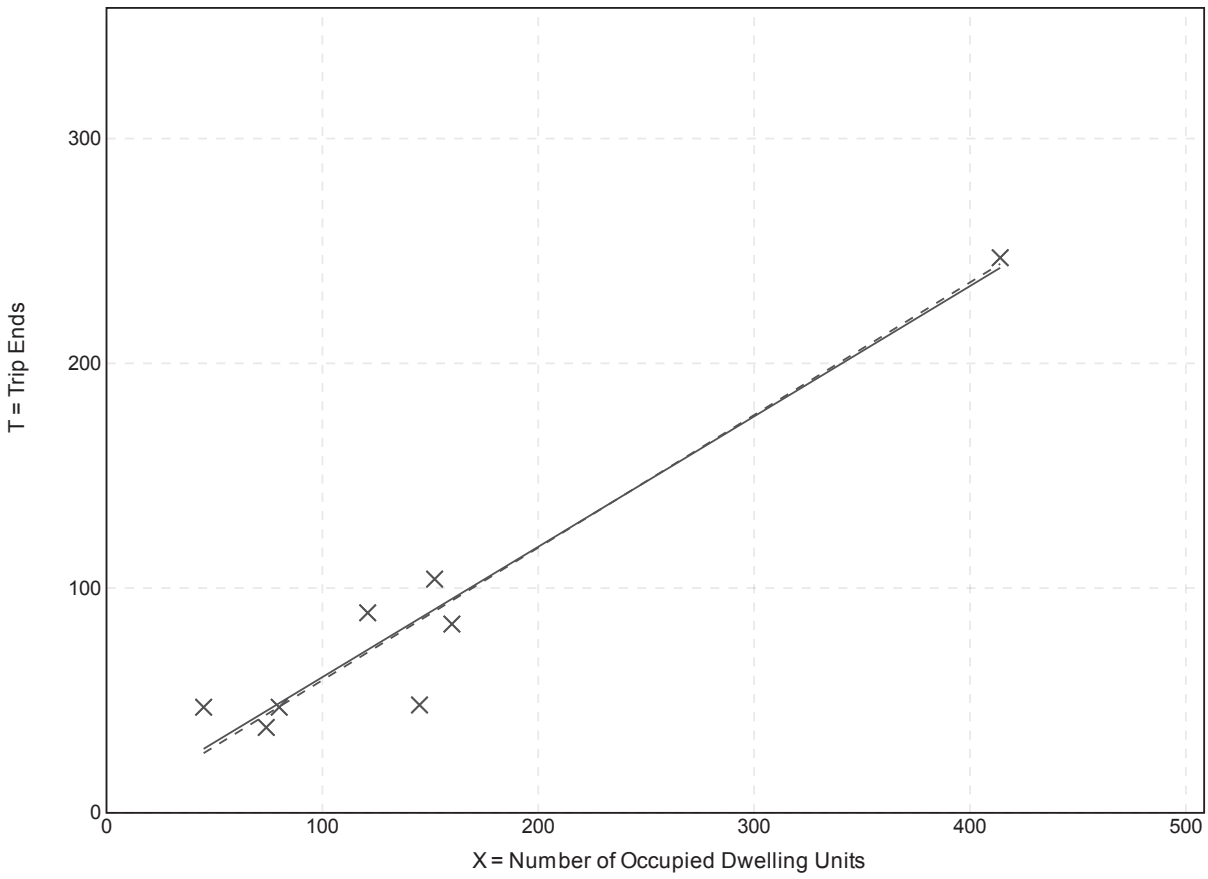
Mobile Home Park
(240)

Vehicle Trip Ends vs:	**Occupied 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:	8
Avg. Num. of Occupied Dwelling Units:	149
Directional Distribution:	62% entering, 38% exiting

Vehicle Trip Generation per Occupied Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.59	0.33 - 1.04	0.15

Data Plot and Equation



Fitted Curve Equation: T = 0.58(X) + 2.38

R^2= 0.93