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ENGINEERING SOLUTIONS

Technical Memorandum

To: Mr. Patrick Jones

Date: May 22, 2015

Project: High Plains Shooting Sports Center TIA

From: Omni-Means
Russell Wenham, PE, TE, PTOE
Kamesh Vedula, PE, TE

Re: Traffic Analysis for Proposed
High Plains Shooting Sports Center

Job No.: 45-5151-01

File No.: C1972MEM002.DOCX

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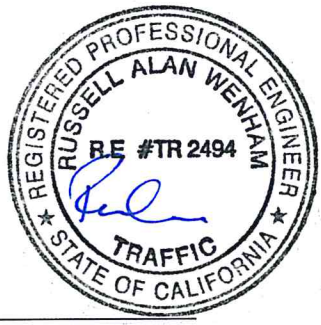


Executive Summary

Omni-Means has performed a focused traffic impact analysis for the proposed High Plains Shooting Sports Center (hereafter referred to as the project) in the County of Shasta, CA. The analysis included calculating the number of vehicle trips generated by the project based on surveys of existing shooting ranges in the Shasta, Tehama, and Sacramento County areas. Vehicle trip rates from the surveys were derived from the linear footage of shooting space at the surveyed facilities and applied to the proposed project. The calculated project trips were added to existing weekday and weekend (Saturday) peak hour volumes surveyed at the project access intersection of Leopard Drive and Dersch Road. The traffic operations at the Leopard Drive/Dersch Road intersection were evaluated, including levels of service, vehicle queuing, and turn lane requirements. Traffic operating conditions were also analyzed for forecast Year 2035 volumes based on the Shasta County Regional Travel Demand Model. Sight distances were surveyed and compared to recommended sight distances established by the American Association of State Highway Transportation Officials guidelines.

Conclusions/Recommendations

- Level of service operating conditions for the Leopard Drive/Dersch Road intersection under existing and forecast Year 2035 conditions are acceptable without the project and would remain acceptable (LOS A) with the addition of the project trips.

- A vehicle queuing analysis was conducted for existing and forecast Year 2035 conditions. Queue lengths of 0-1 vehicles without the project would increase minimally, to 1-2 vehicles with the project during peak hours. Therefore, vehicle queues would be acceptable with the addition of the project trips.

- The intersection volumes were compared to peak hour signalization warrants to determine if the volumes would qualify for installation of a traffic signal. The volumes would not qualify for signalization under existing or future conditions without the project or with the added project trips.

- The intersection was evaluated for installation of separate turn lanes based on Caltrans design guidelines. Existing volumes and forecast Year 2035 volumes would remain below threshold levels without the project and with the addition of the project trips, therefore separate turn lanes are not warranted.

- The existing intersection sight distances (ISD) in both directions from Leopard Drive do not meet the recommended AASHTO distances due to existing vegetation and earth banks. This would be a significant impact.

  To mitigate conditions with the project, it is recommended that the project applicant modify the earth banks by grading/excavation and controlling vegetation along the Leopard Drive and Dersch Road returns. Also, improvements to Leopard Drive, including asphalt pavement and shoulder backing at the connection to the Dersch Road intersection should be installed. Additional grading and clearing, if necessary, should be undertaken to achieve adequate sight distance. With these improvements, sight distances would be sufficient and extend beyond the recommended guidelines. This would mitigate the sight distance issue to a less than significant impact.

- Due to the nature of the project, that will attract many first-time or infrequent visitors, advance signing for Leopard Lane is recommended. The following signs will warn drivers that they are approaching Leopard Lane:

  W2-2: T-Intersection Symbol

  W16-8P: Supplemental Street Name Plaque

Introduction

This technical memorandum has been prepared by Omni-Means to present the results of a focused traffic impact analysis performed for the proposed High Plains Shooting Sports Center (hereafter referred to as the project) to be located on the east side of Leopard Drive north of Dersch Road in Shasta County, CA. The project, as referred to in this report, would consist of public skeet, trap, pistol, and long-rifle ranges with a 5,000 square foot clubhouse, and a separate law-enforcement range and clubhouse. The results of this analysis are intended for use in the project's environmental approval.

Included in this technical memorandum is analysis and discussion of the following items:

- Quantification of the trip generation and trip distribution associated with the proposed project.
- Identification of existing weekday and weekend peak hour intersection volumes and analysis of peak hour operations without the proposed project and with the project.
- The forecast Year 2035 peak hour intersection operating conditions without the project and with the project.
- Existing and projected safety conditions, including potential vehicle queue lengths, turn lane requirements, and sight distances at the Leopard Drive/Dersch Road intersection and in the project vicinity.
- Mitigation measures to alleviate substandard conditions at the study intersection.

The following traffic scenarios have been analyzed as a part of this technical memorandum:

- *Existing* Conditions
- *Existing Plus Project* Conditions
- *Year 2035 No Project* Conditions
- *Year 2035 Plus Project* Conditions

Existing conditions quantify the current traffic operations at the study locations.

The *Existing Plus Project* condition is an analysis scenario in which traffic impacts with the proposed project are investigated in comparison to the *Existing* conditions scenario. Within this scenario, the project generated peak hour volumes have been added to the *Existing* condition volumes to obtain the *Existing Plus Project* traffic volumes.

Year 2035 "No Project" conditions identify traffic operations based on cumulative forecast volumes derived from the Shasta County Travel Demand Model, minus the proposed project.

Year 2035 "Plus Project" conditions build upon *Year 2035 "No Project"* conditions by adding the project-generated trips to the forecast traffic volumes.

Existing Conditions

The proposed project would be located on the east side of Leopard Drive approximately one-half mile north of Dersch Road. The project vicinity and site location are shown in Figures 1 and 2, respectively. The roadways serving the project site are described as follows:

Leopard Drive is a rural, low-volume, dirt road extending north from Dersch Road for approximately one mile where it intersects with Impala Drive and Antler Road, which are also

low-volume dirt roads. The proposed project would be located along the eastern side of Leopard Drive beginning one-half mile north of Dersch Road and extend for one-half mile to Impala Drive. The entrance to the project site would be located at the southern project boundary one-half mile north of Dersch Drive. Leopard Drive enters a free-range cattle area after crossing a cattle-guard grate located approximately 200 feet north of Dersch Road. The surrounding landscape consists of range land with a few single-family homes and auxiliary buildings.

Dersch Road is oriented in a primarily east-west direction extending east from Airport Road in the City of Redding for approximately seven miles to Leopard Drive, then continues another four miles where it intersects with Ash Creek Road and curves north for four more miles to Route 44. Dersch Road is classified as a minor arterial in the California Department of Transportation roadway classification system. In the project vicinity, it is a rural two lane road with double-yellow centerline striping and white pavement edge striping. On each side of the paved road are unimproved shoulders with natural range land grass habitat. Dersch Road has a posted speed limit of 55 mph near Leopard Drive. The Dersch Road/Leopard Drive intersection is a T-intersection consisting of single lane approaches. Leopard Drive extends north from Dersch Road. There is a wide shoulder/turn-out area on the south side of Dersch Road at the Leopard Drive intersection location.

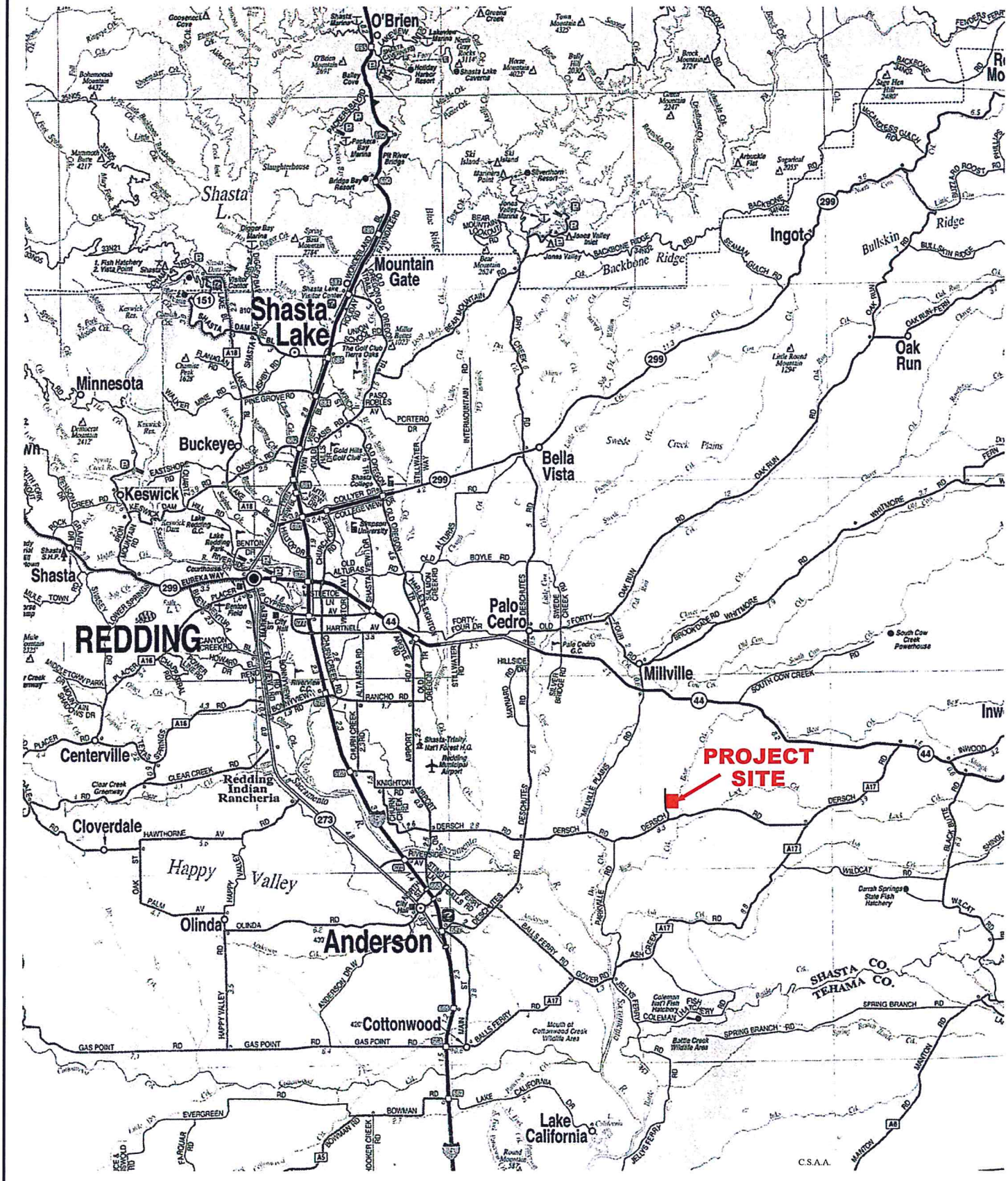
Existing Volumes

The project access intersection of Leopard Drive/Dersch Road was chosen for evaluation during Weekday PM and Weekend Afternoon peak periods of traffic flows. To identify existing volumes, vehicle counts were conducted at the study intersection by Omni-Means on a weekday from 4:00-6:00 pm and on a Saturday and Sunday from 11:00 am to 2:00 pm in order to identify the weekend day with the highest volumes.[1] From these counts, the highest peak hour volumes were utilized for the traffic analysis. During the weekday peak hour, no vehicle trips were surveyed into or out of Leopard Drive and 106 trips were surveyed on Dersch Road. Weekend volumes were highest on Saturday, consisting of 2 trips on Leopard Drive and 86 trips on Dersch Road. The existing peak hour traffic volumes are shown in Figure 4.

Level-of-Service Methodologies

Traffic operations and impacts are typically quantified through the determination of "Level of Service" (LOS). Level of Service is a measure of traffic operating conditions, whereby a letter grade "A" through "F" is assigned to an intersection, representing progressively worsening traffic operations. LOS A represents free-flow conditions with little delay. LOS F represents congested conditions where traffic flows can exceed design capacities resulting in long vehicle queues and delays. At unsignalized intersections with minor-street stop control, stated LOS usually refers to the stop controlled approach with the highest delay and is expressed in seconds of delay. LOS criteria and definitions are provided in the Appendix. The peak hour intersection LOS calculations have been calculated based on the Transportation Research Board (TRB) publication *Highway Capacity Manual, Fourth Edition, 2000* (H*CM-2000) methodology* using Synchro/Simtraffic modeling software.[2] (Level-of-service calculation worksheets are provided in the Appendix.)

[1] *Omni-Means, Weekday AM (7:00-9:00 a.m.) and PM (4:00-6:00 p.m.) peak period intersection counts, May 5&7, 2015.*
[2] *Transportation Research Board (TRB), 2000 Highway Capacity Manual, Intersection Operations, Chapters 16 & 17.*



Project Vicinity Map

North

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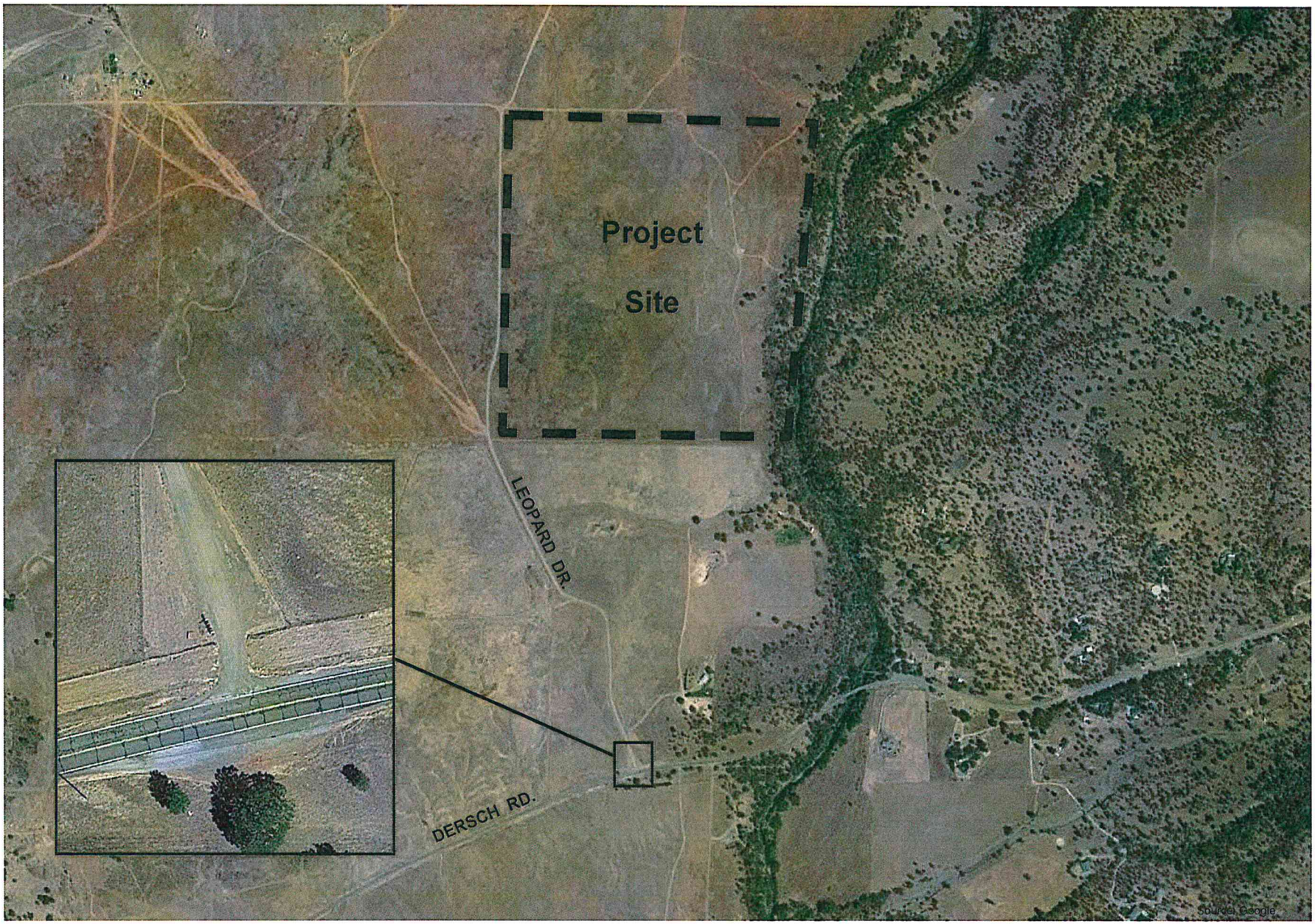
figure 1



Project Site Location

North

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figure 2

Level-of-Service Methodologies

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Significance Criteria

The following standards of significance have been used in this transportation analysis:

For two-way stop intersections, the project is considered to have a significant impact if:

- The project causes the following to occur for the worst-case movement:
  - The LOS declines to an unacceptable LOS, and
  - The volume to capacity ratio exceeds 0.75, and
  - The 95th percentile queue exceeds 75 feet (3 vehicles), OR

- The project causes the worst-case movement's acceptable LOS to decline to an unacceptable LOS and the peak hour volume signal warrant is met, OR

- The project increases the average delay for the worst-case movement by more than 5 seconds per vehicle at an intersection that has an unacceptable LOS without the project and the intersection also meets the peak hour volume signal warrant.

Existing Operating Conditions

A summary of the levels of service identified in this traffic analysis is provided in Table 2. As shown in Table 2, the Leopard Drive/Dersch Road intersection is operating at LOS A conditions on the weekday and weekend with minimal vehicle delays (8.8 seconds or less), which is representative of very efficient overall traffic flows.

Vehicular Queuing Analysis

A vehicle queuing analysis was conducted for existing conditions. Leopard Drive has calculated 95th percentile queue lengths of 11 feet or less, which equates to 0-1 vehicles (assuming 25 feet per vehicle). This corresponds with the observed queues of 0-1 cars during the counts. (Queuing calculation worksheets are provided in the Appendix.)

[3] *Transportation Research Board (TRB), 2000 Highway Capacity Manual, Intersection Operations, Chapters 16 & 17.*

Turn Lane Warrants

The intersection volumes were compared to Caltrans design guidelines regarding installation of separate turn lanes. For left turn lanes, peak hour traffic volumes are utilized by comparing the advancing and opposing volumes on Dersch Road with the percentage of left turning vehicles into the project access road.[4] The volumes associated with the project conditions are well below the Caltrans minimum thresholds, therefore a left turn lane would not be warranted (left turn lane warrant graphs are provided in the Appendix).

The right turn volumes from Dersch Road are also well below minimum thresholds at which right turn lanes would be required (right turn lane warrant graphs are included in the Appendix.)[5]

Signal Warrants

To determine another level of "significance" associated with unsignalized intersection operations, a traffic signal "warrant" analysis has also been completed. The term "signal warrants" refers to established criteria used quantitatively to justify or ascertain the need for installation of a traffic signal at an otherwise unsignalized intersection location. This study employs the signal warrant criteria presented in the Manual on Uniform Traffic Control Devices (*California MUTCD).*[6] Specifically, this study utilized the Peak Hour Warrant for the traffic signal analysis.

The peak hour signal warrant criteria were applied to the study intersection. The intersection volumes do not qualify for signalization under the peak hour criteria (signal warrant worksheets are provided in the Appendix).

Proposed Project

Project Description

The proposed project is a shooting facility that would consist of public skeet, trap, pistol, and long-rifle ranges with a 5,000 square foot clubhouse, and a separate law-enforcement range and clubhouse. The facility would provide approximately 1,500 linear feet of shooting positions encompassed within an approximately 140 acre parcel. The existing site consists of undeveloped range land. A project site plan is provided in Figure 3.

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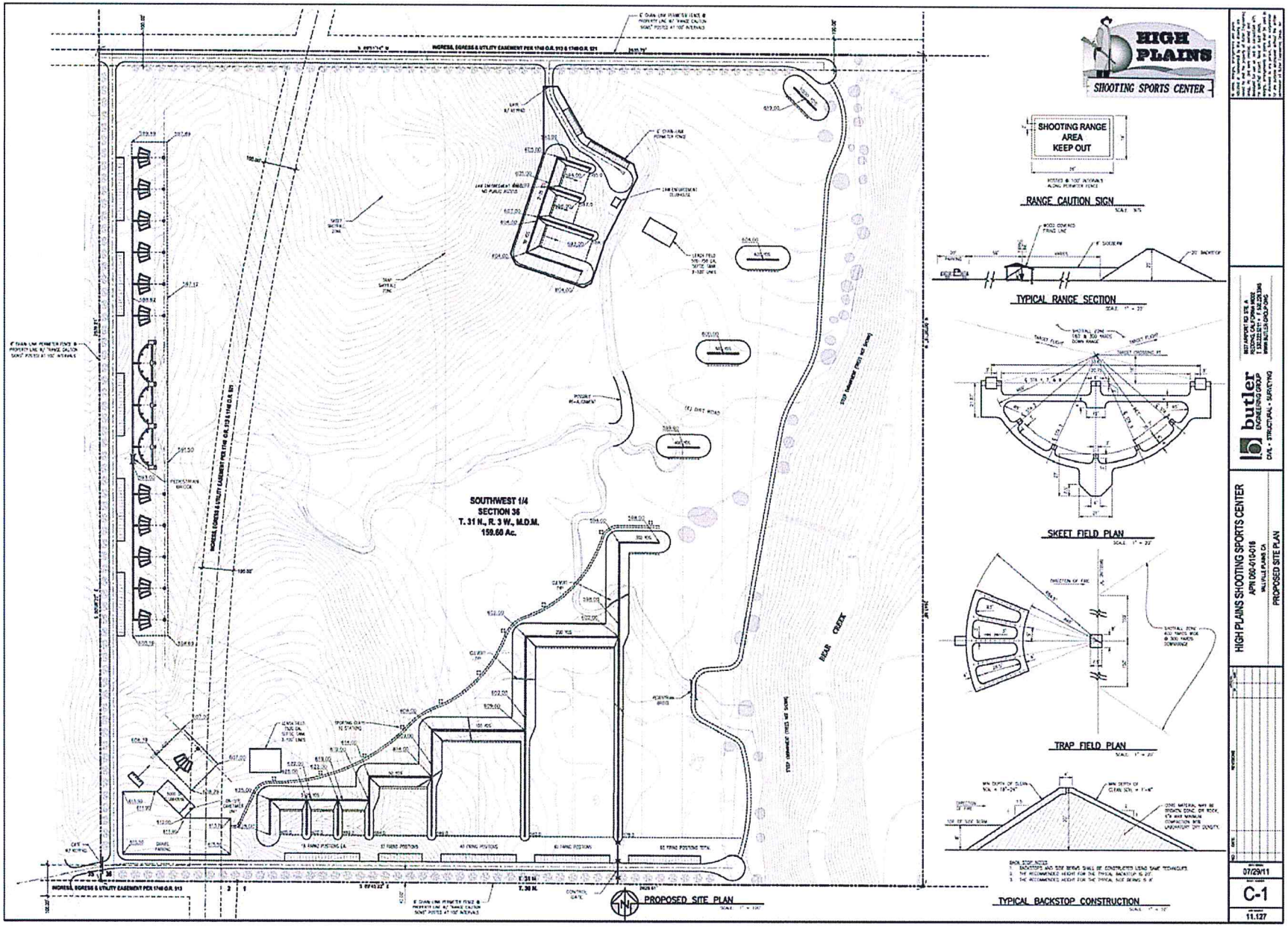
[4] *California Department of Transportation, Guidelines for Reconstruction of Intersections, August 1985.*
[5] *Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November 1985.*
[6] *California Department of Transportation, Manual on Uniform Traffic Control Devices, 2014 Edition.*



Project Site Plan

Reference North

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figure 3

Project Trip Generation

Vehicle trip generation for the proposed project was derived from surveys conducted by Omni-Means of existing shooting facilities within the greater Shasta, Tehama, and Sacramento County areas. (Published data for outdoor shooting facilities is limited and it is believed that surveys of local facilities will provide the most representative data.) For the study, five outdoor shooting clubs/venues were selected for evaluation. Four of the facilities are located in Shasta or Tehama County and share similar features with the proposed project, including locations in primarily rural areas. For comparison purposes, a fifth facility located in more densely populated Sacramento County was also surveyed. The following facilities were surveyed:

Shasta County/Tehama County:	Redding Gun Club
	Shasta County Peace Officer Association (Record Range)
	Hat Creek Rifle & Pistol Club
	Tehama Shooters Association Gun Range
Sacramento County:	Sacramento Valley Shooting Center

Vehicle counts were conducted at the study facilities during a weekday PM period and during weekend Saturday and Sunday afternoon periods.[7] Both weekend days were surveyed in order to identify the weekend day with the highest volumes. The surveyed weekend volumes were highest on Saturday. Based on the survey data, the highest peak hour volumes were utilized for the traffic analysis.

Trip rates were calculated for weekday and weekend peak hours by dividing the surveyed number of trips by the amount of linear feet provided for shooting positions at each facility. The surveyed number of trips and resulting trip generation rates are provided in Table 1.

The four locations with characteristics in common with the proposed project site (located in Shasta and Tehama Counties) shared similar trip rates. Weekday rates ranged from 0.01 to 0.02 trips per linear foot of shooting positions. The weekend Saturday rates ranged from 0.02 to 0.04 trips per linear foot of shooting positions. These facilities had an average trip rate of 0.02 weekday trips and 0.03 weekend trips per linear foot of shooting positions. The Sacramento Valley Shooting Center had higher trip rates of 0.06 weekday and 0.12 weekend trips per linear foot of shooting positions. These higher rates reflect the larger population base and limited number of facilities in the Sacramento region and are not reflective of the proposed location. The project could conceivably generate trips at such a rate on rare occasions, but these would be infrequent and would not constitute a basis for evaluation at a design level. Therefore, the trip rates from the four Shasta and Tehama County surveys were applied to the proposed project. As a conservative methodology, the *highest* observed trip rates (0.02 weekday and 0.04 weekend trips per linear foot of shooting positions) were utilized instead of the average rates to calculate the project trip generation.

The proposed project would consist of approximately 1,500 linear feet of shooting positions. Therefore, the proposed project was calculated to generate 30 weekday PM peak hour trips (12 in, 18 out) and 60 weekend peak hour trips (18 in, 42 out) as shown in Table 1.

[7] *Omni-Means, Weekday Counts conducted January 28, 29, and February 10, 2015. Weekend counts conducted February 14, 15, 21, 22, March 8, 28, and April 11, 2015.*

Table 1: Summary of Surveyed Trip Rates For Existing Gun Ranges

Tehama and Shasta Counties		Surveyed Trips Weekday	Saturday	Sunday
Shasta County Peace Officer Association Record Range 200 linear feet of shooting positions.	Peak Hour Volume: Time of Day: **Peak Hour Trips per Linear Foot:**	3 (1 in, 2 out) 4:15 - 5:15 pm **0.02**	4 (2 in, 2 out) 11:00 am - 12:00 pm **0.02**	3 (2 in, 1 out) 12:00 - 1:00 pm **0.02**
Redding Gun Club 575 linear feet of shooting positions.	Peak Hour Volume: Time of Day: **Peak Hour Trips per Linear Foot:**	4 (2 in, 2 out) 4:00 - 5:00 pm **0.01**	17 (3 in, 14 out) 12:30 - 1:30 pm **0.03**	7 (0 in, 7 out) 1:00 - 2:00 pm **0.01**
Hat Creek Rifle & Pistol Club 285 linear feet of shooting positions.	Peak Hour Volume: Time of Day: **Peak Hour Trips per Linear Foot:**	5 (2 in, 3 out)* 4:00 - 5:00 pm **0.02**	11 (3 in, 8 out) 11:30 am - 12:30 pm **0.04**	No count: club says lower than Saturday. **n.a.**
Tehama Shooters Association Gun Range 405 linear feet of shooting positions.	Peak Hour Volume: Time of Day: **Peak Hour Trips per Linear Foot:**	8 (4 in, 4 out)* 4:00 - 5:00 pm **0.02**	16 (5 in, 11 out) 11:30 am - 12:30 pm **0.04**	No count: club says lower than Saturday. **n.a.**
Average Peak Hour Trips Per Linear Foot:		**0.02 trips per l.f.** (40% in, 60% out)	**0.03 trips per l.f.** (30% in, 70% out)	**0.02 trips per l.f.** 30% in, 70% out)
Highest Peak Hour Trips Per Linear Foot:		**0.02 trips per l.f.** (40% in, 60% out)	**0.04 trips per l.f.** (30% in, 70% out)	**0.02 trips per l.f.** 30% in, 70% out)

*Based on average ratio of weekday to weekend peak hours. Club says typical trips likely lower.

PROJECT TRIP GENERATION

PROPOSED PROJECT (HIGH PLAINS SHOOTING CENTER) TRIP GENERATION		Calculated Trips Weekday	Saturday	Sunday
1,500 linear feet of shooting positiions.	Peak Hour Trip Rate*: **Peak Hour Volume:**	0.02 trips per l.f. **= 30 (12 in, 18 out)**	0.04 trips per l.f. **= 60 (18 in, 42 out)**	0.02 trips per l.f. **= 30 (8 in, 22 out)**

Project Trip Assignment

The project trips were distributed onto the street network based on the volume counts conducted for this study, the project's location relative to population areas, and the regional transportation facilities such as I-5 and Route 44. The turning movement counts indicate that directional distributions are different for the weekday and weekend peak periods. During the weekday pm period, a higher percentage of trips are to/from the west, which is most likely due to the proximity of the Redding population base. Based on these factors, the proposed project trips were assigned in the weekday pm with 65% to/from the west and 35% to/from the east. For

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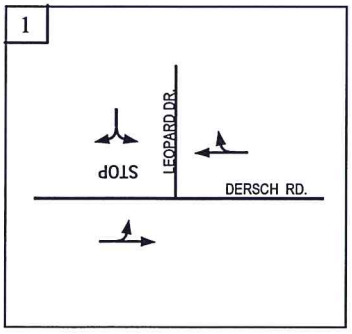
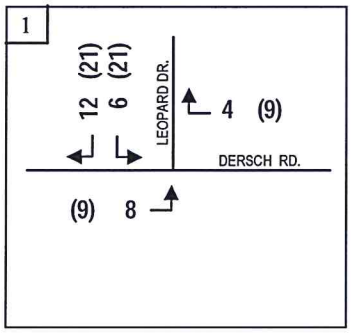
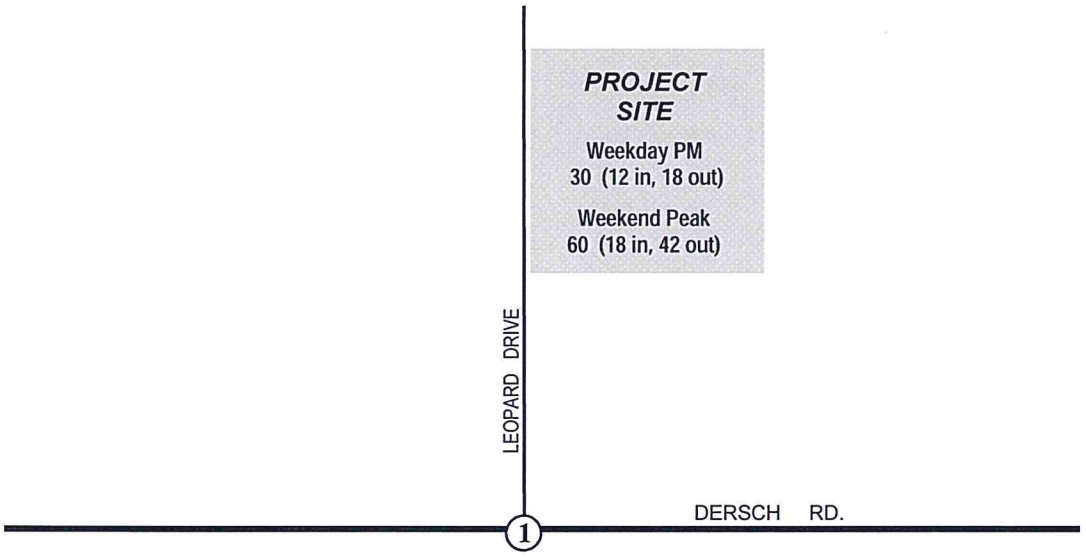


PROJECT TRIPS





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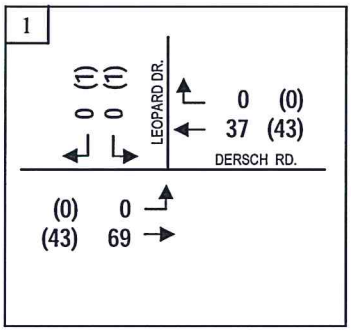
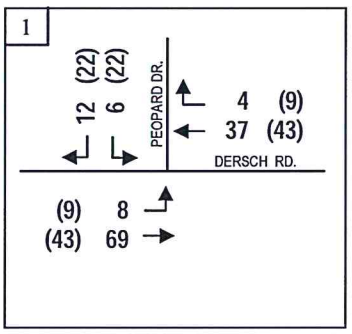
EXISTING WITHOUT PROJECT PEAK HOUR VOLUMES:



EXISTING PLUS PROJECT PEAK HOUR VOLUMES:



Existing And Existing Plus Project
Weekday P.M. and (Weekend) Peak Hour Volumes

Reference North

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figure 4

Cumulative Conditions

Cumulative Year 2035 Forecast Projections

Cumulative (Year 2035) volume projections on Dersch Road were derived from the Shasta County Regional Travel Demand Model (SCTDM) using the growth-increment method.[8] The increase in volumes from the model's base year to year 2035 on Dersch Road is 30 PM peak hour trips. This equates to a 28% increase, representing an annual increase of 1.4 % per year for twenty years above the existing count volumes. The annual percentage increase was applied to the existing count volumes on Dersch Road. It is unlikely Leopard Drive would experience growth equal to Dersch Road. However, to remain conservative, it was assumed each turning movement to/from Leopard Drive without the project would consist of five (5) peak hour trips. The cumulative volumes are shown in Figure 5 and the LOS are shown in Table 2.

Cumulative Without Project Operating Conditions

Intersection conditions at the Leopard Drive/Dersch Road intersection were evaluated based on the cumulative volumes. Under cumulative without project conditions, the Leopard Drive southbound approach would operate at LOS A (9.2 seconds delay or better) during the weekday and weekend peak hours. The eastbound Dersch Road approach would operate at LOS A (delays less than one second) during both peak hours.

Cumulative Plus Project Operating Conditions

The project trips were added to the cumulative volumes. The Leopard Drive southbound approach would operate at LOS A (9.7 seconds delay or better) during the weekday and weekend peak hours. The eastbound Dersch Road approach would operate at LOS A (1.6 seconds delay or better) during both peak hours. Conditions would remain acceptable with the project trips.

Vehicular Queuing Analysis

Under cumulative without project conditions, the southbound Leopard Drive approach to Dersch Road has a calculated 95th percentile queue length of approximately 31 feet (1-2 cars) during the weekday and Saturday peak hours. With the added project trips, calculated queues are 48-55 feet, representing a 1 car increase. This increase would be acceptable. Eastbound queues on Dersch Road resulting from left turns onto Leopard Drive would remain 1 vehicle or less with the addition of the project trips.

Turn Lane Warrants

The cumulative volumes without the project and with the project would remain below the Caltrans thresholds for installation of a left turn lane or a right turn lane on Dersch Road.

Signal Warrants

Peak hour signal warrants were applied to the cumulative without project and cumulative with project volumes. The intersection would not qualify for signalization under the peak hour criteria.

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[8] *Shasta Regional Transportation Agency, Shasta County Travel Demand Model, (ShastaSIM) adopted June 24, 2014..*

TABLE 2
INTERSECTION IMPACT SUMMARY

Leopard Drive / Dersch Road Control Type: MSSC Target LOS: C		WEEKDAY PM PEAK HOUR LOS	Delay	Pk. Hr. Signal Warrant	95th % Queue Length	WEEKEND PEAK HOUR LOS	Delay	Pk. Hr. Signal Warrant	95th % Queue Length
EXISTING	SB	A	0.0	No	OK (0')	A	8.8	No	OK (18')
	EB	A	0.0		OK (0')	A	0.0		OK (0')
EXISTING + PROJECT	SB	A	9.0	No	OK (41')	A	9.3	No	OK (49')
	EB	A	0.8		OK (0')	A	1.3		OK (3')
Increase Due To Project	SB		9.0				0.5		
	EB		0.8				1.3		
Significant Impact?				No				No	
CUMULATIVE NO PROJECT	SB	A	9.2	No	OK (33')	A	9.1	No	OK (33')
	EB	A	0.4		OK (3')	A	0.6		OK (0')
CUMULATIVE + PROJECT	SB	A	9.2	No	OK (44')	A	9.7	No	OK (53')
	EB	A	0.9		OK (11')	A	1.5		OK (5')
Increase Due To Project	SB		0.0				0.6		
	EB		0.5				0.9		
Significant Impact?				No				No	

Legend: MSSC = Minor Street Stop Control; LOS = Level of Service; Delay is listed in "seconds per vehicle"; Queue Length is listed in feet.

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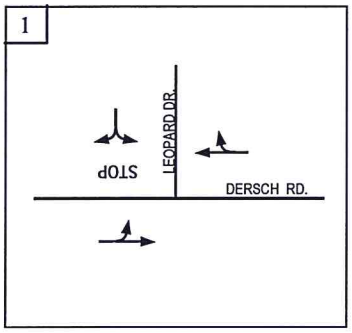
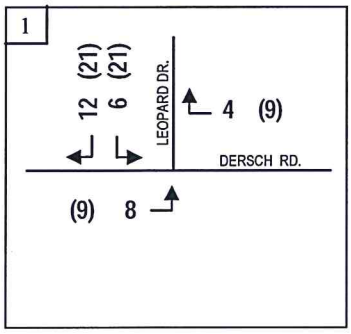
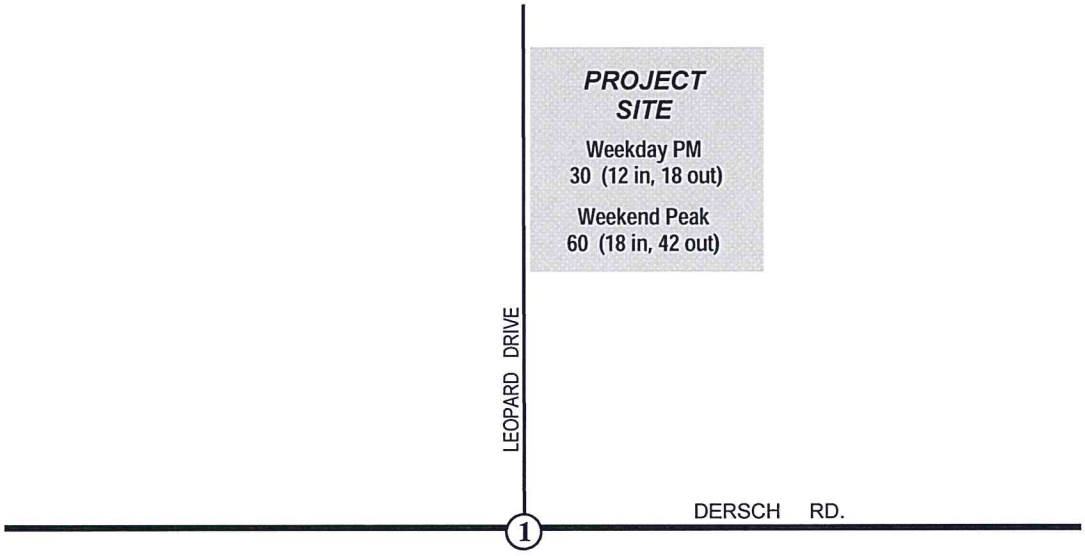


PROJECT TRIPS





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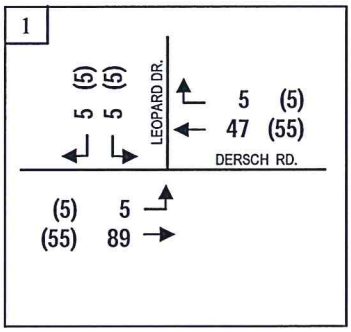
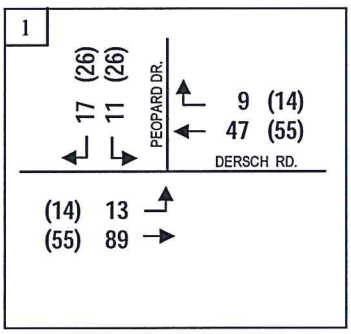
CUMULATIVE WITHOUT PROJECT PEAK HOUR VOLUMES:



CUMULATIVE PLUS PROJECT PEAK HOUR VOLUMES:



Cumulative and Cumulative Plus Project
Weekday P.M. and (Weekend) Peak Hour Volumes

Reference North

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figure 5

VEHICULAR SIGHT DISTANCE EVALUATION

Design Speed for Dersch Road at Leopard Drive

The design speed is a selected speed used to determine the various geometric design features of a roadway. The selected design speed should consider the operating speed (observed free-flow vehicle speeds), topography, adjacent land use and the functional classification of the roadway. For the purposes of the analysis, the following design speed was identified as appropriate:

- 60 MPH Design Speed (55 MPH Speed Limit): Dersch Road at intersection of Leopard Drive.

Sight Distance Standards

The guidelines set forth in *A Policy on Geometric Design of Highways & Streets, 2011 Sixth Edition, AASHTO,* are appropriate for the setting. The American Association of State Highway and Transportation Officials (AASHTO) is a national organization that conducts research and establishes guidelines related to transportation facilities. The *Policy* is the most widely recognized set of guidelines for local street design parameters.

Sight distance is the length of the roadway ahead that is visible to the driver. The available sight distance on a roadway should be sufficiently long to enable a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path.

There are two sight distance standards that were selected for this analysis:

Stopping Sight Distance (SSD). SSD is the sum of two distances; (1) the distance traversed by the vehicle from the instant that driver sights an object necessitating a stop to the instant the brakes are applied, and (2) the distance needed to stop the vehicle from the instant brake application begins. These are referred to as brake reaction distance and braking distance, respectively.

SSD assumes a driver's eye height of 3.5 feet above the road on the approaching vehicle and a 2.0 feet high object stopped in the roadway. The SSD value that will be used for the analysis is:

- 60 MPH Design Speed: 570 LF

The recommended stopping sight distance is based on passenger car operation and does not explicitly consider truck operations. Trucks as a whole, especially the larger and heavier trucks, need longer stopping distances for a given speed than passenger vehicles. However, there is one factor that offsets the additional braking lengths for trucks. The truck driver is able to see substantially farther beyond vertical sight obstructions because of the higher position of the driver's eye (usually in excess of 7.5 feet). Simply put, if there is adequate SSD for an automobile, there is adequate SSD for trucks.

Intersection Sight Distance (ISD). In addition to SSD, sight distance is also needed at the project intersection to allow drivers of vehicles waiting to pull out of a driveway a sufficient view of Dersch Road to decide when to pull out on to Dersch Road. ISD assumes a driver's eye height of 3.5 feet above the driveway and the approaching

vehicle to be seen is 3.5 feet above the roadway on Dersch Road. There are two cases that need to be considered; Left Turn from Leopard Drive and Right Turn from Leopard Drive. In both cases, the following standards apply:

- The vertex (decision point) of the vehicle in a driveway is 15 feet from the edge of traveled way for Leopard Drive. The time gap needed for this turning maneuver is 7.5 seconds for passenger vehicles.
- The ISD for the selected design speed is as follows:
  - 60 MPH Design Speed: 665 LF from decision point.

Dersch Road at Leopard Drive

The SSD was measured by Omni-Means at each observed obstruction in both the eastbound and westbound directions of the intersection. The SSD measurements are shown in Table 3.

Table 3
Dersch Road Sight Distances

Location	SSD Guideline	Measured SSD
Leopard Drive	570 LF	800 LF

Notes: Field measurements considered accurate to +/-10%.

Existing Leopard Drive

The ISD was measured 15 feet from the edge of traveled way for Leopard Drive and is presented in Table 4.

Table 4
Intersection Sight Distances – Leopard Drive

ISD Guideline	Measured ISD: Easterly of the driveway (Approaching from the west)	Measured ISD: Westerly of the driveway (Approaching from the east)	ISD Limiting Condition
665 LF	-	**120 LF**	Vegetation and Earth Banks
665 LF	**105 LF**	-	Vegetation and Earth Banks

Notes: (1) Field measurements considered accurate to +/-10%.
*(2) **Bold** = less than guideline.*

As noted in Table 4, the Intersection Sight Distances at the existing Leopard Drive intersection do not meet AASHTO guidelines. Both the easterly and westerly approach ISD are restricted by the existing vegetation and earth banks.

Intersection Sight Distance Related Mitigation Measures

CEQA standards are not available to identify at what point sight distance issues are significant. Since project's are required to mitigate their significant impacts, traffic engineering judgment is required to identify at what point mitigation is required and to what extent.

To mitigate the project's impacts, it is recommended that the intersection sight distance restrictions that are created by vegetation and earth banks be modified so that the AASHTO guideline values can be achieved. It is recommended that both banks are excavated along the existing Leopard Drive and Dersch Road returns, and that vegetation is controlled at both returns. Improvements to Leopard Drive, including asphalt pavement and shoulder backing, may provide the guideline sight distance, but additional grading and clearing may be required to fully achieve the necessary sight distance. Fixing these restrictions will allow for an extended line of sight well beyond the current ISD conditions at this intersection and will provide sufficient distance to meet the AASHTO guidelines.

APPENDIX

High Plains Shooting Sports Center TIA

Surveyed Trip Rates of Existing Gun Ranges

Level of Service Definitions

LOS Calculation Worksheets

Vehicle Queuing Worksheets

Turn Lane Warrant Worksheets

Signal Warrant Worksheets

SURVEYED TRIP RATES OF EXISTING GUN RANGES

Tehama and Shasta Counties		Surveyed Trips Weekday	Saturday	Sunday
Shasta County Peace Officer Association Record Range	Peak Hour Volume:	3 (1 in, 2 out)	4 (2 in, 2 out)	3 (2 in, 1 out)
	Time of Day:	4:15 - 5:15 pm	11:00 am - 12:00 pm	12:00 - 1:00 pm
200 linear feet of shooting positions.	**Peak Hour Trips per Linear Foot:**	**0.02**	**0.02**	**0.02**
	Total Survey Volume:	3 (1 in, 2 out)	7 (3 in, 4 out)	5 (3 in, 2 out)
	Time of Day:	4:00 - 6:00 pm	11:00 am - 2:00 pm	11:00 am - 2:00 pm
	Average Hourly Trips per Linear Foot:	0.01	0.01	0.01
Redding Gun Club	Peak Hour Volume:	4 (2 in, 2 out)	17 (3 in, 14 out)	7 (0 in, 7 out)
	Time of Day:	4:00 - 5:00 pm	12:30 - 1:30 pm	1:00 - 2:00 pm
575 linear feet of shooting positions.	**Peak Hour Trips per Linear Foot:**	**0.01**	**0.03**	**0.01**
	Total Survey Volume:	8 (3 in, 5 out)	37 (13 in, 24 out)	12 (1 in, 11 out)
	Time of Day:	4:00 - 6:00 pm	11:00 am - 2:00 pm	11:00 am - 2:00 pm
	Average Hourly Trips per Linear Foot:	0.01	0.02	0.01
	Notes:		U.S.P.S.A. Match	Hours 9am - 3pm
Hat Creek Rifle & Pistol Club	Peak Hour Volume:	5 (2 in, 3 out)*	11 (3 in, 8 out)	No count: club says
	Time of Day:	4:00 - 5:00 pm	11:30 am - 12:30 pm	lower than Saturday.
285 linear feet of shooting positions.	**Peak Hour Trips per Linear Foot:**	**0.02**	**0.04**	**n.a.**
	Total Survey Volume:	*Based on ratio of	17 (4 in, 13 out)	No count: club says
	Time of Day:	wkday. to wkend.	11:00 am - 1:00 pm	lower than Saturday.
	Average Hourly Trips per Linear Foot:	peak hours.	0.03	n.a.
Tehama Shooters Association Gun Range	Peak Hour Volume:	8 (4 in, 4 out)*	16 (5 in, 11 out)	No count: club says
	Time of Day:	4:00 - 5:00 pm	11:30 am - 12:30 pm	lower than Saturday.
405 linear feet of shooting positions.	**Peak Hour Trips per Linear Foot:**	**0.02**	**0.04**	**n.a.**
	Total Survey Volume:	*Based on ratio of	24 (6 in, 18 out)	No count: club says
	Time of Day:	wkday. to wkend.	11:00 am - 1:00 pm	lower than Saturday.
	Average Hourly Trips per Linear Foot:	peak hours.	0.03	n.a.
	Notes:		Rifle & handgun competition.	
Average Peak Hour Trips Per Linear Foot:		**0.02 trips per l.f.** (40% in, 60% out)	**0.03 trips per l.f.** (30% in, 70% out)	**0.02 trips per l.f.** 30% in, 70% out)
Highest Peak Hour Trips Per Linear Foot:		**0.02 trips per l.f.** (40% in, 60% out)	**0.04 trips per l.f.** (30% in, 70% out)	**0.02 trips per l.f.** 30% in, 70% out)

PROPOSED PROJECT (HIGH PLAINS SHOOTING CENTER) TRIP GENERATION		Calculated Trips Weekday	Saturday	Sunday
1,500 linear feet of shooting positiions.	Peak Hour Trip Rate:	0.02 trips per l.f.	0.04 trips per l.f.	0.02 trips per l.f.
	Peak Hour Volume:	**= 30 (12 in, 18 out)**	**= 60 (18 in, 42 out)**	**= 30 (8 in, 22 out)**
		Based on highest observed trip rates to remain conservative.		

SURVEYED TRIP RATES OF EXISTING GUN RANGES

Sacramento County		Surveyed Trips Weekday	Saturday	Sunday
Sacramento Valley Shooting Center	Peak Hour Volume:	29 (0 in, 29 out)	68 (16 in, 52 out)	64 (17 in, 47 out)
	Time of Day:	4:00 - 5:00 pm	11:45 am - 12:45 pm	12:15 - 1:15 pm
470 linear feet of shooting positions	**Peak Hour Trips per Linear Foot:**	**0.06**	**0.14**	**0.14**
	Total Survey Volume:	29 (0 in, 29 out)	174 (49 in, 125 out)	165 (58 in, 107 out)
	Time of Day:	4:00 - 5:00 pm	11:00 am - 2:00 pm	11:00 am - 2:00 pm
	Average Hourly Trips per Linear Foot:	0.06	0.12	0.12

LEVEL-OF-SERVICE CRITERIA FOR INTERSECTIONS

Level of Service	Type of Flow	Delay	Maneuverability	Control Delay (seconds/vehicle)		
				Signalized	Unsignalized	All-Way Stop
A	Stable Flow	Very slight delay. Progression is very favorable, with most vehicles arriving during the green phase not stopping at all.	Turning movements are easily made, and nearly all drivers find freedom of operation.	≤ 10.0 secs. ≤ 0.60 v/c	≤ 10.0	≤ 10.0
B	Stable Flow	Good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.	Vehicle platoons are formed. Many drivers begin to feel somewhat restricted within groups of vehicles.	>10 and ≤ 20.0 secs. 0.61 – 0.70 v/c	>10 and ≤ 15.0	>10 and ≤ 15.0
C	Stable Flow	Higher delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, although many still pass through the intersection without stopping.	Back-ups may develop behind turning vehicles. Most drivers feel somewhat restricted	>20 and ≤ 35.0 secs. 0.71 – 0.80 v/c	>15 and ≤ 25.0	>15 and ≤ 25.0
D	Approaching Unstable Flow	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity ratios. Many vehicles stop, and the proportion of vehicles of stopping declines. Individual cycle failures are noticeable.	Maneuverability is severely limited during short periods due to temporary back-ups.	>35 and ≤ 55.0 secs. 0.81 – 0.90 v/c	>25 and ≤ 35.0	>25 and ≤ 35.0
E	Unstable Flow	Generally considered to be the limit of acceptable delay. Indicative of poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences.	There are typically long queues of vehicles waiting upstream of the intersection.	>55 and ≤ 80.0 secs. 0.91 – 1.00 v/c	>35 and ≤ 50.0	>35 and ≤ 50.0
F	Forced Flow	Generally considered to be unacceptable to most drivers. Often occurs with over saturation. May also occur at high volume-to-capacity ratios. There are many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors.	Jammed conditions. Back-ups from other locations restrict or prevent movement. Volumes may vary widely, depending principally on the downstream back-up conditions.	> 80.0 secs. > 1.00 v/c	> 50.0	> 50.0

Reference: Transportation Research Board, Highway Capacity Manual 2010.

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	69	37	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade, %		0%	0%		0%	
Peak Hour Factor	0.78	0.78	0.66	0.66	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	88	56	0	0	0
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow All	56	0	-	0	144	56
Stage 1	-	-	-	-	56	-
Stage 2	-	-	-	-	88	-
Follow-up Headway	2.218	-	-	-	3.518	3.318
Pot Capacity-1 Maneuver	1549	-	-	-	849	1011
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	935	-
Time blocked-Platoon, %	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1549	-	-	-	849	1011
Mov Capacity-2 Maneuver	-	-	-	-	849	-
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	935	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS	-	-	A

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Cap, veh/h	1549	-	-	-	0
HCM Control Delay, s	0	-	-	-	0
HCM Lane V/C Ratio	-	-	-	-	-
HCM Lane LOS	A	-	-	-	A
HCM 95th-tile Q, veh	0.0	-	-	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	43	43	0	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade, %		0%	0%		0%	
Peak Hour Factor	0.67	0.67	0.90	0.90	0.50	0.50
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	64	48	0	2	2
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow All	48	0	-	0	112	48
Stage 1	-	-	-	-	48	-
Stage 2	-	-	-	-	64	-
Follow-up Headway	2.218	-	-	-	3.518	3.318
Pot Capacity-1 Maneuver	1559	-	-	-	885	1021
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	959	-
Time blocked-Platoon, %	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1559	-	-	-	885	1021
Mov Capacity-2 Maneuver	-	-	-	-	885	-
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	959	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS	-	-	A

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Cap, veh/h	1559	-	-	-	948
HCM Control Delay, s	0	-	-	-	8.8
HCM Lane V/C Ratio	-	-	-	-	0.00
HCM Lane LOS	A	-	-	-	A
HCM 95th-tile Q, veh	0.0	-	-	-	0.0

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	8	69	37	4	6	12
Conflicting Peds, #/hr	3	0	0	3	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade, %		0%	0%		0%	
Peak Hour Factor	0.78	0.78	0.66	0.66	0.50	0.50
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	88	56	6	12	24
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow All	62	0	-	0	168	62
Stage 1	-	-	-	-	59	-
Stage 2	-	-	-	-	109	-
Follow-up Headway	2.218	-	-	-	3.518	3.318
Pot Capacity-1 Maneuver	1541	-	-	-	822	1003
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	916	-
Time blocked-Platoon, %	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1537	-	-	-	816	1000
Mov Capacity-2 Maneuver	-	-	-	-	816	-
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	910	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	9
HCM LOS	-	-	A

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Cap, veh/h	1537	-	-	-	930
HCM Control Delay, s	7.358	0	-	-	9
HCM Lane V/C Ratio	0.01	-	-	-	0.04
HCM Lane LOS	A	A	-	-	A
HCM 95th-tile Q, veh	0.0	-	-	-	0.1

Notes

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Intersection	
Intersection Delay, s/veh	4.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	9	43	43	9	22	22
Conflicting Peds, #/hr	3	0	0	3	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade, %		0%	0%		0%	
Peak Hour Factor	0.67	0.67	0.90	0.90	0.50	0.50
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	64	48	10	44	44
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow All	58	0	-	0	144	56
Stage 1	-	-	-	-	53	-
Stage 2	-	-	-	-	91	-
Follow-up Headway	2.218	-	-	-	3.518	3.318
Pot Capacity-1 Maneuver	1546	-	-	-	849	1011
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	933	-
Time blocked-Platoon, %	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1542	-	-	-	841	1008
Mov Capacity-2 Maneuver	-	-	-	-	841	-
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	925	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	9.3
HCM LOS	-	-	A

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Cap, veh/h	1542	-	-	-	917
HCM Control Delay, s	7.355	0	-	-	9.3
HCM Lane V/C Ratio	0.01	-	-	-	0.10
HCM Lane LOS	A	A	-	-	A
HCM 95th-tile Q, veh	0.0	-	-	-	0.3

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	5	89	47	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade, %		0%	0%		0%	
Peak Hour Factor	0.78	0.78	0.66	0.66	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	114	71	8	5	5
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow All	79	0	-	0	202	75
Stage 1	-	-	-	-	75	-
Stage 2	-	-	-	-	127	-
Follow-up Headway	2.218	-	-	-	3.518	3.318
Pot Capacity-1 Maneuver	1519	-	-	-	787	986
Stage 1	-	-	-	-	948	-
Stage 2	-	-	-	-	899	-
Time blocked-Platoon, %	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1519	-	-	-	784	986
Mov Capacity-2 Maneuver	-	-	-	-	784	-
Stage 1	-	-	-	-	948	-
Stage 2	-	-	-	-	895	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	9.2
HCM LOS	-	-	A

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Cap, veh/h	1519	-	-	-	873
HCM Control Delay, s	7.38	0	-	-	9.2
HCM Lane V/C Ratio	0.00	-	-	-	0.01
HCM Lane LOS	A	A	-	-	A
HCM 95th-tile Q, veh	0.0	-	-	-	0.0

Notes

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Intersection	
Intersection Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	5	55	55	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade, %		0%	0%		0%	
Peak Hour Factor	0.67	0.67	0.90	0.90	0.50	0.50
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	82	61	6	10	10
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow All	67	0	-	0	161	64
Stage 1	-	-	-	-	64	-
Stage 2	-	-	-	-	97	-
Follow-up Headway	2.218	-	-	-	3.518	3.318
Pot Capacity-1 Maneuver	1535	-	-	-	830	1000
Stage 1	-	-	-	-	959	-
Stage 2	-	-	-	-	927	-
Time blocked-Platoon, %	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1535	-	-	-	826	1000
Mov Capacity-2 Maneuver	-	-	-	-	826	-
Stage 1	-	-	-	-	959	-
Stage 2	-	-	-	-	922	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	9.1
HCM LOS	-	-	A

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Cap, veh/h	1535	-	-	-	905
HCM Control Delay, s	7.357	0	-	-	9.1
HCM Lane V/C Ratio	0.01	-	-	-	0.02
HCM Lane LOS	A	A	-	-	A
HCM 95th-tile Q, veh	0.0	-	-	-	0.1

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	13	89	47	9	11	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade, %		0%	0%		0%	
Peak Hour Factor	0.78	0.78	0.66	0.66	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	114	71	14	11	17
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow All	85	0	-	0	225	78
Stage 1	-	-	-	-	78	-
Stage 2	-	-	-	-	147	-
Follow-up Headway	2.218	-	-	-	3.518	3.318
Pot Capacity-1 Maneuver	1512	-	-	-	763	983
Stage 1	-	-	-	-	945	-
Stage 2	-	-	-	-	880	-
Time blocked-Platoon, %	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1512	-	-	-	754	983
Mov Capacity-2 Maneuver	-	-	-	-	754	-
Stage 1	-	-	-	-	945	-
Stage 2	-	-	-	-	869	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	9.2
HCM LOS	-	-	A

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Cap, veh/h	1512	-	-	-	878
HCM Control Delay, s	7.407	0	-	-	9.2
HCM Lane V/C Ratio	0.01	-	-	-	0.03
HCM Lane LOS	A	A	-	-	A
HCM 95th-tile Q, veh	0.0	-	-	-	0.1

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	4.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	14	55	55	14	26	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade, %		0%	0%		0%	
Peak Hour Factor	0.67	0.67	0.90	0.90	0.50	0.50
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	82	61	16	52	52
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow All	77	0	-	0	193	69
Stage 1	-	-	-	-	69	-
Stage 2	-	-	-	-	124	-
Follow-up Headway	2.218	-	-	-	3.518	3.318
Pot Capacity-1 Maneuver	1522	-	-	-	796	994
Stage 1	-	-	-	-	954	-
Stage 2	-	-	-	-	902	-
Time blocked-Platoon, %	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1522	-	-	-	785	994
Mov Capacity-2 Maneuver	-	-	-	-	785	-
Stage 1	-	-	-	-	954	-
Stage 2	-	-	-	-	889	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	9.7
HCM LOS	-	-	A

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Cap, veh/h	1522	-	-	-	877
HCM Control Delay, s	7.398	0	-	-	9.7
HCM Lane V/C Ratio	0.01	-	-	-	0.12
HCM Lane LOS	A	A	-	-	A
HCM 95th-tile Q, veh	0.0	-	-	-	0.4

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection: 1: Dersch Road & Leopard Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 1: Dersch Road & Leopard Drive

Movement	SB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	3
95th Queue (ft)	18
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 1: Dersch Road & Leopard Drive

Movement	SB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	16
95th Queue (ft)	41
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 1: Dersch Road & Leopard Drive

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	4	50
Average Queue (ft)	0	26
95th Queue (ft)	3	49
Link Distance (ft)	4732	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 1: Dersch Road & Leopard Drive

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	5	31
Average Queue (ft)	0	10
95th Queue (ft)	3	33
Link Distance (ft)	4732	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 1: Dersch Road & Leopard Drive

Movement	SB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	10
95th Queue (ft)	33
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

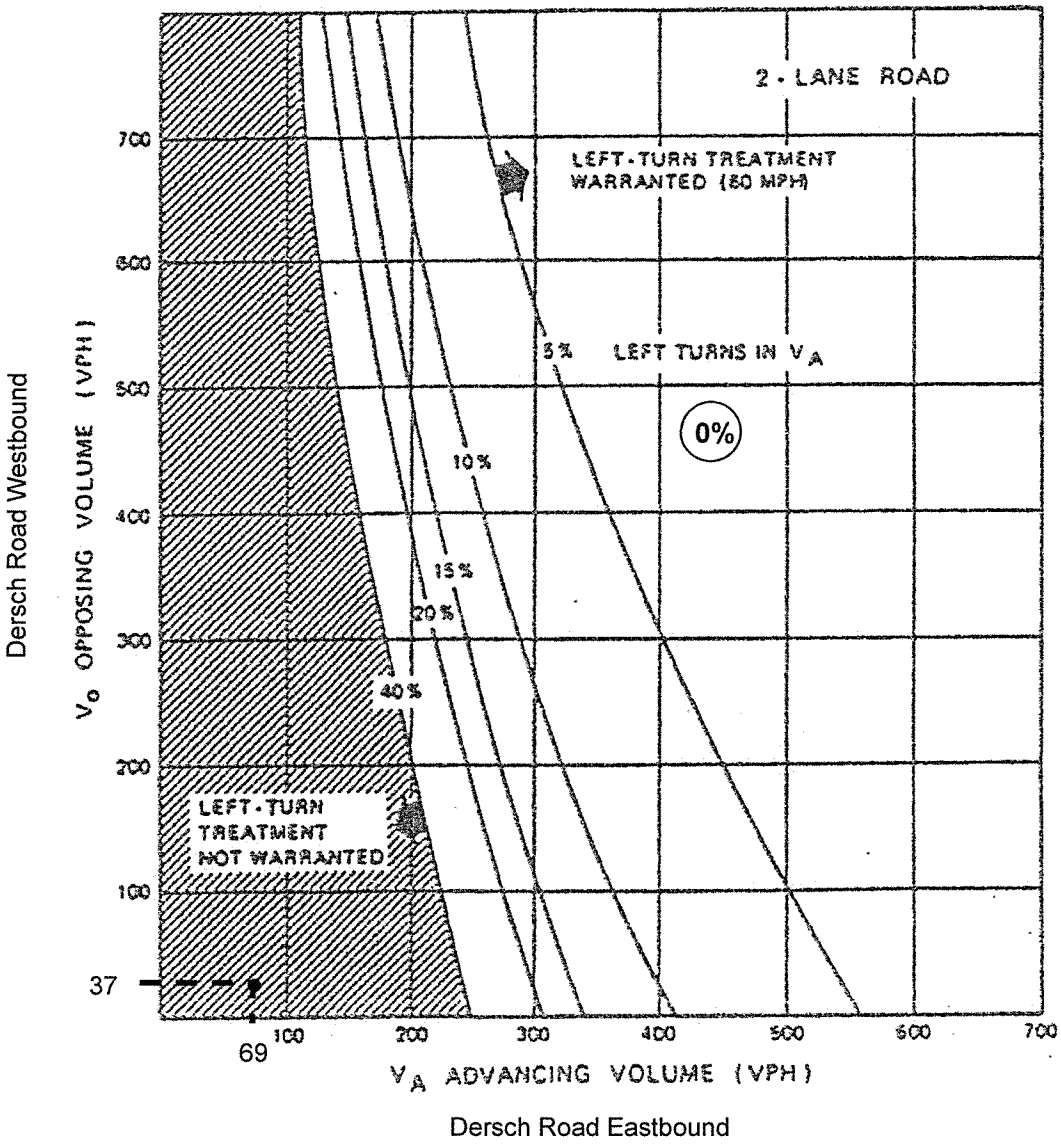
Intersection: 1: Dersch Road & Leopard Drive

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	24	40
Average Queue (ft)	1	18
95th Queue (ft)	11	44
Link Distance (ft)	4732	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 1: Dersch Road & Leopard Drive

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	10	62
Average Queue (ft)	0	29
95th Queue (ft)	5	53
Link Distance (ft)	4732	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

LEFT TURN LANE WARRANTS



High Plains Shooting Range Project

Dersch Road / Leopard Drive Intersection

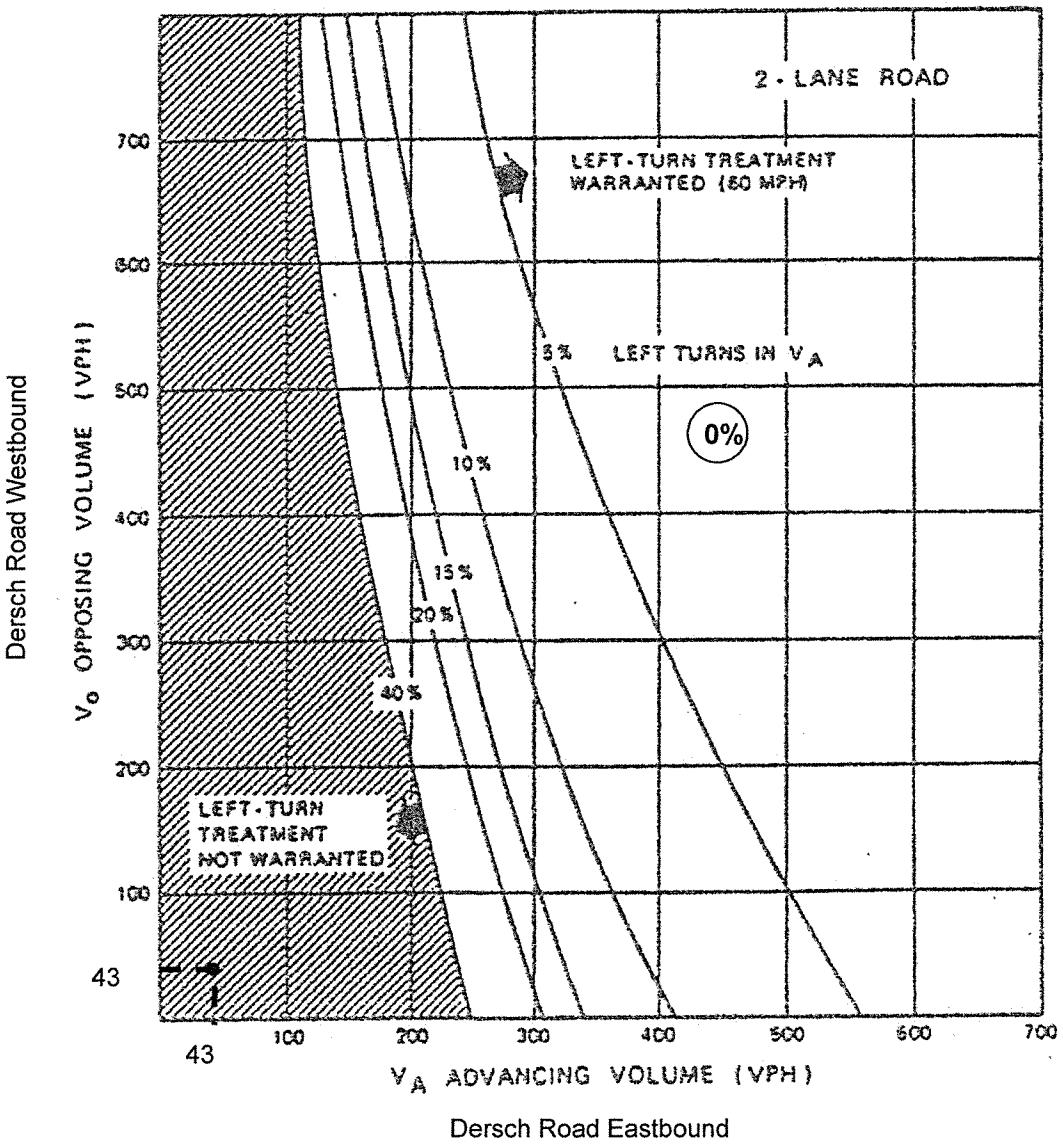
EXISTING WEEKDAY PM PEAK HOUR

V_A = 69 L.T. % = 0/69 = 0% V_o = 37

LEFT TURN LANE NOT WARRANTED

Caltrans, "Guidelines for Reconstruction of Intersections", August 1985.
Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

LEFT TURN LANE WARRANTS



High Plains Shooting Range Project

Dersch Road / Leopard Drive Intersection

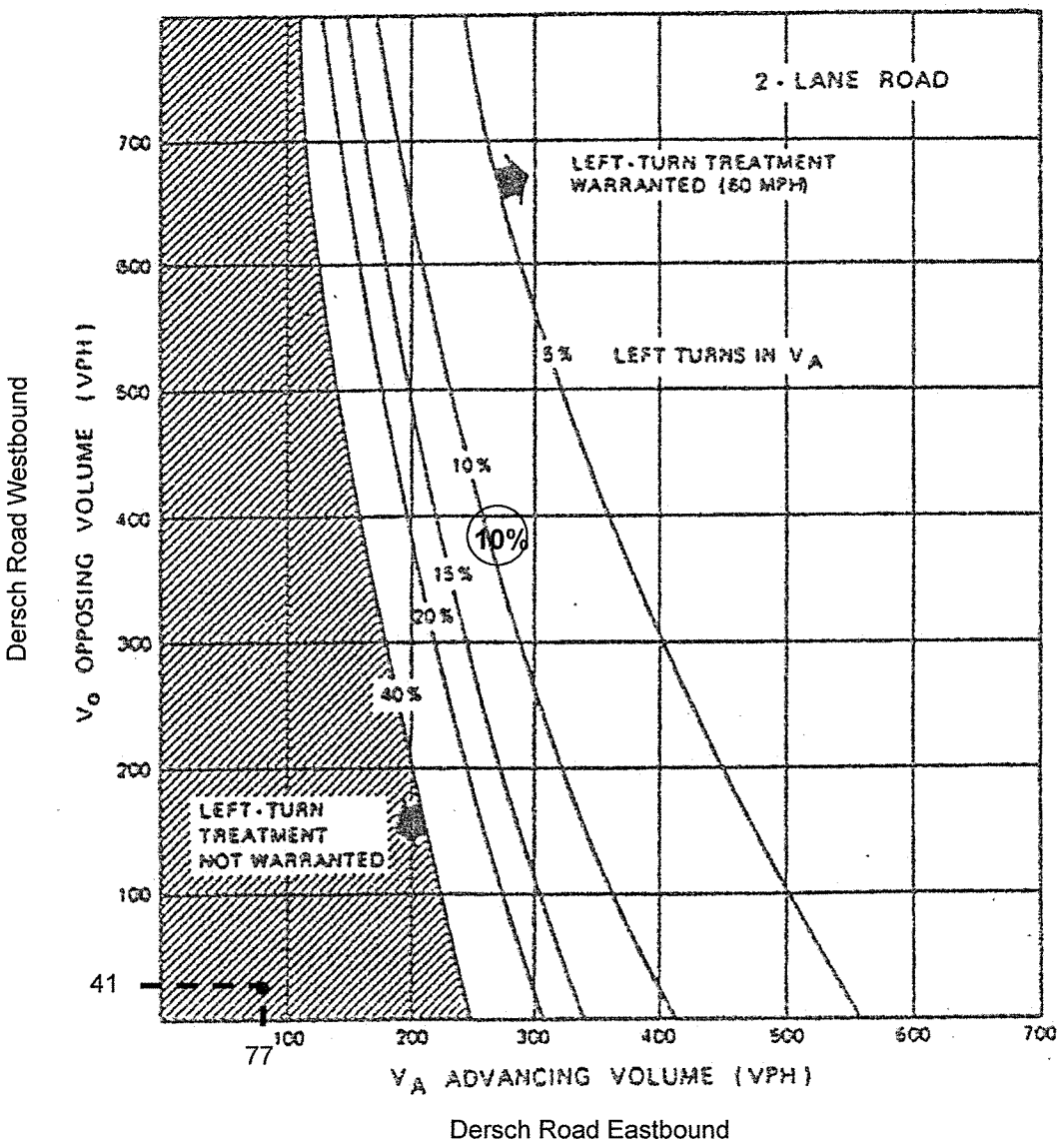
EXISTING WEEKEND PEAK HOUR

V_A = 43 L.T. % = 0/43 = 0% V_o = 43

LEFT TURN LANE NOT WARRANTED

Caltrans, "Guidelines for Reconstruction of Intersections", August 1985.
Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

LEFT TURN LANE WARRANTS



High Plains Shooting Range Project

Dersch Road / Leopard Drive Intersection

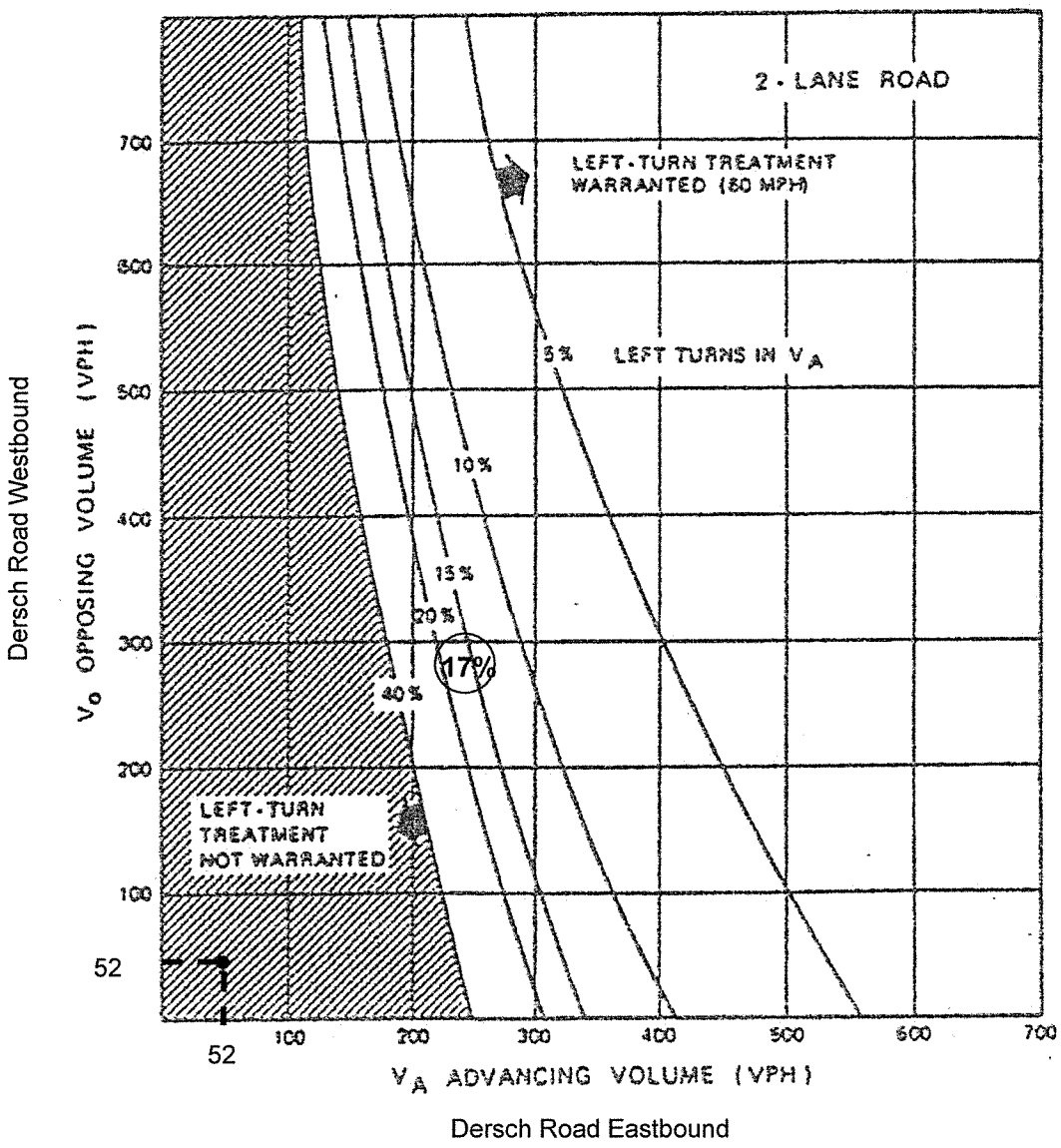
EXISTING + PROJECT WEEKDAY PM PEAK HOUR

V_A = 77 L.T. % = 8/77 = 10% V_o = 41

LEFT TURN LANE NOT WARRANTED

Caltrans, "Guidelines for Reconstruction of Intersections", August 1985.
Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

LEFT TURN LANE WARRANTS



High Plains Shooting Range Project

Dersch Road / Leopard Drive Intersection

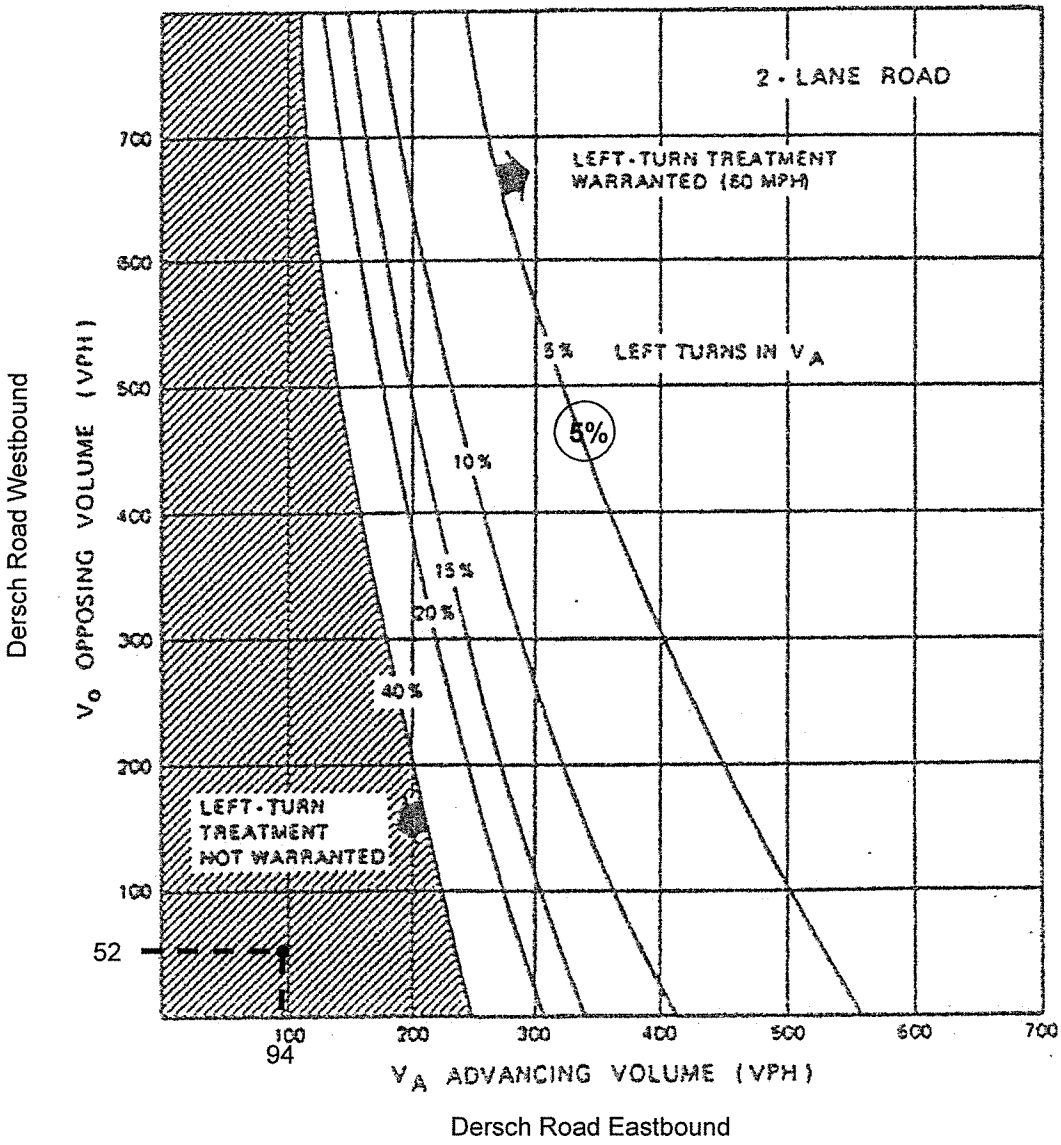
EXISTING + PROJECT WEEKEND PEAK HOUR

V_A = 52 L.T. % = 9/52 = 17% V_o = 52

LEFT TURN LANE NOT WARRANTED

Caltrans, "Guidelines for Reconstruction of Intersections", August 1985.
Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

LEFT TURN LANE WARRANTS



High Plains Shooting Range Project

Dersch Road / Leopard Drive Intersection

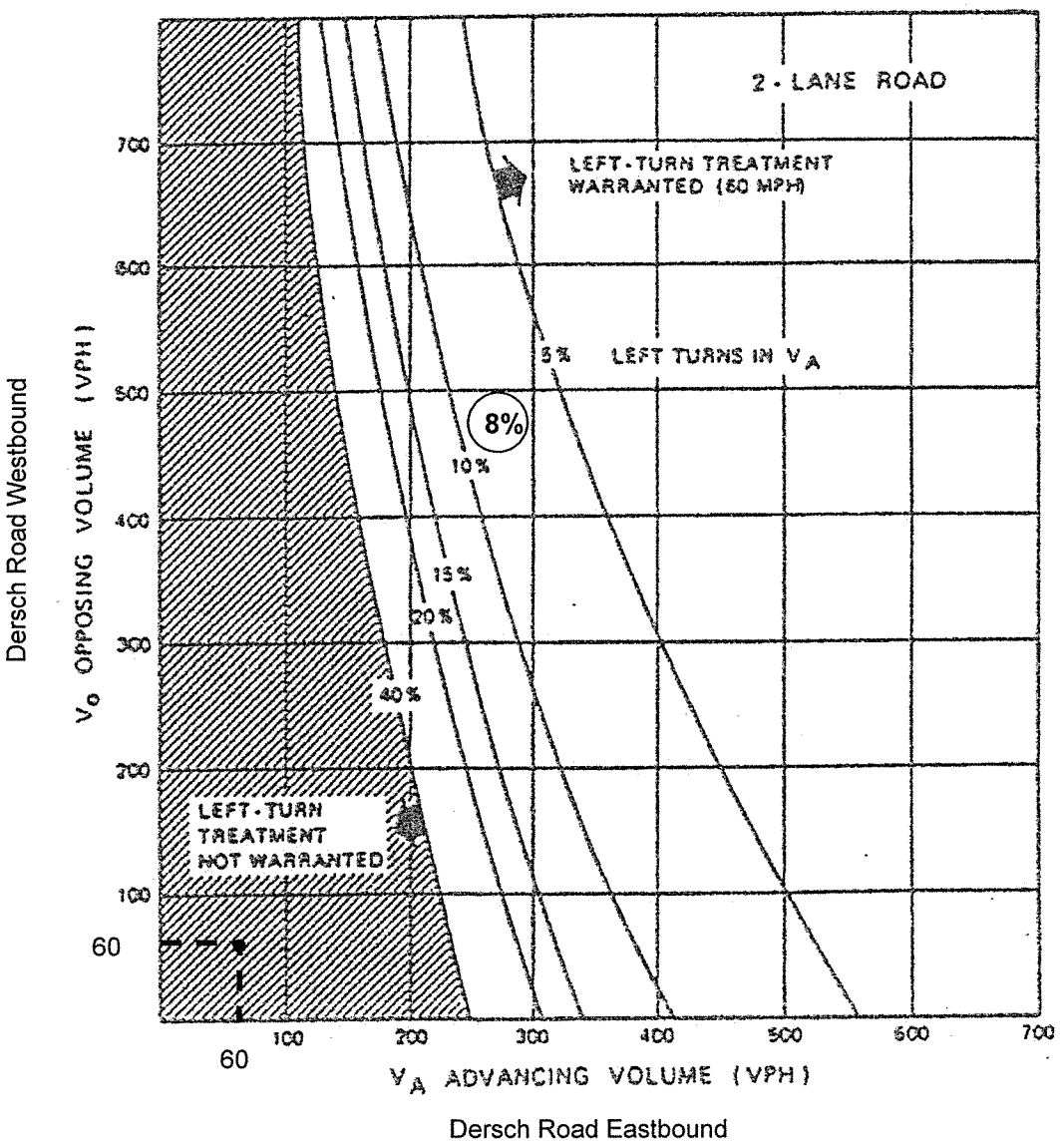
CUMULATIVE YEAR 2035 WEEKDAY PM PEAK HOUR

V_A = 94 L.T. % = 5/94 = 5% V_o = 52

LEFT TURN LANE NOT WARRANTED

Caltrans, "Guidelines for Reconstruction of Intersections", August 1985.
Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

LEFT TURN LANE WARRANTS



High Plains Shooting Range Project

Dersch Road / Leopard Drive Intersection

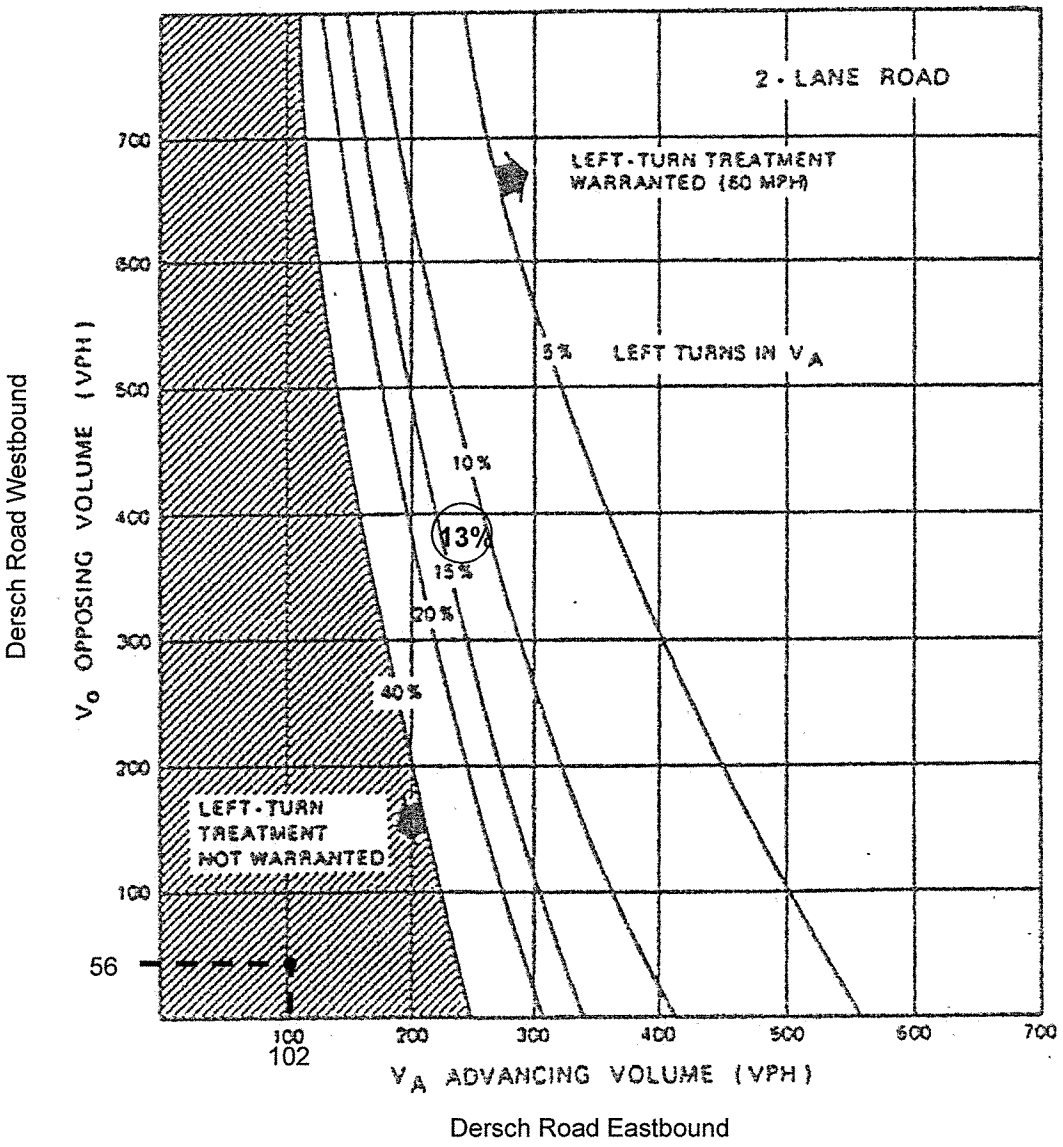
CUMULATIVE YEAR 2035 WEEKEND PEAK HOUR

V_A = 60 L.T. % = 5/55 = 8% V_o = 60

LEFT TURN LANE NOT WARRANTED

Caltrans, "Guidelines for Reconstruction of Intersections", August 1985.
Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

LEFT TURN LANE WARRANTS



High Plains Shooting Range Project

Dersch Road / Leopard Drive Intersection

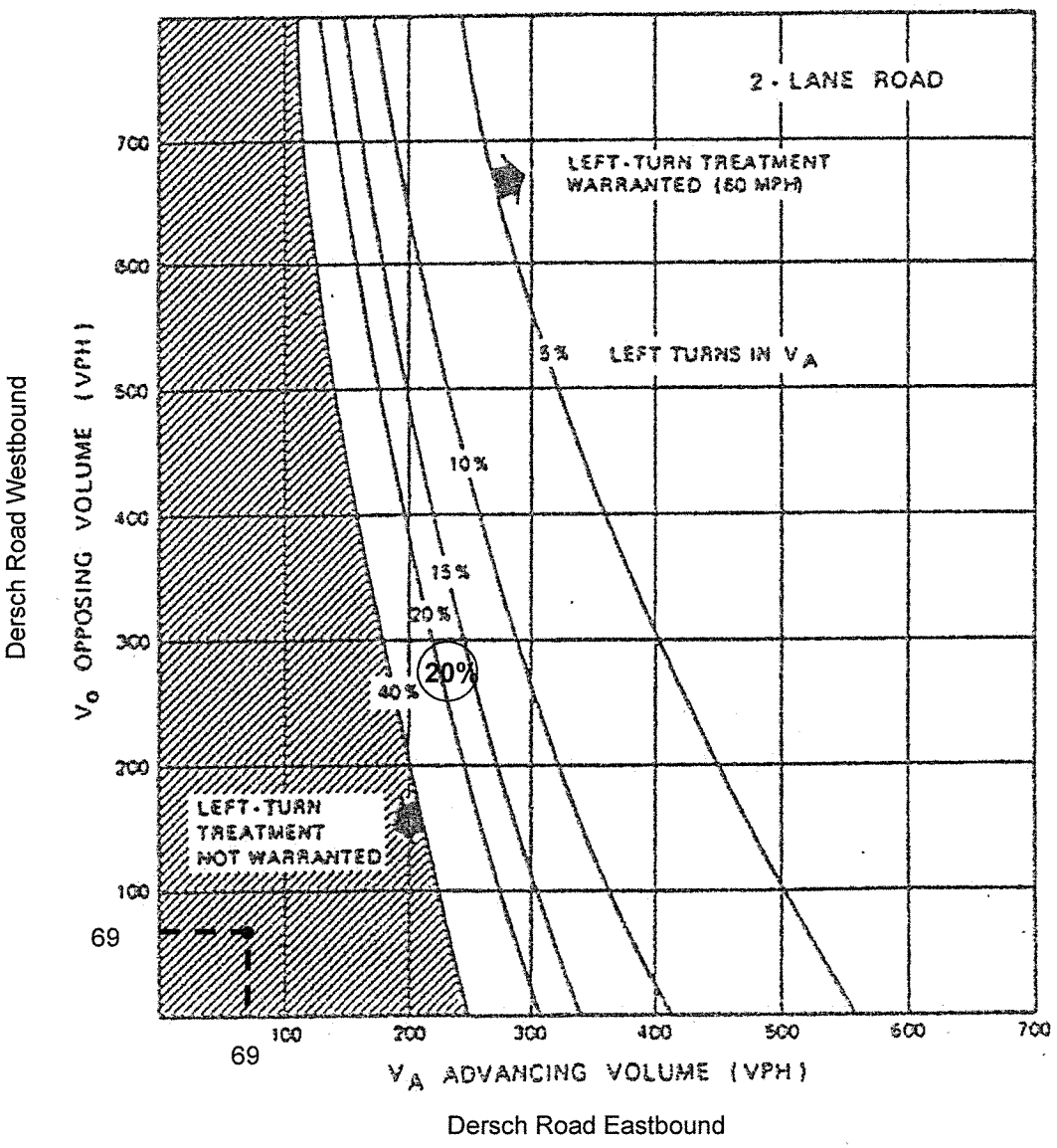
CUMULATIVE YEAR 2035 + PROJECT WEEKDAY PM PEAK HOUR

V_A = 102 L.T. % = 13/102 = 13% V_o = 56

LEFT TURN LANE NOT WARRANTED

Caltrans, "Guidelines for Reconstruction of Intersections", August 1985.
Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

LEFT TURN LANE WARRANTS



High Plains Shooting Range Project

Dersch Road / Leopard Drive Intersection

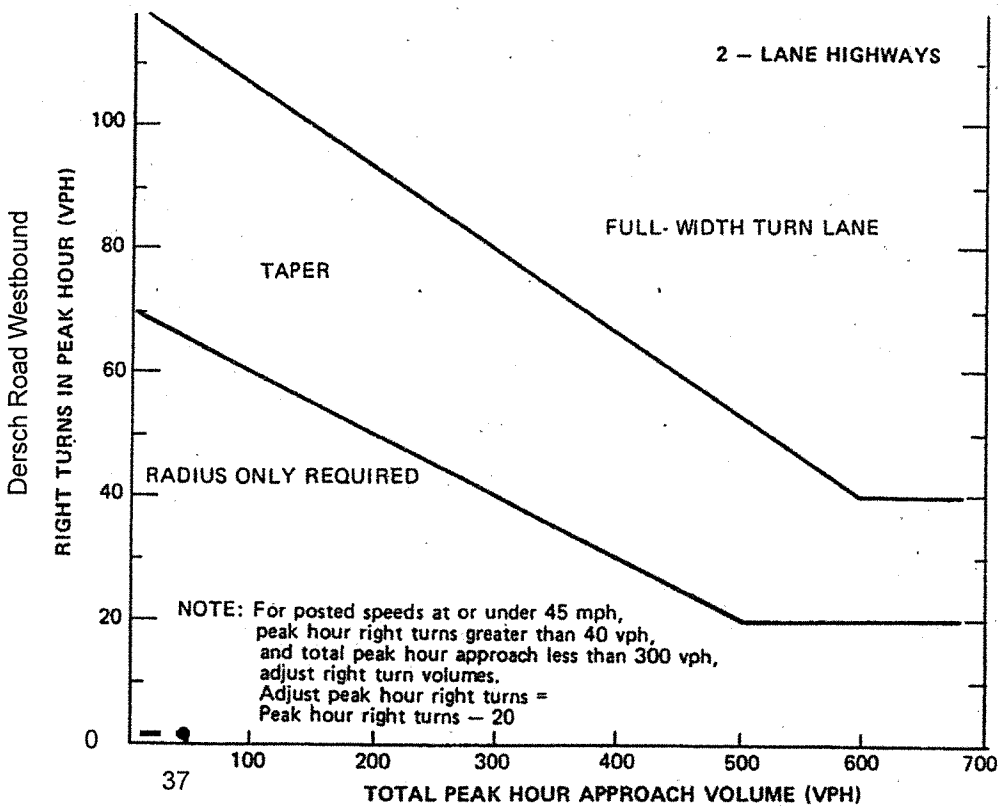
CUMULATIVE YEAR 2035 + PROJECT WEEKEND PEAK HOUR

V_A = 69 L.T. % = 14/69 = 20% V_o = 69

LEFT TURN LANE NOT WARRANTED

Caltrans, "Guidelines for Reconstruction of Intersections", August 1985.
Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

RIGHT TURN LANE WARRANTS



Dersch Road Westbound

High Plains Shooting Range Project

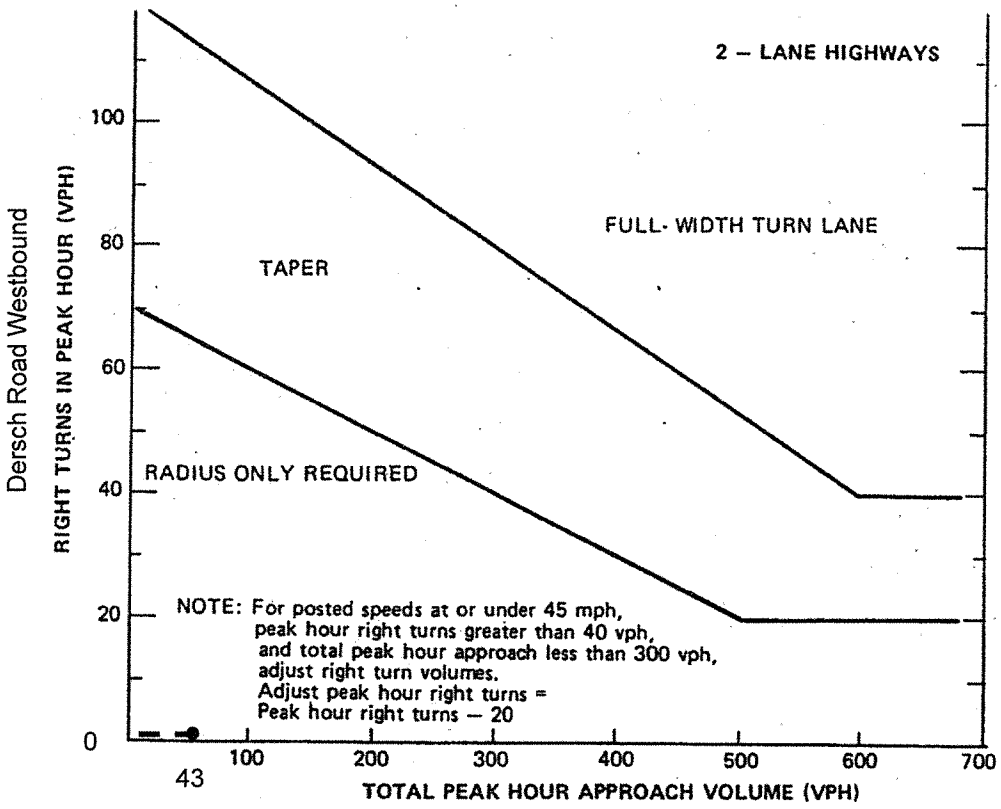
Dersch Road / Leopard Drive Intersection

EXISTING WEEKDAY PM PEAK HOUR

RIGHT TURN LANE NOT WARRANTED

Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

RIGHT TURN LANE WARRANTS



43

Dersch Road Westbound

High Plains Shooting Range Project

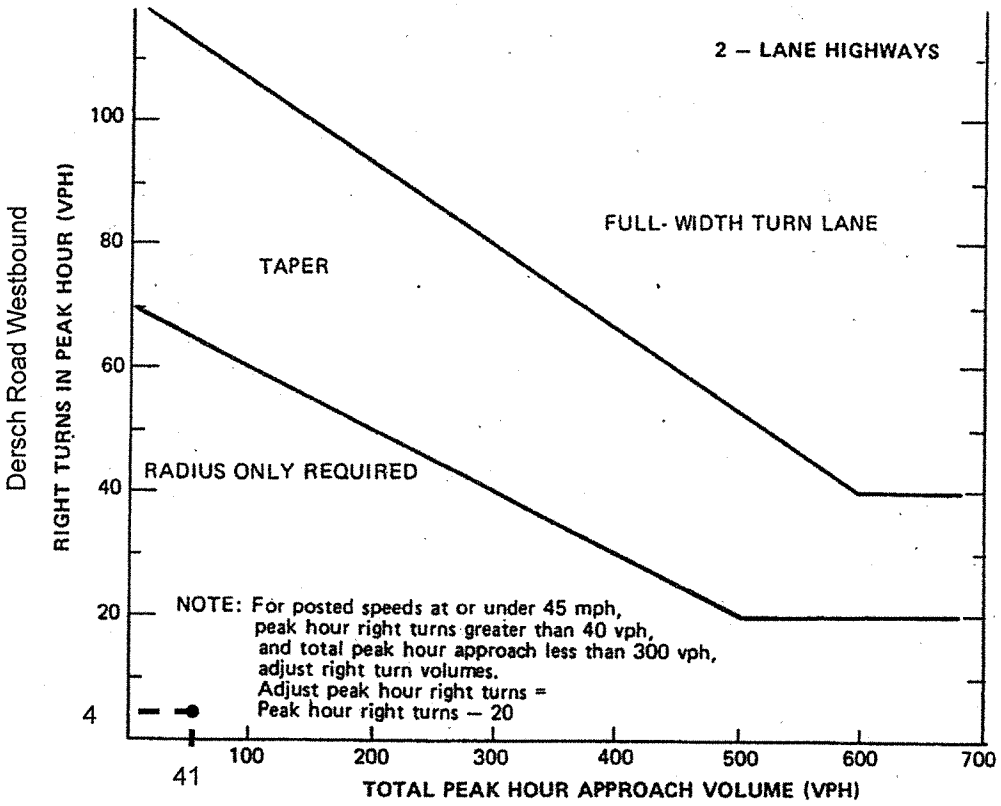
Dersch Road / Leopard Drive Intersection

EXISTING WEEKEND PEAK HOUR

RIGHT TURN LANE NOT WARRANTED

Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

RIGHT TURN LANE WARRANTS



Dersch Road Westbound

High Plains Shooting Range Project

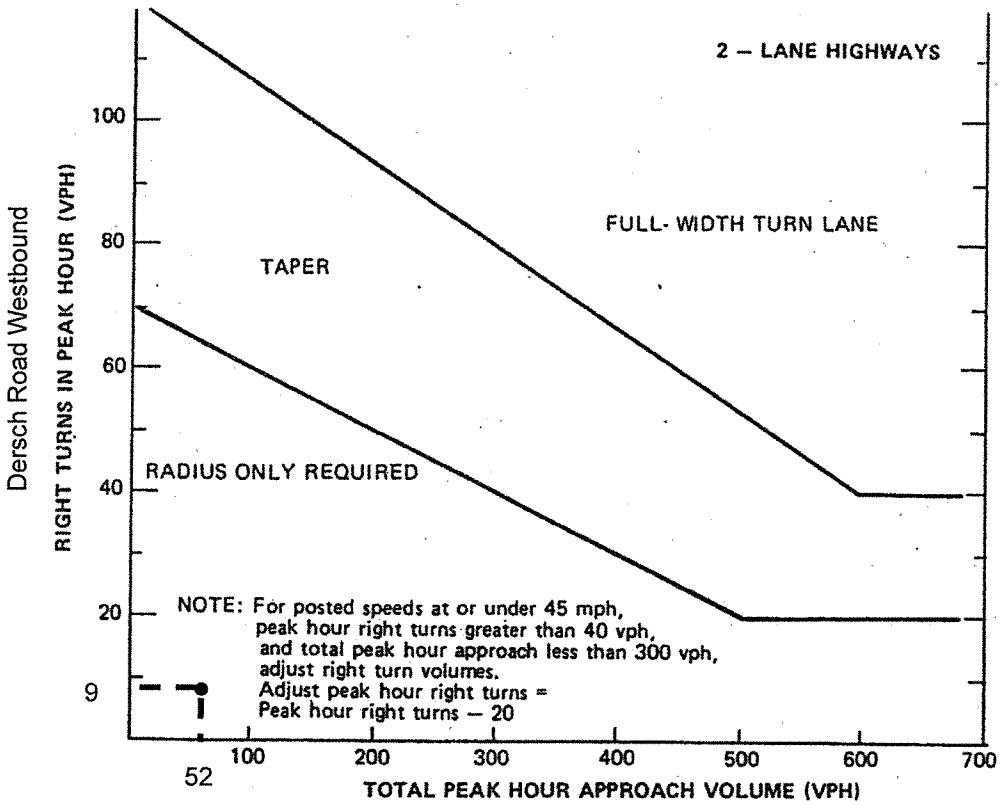
Dersch Road / Leopard Drive Intersection

EXISTING + PROJECT WEEKDAY PM PEAK HOUR

RIGHT TURN LANE NOT WARRANTED

Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

RIGHT TURN LANE WARRANTS



Dersch Road Westbound

High Plains Shooting Range Project

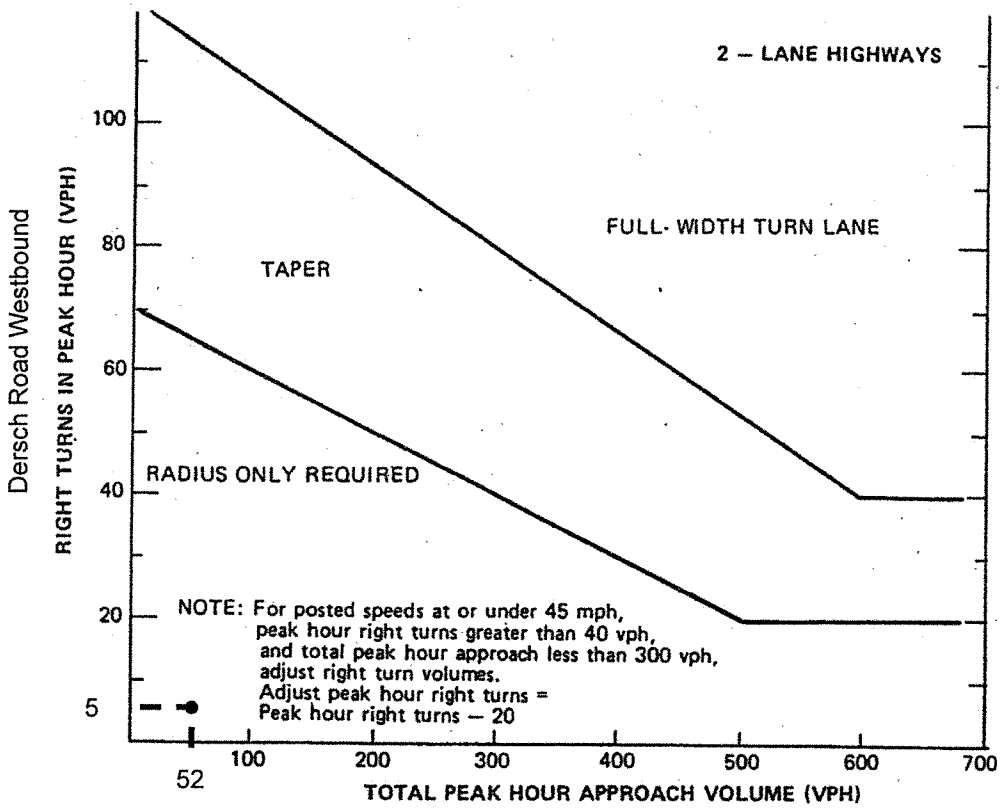
Dersch Road / Leopard Drive Intersection

EXISTING + PROJECT WEEKEND PEAK HOUR

RIGHT TURN LANE NOT WARRANTED

Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

RIGHT TURN LANE WARRANTS



Dersch Road Westbound

High Plains Shooting Range Project

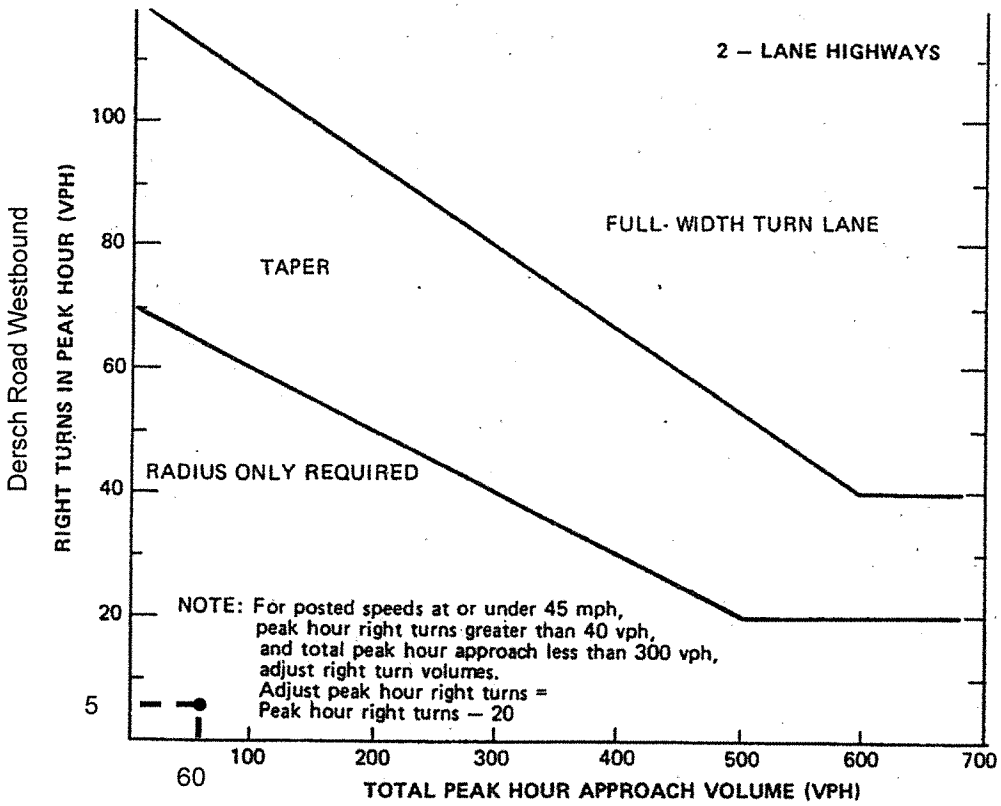
Dersch Road / Leopard Drive Intersection

CUMULATIVE YEAR 2035 WEEKDAY PM PEAK HOUR

RIGHT TURN LANE NOT WARRANTED

Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

RIGHT TURN LANE WARRANTS



Dersch Road Westbound

High Plains Shooting Range Project

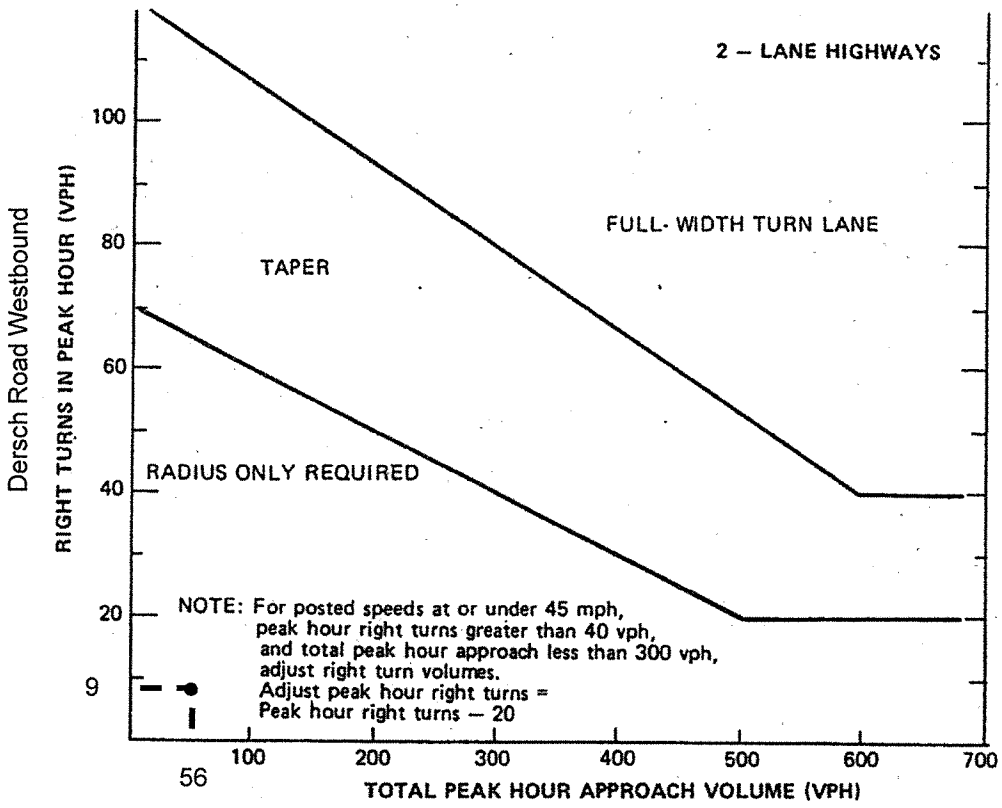
Dersch Road / Leopard Drive Intersection

CUMULATIVE YEAR 2035 WEEKEND PEAK HOUR

RIGHT TURN LANE NOT WARRANTED

Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

RIGHT TURN LANE WARRANTS



Dersch Road Westbound

High Plains Shooting Range Project

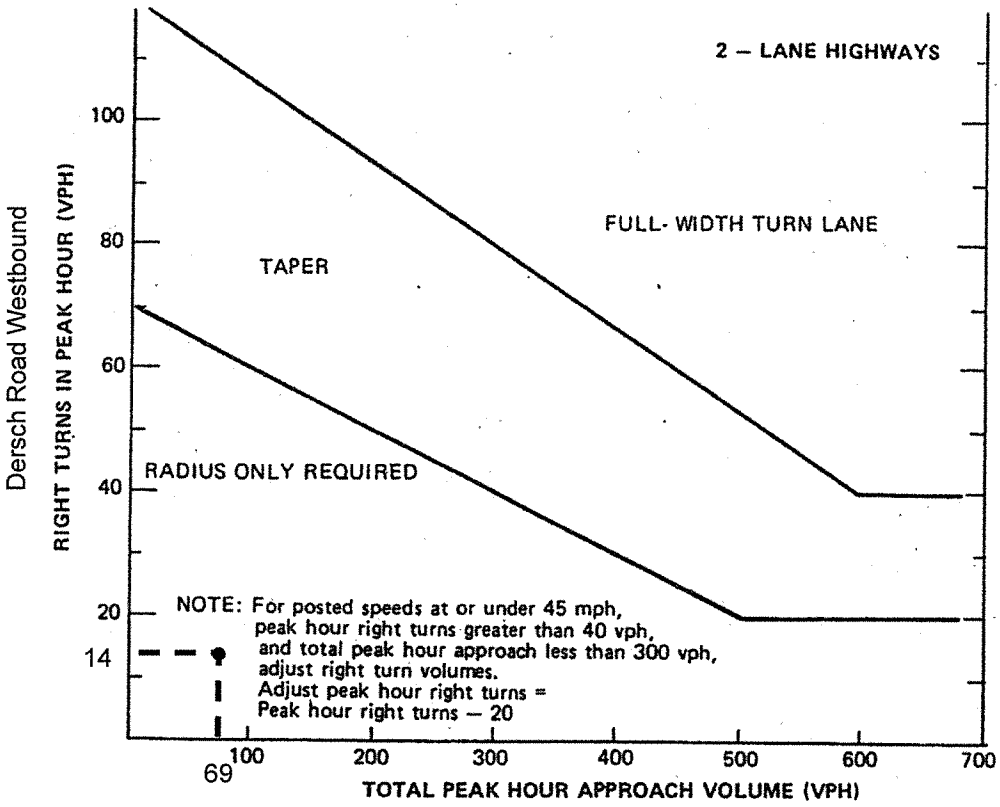
Dersch Road / Leopard Drive Intersection

CUMULATIVE YEAR 2035 + PROJECT WEEKDAY PM PEAK HOUR

RIGHT TURN LANE NOT WARRANTED

Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

RIGHT TURN LANE WARRANTS



Dersch Road Westbound

High Plains Shooting Range Project

Dersch Road / Leopard Drive Intersection

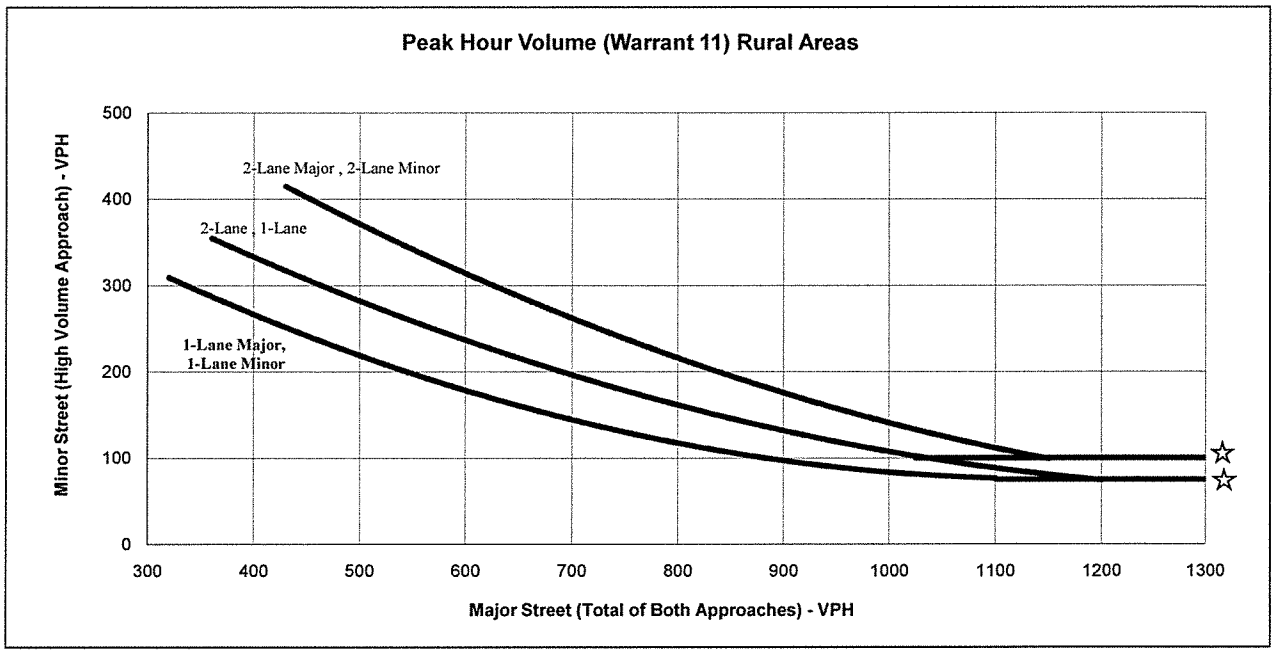
CUMULATIVE YEAR 2035 + PROJECT WEEKEND PEAK HOUR

RIGHT TURN LANE NOT WARRANTED

Transportation Research Board, National Cooperative Highway Research Program Report 279, "Intersection Channelization Design Guide", November, 1985.

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

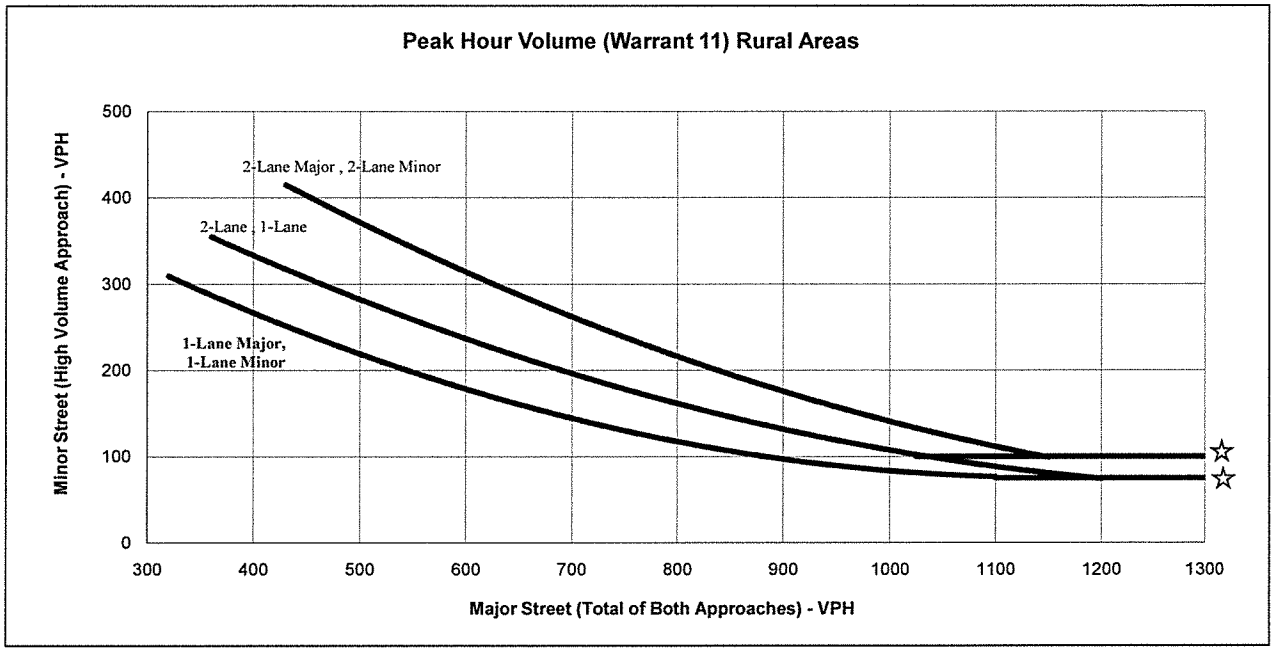


☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Dersch Road / Leopard Drive
Scenario:	Existing Weekday PM Peak Hour Conditions
Minor St. Volume:	0
Major St. Volume:	106
Warrant Met?:	No

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

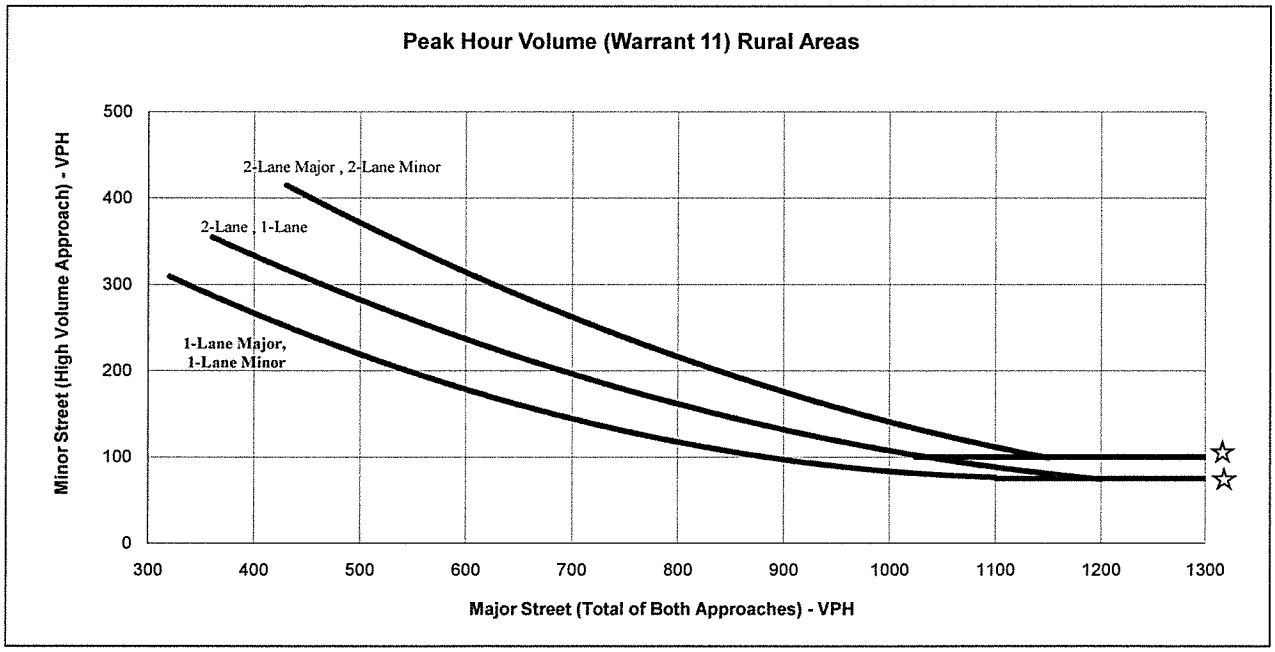


☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Dersch Road / Leopard Drive
Scenario:	Existing Weekend Peak Hour Conditions
Minor St. Volume:	2
Major St. Volume:	86
Warrant Met?:	No

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

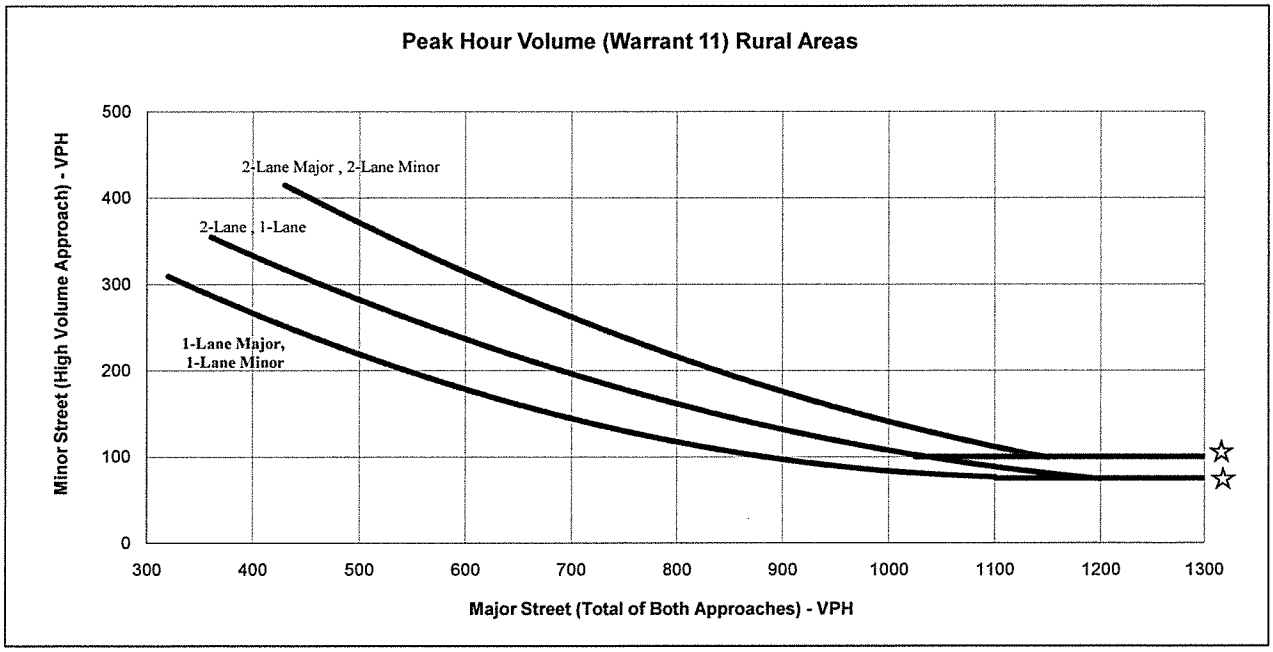


☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Dersch Road / Leopard Drive
Scenario:	Existing + Project Weekday PM Peak Hour Conditions
Minor St. Volume:	18
Major St. Volume:	118
Warrant Met?:	No

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

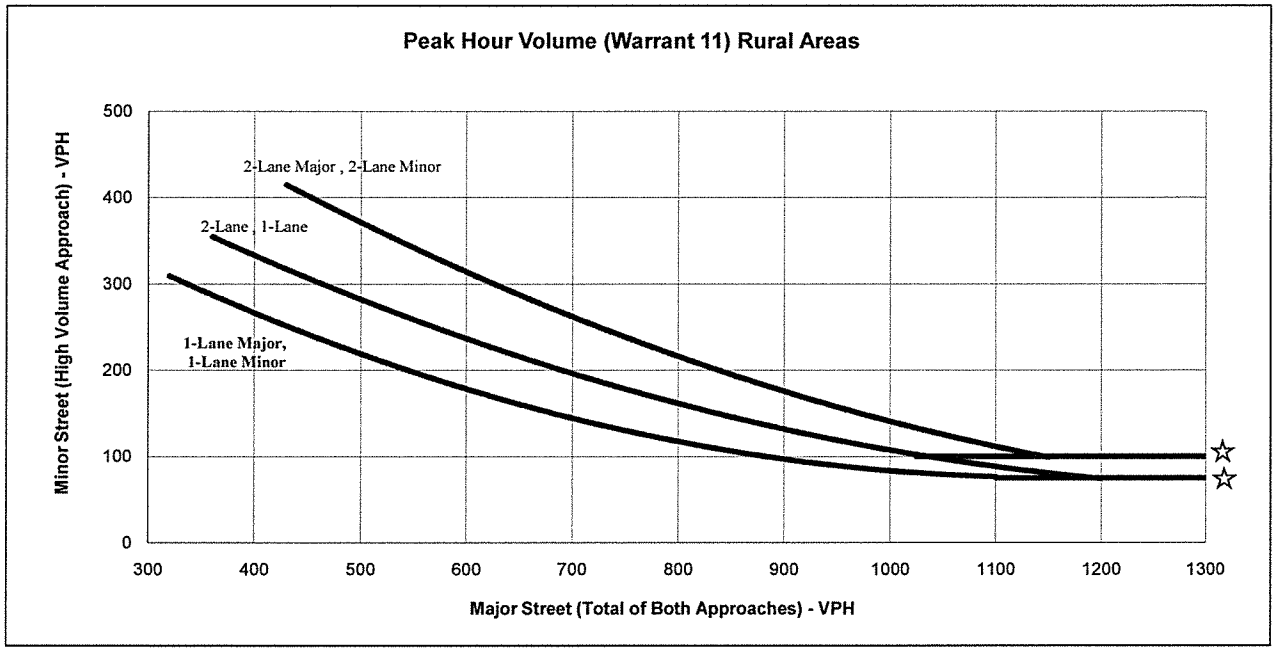


☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Dersch Road / Leopard Drive
Scenario:	Existing + Project Weekend Peak Hour Conditions
Minor St. Volume:	42
Major St. Volume:	104
Warrant Met?:	No

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

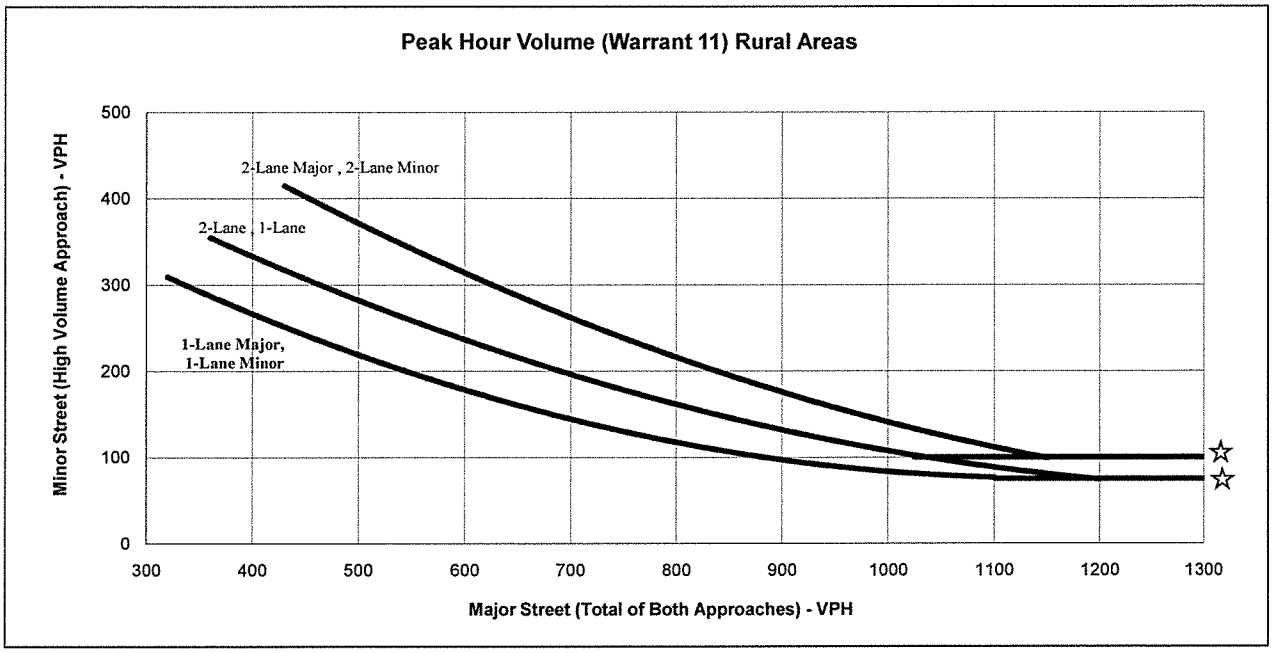


☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Dersch Road / Leopard Drive
Scenario:	Cumulative Year 2035 Weekday PM Peak Hour Conditions
Minor St. Volume:	10
Major St. Volume:	146
Warrant Met?:	No

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

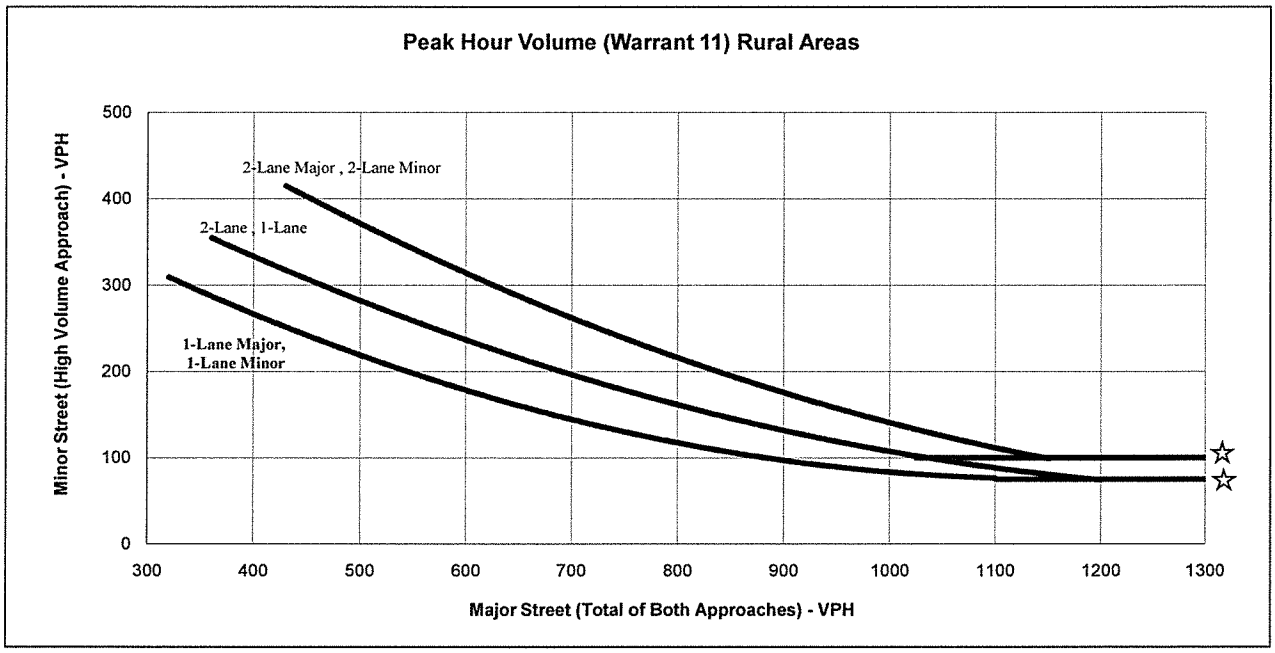


☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Dersch Road / Leopard Drive
Scenario:	Cumulative Year 2035 Weekend Peak Hour Conditions
Minor St. Volume:	10
Major St. Volume:	120
Warrant Met?:	No

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*

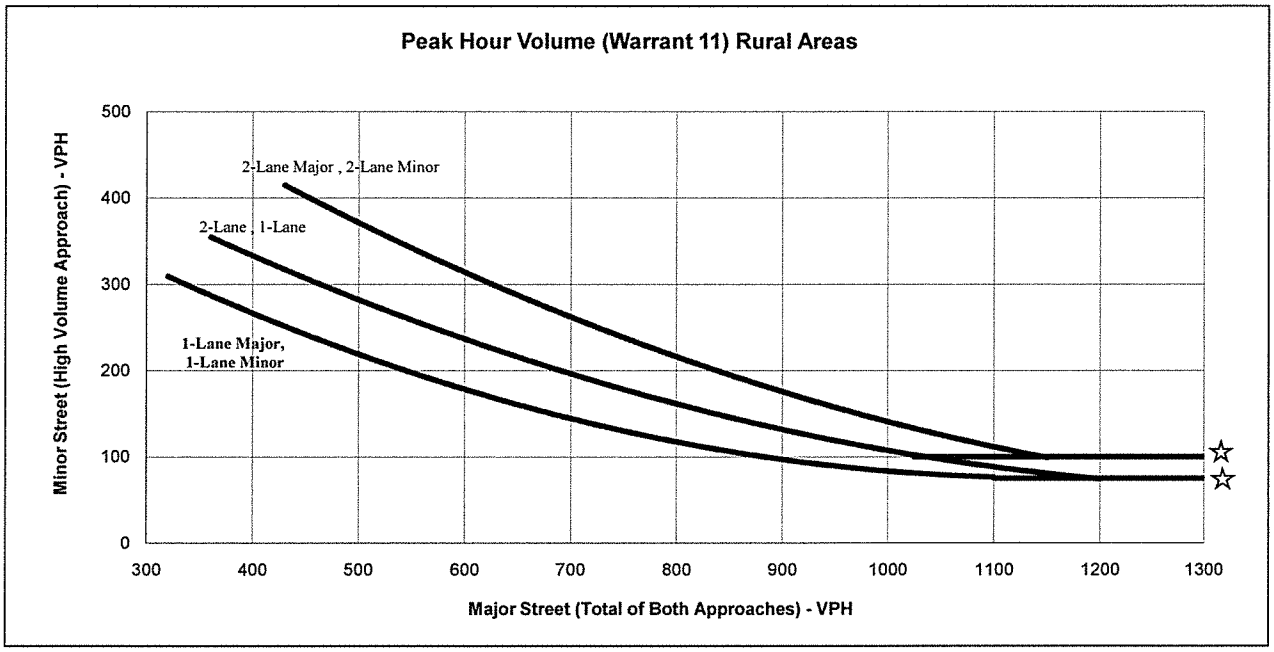


☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Dersch Road / Leopard Drive
Scenario:	Cumulative Year 2035 + Project Weekday PM Peak Hour Conditions
Minor St. Volume:	28
Major St. Volume:	158
Warrant Met?:	No

Both 1 Lane Approaches		2 or more Lane and One Lane Approaches		Both 2 or more Lane Approaches	
Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach	Major Street Total of Both Approaches	Minor Street High Volume Approach
370	280				
400	270	460	297	430	410
500	215	500	290	500	380
600	185	600	230	600	310
700	140	700	198	700	265
800	115	800	170	800	210
900	99	900	125	900	180
1000	85	1000	105	1000	140
1100	75	1100	90	1100	110
1200	75	1200	75	1150	100
1300	75	1300	75	1300	100

** Note: Values in Table are approximate, actual curves based upon 2nd order polynomial equation*



☆ NOTE:
100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

Intersection:	Dersch Road / Leopard Drive
Scenario:	Cumulative Year 2035 + Project Weekend Peak Hour Conditions
Minor St. Volume:	52
Major St. Volume:	138
Warrant Met?:	No