Technical Memorandum

TO: Mary Bilse, ICF

FROM: Jonathan Sanchez, PE; CR Associates

Cristian Belmudez; CR Associates

DATE: May 21, 2021

RE: Estrella Solar Project – Access Management Analysis

This Access Management Analysis serves to document if a left-turn lane or a right-turn lane is required to access the Estrella Solar Project (Proposed Project). This study was conducted in accordance with the County of Los Angeles – Access Management for Private Development Guidelines (County guidelines), May 2011, which is included as **Attachment A**.

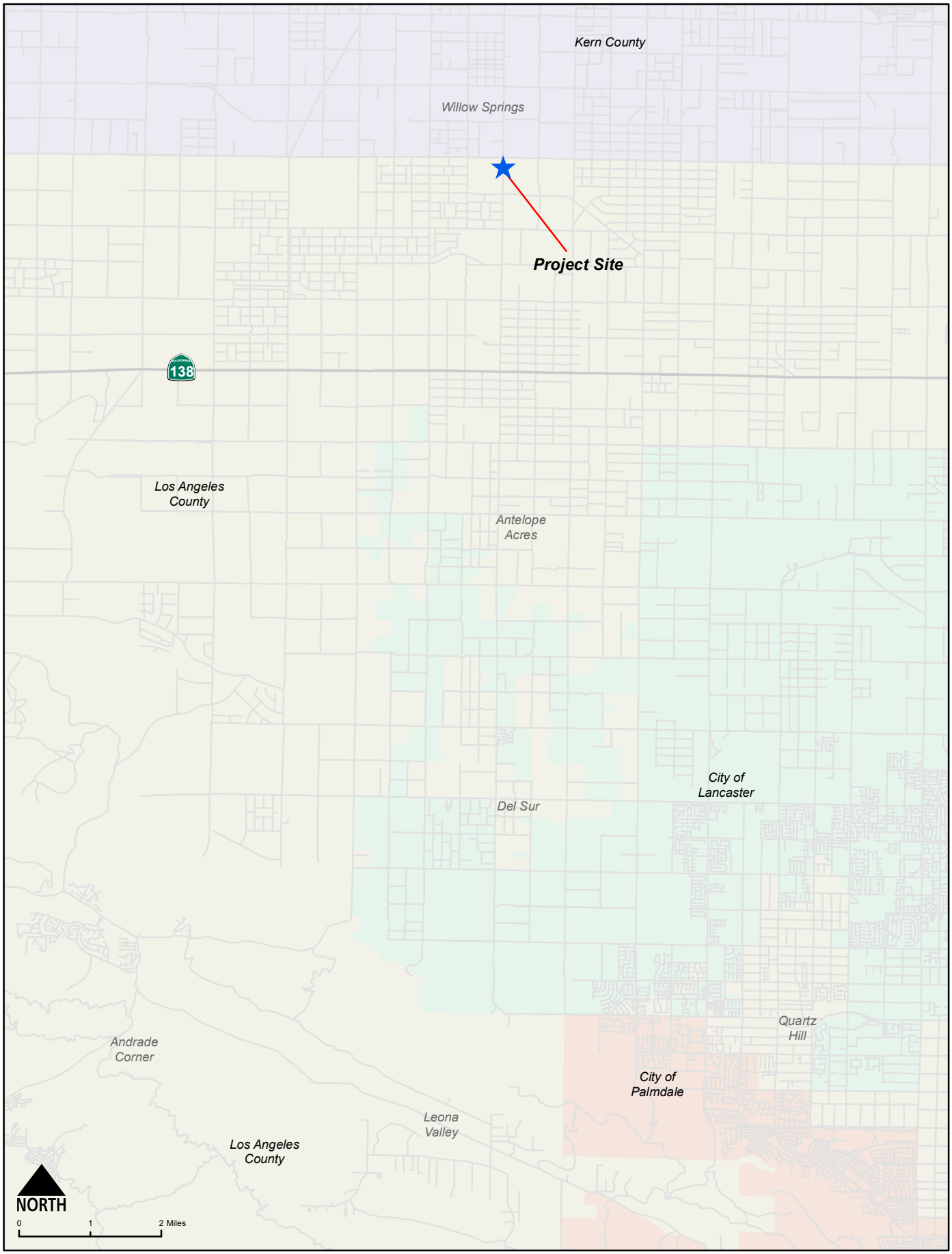
1.0 Project Description

The Proposed Project is located in the County of Los Angeles within the Antelope Valley Area, in the western portion of the Mojave Desert. The Proposed Project consists of two parcels (3262-006-002 & 3262-006-003) bound by West Avenue A-8 to the south, West Avenue A to the north, 95th Street West to the west, and 90th Street West to the east. The Proposed Project will develop a utility-scale Solar Generating Facility (SGF) and optional battery energy storage system (BESS) across both parcels that encompass approximately 149 acres of land. The Proposed Project would employ photovoltaic (PV) modules that convert sunlight directly into electrical energy without use of hear transfer fluid or cooling water. The SGF would utilize PV technology on either mixed-tilt or tracker mounting supports. The facility would then have the option to transfer electricity directly into the grid or into the optional BESS during peak energy hours. The proposed project would have a generating capacity of up to 21 megawatts (MW) alternating current (AC). The project facilities would operate year-round, producing electric power during daytime hours and discharging stored electric power at night. **Figure 1** displays the Proposed Project regional location.

Access to the project site is proposed along 90th Street West. This new driveway would function as the west leg of a new three-legged T-intersection along 90th Street West and south of West Avenue A. **Figure 2** displays the Proposed Project site plan.

2.0 Project Operations and Trip Generation

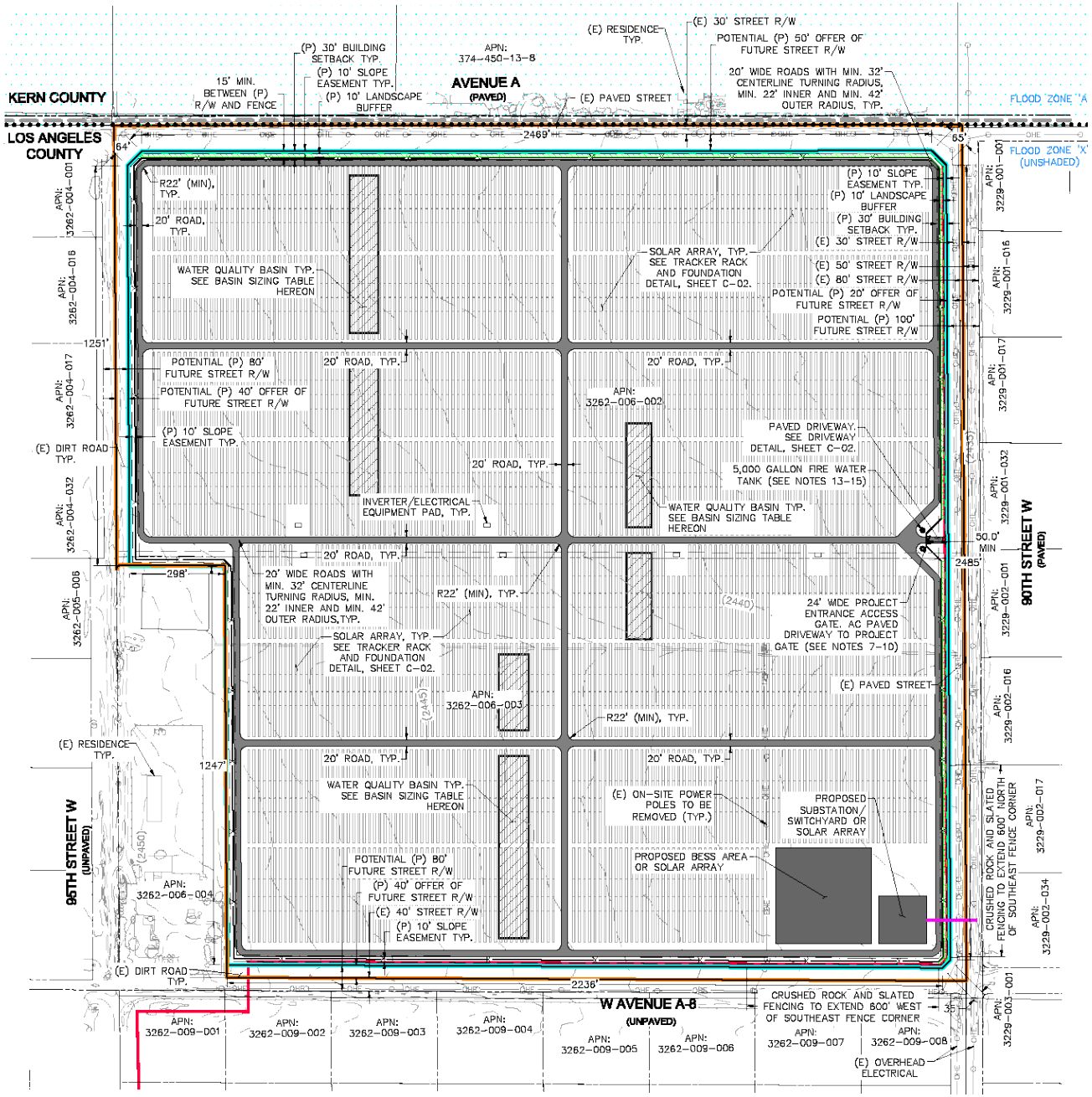
The Proposed Project will employ photovoltaic modules that convert sunlight directly into electrical energy without use of heat transfer fluid or cooling water. The Proposed Project is not anticipated to have on-site personnel. The only anticipated trips associated with the Proposed Project are maintenance, security activities, and panel washing (1-2 times per year depending on annual rainfall). These activities would be performed on an as-needed basis and are not anticipated to exceed 10 visits annually (20 truck trips total). Therefore, the Proposed Project is not anticipated to create a daily increase in population or visitors within the area. The trips associated with the Proposed Project are anticipated to come from the east (via SR-14) and along West Avenue A or from the south (via SR-138) and along 90th Street West.



Estrella Solar Project
Access Management Analysis

CHEN RYAN

Figure 1
Proposed Project Regional Location



Estrella Solar Project
Access Management Analysis

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Figure 2
Project Site Plan

3.0 Project Study Area

Based on discussion with County of Los Angeles staff, and in accordance with County guidelines, the defined study area should include project driveways proposed along highways. Highways are identified in the Los Angeles County Master Plan of Highways – North Half Map, included in **Attachment B**. Therefore, the project study area includes the following roadway segment and proposed project driveway:

Roadway Segments

- 90th Street West, between West Avenue A and West Avenue B

Project Driveways

- Project Driveway #1: This driveway would function as the west leg of a new three-legged T-intersection along 90th Street West and located south of West Avenue A

Attachment C includes detailed site plans displaying the location of the proposed project driveway.

4.0 Access Management Analysis

This access management analysis evaluates the need for left and/or right-turn lanes to access the project site. As per the County guidelines, the main factors that contribute to the need for turn lane implementation are design speed, stopping sight distance, and traffic volumes at the proposed access point(s). Vehicles accessing the Proposed Project are anticipated to make left and right turns depending on the direction of travel. Therefore, both left and right-turn lane requirements were evaluated. The analysis methodologies and standards used to identify the need for turn-lanes are outlined below.

Design Speed

Roadway classifications for the study roadway segments were obtained from the Los Angeles County Master Plan of Highways – North Half map. The design speed of a study roadway segment is utilized to determine stopping sight distance and traffic volume requirements. The design speed for study roadway segments are based on their respective roadway classifications as follows:

- Major Highway: 65 MPH (60 MPH[1])
- Secondary Highway or Parkway: 60 MPH (55 MPH[1])
- Limited Secondary Highway: 55 MPH (45 MPH[1])

Stopping Sight Distance

As defined by the Caltrans Highway Design Manual (Caltrans HDM), stopping sight distance is the distance required by the driver of a vehicle traveling at a given speed to bring the vehicle to a stop after an object on the road becomes visible. Per the County guidelines, a vehicle traveling towards the driveway in the same direction as another vehicle turning left or right into the driveway should be able to identify the back bumper of that vehicle. Similarly, a vehicle turning left into the driveway should be able to identify the front bumper of another vehicle traveling towards the driveway in the opposing direction. See Attachment A for specific details regarding sight distance analysis per the County guidelines. **Table 1** displays the minimum sight distance requirements based on design speed.

[1] Lower design speed exceptions may be made based on roadway constraints such as topography, intersection spacing, and other road conditions, subject to Public Works approval.

Table 1 Stopping Sight Distance Standards

Design Speed (MPH)	Stopping Sight Distance (ft)
65	660
60	580
55	500
50	430
45	360
40	300
35	250
30	200
25	150
20	125

Notes:
Minimum stopping sight distances should be increased by 20 percent on sustained downgrades steeper than 3 percent and longer than one mile, consistent with Caltrans standards.

Traffic Volumes

According to the County guidelines, the use of the nomographs (included in the County guidelines) is required to determine if traffic volumes warrant turning lane treatment. Below are the design criteria used to evaluate traffic volumes at proposed driveways:

- Opposing traffic volumes – volume of traffic that is traveling in the opposite direction of where a turn lane is being considered to access the Proposed Project. It should be noted this only applies to left-turn lanes since vehicles utilizing a right-turn lane do not need to wait for gaps in opposing traffic to access the Proposed Project.
- Advancing traffic volumes – volume of traffic that is traveling in the same direction of where a turn lane is being considered to access the Proposed Project.
- Turning traffic volumes – volume of traffic that is anticipated to make a turn using the turn lane that is being considered to access the Proposed Project.

A daily traffic count was conducted along the study roadway segment in October 2020. However, since current travel patterns do not reflect traffic conditions prior to COVID-19 restrictions, a count validation was conducted to verify the difference in traffic pre and post COVID-19 restrictions. Since historic counts from March 2017 were observed to be approximately 15% higher than the traffic counts conducted in October 2020, the March 2017 counts were utilized as baseline traffic volume. Furthermore, per the County guidelines, historical traffic counts should be adjusted to reflect project opening year (2022) traffic volumes by utilizing the following formula:

$$\text{Future Volume} = \text{Existing Volume} \times \left(1 + \frac{\text{annual growth rate}}{100}\right)^{\text{\# of years}}$$

The "annual growth rate" and "# of years" inputs for the formula above come from Table 2 of the County guidelines, which references the County of Los Angeles Congestion Management Program (CMP). Since the Proposed Project is located in an area where this table does not provide a specific applicable growth rate, the closest city (Lancaster)'s annual growth rates (3.29% from 2015 and 3.27% from 2020) were assumed

to be appropriate. **Attachment D** provides both the existing and historic daily traffic counts, as well as traffic volume growth calculations displaying the adjusted traffic volumes used in this analysis.

4.1 Left-Turn Lane Requirement

The left-turn lane requirements were evaluated along the study area roadway segment and proposed project driveway using the criteria and methodologies outlined in Section 4.0.

Design Speed

Table 2 displays the roadway classification and design speed for the study roadway segment.

Table 2 Roadway Classifications and Design Speeds

Roadway	Segment	Roadway Classification	Design Speed
90th Street West	West Avenue A to West Avenue B	Major Highway	65 MPH

Stopping Sight Distance Analysis

Roadway improvement plans were searched in the following County's website: https://dpw.lacounty.gov/des/design/hwyMain.cfm to see if an engineering analysis would be required. However, no roadway improvement plans were found on the website. Therefore, a sight distance analysis was conducted at the project driveway location on April 20, 2021. Based on the minimum stopping sight distance requirements shown previously in Table 1, with the roadway design speed being 65 MPH, the minimum stopping sight distance was determined to be 660 feet.

Field measurements based on a driver's eye and target object height of 3.5 feet and 2 feet above the surface of the roadway, respectively, were conducted at the roadway adjacent to the project driveway (90th Street West). Field measurements determined that stopping sight distances for left turns are greater than 660 feet. Thus, the proposed driveway exceeds the minimum stopping sight distances and a left-turn lane is not required to access the Proposed Project. **Figure 3** displays where the back bumper for the left-turning vehicle would be located, which is at the center of the travel lane, 20 feet back from the nearside curb prolongation of the proposed driveway. Additionally, Figure 3 displays the driver's eye for the advancing vehicle located 3.5 above the pavement surface, 4 feet from the centerline.

Traffic Volumes Analysis

The Proposed Project is not anticipated to exceed 10 visits annually (20 truck trips total). These visits would be primarily for maintenance purposes and are anticipated to occur throughout the year (less than once a month). In other words, during ten days of a typical year there would be a single truck to and from the project site. The trips associated with the Proposed Project are anticipated to come from the east (via SR-14) and along West Avenue A or from the south (via SR-138) and along 90th Street West.

The County guidelines require that traffic volumes at the project driveway be evaluated during both the AM and PM peak hours. Since truck trips to the project site will not occur on a daily basis, a hypothetical scenario was assumed where all of the trips anticipated during a typical year would occur on a single day. Additionally, it was assumed that the trips would occur only during the AM and PM peak hours. This approach results in 20 truck trips during both the AM and PM peak hours. Opposing and advancing traffic volumes during the AM and PM peak hours were obtained from the adjusted daily traffic count, discussed previously in Section 4.0. **Table 3** displays the anticipated traffic volumes at the project driveway during the AM and PM peak hours.

Table 3 Left-Turn Lane Treatment

Proposed Project Driveway	Opposing (V_O)		Advancing (V_A)		Left-Turning (V_L)		V_L / V_A x 100 (%)		Left-Turn Lane Warranted?
	AM	PM	AM	PM	AM	PM	AM	PM	
90th Street West & Project Driveway	81	79	50	79	10	10	20%	13%	No

Figure 3 Stopping Sight Distance

Traveling Northbound

Traveling Southbound

The nomograph from Figure 5 in Chapter 1 of the County guidelines was utilized to determine if traffic volumes warrant the implementation of a left-turn lane. It should be noted that due to the absence of a 65 mph nomograph, the 60 mph nomograph was utilized in accordance with the County guidelines. The curves represent the percentage of left turns in advancing volume – calculated by dividing left-turn volume by advancing volume and multiplying by 100. The opposing volume and advancing volume were plotted on the nomograph, included as **Attachment E**, and the point was observed to determine the following:

- If the point is to the right of the corresponding percentage curve, then a left-turn lane is warranted based on traffic volumes
- If the point is to the left of the corresponding percentage curve, then a left-turn lane is not warranted based on traffic volumes

The plotted point for the proposed driveway is to the left of the percentage curve. Therefore, a left-turn lane is not warranted at the proposed project driveway.

4.2 Right-Turn Lane Requirement

The right-turn lane requirements were evaluated along the study area roadway segment and proposed project driveway using the criteria and methodologies outlined in Section 4.0.

Design Speed

Table 2, shown previously, displays the roadway classification and design speed for the study roadway segment.

Stopping Sight Distance Analysis

Similar to the findings of the sight distance analysis conducted for left-turns, field measurements determined the stopping sight distance for a right-turn is also greater than the minimum stopping sight distance of 660 feet. Thus, the proposed driveway exceeds the minimum stopping sight distance and a right-turn lane is not required. Figure 3, shown previously, displays where the back bumper for the right-turning vehicle would be located, which is in the center of the travel lane, 20 feet back from the nearside curb prolongation of the proposed driveway. Additionally, Figure 3 displays the driver's eye for the advancing vehicle located 3.5 above the pavement surface, 4 feet from the centerline.

Traffic Volumes Analysis

Similar to the traffic volume analysis for left-turn treatment, this analysis also assumed a hypothetical scenario where all of the trips anticipated during a typical year occur on a single day and only during the AM and PM peak hours. Advancing traffic volumes during the AM and PM peak hours were obtained from the adjusted daily traffic counts, discussed previously in Section 4.0. It should be noted that evaluating the need for right-turn treatment does not require opposing traffic volumes since vehicles utilizing a right-turn lane do not need to wait for gaps in opposing traffic to access the Proposed Project. **Table 4** displays the anticipated traffic volumes at the project driveway during the AM and PM peak hours.

Table 4 Right-Turn Lane Treatment

Proposed Project Driveway	Advancing (V_A)		Right-Turning (V_R)		V_R / V_A x 100 (%)		Right-Turn Lane Warranted?
	AM	PM	AM	PM	AM	PM	
90th Street West & Project Driveway	81	79	10	10	12%	13%	No

The nomograph from Figure 1 in Chapter 2 of the County guidelines was utilized to determine if traffic volumes warrant the implementation of a right-turn lane. Similar to the left-turn treatment, the 60 mph nomograph was utilized in accordance with the County guidelines. The curves represent the design speed of the study roadway segment. For the proposed project driveway, the percentage of right turns in the advancing volumes were calculated by dividing right-turn volume by advancing volume and multiplying by 100. The advancing volume and percentage were plotted on the nomograph, included as Attachment E, and the points where observed to determine the following:

- If the point is above or to the right of the corresponding design speed curve, then a right-turn lane is warranted based on traffic volumes.
- If the point is below or to the left of the corresponding design speed curve, then a right-turn lane is not warranted based on traffic volumes.

The plotted point for the proposed driveway falls below and to the left of the 60 MPH design speed curve. Therefore, a right-turn lane is not warranted at the proposed project driveway.

5.0 Conclusion

As per the County of Los Angeles – Access Management for Private Development Guidelines, the main factors that contribute to the need for turn lane implementation are design speed, stopping sight distance, and traffic volumes at the proposed access point(s). Since the Proposed Project is rurally located and no major developments exist along 90th Street West, within the vicinity of the Proposed Project, the project driveway exceeds the minimum stopping sight distances required for approaching traffic. Additionally, the anticipated traffic volumes during both the AM and PM peak hours at the proposed driveway do not warrant the implementation of turn lanes. Therefore, installation of turn lanes is not required at the proposed project driveway.

Attachment A
County of Los Angeles – Access Management for Private Developments Guidelines

Approved: Dennis Hunter, Deputy Director

County of Los Angeles
Department of Public Works

Access Management For Private Developments

Guidelines Manual

May 2011

Revised: June 2011

Record of Revisions

NO.	DESCRIPTION OF REVISION	REVISION EFFECTIVE DATE:
1	Revised originally approved May 2011 "Left-Turn Lane Implementation For Private Development Fronting Two-Lane, Rural Undivided Highways Guidelines Manual" to reflect a chapter layout that would be more conducive to adding additional guideline material (in the form of addtional chapters) at a later date. The Manual title has changed to "Access Management For Private Development" and the original Left-Turn Manual has now become Chapter 1. Added Chapter 2, "Right-Turn Lane Implementation For Private Development Fronting Two-Lane, Rural, Undivided Highways.	June 2011

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Chapter Listing

Section 1 Introduction

Increased development within Los Angeles County has resulted in a rise in the demand for direct access connections from developed lots to the County highway network. It is these access points, if not designed, managed, and located appropriately, that could contribute to traffic delays and conflicts among the various users of a roadway.

The content within this manual shall serve as a standardized approach for the design of access points for development within Los Angeles County and shall be used as a guideline to aide private developers, their engineers, and consultants in designing a project access point that not only will benefit the County's highway system but also the project itself. Public Works staff will also use this guideline manual to assist in the formulation and preparation of conditions of approval for tentative maps, parcel maps, and plot plans (associated with conditional use permits, and other single-lot developments, subject to conditions).

These guidelines shall be applicable for all private developments, subject to discretionary approval or those projects subject to improvement requirements under Los Angeles County Code Title 22, Chapter 22.48, Part 4 (Section 22.48.220, et seq.).

Pubic Works' vision for this manual is to add content whenever the needs arise or to initiate updates as dictated by changes to technology or engineering practices. Therefore this manual shall be a living document and will be subject to periodic changes.

Section 2 Acknowledgements

Document Preparation Team

As stated in Section 1, the document preparation team for each individual chapter will be included at the end of each chapter. However, the following were contributing members of a committee that were involved in the creation of the overall introduction for the Guidelines Manual as shown on the previous pages:

Design Division:
Roy Cruz

Land Development Division:
Matthew Dubiel
Andy Narag
Sam Richards

Operational Services Division:
David Fryer
Keith Lee
Javier Robles
Robert Scharf

Road Maintenance Division:
Jeff Harkins

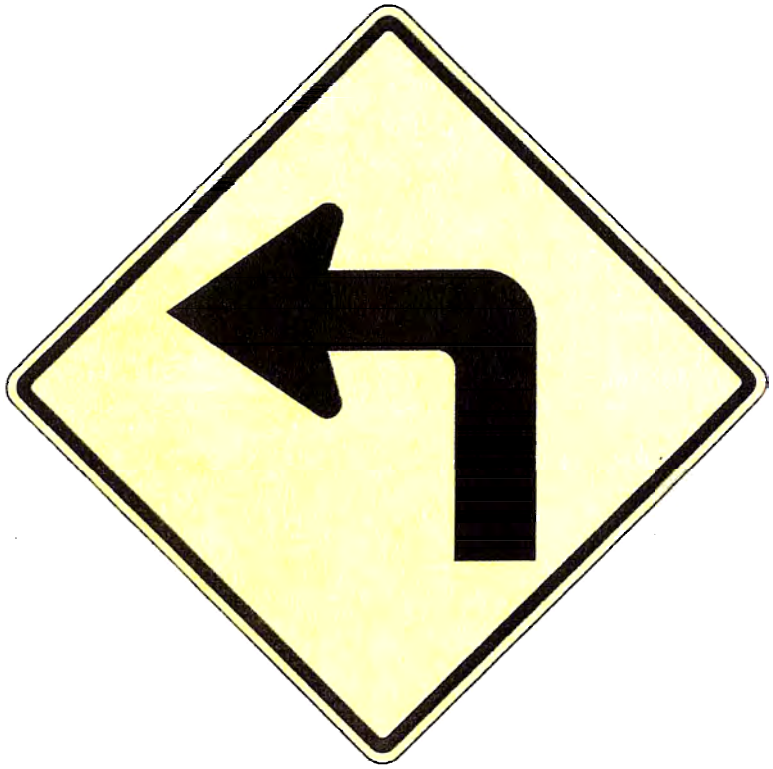
Traffic and Lighting Division:
Gerald Ley
Jeff Pletyak

Approved: Dennis Hunter

Dennis Hunter, Deputy Director

County of Los Angeles
Department of Public Works

Access Management For Private Developments
Guidelines Manual



Chapter 1
Left-Turn Lane Implementation For Private Development Fronting Two-Lane Rural Undivided Highways

May 2011

Revised: June 2011

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Section 1 Introduction

Private developments are increasingly being proposed throughout the rural areas of Los Angeles County, along highways that are not built to ultimate width and/or lack exclusive left-turn lanes. Many of these proposed projects, once analyzed, could benefit from the installation of a exclusive left-turn lane on the frontage roadway to facilitate ingress vehicular movement at the project's access point.

The refuge area provided by exclusive left-turn lanes can also lead to enhanced traffic operation by minimizing potential conflicts between various users of the roadway.

These guidelines have been established for the following reasons:

- To assist in the formulation and preparation of conditions of approval for tentative maps, parcel maps, and plot plans (associated with conditional use permits and other single-lot developments, subject to conditions).

- To provide a standardized approach in analyzing the need for implementation of left-turn lanes on two-lane rural highways fronting private developments.

These guidelines shall be applicable for all private developments, subject to discretionary approval or those projects subject to improvement requirements under Los Angeles County Code Title 22, Chapter 22.48, Part 4 (Section 22.48.220, et seq.). For projects where a detailed traffic study is required by the County of Los Angeles Department of Public Works' Traffic and Lighting Division, an analysis of the sight distance and traffic volumes at the proposed access point, based on these guidelines, should be included in the study to verify if the need for a dedicated left-turn lane exists.

The following references were used to develop these left-turn lane implementation guidelines:

- Los Angeles County Code Title 21
- Los Angeles County Code Title 22
- AASHTO
- California Department of Transportation (Caltrans) Highway Design Manual
- Harmelink, M.D., *Aspects of Traffic Control Devices: Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections*, Highway Research Board Report No. 211, Washington, DC, Highway Research Board, National Research Council, 1967.

Design speeds and the corresponding sight distance criteria utilized for these guidelines are based on standards referenced in Chapter 200 of the Caltrans Highway Design Manual. Minimum design speeds assigned for each classification of roadway, as referenced in these guidelines, are based on current design practices being used at the County of Los Angeles Department of Public Works (Public Works).

This chapter will be a living document and may be periodically revised or updated.

Section 2 Left-Turn Lane Implementation Guidelines

This section establishes prescribed steps to be used in evaluating whether conditions related to the implementation of left-turn lanes on rural two-lane highways, fronting proposed developments within the County of Los Angeles, should be imposed.

The main factors identified in these guidelines that contribute to the need for left-turn lane implementation are the design speed of the fronting roadway; stopping sight distance (both horizontal and vertical) at the project's access point; and the correlation between the opposing, advancing, and left-turn projected traffic volumes, post-project implementation, as analyzed at the project access point.

A step-by-step process to evaluate these factors can be found on the following pages:

> The guidelines found in this chapter shall in no way preclude the use of sound engineering judgment in analyzing the need for left-turn lane implementation at a particular project entrance. Each project shall be reviewed on a case-by-case basis and be thoroughly evaluated to determine if a left-turn lane should be installed or not. Other factors that should be taken into consideration that are outside the scope of this chapter include, but are not limited to, accident history, existing traffic operations, and other geometric constraints in the general vicinity of the proposed project. In addition, due to the uniqueness of each project, imposing vehicular access restrictions at a particular project site may be necessary and this manual shall not preclude Public Works from conditioning a project in this manner.

Step 1 - Record the Project Information and Determine the Design Parameters

Step 1A – General Project Information – Please fill in all applicable project information. Denote "N/A" if an item does not apply.

Type of Project:
- ☐ Subdivision–TR#_____, PM#_____
- ☐ Conditional Use Permit–CUP#_____
- ☐ Single Lot Development–Zone_____

Project Address:

_____

Assessor's Parcel Number(s)_____

Street name where access is being proposed:_____

Step 1B–Determine the Classification of the Roadway–Please check the box of the corresponding highway classification of the roadway where access is being proposed.

- ☐ Major Highway–100 feet minimum Right of Way Width
- ☐ Parkway–80 feet minimum Right-of-Way Width
- ☐ Secondary Highway–80 feet minimum Right of Way Width
- ☐ Limited Secondary Highway–64 feet to 80 feet of Standard Right of Way Width

Roadway classifications throughout the County of Los Angeles can be found on the County's Highway Plan. Depending on where the proposed project is located, you may access the appropriate Highway Plan at the following web addresses:

North County Highway Plan:
http://planning.lacounty.gov/assets/upl/data/map_t04-hwy-plan-north-existing.pdf

South County Highway Plan:
http://planning.lacounty.gov/assets/upl/data/map_t05-hwy-plan-south-existing.pdf

Step 1C – Determine the Design Speed of the Roadway–The design speed chosen should reflect the minimum design speed corresponding to the roadway classification determined/recorded in Step 1B. These design speeds are shown below.

Major Highway: 65 mph (60 mph*)
Secondary Highway or Parkway: 60 mph (55 mph*)
Limited Secondary Highway: 55 mph (45mph*)

* Lower design speed exception may be made based on roadway constraints such as topography, intersection spacing, and other road conditions, subject to Public Works approval.

Please record the design speed of the roadway below:

The Design Speed of _____
(Name of Roadway where Access is Being Proposed)
is_____ mph.

Step 2 – Analyze the Horizontal and Vertical Stopping Sight Distance

Stopping sight distance as defined in the Caltrans Highway Design Manual is the distance required by the driver of a vehicle traveling at a given speed to bring the vehicle to a stop after an object on the road becomes visible.

Line of sight should be based on the minimum design speeds for each roadway classification as determined in Step 1C above.

Table 1 below shows the stopping sight distance lengths for corresponding design speeds based on standards referenced in Chapter 200 of the Caltrans Highway Design Manual. The values shown should be increased by 20 percent on sustained downgrades steeper than 3 percent and longer than one mile to be consistent with the Caltrans standard found in the Highway Design Manual.

Table 1 – Stopping Sight Distance Standards

Design Speed (MPH)	Stopping Sight Distance (ft) [1]
65	660
60	580
55	500
50	430
45	360
40	300
35	250
30	200
25	150
20	125

Since the purpose of this chapter is to evaluate if a left-turn lane is necessary considering current and projected vehicular traffic conditions, the measurement of stopping sight distance is essentially from the driver's eye of one vehicle to the bumper of another vehicle. Therefore, the evaluation of stopping sight distance within the context of this chapter should utilize a driver's eye and the target object height of 3.5 feet and 2.0 feet above the surface of the roadway respectively.

[1] Stopping sight distance values are based on CALTRANS Highway Design Manual, January 4, 2007 edition, Table 201.1.

An appropriate line-of-sight exhibit analyzing the horizontal and vertical stopping sight distance in both directions should be submitted for evaluation along with the proposed plot plan. The line-of-sight exhibit should show the location of the back bumper for the left-turning vehicle (vehicle 1), which is presumed to be located in the center of the travel lane, 20 feet (for a typical passenger car) back from the nearside curb prolongation of the proposed driveway. Should the proposed use of the site involve vehicles other than typical passenger cars, the assumed location of the back bumper of vehicle 1 would change accordingly based on the typical length of the project's design vehicle. Design vehicle lengths should be obtained from AASHTO's, *A Policy on Geometric Design of Highways and Streets* (latest edition). In addition, the line-of-sight exhibit should show the drivers eye for the advancing vehicle (vehicle 2), which can be presumed to be 3.5 feet above the pavement surface, 4 feet from the centerline (or center lane line as appropriate), and positioned at the appropriate stopping sight distance (as determined from Table 1 above) away from the back bumper of vehicle 1.

The use of stopping sight distance shall be based on the evaluation of the existing and proposed field conditions and constraints subject to Public Works' review and approval.

Sight Distance Evaluation Outcome Based on Table 1:

Is There Adequate Sight Distance?	Action To Be Taken
No	Exclusive Left-Turn Lane should be installed on the fronting roadway
Yes	Continue evaluation with STEP 2

Please note that a similar analysis should be performed to evaluate the stopping sight distance between the driver's eye of vehicle 1 and the front bumper or conflict point of a vehicle traveling in the opposite direction, vehicle 3. If adequate stopping sight distance cannot be achieved between a vehicle making a left turn (vehicle 1) and an on-coming vehicle (vehicle 3) then additional traffic control measures such as a traffic signal should be considered. If said measure cannot be achieved or is not warranted, access restrictions may be imposed.

Step 3 – Analyze the Correlation between Opposing Volume, Advancing Volume, and Left-Turn Volumes for a Given Design Speed

The relationship between the opposing traffic volume[2], advancing traffic volume[3], left-turn volume[4], and design speed is critical in determining if a left-turn lane is

[2] Opposing traffic volume as used in this context shall refer to the volume of traffic that is traveling in the opposite direction of where a left-turn lane is being considered at the proposed project access point.
[3] Advancing traffic volume as used in this context shall refer to the volume of traffic that is traveling in the same direction of where the left-turn lane is being considered at the proposed project access point.
[4] Left-turn volume as used in this context shall refer to the volume of traffic that is anticipated to make a left-turn into the proposed project access point.

warranted at a proposed driveway or street along an two-lane rural undivided highway and can be evaluated by using the appropriate Harmelink nomograph shown in Figures 1 through 5 on the following pages. These nomographs were developed by M.D. Harmelink (documented in the *Aspects of Traffic Control Devices: Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections*, Highway Research Board Report No. 211, Washington, DC, Highway Research Board, National Research Council, 1967). These nomographs have been accepted as a basic guideline by other entities and are included in publications developed by other states. Instructions on how to utilize these nomographs to determine the minimum threshold for which a left-turn lane should be implemented can be found under each figure. Please note that due to the absence of a 65 mph nomograph the 60 mph nomograph may be used for evaluation of roadways with a 65 mph design speed.

Examples on how to use the nomographs can be found below. The Total Advancing Volume (V_A) and the Total Opposing Volume (V_O) values referenced are to be provided by the applicant using volumes obtained from a current traffic count in the vicinity of the proposed project. Said traffic counts should be performed from an independent traffic count company at the applicant's expense. These traffic counts are to be taken along the property frontage in the vicinity of the proposed project access during the AM and PM peak hours on appropriate days as determined by Public Works. The Total Left-turn Volumes, (V_L) should be projected for the project build out year by the applicant using an independent traffic consultant. For projects with a build out year of 2015 or beyond, the applicable traffic volume growth factor, which can be found in Table 2 of this chapter, shall be applied. The design speed as referenced in the following examples is the speed determined in Step 1C above.

Example 1

Determined Values as indicated above:

- Design Speed = 50mph
- Total Advancing Volume including all turning movements, V_A= 480vph
- Total Opposing Volume including all turning movements, V_O=96vph
- Total Left-turn Volumes into the project site for the projected build out year, V_L = 50vph

Project Location = Agoura Hills
Build out Year = 2020

Analyze:

If an exclusive left-turn lane into the project site is warranted.

Solution:

Step A: Determine the applicable Traffic Volume Growth Factor from Table 2.

The corresponding Growth Factor from Table 2 for a buildout year of 2020 in the City of Agoura Hills is 1.041.

Step B: Apply the growth factor found in Step A to the total advancing and opposing volumes determined from a traffic count company.

Total Advancing Volume with ambient growth factor applied:
V_A = 480vph x 1.041 = 500vph

Total Opposing Volume with ambient growth factor applied:
V_O=96vph x 1.041 = 100vph

Step C: Calculate the percentage of left-turns.
(V_L / V_A) x 100 =
(50vph / 500vph) x 100 =
0.10 x 100 = 10%

Step D: Using Figure 3, find the intersection point of V_A (500vph) and V_O (100vph).

Step E: Determine the location of the point found in Step D relative to the 10% curve found in Step C. If the intersection point lies to the right of the curve then a left-turn lane is warranted based on volumes. If it lies to the left of the curve then a left-turn lane is not warranted based on volumes. In this case, the intersection point of V_A (500vph) and V_O (100vph) lies to the right of the 10% curve on Figure 3 and, therefore, a left-turn lane is warranted.

Example 2 below utilizes the same values as Example 1; however, this method compares the actual percentage of vehicles making a left-turn to the percentage found to be the threshold for warranting a left-turn lane. As in Example 1, Example 2 shows the same outcome; a left-turn lane is warranted.

Example 2

Determined Values as indicated above:

- Design Speed = 50mph
- Total Advancing Volume including all turning movements, V_A= 480vph
- Total Opposing Volume including all turning movements, V_O=96vph
- Total Left turn volumes into the project site for the projected build out year, V_L = 50vph

Project Location = Agoura Hills
Build out Year = 2020

Analyze:
If an exclusive left-turn lane into the project site is warranted.

Solution:

Step A: Determine the applicable Traffic Volume Growth Factor from Table 2.

The corresponding Growth Factor from Table 2 for a build out year of 2020 in the City of Agoura Hills is 1.041.

Step B: Apply the growth factor found in Step A to the total advancing and opposing volumes determined from a traffic count company.

Total Advancing Volume with ambient growth factor applied:
V_A = 480vph x 1.041 = 500vph

Total Opposing Volume with ambient growth factor applied:
V_O=96vph x 1.041 = 100vph

Step C: Using Figure 3, find the intersection point of V_A (500vph) and V_O (100vph) and determine the corresponding "percentage left-turn curve" that applies (e.g., determine the curve that would pass through the intersection point). In this case, the corresponding percentage of left-turns that would warrant a left-turn lane would be approximately 8.5%.

Step D: Determine the actual percentage of left turns based on the determined values of the total advancing volume ($V_{A)}$ and the total left-turn volumes, ($V_{L)}$.

(V_L / V_A) x 100 =
(50vph / 500vph) x 100 =
0.10 x 100 = 10%

Step E: Compare the actual percentage of left turns as determined in Step D with the percentage of left turns that would warrant a left-turn lane as determined in Step C. In this case, the actual left-turn volume of 10% is higher than 8.5% (which is the threshold for which a left-turn lane is warranted); therefore, the project should install a left-turn lane.

Example 3 below, again utilizes the same volumes as both Example 1 and 2; however, this method compares the actual volume of vehicles making a left-turn to the volume found to be the threshold for warranting a left-turn lane. The outcome of Example 3 is the same as that of the preceding examples; a left-turn lane is warranted.

Example 3

Determined Values as indicated above:

- Design Speed = 50mph
- Total Advancing Volume including all turning movements, V_A= 480vph
- Total Opposing Volume including all turning movements, V_O=96vph
- Total Left-turn volumes into the project site for the projected build out year, V_L = 50vph

Project Location = Agoura Hills
Build out Year = 2020

Analyze:

If an exclusive left-turn lane into the project site is warranted.

Solution:

Step A: Determine the applicable Traffic Volume Growth Factor from Table 2.

The corresponding Growth Factor from Table 2 for a build out year of 2020 in the City of Agoura Hills is 1.041.

Step B: Apply the growth factor found in Step A to the total advancing and opposing volumes determined from a traffic count company.

Total Advancing Volume with ambient growth factor applied:
V_A = 480vph x 1.041 = 500vph

Total Opposing Volume with ambient growth factor applied:
V_O=96vph x 1.041 = 100vph

Step C: Using Figure 3, find the intersection point of V_A (500vph) and V_O (100vph) and determine the corresponding "percentage left-turn curve" that applies (e.g., determine the curve that would pass through the intersection point). In this case, the corresponding percentage of left-turns that would warrant a left-turn lane would be approximately 8.5%.

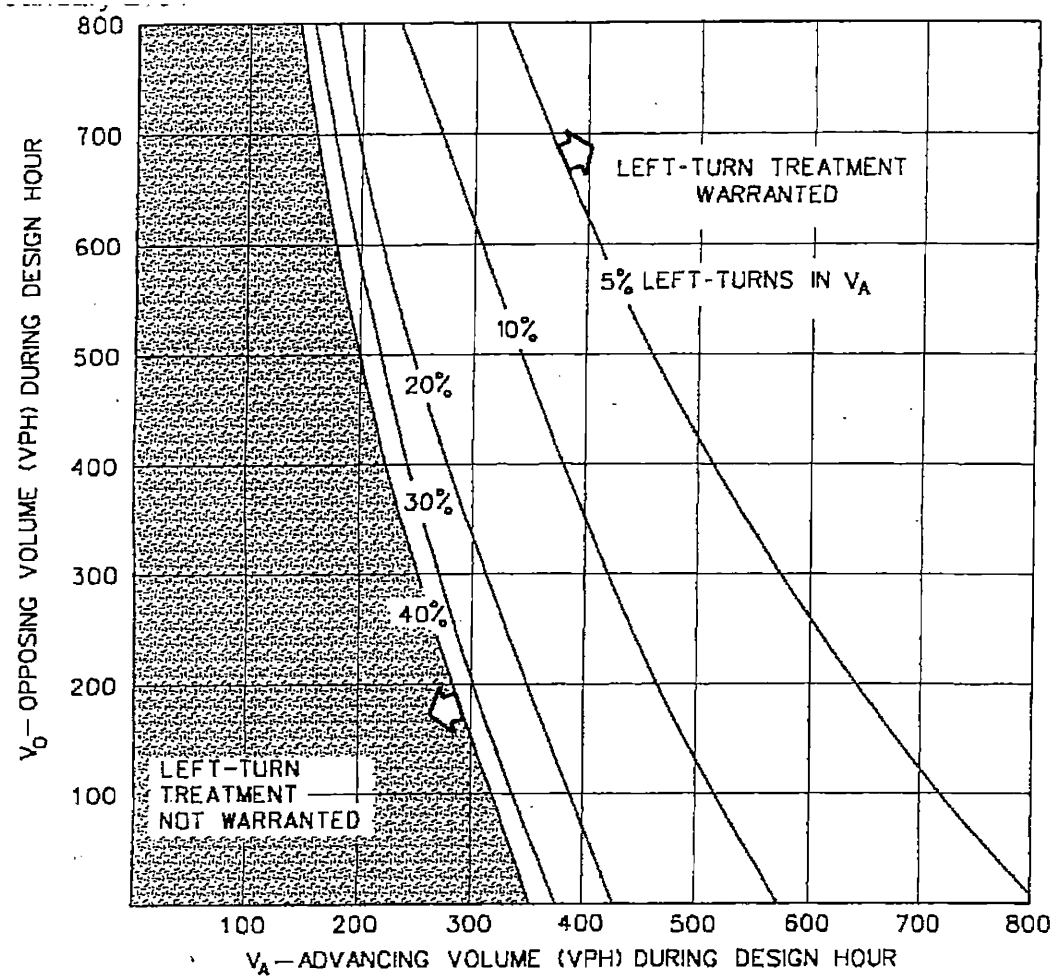
Step D: Determine the volume threshold for which a left-turn lane would be warranted by multiplying the approaching volume ($V_{A)}$ by the percentage found in Step C.

V_A x 8.5%
500vph x (8.5/100) =
500vph x 0.085 =
42.5 vph

Step E: Compare the actual volume of left turns ($V_{L)}$ with the volume of left turns that would warrant a left-turn lane as determined in Step D. In this case, the actual left-turn volume of 50 vph is higher than 42.5vph, which is the threshold for which a left-turn lane is warranted; therefore, the project should install a left-turn lane.

V_A = TOTAL ADVANCING TRAFFIC VOLUME INCLUDING ALL TURNING TRAFFIC

V_O = TOTAL OPPOSING TRAFFIC VOLUME INCLUDING ALL TURNING TRAFFIC



Instructions:

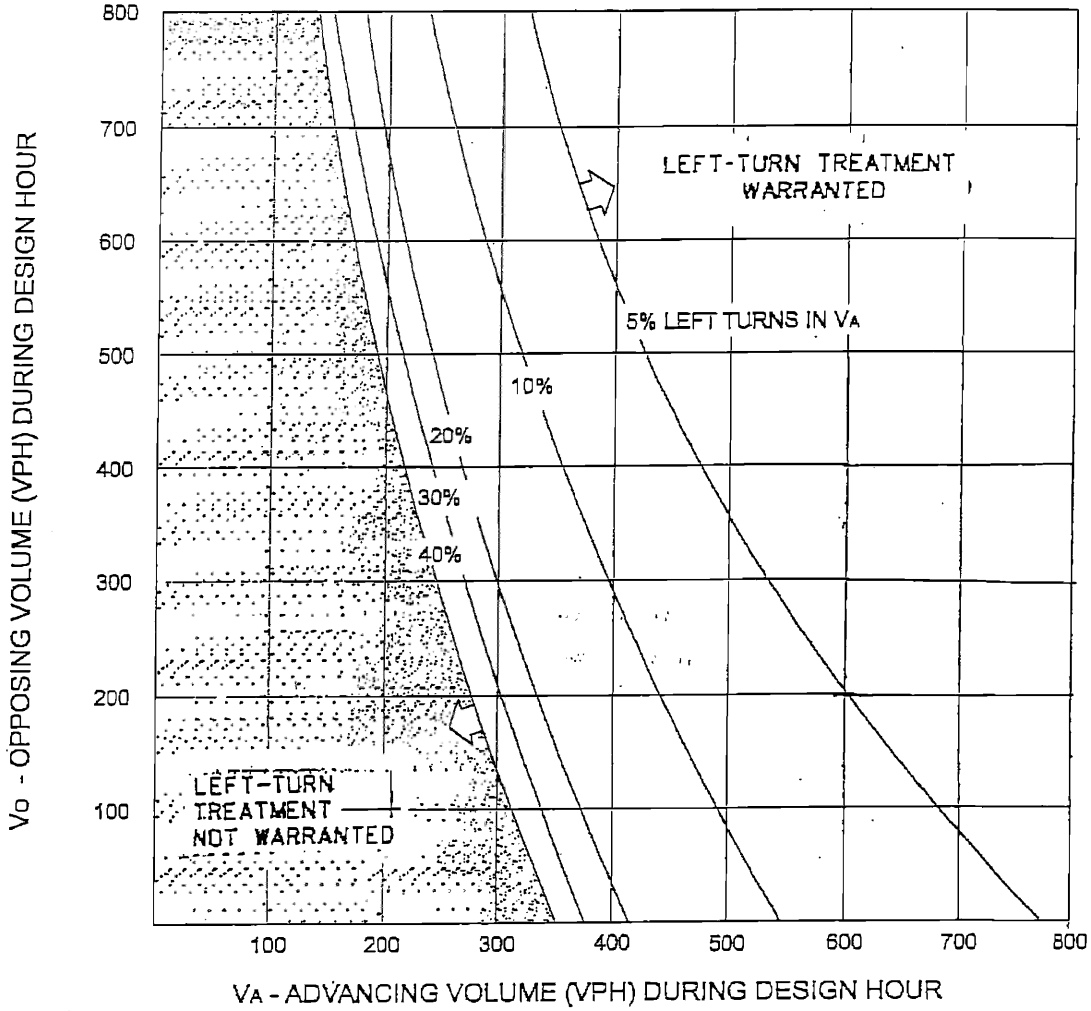
1. *The family of curves represent the percent of left turns in the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of 5, the designer should estimate where the curve lies.*
2. *Read V_A and V_O into the chart and locate the intersection of the two volumes.*
3. *Note the location of the point in #2 relative to the line in #1. If the point is to the right of the line, then a left-turn lane is warranted. If the point is to the left of the line, then a left-turn lane is not warranted based on traffic volumes.*

VOLUME WARRANTS FOR LEFT-TURN LANE AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (40 mph)

Figure 1

V_A = TOTAL ADVANCING TRAFFIC VOLUME INCLUDING ALL TURNING TRAFFIC

V_O = TOTAL OPPOSING TRAFFIC VOLUME INCLUDING ALL TURNING TRAFFIC

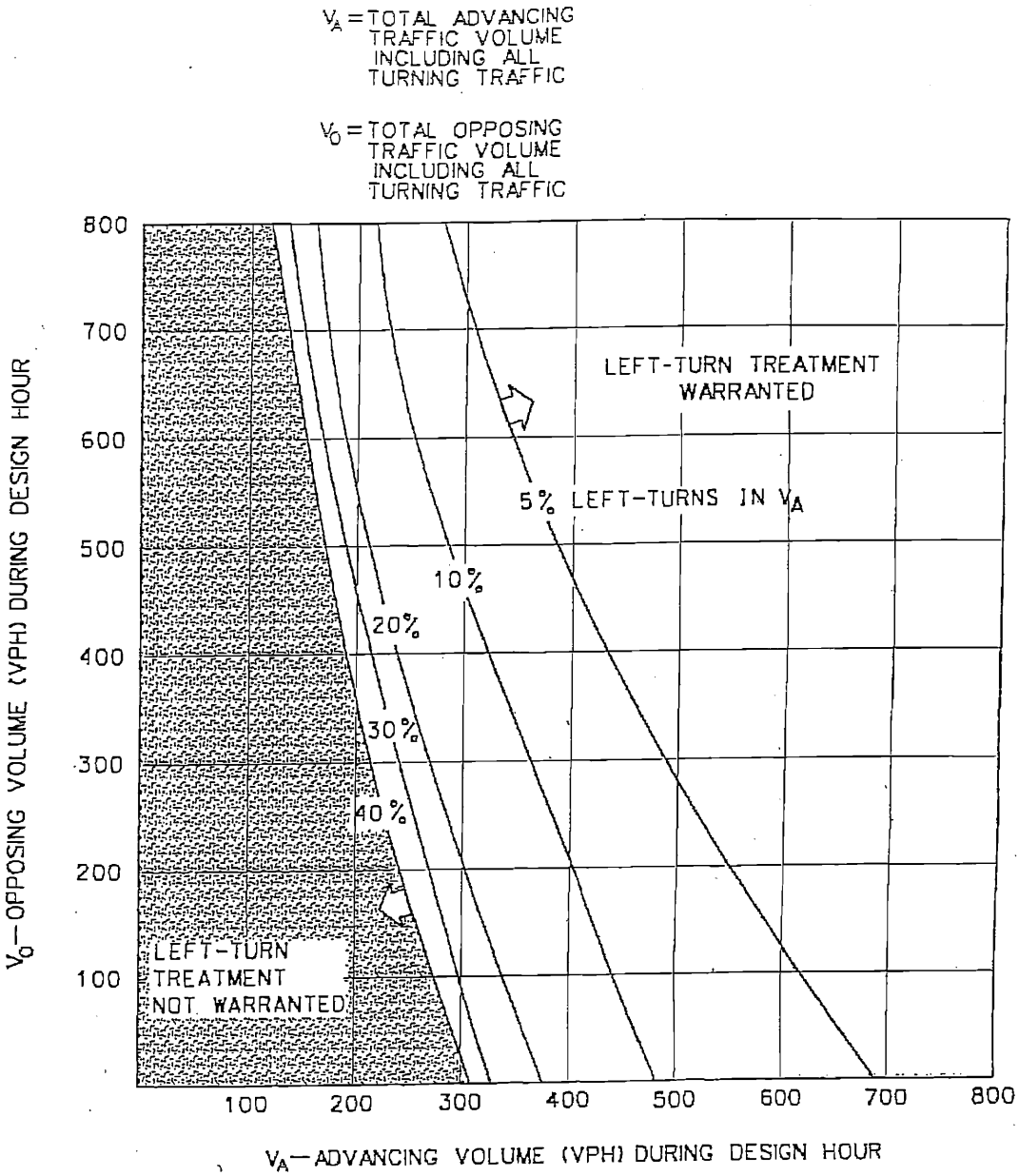


Instructions:

1. *The family of curves represent the percent of left turns in the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of 5, the designer should estimate where the curve lies.*
2. *Read V_A and V_O into the chart and locate the intersection of the two volumes.*
3. *Note the location of the point in #2 relative to the line in #1. If the point is to the right of the line, then a left-turn lane is warranted. If the point is to the left of the line, then a left-turn lane is not warranted based on traffic volumes.*

VOLUME WARRANTS FOR LEFT-TURN LANE AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (**45 mph**)

Figure 2



Instructions:

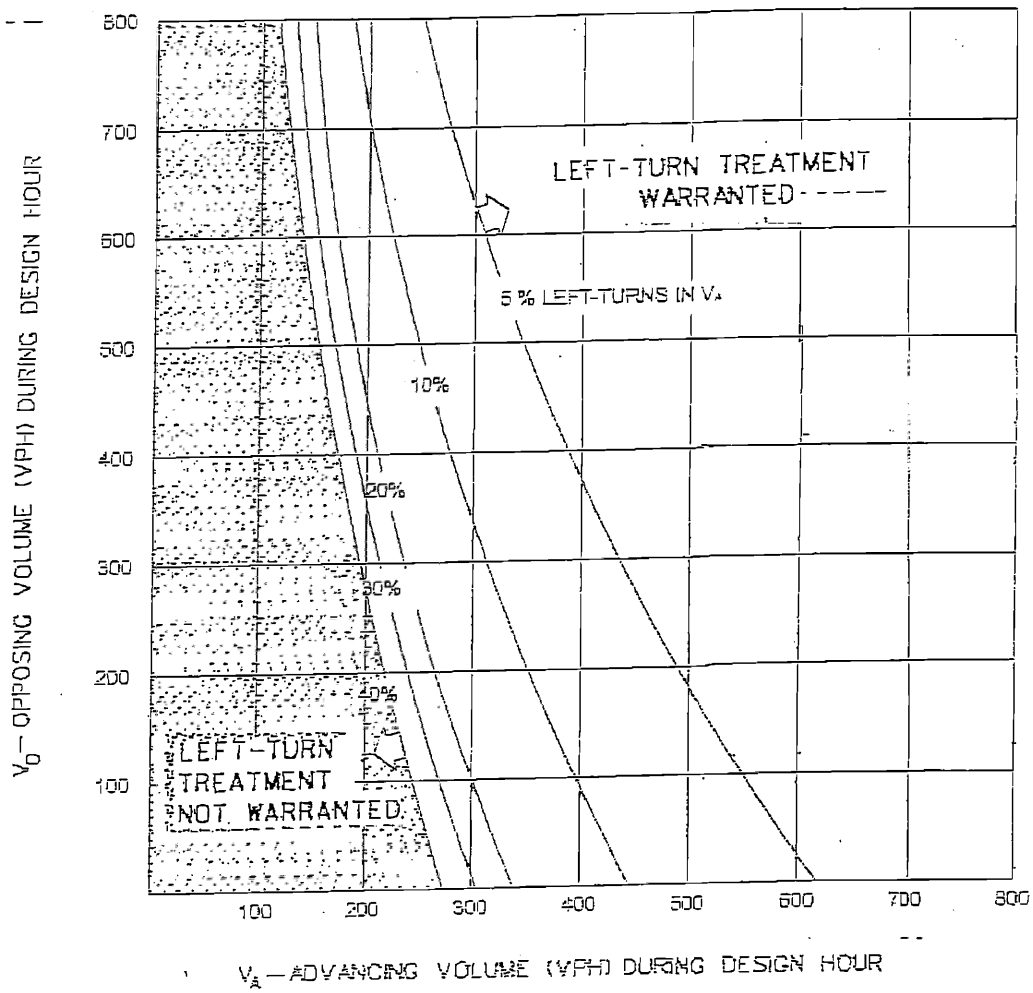
1. *The family of curves represent the percent of left turns in the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of 5, the designer should estimate where the curve lies.*
2. *Read V_A and V_O into the chart and locate the intersection of the two volumes.*
3. *Note the location of the point in #2 relative to the line in #1. If the point is to the right of the line, then a left-turn lane is warranted. If the point is to the left of the line, then a left-turn lane is not warranted based on traffic volumes.*

VOLUME WARRANTS FOR LEFT-TURN LANE AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (50 mph)

Figure 3

V_A = TOTAL ADVANCING TRAFFIC VOLUME INCLUDING ALL TURNING TRAFFIC

V_O = TOTAL OPPOSING TRAFFIC VOLUME INCLUDING ALL TURNING TRAFFIC



Instructions:

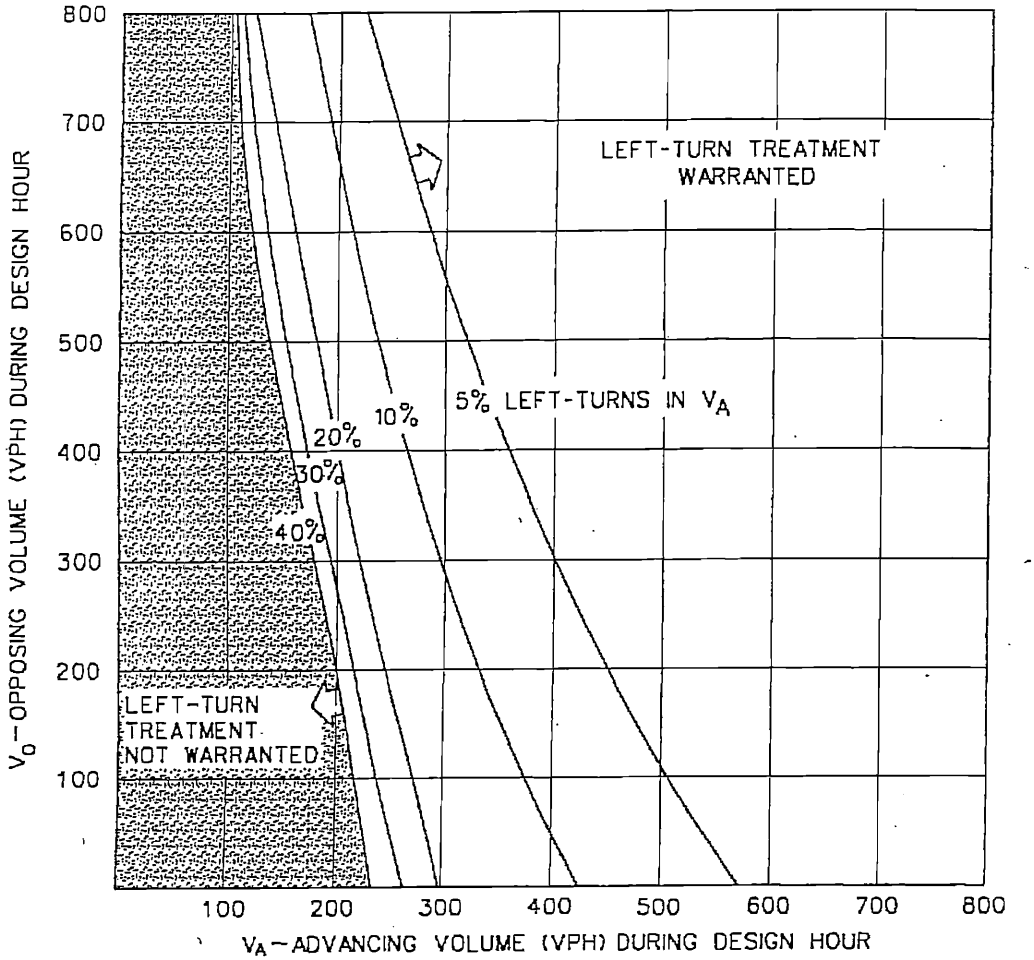
1. *The family of curves represent the percent of left turns to the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of 5, the designer should estimate where the curve lies.*
2. *Read V_A and V_O into the chart and locate the intersection of the two volumes.*
3. *Note the location of the point in #2 relative to the line in #1. If the point is to the right of the line, then a left-turn lane is warranted. If the point is to the left of the line, then a left-turn lane is not warranted based on traffic volumes.*

VOLUME WARRANTS FOR LEFT-TURN LANE AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (**55 mph**)

Figure 4

V_A = TOTAL ADVANCING TRAFFIC VOLUME INCLUDING ALL TURNING TRAFFIC

V_O = TOTAL OPPOSING TRAFFIC VOLUME INCLUDING ALL TURNING TRAFFIC



Instructions:

1. *The family of curves represent the percent of left turns in the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of 5, the designer should estimate where the curve lies.*
2. *Read V_A and V_O into the chart and locate the intersection of the two volumes.*
3. *Note the location of the point in #2 relative to the line in #1. If the point is to the right of the line, then a left-turn lane is warranted. If the point is to the left of the line, then a left-turn lane is not warranted based on traffic volumes.*

VOLUME WARRANTS FOR LEFT-TURN LANE AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (60 mph)

Figure 5

Table 2 - Traffic Volume Growth Factors

Representative City/Place	2010	Compound Annual Growth (%)	2015	Compound Annual Growth (%)	2020	Compound Annual Growth (%)	2025	Compound Annual Growth (%)	2030	Compound Annual Growth (%)	2035
Agoura Hills	1.000	0.40	1.020	0.41	1.041	0.21	1.052	0.21	1.063	0.22	1.075
Santa Clarita	1.000	2.75	1.145	2.43	1.291	0.87	1.348	0.83	1.405	0.78	1.461
Lancaster	1.000	3.95	1.214	3.29	1.427	3.27	1.676	2.80	1.924	2.45	2.172
Palmdale	1.000	2.55	1.134	2.24	1.267	1.47	1.363	1.36	1.458	1.27	1.553
Angeles Forest	1.000	2.85	1.151	2.48	1.301	1.39	1.394	1.30	1.487	1.22	1.580
West S.F. Valley	1.000	0.53	1.027	0.52	1.054	0.26	1.068	0.28	1.083	0.26	1.097
Burbank	1.000	0.48	1.024	0.48	1.049	0.27	1.063	0.26	1.077	0.28	1.092
Sylmar	1.000	0.48	1.024	0.48	1.049	0.42	1.071	0.41	1.093	0.38	1.114
Malibu	1.000	0.53	1.027	0.52	1.054	0.40	1.075	0.39	1.096	0.38	1.117
Santa Monica	1.000	0.28	1.014	0.27	1.028	0.19	1.038	0.21	1.049	0.19	1.059
West/Central L.A.	1.000	0.14	1.007	0.14	1.014	0.20	1.024	0.19	1.034	0.19	1.044
South Bay/LAX	1.000	0.26	1.013	0.26	1.026	0.17	1.035	0.17	1.044	0.17	1.053
Palos Verdes	1.000	0.50	1.025	0.50	1.051	0.19	1.061	0.19	1.071	0.19	1.081
Long Beach	1.000	1.48	1.076	1.37	1.152	0.14	1.160	0.14	1.168	0.15	1.177
Vernon	1.000	1.42	1.073	1.33	1.146	0.21	1.158	0.21	1.170	0.20	1.182
Downey	1.000	1.02	1.052	0.97	1.104	0.22	1.116	0.20	1.127	0.21	1.139
Downtown L.A.	1.000	0.18	1.009	0.18	1.018	0.23	1.030	0.23	1.042	0.23	1.054
Glendale	1.000	0.28	1.014	0.26	1.027	0.27	1.041	0.27	1.055	0.25	1.068
Pasadena	1.000	0.81	1.041	0.78	1.082	0.29	1.098	0.31	1.115	0.29	1.131
West Covina	1.000	0.46	1.023	0.45	1.046	0.38	1.066	0.37	1.086	0.37	1.106
Pomona	1.000	1.57	1.081	1.44	1.161	0.49	1.190	0.48	1.219	0.47	1.248

Volume Evaluation Outcome Based on Appropriate Harmelink Nomograph:

Is a Left-Turn Treatment Warranted?	Action To Be Taken
No	No action required, Installation of a Exclusive Left-Turn Lane on the fronting roadway is not necessary
Yes	Exclusive Left-Turn Lane should be installed on the fronting roadway

Section 3 Project Implementation

This section establishes the procedures and process for the planning and evaluation of implementation of left-turn lanes for private developments fronting a two-lane, rural highway.

a) Tentative Map Review and Plot Plan Review

All proposed subdivisions and plot plans will be reviewed by Public Works' Land Development Division, Road and Grading Section, for adherence to the left-turn lane implementation criteria established in these guidelines. The applicant is, however, responsible for coordinating the review with, and incorporating design criterion imposed by, any other agency including, but not limited to, the Department of Regional Planning and the County of Los Angeles Fire Department.

All Conditions of Approval related to left-turn lanes at private developments will be prepared in accordance with these guidelines.

The applicant shall be responsible for preparing and submitting the appropriate engineering plans, studies, and/or analyses to allow adequate review in accordance with these guidelines by Public Works staff. In addition, the applicant shall bear the entire cost associated with the preparation of said plans/documents as well as depositing any necessary funds to allow Public Works' staff to recover the actual costs of review.

b) Final Engineering

Should a left-turn lane be required of a project, conditions of approval will be prepared accordingly and the applicant will be 100 percent responsible for submitting the appropriate final engineering plans. All plans shall be prepared by a licensed Civil Engineer.

Street Improvement Plans and Striping Plans associated with the implementation of left-turn lanes at private driveways will be reviewed by the Land Development Division, Road and Grading Section. Grading plans associated with subdivisions and Conditional Use Permits (CUP) will also be reviewed by the Land Development Division, Road and Grading Section. However, grading plans associated with single-lot developments (other than CUPs) will be reviewed by the applicable Building and Safety district office. Plan check fees for road, striping, and grading plans will be based on fee schedules in effect at the time of submittal.

Should additional pavement be necessary to implement a left-turn lane, a soils report or materials test may be needed to adequately analyze the pavement structural sections. Any proposed structural section is subject to approval by Public Works' Geotechnical and Materials Engineering Division, Soils and Geology Section. It is also the applicant's responsibility to verify the adequacy of the existing road right of way to accommodate any needed improvements and to acquire, prior to tentative map approval (for subdivision related projects), any additional right of way required to implement the left-turn lane.

The applicant shall be solely responsible for submitting, coordinating, and processing each applicable plan review through each reviewing division/section.

c) Construction

It is the responsibility of the applicant to apply for and obtain the necessary encroachment permits for any required work within the public right of way and to pay all applicable fees prior to permit issuance.

Section 4 Acknowledgements

Document Preparation Team

The following were contributing members of a committee that was established for the sole purpose of formulating this document:

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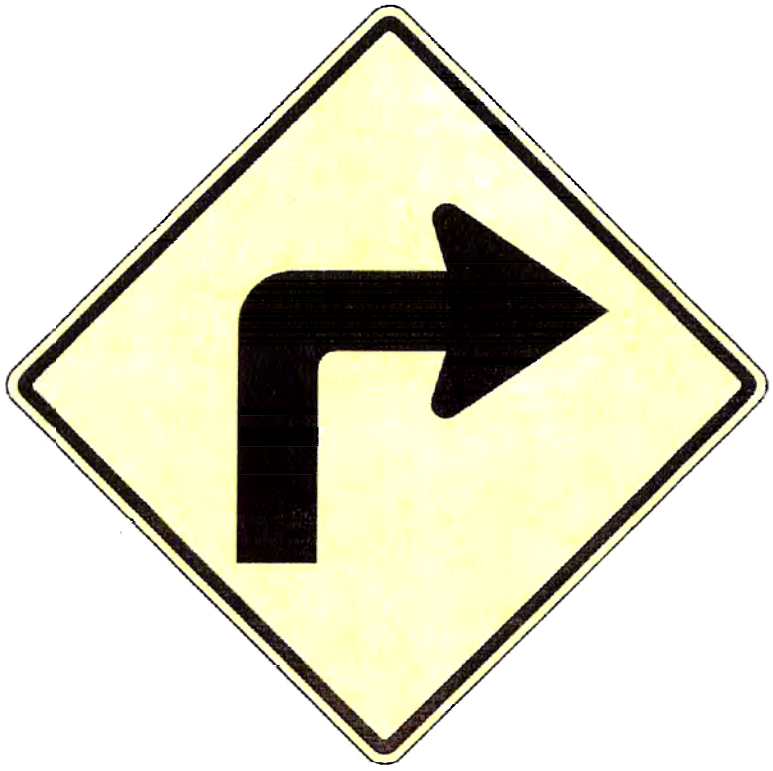
County of Los Angeles
Department of Public Works

Access Management For
Private Developments
Guidelines Manual



Chapter 2
Right-Turn Lane Implementation
For Private Development
Fronting Two-Lane Rural
Undivided Highways

June 2011

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Section 1 Introduction

Private developments are increasingly being proposed throughout the rural areas of Los Angeles County, along highways that are not built to ultimate width and/or lack exclusive right-turn lanes. Many of these proposed projects, once analyzed, could benefit from the installation of an exclusive right-turn lane on the frontage roadway to facilitate ingress vehicular movement at the project's access point.

The refuge area provided by exclusive right-turn lanes can also lead to enhanced traffic operation by minimizing potential conflicts between various users of the roadway.

These guidelines have been established for the following reasons:

- To assist in the formulation and preparation of conditions of approval for tentative maps, parcel maps, and plot plans (associated with conditional use permits and other single-lot developments, subject to conditions).
- To provide a standardized approach in analyzing the need for implementation of right-turn lanes on two-lane rural highways fronting private developments.

These guidelines shall be applicable for all private developments, subject to discretionary approval or those projects subject to improvement requirements under Los Angeles County Code Title 22, Chapter 22.48, Part 4 (Section 22.48.220, et seq.). For projects where a detailed traffic study is required by the County of Los Angeles Department of Public Works' Traffic and Lighting Division, an analysis of the sight distance and traffic volumes at the proposed access point, based on these guidelines, should be included in the study to verify if the need for a dedicated right-turn lane exists.

The following references were used to develop these right-turn lane implementation guidelines:

- Los Angeles County Code Title 21
- Los Angeles County Code Title 22
- AASHTO
- California Department of Transportation (Caltrans) Highway Design Manual
- Traffic Volume Warrants for Right Turn Auxillary Lanes At Unsignalized Intersections, (Willey, L.B., 1989), in Vermont Agency of Transportation Guidelines for Engineering Issues, Attachment G, 1994.
- *Turn Lane Warrants: Concepts, Standards, Application in Review,* presented by David J. DeBaie P.E., P.T.O.E at the 2004 ITE, District Meeting in Burlington Vermont.

- Harmelink, M.D., *Aspects of Traffic Control Devices: Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections*, Highway Research Board Report No. 211, Washington, DC, Highway Research Board, National Research Council, 1967.

Design speeds and the corresponding sight distance criteria utilized for these guidelines are based on standards referenced in Chapter 200 of the Caltrans Highway Design Manual. Minimum design speeds assigned for each classification of roadway, as referenced in these guidelines, are based on current design practices being used at the County of Los Angeles Department of Public Works (Public Works).

This chapter will be a living document and may be periodically revised or updated.

Section 2 Right-Turn Lane Implementation Guidelines

This section establishes prescribed steps to be used in evaluating whether conditions related to the implementation of right-turn lanes on rural, two-lane highways, fronting proposed developments within the County of Los Angeles, should be imposed.

The main factors identified in these guidelines that contribute to the need for right-turn lane implementation are the design speed of the fronting roadway; stopping sight distance (both horizontal and vertical) at the project's access point; and the correlation between the advancing and right-turn projected traffic volumes, post-project implementation, as analyzed at the project access point.

A step-by-step process to evaluate these factors can be found on the following pages:

> The guidelines found in this chapter shall in no way preclude the use of sound engineering judgment in analyzing the need for right-turn lane implementation at a particular project entrance. Each project shall be reviewed on a case-by-case basis and be thoroughly evaluated to determine if a right-turn lane should be installed or not. Other factors that should be taken into consideration that are outside the scope of this chapter include, but are not limited to, accident history, existing traffic operations, and other geometric constraints in the general vicinity of the proposed project. In addition, due to the uniqueness of each project, imposing vehicular access restrictions at a particular project site may be necessary and this chapter shall not preclude Public Works from conditioning a project in this manner.

Step 1 - Record the Project Information and Determine the Design Parameters

Step 1A – General Project Information – Please fill in all applicable project information. Denote "N/A" if an item does not apply.

Type of Project:
- ☐ Subdivision–TR#_____, PM#_____
- ☐ Conditional Use Permit–CUP#_____
- ☐ Single Lot Development–Zone_____

Project Address:

_____

Assessor's Parcel Number(s)_____

Street name where access is being proposed:_____

Step 1B–Determine the Classification of the Roadway–Please check the box of the corresponding highway classification of the roadway where access is being proposed.

- ☐ Major Highway–100 feet minimum Right of Way Width
- ☐ Parkway–80 feet minimum Right-of-Way Width
- ☐ Secondary Highway–80 feet minimum Right of Way Width
- ☐ Limited Secondary Highway–64 feet to 80 feet of Standard Right of Way Width

Roadway classifications throughout the County of Los Angeles can be found on the County's Highway Plan. Depending on where the proposed project is located, you may access the appropriate Highway Plan at the following web addresses:

North County Highway Plan:
http://planning.lacounty.gov/assets/upl/data/map_t04-hwy-plan-north-existing.pdf

South County Highway Plan:
http://planning.lacounty.gov/assets/upl/data/map_t05-hwy-plan-south-existing.pdf

Step 1C – Determine the Design Speed of the Roadway–The design speed chosen should reflect the minimum design speed corresponding to the roadway classification determined/recorded in Step 1B. These design speeds are shown below.

Major Highway: 65 mph (60 mph*)
Secondary Highway or Parkway: 60 mph (55 mph*)
Limited Secondary Highway: 55 mph (45mph*)

* Lower design speed exception may be made based on roadway constraints such as topography, intersection spacing, and other road conditions, subject to Public Works approval.

Please record the design speed of the roadway below:

The Design Speed of _____
(Name of Roadway where Access is Being Proposed)
is_____ mph.

Step 2 – Analyze the Horizontal and Vertical Stopping Sight Distance

Stopping sight distance as defined in the Caltrans Highway Design Manual is the distance required by the driver of a vehicle traveling at a given speed to bring the vehicle to a stop after an object on the road becomes visible.

Line of sight should be based on the minimum design speeds for each roadway classification as determined in Step 1C above.

Table 1 below shows the stopping sight distance lengths for corresponding design speeds based on standards referenced in Chapter 200 of the Caltrans Highway Design Manual. The values shown should be increased by 20 percent on sustained downgrades steeper than 3 percent and longer than one mile to be consistent with the Caltrans standard found in the Highway Design Manual.

Table 1 – Stopping Sight Distance Standards

Design Speed (MPH)	Stopping Sight Distance (ft) [1]
65	660
60	580
55	500
50	430
45	360
40	300
35	250
30	200
25	150
20	125

Since the purpose of this chapter is to evaluate if a right-turn lane is necessary considering current and projected vehicular traffic conditions, the measurement of stopping sight distance is essentially from the driver's eye of one vehicle to the bumper of another vehicle. Therefore, the evaluation of stopping sight distance within the context of this chapter should utilize a driver's eye and the target object height of 3.5 feet and 2.0 feet above the surface of the roadway respectively.

[1] Stopping sight distance values are based on CALTRANS Highway Design Manual, January 4, 2007 edition, Table 201.1.

An appropriate line-of-sight exhibit analyzing the horizontal and vertical stopping sight distance in both directions should be submitted for evaluation along with the proposed plot plan. The line-of-sight exhibit should show the location of the back bumper for the right-turning vehicle (vehicle 1), which is presumed to be located in the center of the travel lane, 20 feet (for a typical passenger car) back from the nearside curb prolongation of the proposed driveway. Should the proposed use of the site involve vehicles other than typical passenger cars, the assumed location of the back bumper of vehicle 1 would change accordingly based on the typical length of the project's design vehicle. Design vehicle lengths should be obtained from AASHTO's, *A Policy on Geometric Design of Highways and Streets* (latest edition). In addition, the line-of-sight exhibit should show the drivers eye for the advancing vehicle (vehicle 2), which can be presumed to be 3.5 feet above the pavement surface, 4 feet from the centerline (or center lane line as appropriate), and positioned at the appropriate stopping sight distance (as determined from Table 1 above) away from the back bumper of vehicle 1.

The use of stopping sight distance shall be based on the evaluation of the existing and proposed field conditions and constraints subject to Public Works' review and approval.

Sight Distance Evaluation Outcome Based on Table 1:

Is There Adequate Sight Distance?	Action To Be Taken
No	Exclusive Right-Turn Lane should be installed on the fronting roadway
Yes	Continue evaluation with STEP 2

Step 3 – Analyze the Correlation between the Advancing Volume and the Right-Turn Volumes for a Given Design Speed

The relationship between the advancing traffic volume[2], right-turn volume[3], and design speed is critical in determining if a right-turn lane is warranted at a proposed driveway or street along an two-lane rural undivided highway and can be evaluated by using the Volume Warrant for Right-Turn Lanes at Unsignalized Intersections for 2-lane Highways as shown in Figure 1 on page 2-11. This nomograph was adopted by the Vermont Agency of Transportation (documented in the Traffic Volume Warrants for Right Turn Auxillary Lanes At Unsignalized Intersections, (Willey, L.B., 1989), in Vermont Agency of Transportation Guidelines for Engineering Issues, Attachment G, 1994) and was modified to reflect only the curves related to the two-lane highways. It is based on the same concepts used by M.D Harmelink to create the largely popular Harmelink nomographs for left-turn warrants (documented in the *Aspects of Traffic Control Devices: Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade*

[2] Advancing traffic volume as used in this context shall refer to the volume of traffic that is traveling in the same direction of where the right-turn lane is being considered at the proposed project access point.
[3] Right-turn volume as used in this context shall refer to the volume of traffic that is anticipated to make a right-turn into the proposed project access point.

Intersections, Highway Research Board Report No 211, Washington, DC, Highway Research Board, National Research Council, 1967). The concept behind the Harmelink nomographs for left-turn implementation, involves using the design speed and the opposing[4], advancing[5], and left-turn traffic volumes[6] to evaluate the relationship between the arrival of a vehicle approaching the intersection[7] that is forced to queue behind a slow moving or stopped vehicle that is waiting for a large enough gap in the opposing traffic to turn left. The Harmelink nomographs for left-turn implementation can be found in Chapter 1 this Guidelines Manual.

Since drivers of right-turning vehicles do not need to wait for gaps in opposing traffic to negotiate the turn, the nomograph shown in Figure 1 simply compares three critical design criteria; advancing traffic volume[8], right-turn traffic volume[9], and design speed. Similar nomographs using the same basic concepts are being utilized by other entities and are included in publications developed by other states. Instructions on how to use the nomograph shown in Figure 1 to determine the minimum threshold for which a right-turn lane should be implemented can be found under the figure. Please note that due to the absence of a 65 mph speed curve the 60 mph speed curve may be used for evaluation of roadways with a 65 mph design speed.

It is important to note that the term advancing traffic volume as used above has different meanings depending on the context that they are used.

The advancing traffic volume is the volume of traffic that is traveling in the same direction of the vehicle negotiating the turn movement (left or right) being analyzed. For example, if one was to evaluate the need for a right turn lane into a project driveway located on the south side of a highway that runs in the east/west direction, the advancing traffic volume would be the volume of traffic traveling in the eastbound direction. Conversely, if one was to evaluate the need for a left-turn lane into the same project driveway, the advancing traffic volume would be the volume of traffic traveling in the westbound direction.

Similarly, the term opposing traffic volume is the volume of traffic that is traveling in the opposite direction of any given vehicle.

Examples on how to use the nomograph shown in Figure 1 can be found below. The Total Advancing Volume (V_A) value referenced is to be provided by the applicant using volumes obtained from a current traffic count in the vicinity of the proposed project. Said traffic counts should be performed by an independent

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[4] Opposing traffic volume as used in this context shall refer to the volume of traffic that is traveling in the opposite direction of where a left-turn lane is being considered at the proposed project access point.
[5] Advancing traffic volume as used in this context shall refer to the volume of traffic that is traveling in the same direction of where the left-turn lane is being considered at the proposed project access point.
[6] Left-turn volume as used in this context shall refer to the volume of traffic that is anticipated to make a left-turn into the proposed project access point.
[7] Intersection in this context refers to the converging of the project driveway access to the 2-lane highway.
[8] Advancing traffic volume as used in this context shall refer to the volume of traffic that is traveling in the same direction of where the right-turn lane is being considered at the proposed project access point.
[9] Right-turn volume as used in this context shall refer to the volume of traffic that is anticipated to make a right-turn into the proposed project access point.

traffic count company at the applicant's expense. Please note that it may also be necessary for the developer of private development to analyze the need for a left-turn lane (see chapter 1 of this manual for evaluation procedures). If this is the case, it is important to recognize that the Total Opposing Volume (V_O) data collected during the left-turn lane analysis under the Chapter 1 guidelines is the same as the Total Advancing Volume (V_A) referenced herein. The traffic counts are to be taken along the property frontage in the vicinity of the proposed project access during the AM and PM peak hours on appropriate days as determined by Public Works.

The total right-turn Volumes, (V_R) should be projected for the project build out year by the applicant using an independent traffic consultant. For projects with a build out year of 2015 or beyond, the applicable traffic volume growth factor, which can be found in Table 2 of this chapter, shall be applied. The design speed as referenced in the following examples is the speed determined in Step 1C above.

Example 1

Determined Values as indicated above:

- Design Speed = 60mph
- Total Advancing Volume including all turning movements, V_A= 384vph
- Total Right-turn Volumes into the project site for the projected build out year, V_R = 80vph

Project Location = Agoura Hills
Build out Year = 2020

Analyze:

If an exclusive right-turn lane into the project site is warranted.

Solution:

Step A: Determine the applicable Traffic Volume Growth Factor from Table 2.

The corresponding Growth Factor from Table 2 for a build out year of 2020 in the City of Agoura Hills is 1.041.

Step B: Apply the growth factor found in Step A to the total advancing volume determined from a traffic count company.

Total Advancing Volume with ambient growth factor applied:
V_A = 384vph x 1.041 = 400vph

Step C: Calculate the percentage of right-turns in the advancing volume.
(V_R / V_A) x 100 =
(80vph / 400vph) x 100 =
0.20 x 100 = 20%

Step D: Using Figure 1, find the intersection point of V_A (400vph) and the percentage found in Step C (20%).

Step E: Determine the location of the point found in Step D relative to the 60 mph design speed curve. If the intersection point lies above or to the right of the curve then a right-turn lane is warranted based on volumes. If it lies below or to the left of the curve then a right-turn lane is not warranted based on volumes. In this case, the intersection point of V_A (400vph) and 20% lies above the 60mph design speed curve on Figure 1 and, therefore, a right-turn lane is warranted.

Example 2 below utilizes the same values as Example 1; however, this method compares the design speed of the roadway to the design speed found to be the threshold for warranting a right-turn lane. As in Example 1, Example 2 shows the same outcome; a right-turn lane is warranted.

Example 2

Determined Values as indicated above:

- Design Speed = 60mph
- Total Advancing Volume including all turning movements, V_A= 384vph
- Total Right-turn Volumes into the project site for the projected build out year, V_R = 80vph

Project Location = Agoura Hills
Build out Year = 2020

Analyze:

If an exclusive right-turn lane into the project site is warranted.

Solution:

Step A: Determine the applicable Traffic Volume Growth Factor from Table 2.

The corresponding Growth Factor from Table 2 for a build out year of 2020 in the City of Agoura Hills is 1.041.

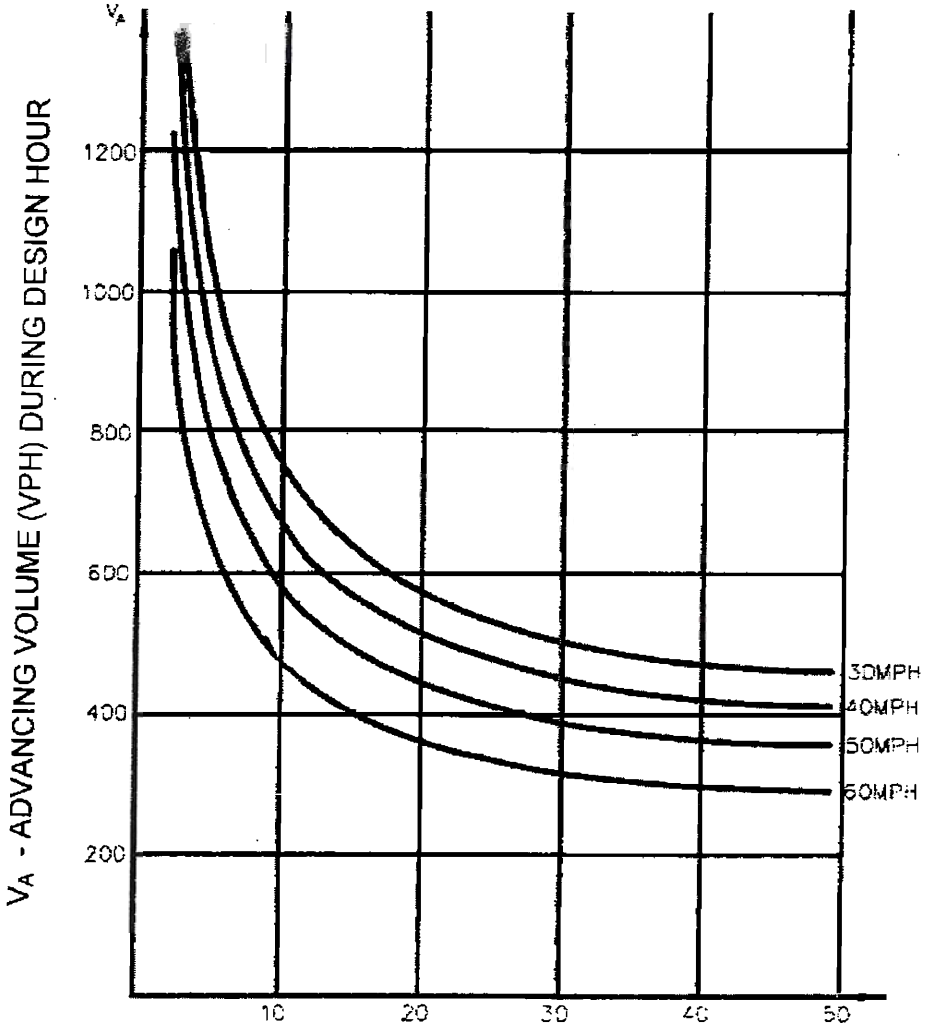
Step B: Apply the growth factor found in Step A to the total advancing volume determined from a traffic count company.

Total Advancing Volume with ambient growth factor applied:
V_A = 384vph x 1.041 = 400vph

Step C: Calculate the percentage of right-turns in the advancing volume.
(V_R / V_A) x 100 =
(80vph / 400vph) x 100 =
0.20 x 100 = 20%

Step D: Using Figure 1, find the intersection point of V_A (400vph) and the percentage found in Step C (20%) and determine the corresponding "design speed curve" that applies (e.g., determine the curve that would pass through the intersection point). In this case, the corresponding design speed that would warrant a right-turn lane would be approximately 55mph.

Step E: Compare the actual design speed of the roadway with the design speed that would warrant a right-turn lane as determined in Step D. In this case, the actual design speed of the roadway (60mph) is higher than 55mph (which is the threshold for which a right-turn lane is warranted); therefore, the project should install a right-turn lane.



Instructions:

1. The family of curves represent the design speed of the roadway as determined by the designer in Step 1C.

2. Determine the percentage (%) of right-turns (V_R) in the advancing volumes (V_A) during the design hour by dividing V_R by V_A and multiplying this value by 100. Please note V_A is the total advancing traffic volume including all turning traffic.

3. Read V_A and the percentage into the chart and locate the intersection of the two values.

4. Note the location of the point found in no. 3 above relative to the line described in no. 1 above. If the point is above or to the right of the line, then a right-turn lane is warranted based on traffic volumes. If the point is below or to the left of the line, then a right-turn lane is not warranted based on traffic volumes.

Volume Warrant for Right-Turn Lane at Unsignalized Intersections on 2-lane Highways
Figure 1

Table 2 - Traffic Volume Growth Factors

Representative City/Place	2010	Compound Annual Growth (%)	2015	Compound Annual Growth (%)	2020	Compound Annual Growth (%)	2025	Compound Annual Growth (%)	2030	Compound Annual Growth (%)	2035
Agoura Hills	1.000	0.40	1.020	0.41	1.041	0.21	1.052	0.21	1.063	0.22	1.075
Santa Clarita	1.000	2.75	1.145	2.43	1.291	0.87	1.348	0.83	1.405	0.78	1.461
Lancaster	1.000	3.95	1.214	3.29	1.427	3.27	1.676	2.80	1.924	2.45	2.172
Palmdale	1.000	2.55	1.134	2.24	1.267	1.47	1.363	1.36	1.458	1.27	1.553
Angeles Forest	1.000	2.85	1.151	2.48	1.301	1.39	1.394	1.30	1.487	1.22	1.580
West S.F. Valley	1.000	0.53	1.027	0.52	1.054	0.26	1.068	0.28	1.083	0.26	1.097
Burbank	1.000	0.48	1.024	0.48	1.049	0.27	1.063	0.26	1.077	0.28	1.092
Sylmar	1.000	0.48	1.024	0.48	1.049	0.42	1.071	0.41	1.093	0.38	1.114
Malibu	1.000	0.53	1.027	0.52	1.054	0.40	1.075	0.39	1.096	0.38	1.117
Santa Monica	1.000	0.28	1.014	0.27	1.028	0.19	1.038	0.21	1.049	0.19	1.059
West/Central L.A.	1.000	0.14	1.007	0.14	1.014	0.20	1.024	0.19	1.034	0.19	1.044
South Bay/LAX	1.000	0.26	1.013	0.26	1.026	0.17	1.035	0.17	1.044	0.17	1.053
Palos Verdes	1.000	0.50	1.025	0.50	1.051	0.19	1.061	0.19	1.071	0.19	1.081
Long Beach	1.000	1.48	1.076	1.37	1.152	0.14	1.160	0.14	1.168	0.15	1.177
Vernon	1.000	1.42	1.073	1.33	1.146	0.21	1.158	0.21	1.170	0.20	1.182
Downey	1.000	1.02	1.052	0.97	1.104	0.22	1.116	0.20	1.127	0.21	1.139
Downtown L.A.	1.000	0.18	1.009	0.18	1.018	0.23	1.030	0.23	1.042	0.23	1.054
Glendale	1.000	0.28	1.014	0.26	1.027	0.27	1.041	0.27	1.055	0.25	1.068
Pasadena	1.000	0.81	1.041	0.78	1.082	0.29	1.098	0.31	1.115	0.29	1.131
West Covina	1.000	0.46	1.023	0.45	1.046	0.38	1.066	0.37	1.086	0.37	1.106
Pomona	1.000	1.57	1.081	1.44	1.161	0.49	1.190	0.48	1.219	0.47	1.248

Volume Evaluation Outcome Based on Nomograph shown in Figure 1:

Is a Right-Turn Treatment Warranted?	Action To Be Taken
No	No action required, Installation of a Exclusive Right-Turn Lane on the fronting roadway is not necessary
Yes	Exclusive Right-Turn Lane should be installed on the fronting roadway

Section 3 Project Implementation

This section establishes the procedures and process for the planning and evaluation of implementation of right-turn lanes for private developments fronting a two-lane rural highway.

a) Tentative Map Review and Plot Plan Review

All proposed subdivisions and plot plans will be reviewed by Public Works' Land Development Division, Road and Grading Section, for adherence to the right-turn lane implementation criteria established in these guidelines. The applicant is, however, responsible for coordinating the review with, and incorporating design criterion imposed by, any other agency including, but not limited to, the Department of Regional Planning and the County of Los Angeles Fire Department.

All Conditions of Approval related to right-turn lanes at private developments will be prepared in accordance with these guidelines.

The applicant shall be responsible for preparing and submitting the appropriate engineering plans, studies, and/or analyses to allow adequate review in accordance with these guidelines by Public Works staff. In addition, the applicant shall bear the entire cost associated with the preparation of said plans/documents as well as depositing any necessary funds to allow Public Works' staff to recover the actual costs of review.

b) Final Engineering

Should a right-turn lane be required of a project, conditions of approval will be prepared accordingly and the applicant will be 100 percent responsible for submitting the appropriate final engineering plans. All plans shall be prepared by a licensed Civil Engineer.

Street Improvement Plans and Striping Plans associated with the implementation of right-turn lanes at private driveways will be reviewed by the Land Development Division, Road and Grading Section. Grading plans associated with subdivisions and Conditional Use Permits (CUP) will also be reviewed by the Land Development Division, Road and Grading Section. However, grading plans associated with single-lot developments (other than CUPs) will be reviewed by the applicable Building and Safety district office. Plan check fees for road, striping, and grading plans will be based on fee schedules in effect at the time of submittal.

Should additional pavement be necessary to implement a right-turn lane, a soils report or materials test may be needed to adequately analyze the pavement structural sections. Any proposed structural section is subject to approval by Public Works' Geotechnical and Materials Engineering Division, Soils and Geology Section. It is also the applicant's responsibility to verify the adequacy of the existing road right of way to accommodate any needed improvements and to acquire, prior to tentative map approval (for subdivision related projects), any additional right of way required to implement the right-turn lane.

The applicant shall be solely responsible for submitting, coordinating, and processing each applicable plan review through each reviewing division/section.

c) Construction

It is the responsibility of the applicant to apply for and obtain the necessary encroachment permits for any required work within the public right of way and to pay all applicable fees prior to permit issuance.

Section 4 Acknowledgements

Document Preparation Team

The following were contributing members of a committee that was established for the sole purpose of formulating this document:

Design Division:
Roy Cruz

Land Development Division:
Matthew Dubiel
Andy Narag
Sam Richards

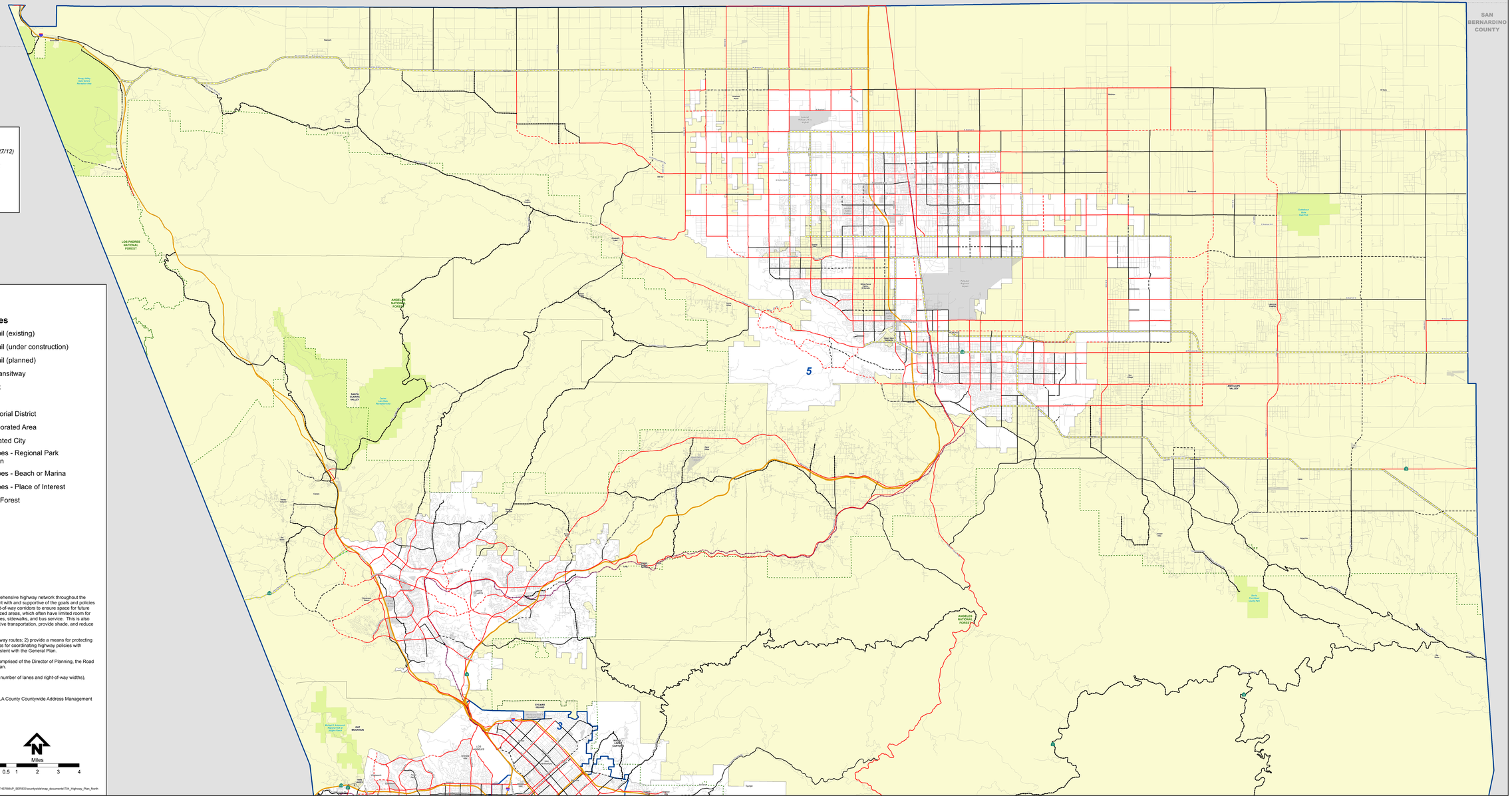
Operational Services Division:
David Fryer
Keith Lee
Javier Robles
Robert Scharf

Road Maintenance Division:
Jeff Harkins

Traffic and Lighting Division:
Gerald Ley
Jeff Pletyak

Attachment B
Los Angeles County Master Plan of Highways – North Half Map

Los Angeles County Master Plan of Highways - North Half



AS AMENDED:

GPA 2009-00006-(5) - Santa Clarita Valley Area Plan update (11/27/12)

GPA 2007-00019-(5) - Antelope Valley Area Plan update (6/16/15)

GPA 01-305-(All Districts) - General Plan Update (10/6/15)

LEGEND:

Major Highway
- Existing
- Proposed

Secondary Highway
- Existing
- Proposed

Limited Secondary Highway
- Existing
- Proposed

Parkway
- Existing
- Proposed

Expressway
- Existing
- Proposed

Freeway
- Existing
- Proposed

Base Features
- Metro Rail (existing)
- Metro Rail (under construction)
- Metro Rail (planned)
- Metro Transitway
- Metrolink
- Streets
- Supervisorial District
- Unincorporated Area
- Incorporated City
- Land Types - Regional Park or Garden
- Land Types - Beach or Marina
- Land Types - Place of Interest
- National Forest

NOTES:

The Los Angeles County Highway Plan provides policy guidance for building a comprehensive highway network throughout the unincorporated areas. The Highway Plan provides a highway system that is consistent with and supportive of the goals and policies outlined in the Land Use Element. More specifically, the Highway Plan maintains right-of-way corridors to ensure space for future facility improvements to accommodate alternative modes. This is important in urbanized areas, which often have limited room for expansion, but are in need of additional facilities and improvements, such as bike lanes, sidewalks, and bus service. This is also important in rural areas to accommodate trails and landscaping, which encourage active transportation, provide shade, and reduce runoff from pollutants.

The purpose of the Highway Plan is to: 1) depict the general location of planned highway routes; 2) provide a means for protecting highway rights-of-way within the unincorporated areas; 3) establish a plan and process for coordinating highway policies with neighboring cities and counties; and 4) provide for a system of highways that is consistent with the General Plan.

The Los Angeles County Interdepartmental Engineering Committee (IEC), which is comprised of the Director of Planning, the Road Commissioner, and the County Engineer, is charged with maintaining the Highway Plan.

For more information about each of these classifications (including information about number of lanes and right-of-way widths), please consult the Los Angeles County General Plan, chapter 7 - Mobility Element: http://planning.lacounty.gov/generalplan/generalplan

Street Centerline data from 2010 TIGER (US Census Bureau), modified through the LA County Countywide Address Management System (CAMS).

LOS ANGELES COUNTY
Dept. of Regional Planning
320 W. Temple St
Los Angeles, CA 90012

Miles
0 0.5 1 2 3 4

Current as of: 3/9/2016

\OTHERMAP_SERIES\countywidemap_documents\TD4_Highway_Plan_North

Attachment C
Detailed Site Plans

CONDITIONAL USE PERMIT FOR ESTRELLA SOLAR 21 MWAC

NOTES

1. THE PROJECT IS LOCATED WITHIN FEMA, PER FEMA FLOOD INSURANCE RATE MAP NO. 06037C0150F IN FLOOD ZONE "X".
   A. ZONE "X" (UNSHADED) IS DESIGNATED AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN.
2. FIRE APPARATUS ON-SITE & OFF-SITE ACCESS ROADS SHALL BE INSTALLED PRIOR TO OCCUPANCY OR OPERATION OF THE FACILITY.
3. PORTABLE TOILETS WILL BE PROVIDED DURING CONSTRUCTION AND MAINTENANCE ACTIVITIES. NO OTHER SANITARY FACILITIES WILL BE ON SITE.
4. INTERIOR ACCESS ROADS WILL BE 20' WIDE, COMPACTED TO THE 90% WITH MIN 32' TURNING RADIUS AT CENTERLINE. THE INNER RADIUS WILL BE MIN 22' AND THE OUTER RADIUS WILL BE MIN 42'. INTERIOR ACCESS ROADS WILL BE PROVIDED TO INVERTER/ELECTRICAL EQUIPMENT PADS AND AROUND THE PERIMETER OF THE PROJECT.
5. EXISTING GRADE (EG) CONTOURS SHOWN ARE SOURCED FROM USGS AND OBTAINED ON 02/06/2020.
6. GATE SETBACKS WILL BE 50' FROM EDGE OF PAVEMENT. DRIVEWAY WILL BE 24' WIDE OR GREATER AND ASPHALT PAVED WHERE CONNECTING TO AN EXISTING ASPHALT PAVED ROAD.
7. FIRE DEPARTMENT ACCESS DEVICE AND EMERGENCY CONTACT PLACARD SHALL BE LOCATED AT ALL ENTRANCE GATES.
8. THE FACILITY EMERGENCY CONTACT INFORMATION SHALL BE PROVIDED WITH EACH LIMITED ACCESS DEVICE, PER COUNTY OF LOS ANGELES FIRE DEPARTMENT REGULATION 5, AND SHALL BE CLEARLY INDICATED WITH AN APPROPRIATE PLACARD AT EACH INGRESS LOCATION. THE MINIMUM SIZE OF THE PLACARD SHALL BE 12 INCHES X 12 INCHES.
9. ALL LOCKING DEVICES SHALL COMPLY WITH THE COUNTY OF LOS ANGELES FIRE DEPARTMENT REGULATION 5, COMPLIANCE FOR INSTALLATION OF EMERGENCY ACCESS DEVICES
10. NO INTERIOR GATES PERMITTED ON THE ON-SITE ACCESS ROADS
11. ALL DIMENSIONS SHOWN ARE APPROXIMATE AND SUBJECT TO VERIFICATION DURING DETAILED DESIGN.
12. THERE MUST BE AN ACCESS ROAD AROUND THE PERIMETER.
13. EACH ENTRANCE OR EXIT MUST HAVE A MINIMUM 10,000 GALLON FIRE WATER STORAGE; THIS MAY BE FULFILLED BY USING ONE OR MORE FIRE WATER TANKS OF VARIOUS SIZES SUCH AS TWO 5,000 GALLON TANKS; EACH TANK SHALL INDEPENDENTLY MEET THE REQUIREMENTS LISTED HEREIN INCLUDING BUT NOT LIMITED TO SIGNAGE, VALVES, WARNING AND BOLLARDS.
14. WATER TANKS SHALL BE CLEARLY IDENTIFIED FOR "FIRE DEPARTMENT USE ONLY" AND BE IN COMPLIANCE WITH FIRE DEPARTMENT STANDARDS
15. TANK CONNECTIONS PER LOS ANGELES COUNTY FIRE DEPARTMENT. TANK WILL BE ACCESSIBLE FROM THE INTERIOR ACCESS ROAD ADJACENT TO THE ENTRANCE.
16. THE WATER TANKS SHALL HAVE A LOW LEVEL WATER LOCAL ALARM WHICH SHALL BE IN COMPLIANCE WITH ALL APPLICABLE CODES AND REGULATIONS. THE LOW LEVEL WATER LOCAL ALARM CAN BE BATTERY OPERATED.
17. THE WATER TANK SHALL HAVE A FIRE DEPARTMENT SUPPLY OUTLET OF 2.5" IN DIAMETER FOR NATIONAL STANDARD THREADS. THE SUPPLY OUTLET IS TO BE LOCATED 14-24 INCHES ABOVE THE FINISHED GRADE, AND IS REQUIRED TO BE PROTECTED BY APPROVED BARRICADES. IF THE OUTLET IS NOT PROVIDED DIRECTLY OFF OF THE TANK, A 6" UNDERGROUND PIPE TO A 4" UPRIGHT PIPE WITH AN OUTLET OF 2.5" WITH NATIONAL STANDARD THREADS, WHICH IS REQUIRED TO BE PROTECTED BY BARRICADES.
18. THE DEVELOPMENT FOOTPRINT IS APPROXIMATELY 136 ACRES (GROSS) AND IS ENTIRELY IN LA COUNTY.
19. A MAXIMUM 8' STANDARD SECURITY FENCE WITH WILDLIFE PASS-THRU WILL SURROUND THE SOLAR SITE. SEE DETAIL ON SHEET C-02.
20. ALL ELECTRICAL DISCONNECT LOCATIONS SHALL BE CLEARLY IDENTIFIED.
21. ALL ELECTRICAL SHALL BE IN COMPLIANCE WITH ALL APPLICABLE STATE AND LOCAL CODES
22. THE CLEARANCE OF VEGETATION SHALL BE IN COMPLIANCE WITH THE BRUSH CLEARANCE REGULATION AS DEFINED BY THE FIRE CODE OR AS DIRECTED BY THE FIRE OFFICIAL.
23. THE VEGETATION SHALL BE TRIMMED TO A MAXIMUM HEIGHT OF 6" WITHIN THE BOUNDARIES OF THE SOLAR ARRAY.
24. ELECTRICAL TRANSFORMER VAULTS OR STRUCTURES SHALL HAVE ALL VEGETATION CLEARED TO MINERAL SOIL FOR A DISTANCE OF 50'
25. ALL NEW FACILITIES WITHIN LOS ANGELES COUNTY JURISDICTION WILL BE UNDERGROUND WITH A FRANCHISE AGREEMENT PRIOR TO CONSTRUCTION
26. APPROPRIATE GROUND PROTECTION PRACTICE, SUCH AS CONSTRUCTION MATS, STABILIZERS, OR ESTABLISHED VEGETATION WILL BE UTILIZED FOR BOTH DUST SUPPRESSION AND TO ENSURE THAT THE VEHICLES OR MACHINERIES ARE COMPATIBLE WITH CONTINUED AND FUTURE VEGETATION GROWTH.
27. RIGHT-OF-WAY DEDICATIONS TO BE CONFIRMED BY COUNTY PLANNER; POTENTIAL PROPOSED DEDICATIONS SHALL NOT BE CONSIDERED LEGALLY BINDING; TITLE REPORTS SHALL GOVERN UNTIL DEDICATIONS ARE SPECIFICALLY REQUESTED BY THE COUNTY IN CONDITIONS OF APPROVAL OR NOTED ON PLANS AS "PROPOSED IRREVOCABLE OFFER TO DEDICATE."
28. THIS PROJECT SHALL COMPLY WITH LOS ANGELES COUNTY CODE OF ORDINANCES (ZONING CODE); ONE PROJECT IDENTIFICATION SIGN SHALL BE LOCATED AT EACH TEMPORARY OR PERMANENT INGRESS OR EGRESS POINTS. SIGNS SHALL INCLUDE AN EMERGENCY CONTACT INFORMATION. NO OTHER SIGNS SHALL BE POSTED AT THE FACILITY OTHER THAN SAFETY, DIRECTIONAL, AND WARNING SIGNS.
29. THIS PROJECT SHALL COMPLY WITH LOS ANGELES COUNTY CODE OF ORDINANCES FOR OUTDOOR LIGHTING WITHIN THE RURAL OUTDOOR LIGHTING DISTRICT, WHICH IS LIMITED TO THAT REQUIRED FOR SAFETY AND SECURITY, SHALL BE SHIELDED AND DIRECTED DOWNWARD TO AVOID LIGHT TRESPASS AND SHALL INCLUDE: i. MOTION SENSORS FOR ENTRY-LIGHTING TO THE ON-SITE EQUIPMENT, STRUCTURES, AND BUILDINGS; AND ii. AND LIGHT-SENSOR OR MOTION-SENSOR LIGHTING FOR MAIN ACCESS GATE, OPERATIONS AND MAINTENANCE BUILDING DOORWAYS, AND ANY PARKING AREAS OF FACILITIES WITH OPERATION AND MAINTENANCE BUILDINGS.
30. THIS PROJECT SHALL COMPLY WITH LOS ANGELES COUNTY CODE OF ORDINANCES CHAPTER 22.140.510 – RENEWABLE ENERGY, §1600.
31. EXISTING ROAD RIGHT-OF-WAY DIMENSIONS ARE BASED ON LA COUNTY ASSESSOR MAP DATA.

BENCHMARK NOTE

DOCUMENT DESCRIPTION:

LOS ANGELES COUNTY PUBLIC WORKS
BENCHMARK NO. TL6423

DESCRIPTION: L&LA CO BM TAG IN NW COR CONC MAIL BOX PAD AT SE COR AVE A & 90 ST W, 27.2

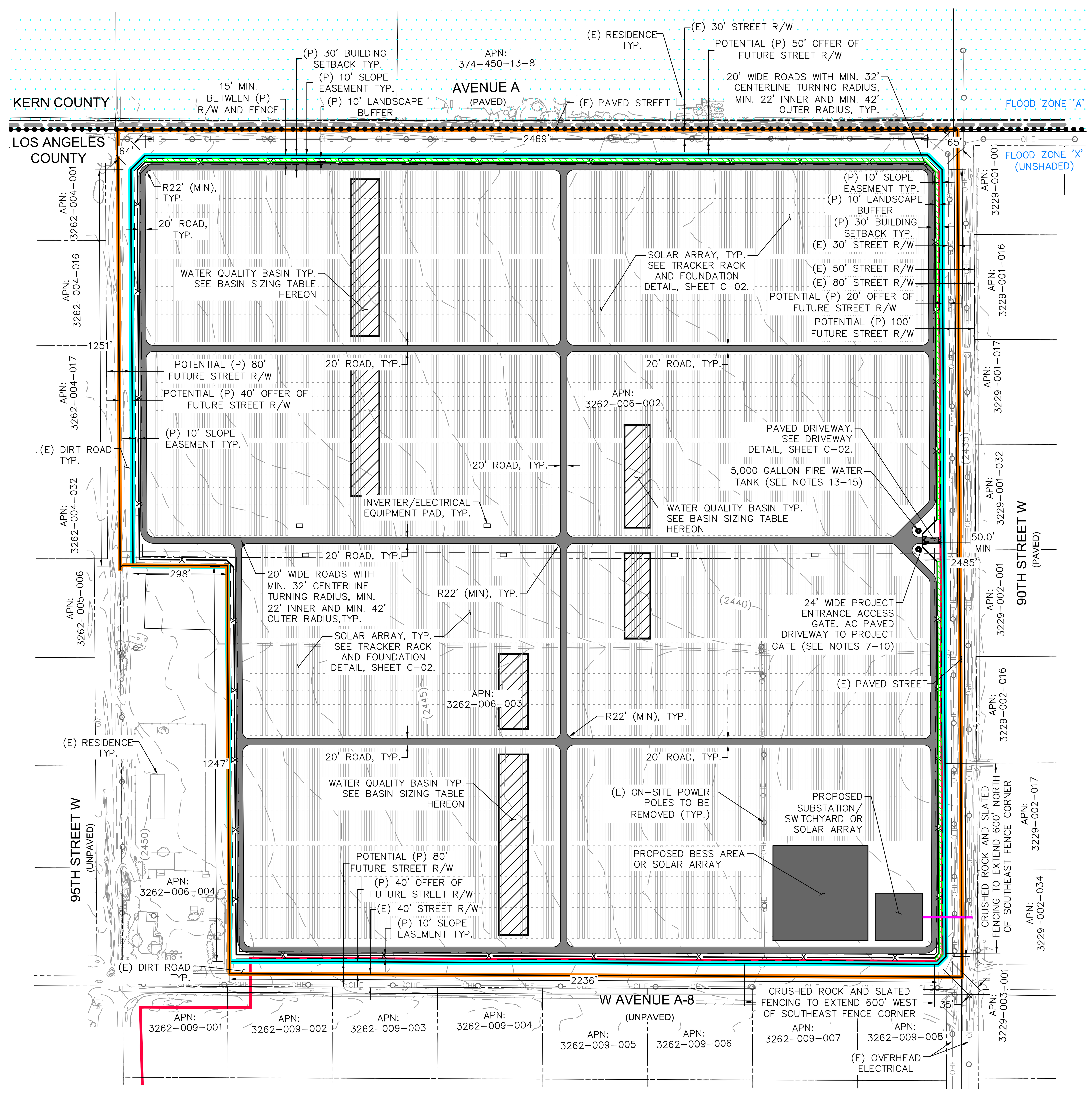
ELEVATION: 2434.528

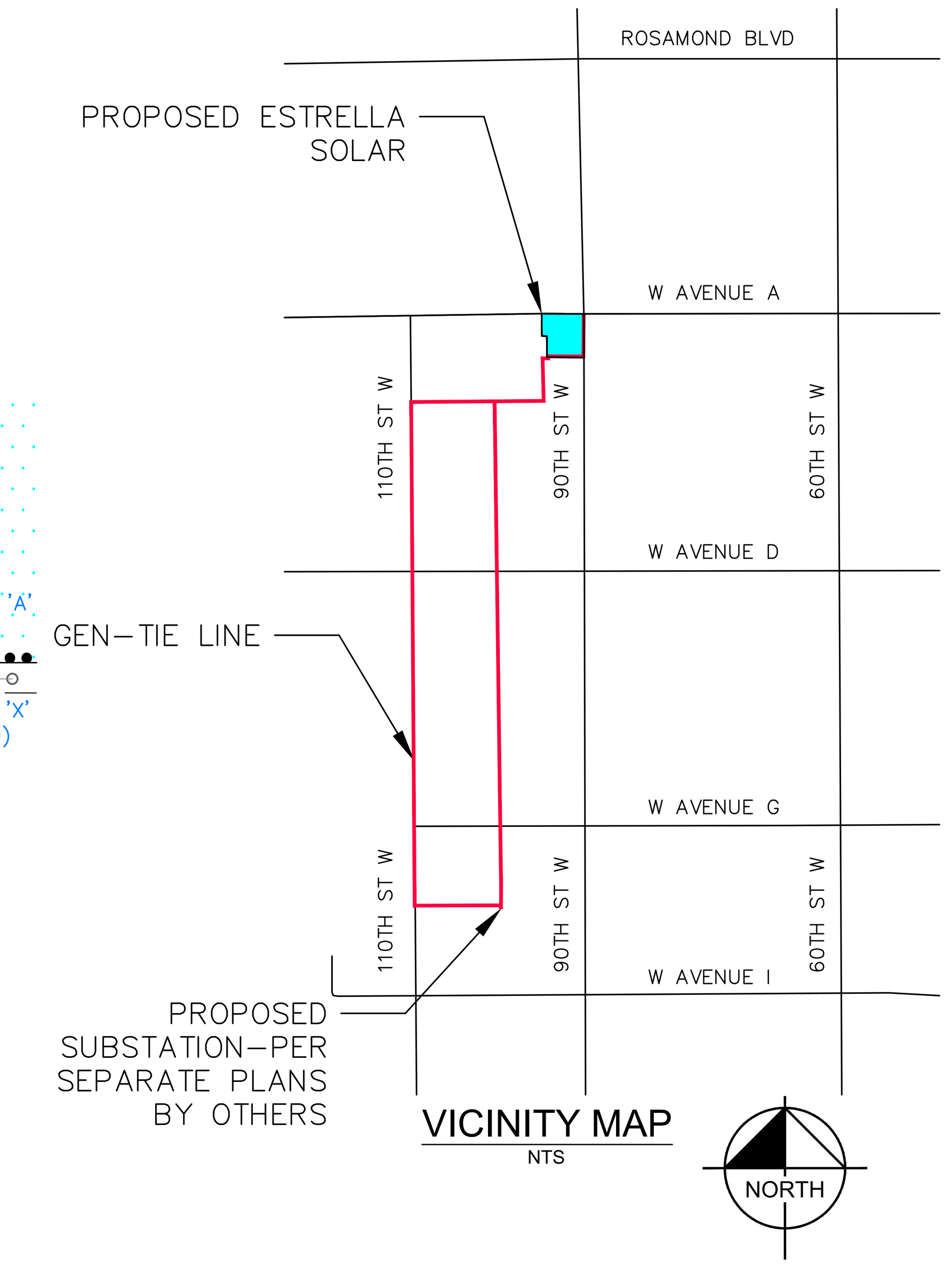
ESTIMATED EARTHWORK QUANTITIES

DESCRIPTION	CUT (CY)	FILL (CY)	NET
BASINS (SEE DRAINAGE REPORT FOR MORE INFORMATION	*8700*	*8700*	*0 CY*
GENERAL GRADING	*0*	*0*	*0 CY*
*TOTALS**	*8700*	*8700*	*0 CY*

OVEREXCAVATION IS LIMITED TO GENERIC ROAD CONSTRUCTION (1-FOOT SCARIFICATION AND RECOMPACTION). SEE RETENTION BASING SIZING TABLE BELOW FOR BASIN EARTHWORK BREAKDOWN. NO IMPORT OR EXPORT OF EARTHWORK IS ANTICIPATED; TO BE BALANCED ON-SITE WITH EXCEPTION OF BASE COURSE FOR PAVED DRIVEWAYS.

THE EARTHWORK QUANTITIES ABOVE ARE FOR PERMIT PURPOSES ONLY. THEY HAVE NOT BEEN FACTORED TO ACCOUNT FOR CHANGES IN VOLUME DUE TO BULKING, CLEARING AND GRUBBING, SHRINKAGE, OVER-EXCAVATION AND RE-COMPACTION, AND CONSTRUCTION METHODS. NOR DO THEY ACCOUNT FOR THE THICKNESS OF BUILDING PADS, EQUIPMENT PADS, ETC. THE CONTRACTOR SHALL RELY ON THEIR OWN EARTHWORK ESTIMATES FOR BIDDING PURPOSES. INFORMATION LISTED ABOVE ARE PRELIMINARY ESTIMATES; FINAL LOCATIONS AND QUANTITIES DEPENDENT ON FINAL ENGINEERING DESIGN LAYOUT.





VICINITY MAP
NTS

LEGEND

- PROJECT BOUNDARY/PROPOSED OFFER TO DEDICATE
- GEN-TIE LINE OPTION 1
- GEN-TIE LINE OPTION 2
- EXISTING PROPERTY LINE
- EASEMENT LINE
- FEMA FLOOD ZONE LINE
- PARCEL LINES
- ROAD CENTERLINE
- BUILDING SETBACK LINE
- COUNTY LIMIT
- OVERHEAD ELECTRIC LINE
- (2700) EXISTING GRADE CONTOUR (SEE NOTE 5)
- 2700 PROPOSED GRADE CONTOUR (IN PROGRESS)
- LIMIT OF PROPOSED GRADING
- (P) SLOPE EASEMENT
- CHAIN LINK SECURITY FENCE WITH 3 STRAND BARBED WIRE AND WILD LIFE PASS-THRU (SEE NOTE 19)
- PROPOSED ACCESS ROAD (SEE NOTE 4)
- PROPOSED 10' LANDSCAPE BUFFER
- PROPOSED WATER QUALITY BASIN WITH CORRESPONDING DRAINAGE AREA LABEL; SEE ONSITE AND OFFSITE DRAINAGE REPORT – IN PROGRESS)
- INVERTER
- FIRE WATER TANK (SEE NOTES 13-15)
- SCE POWER POLE
- PAVED DRIVEWAY
- FLOODZONE X (SHADED)
- FLOODZONE A (SHADED)
- SOLAR ARRAY

RETENTION BASIN SIZING TABLE

Subarea "DA-"	SWQDv (Storm Water Quality Design Volume) Required* (cf)	Minimum Additional Retention Volume (cf) for 50-Year Event	Existing Retention Volume (cf)	Total Required Retention Volume (cf)	Design Length (ft)	Design Width (ft)	Design Area (sf)	Design Depth (ft)	BMP Design Volume Provided Design Volume (cf)	Vdesign > Vrequired?	Estimated Earthwork Excavation (cy)
1	29,960	41,468	-	41,468	920	91	83,720	0.5	41,860	*YES*	3,500
2	17,579	24,338	-	24,338	594	82	48,708	0.5	24,354	*YES*	2,100
3	26,627	36,867	-	36,867	807	92	74,244	0.5	37,122	*YES*	3,100
										Basin Total:	8,700

Minimum Corrected In-situ Infiltration Rate for retention-based stormwater measures: 0.30 inches/hour (per LID Manual)
Maximum Ponding Possible per LA County LID Manual BMP Fact Sheet RET-2: *96 h * 0.30 in. / h * 1 ft / 12 in. = 2.40 ft*
Maximum Anticipated Design Ponding Depth per Detail Hereon: 1.50 ft (less than 2.40 ft)
Due to calculations hereon and consistent with drainage report narrative, designed basins are expected to infiltrate the required volume within the maximum allowable drawdown time set forth by the County. (Based on assumed minimum infiltration rate and to be confirmed with rates in
*The on-site storm water quality design volume (SWQDv) is for the 0.75-inch, 24-hour storm of the post-development condition.

ABBREVIATIONS

AC	– ASPHALT CONCRETE
ALTA	– AMERICAN LAND TITLE ASSOCIATION
APN	– ASSESSOR'S PARCEL NUMBER
ASTM	– INTERNATIONAL ASSOCIATION FOR TESTING AND MATERIALS
C/L	– CENTERLINE
CY	– CUBIC YARDS
DIA	– DIAMETER
EG	– EXISTING GRADE
ELEV.	– ELEVATION
(E)	– EXISTING
(F)	– FUTURE
FEMA	– FEDERAL EMERGENCY MANAGEMENT AGENCY
FG	– FINISHED GROUND
FT	– FEET
GA	– GAGE
L	– LENGTH
LS	– LANDSCAPE
MAX	– MAXIMUM
M	– MAINTENANCE
MIN	– MINIMUM
NTS	– NOT TO SCALE
O.C.	– ON CENTER
P.I.P.	– PROTECT IN PLACE
P/L	– PROPERTY LINE
(P)	– PROPOSED
R	– RADIUS
R/W	– RIGHT-OF-WAY
STA	– STATION
STDS	– STANDARDS
TBD	– TO BE DETERMINED
TYP.	– TYPICAL

NORTH

GRAPHIC SCALE IN FEET
0 100 200 400
1"=200' WHEN PLOTTED ON 30"x42"

S·POWER
SUSTAINABLE POWER GROUP
5000 EAST SPRING ST. SUITE 130 LONG BEACH, CA 90815

Kimley»Horn

765 The City Drive, Suite 200
Orange, CA 92868
(714) 939-1030

NOT ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER DAVID M. BOSCO NO. CIVIL STATE OF CALIFORNIA

ESTRELLA SOLAR

SINGLE-AXIS TRACKER PHOTOVOLTAIC ARRAYS
21 MWAC

EXISTING AND PROPOSED ZONING - A-2
GROSS ACRES - APPROX. 152.
PROJECT ACRES - APPROX. 136
APNS - 3262-006-002 & 3262-006-003

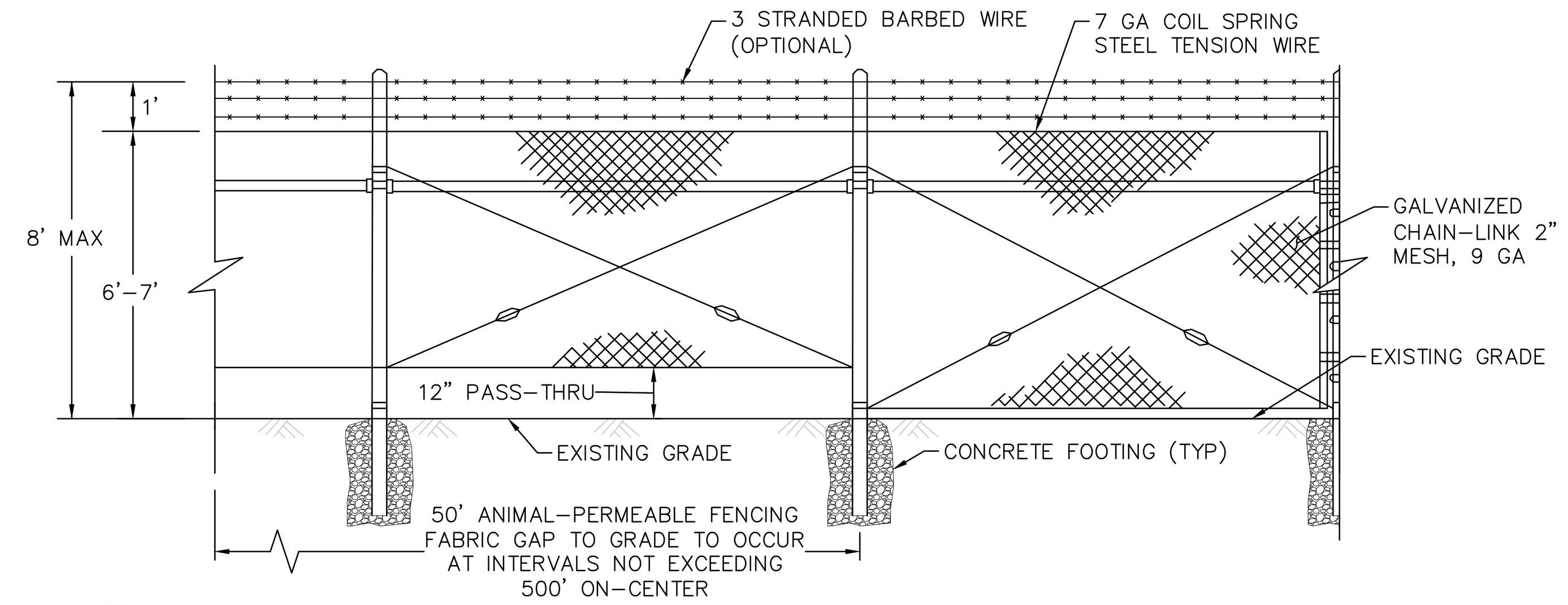
CUP SITE PLAN

21 MW SOLAR PHOTOVOLTAIC GENERATION FACILITY
WEST OF 90TH STREET WEST AND SOUTH OF WEST AVENUE A
UNINCORPORATED LOS ANGELES COUNTY, CALIFORNIA

CUP -

DRAWN BY: DM	DATE: 9/23/2020
CHECKED BY: TG	

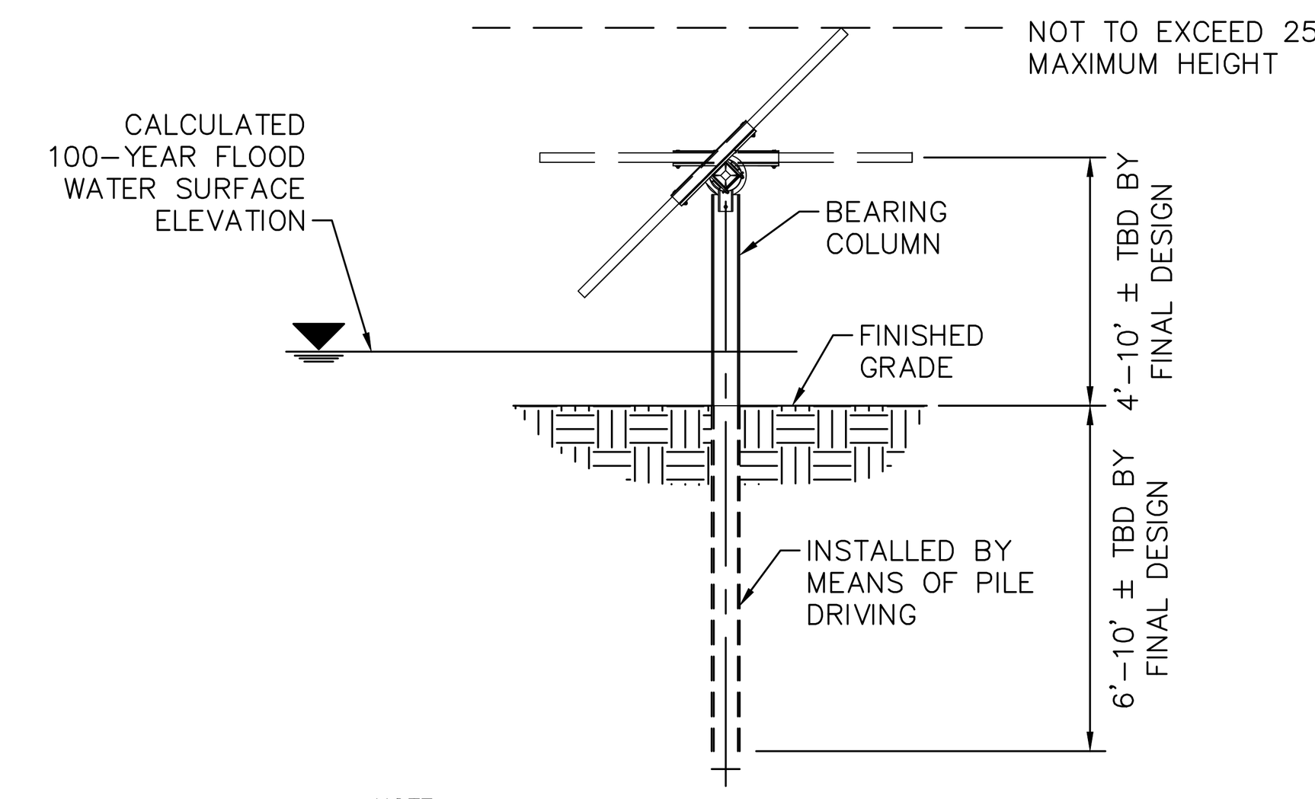
C-01



NOTE:
1. SLATTED FENCING TO OCCUR IN LIMITED EXTENTS PER SITE PLAN FOR SCREENING PURPOSES.

CHAIN LINK SECURITY FENCE

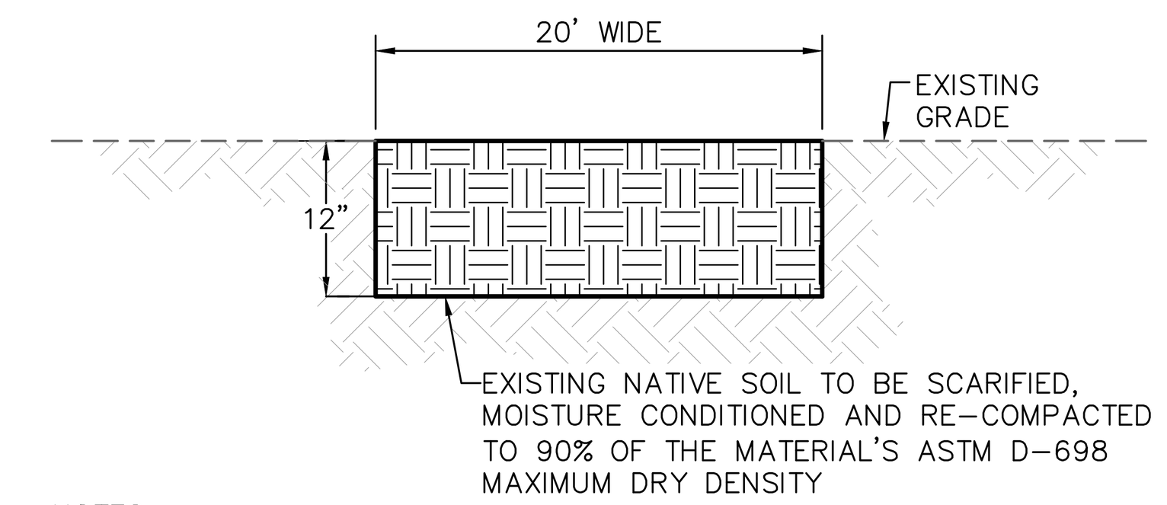
N.T.S.



NOTE:
1. FREEBOARD NOTED ABOVE MAY BE ACHIEVED USING FLOOD STOW SENSORS, TO BE DETERMINED DURING FINAL DESIGN.

TRACKER RACK AND FOUNDATION DETAIL

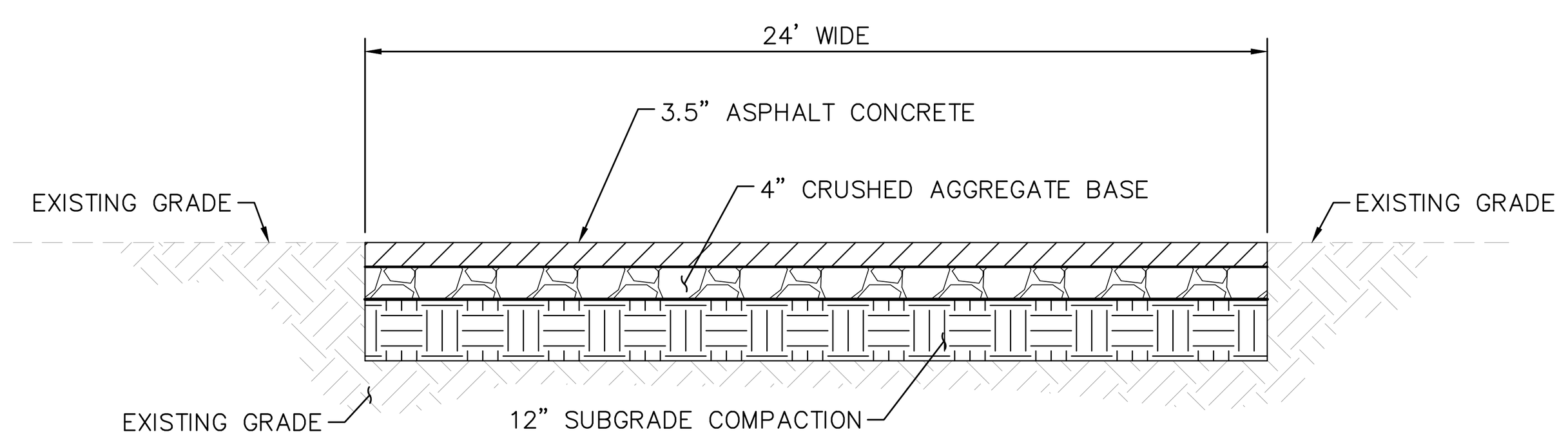
N.T.S.



NOTES:
1. REMOVE ALL GRASSES AND ORGANICS WITHIN ACCESS ROAD AREA.
2. SCARIFY, MOISTURE CONDITION, AND RE-COMPACT EXISTING NATIVE SOILS (THICKNESS PER DETAIL) TO 90% OF THE MATERIAL'S ASTM D-698 MAXIMUM DRY DENSITY.
3. COMPACTION SHALL BE VERIFIED BY TESTING BY THE GEOTECHNICAL CONSULTANT.

ON-SITE COMPACTED NATIVE ACCESS ROAD

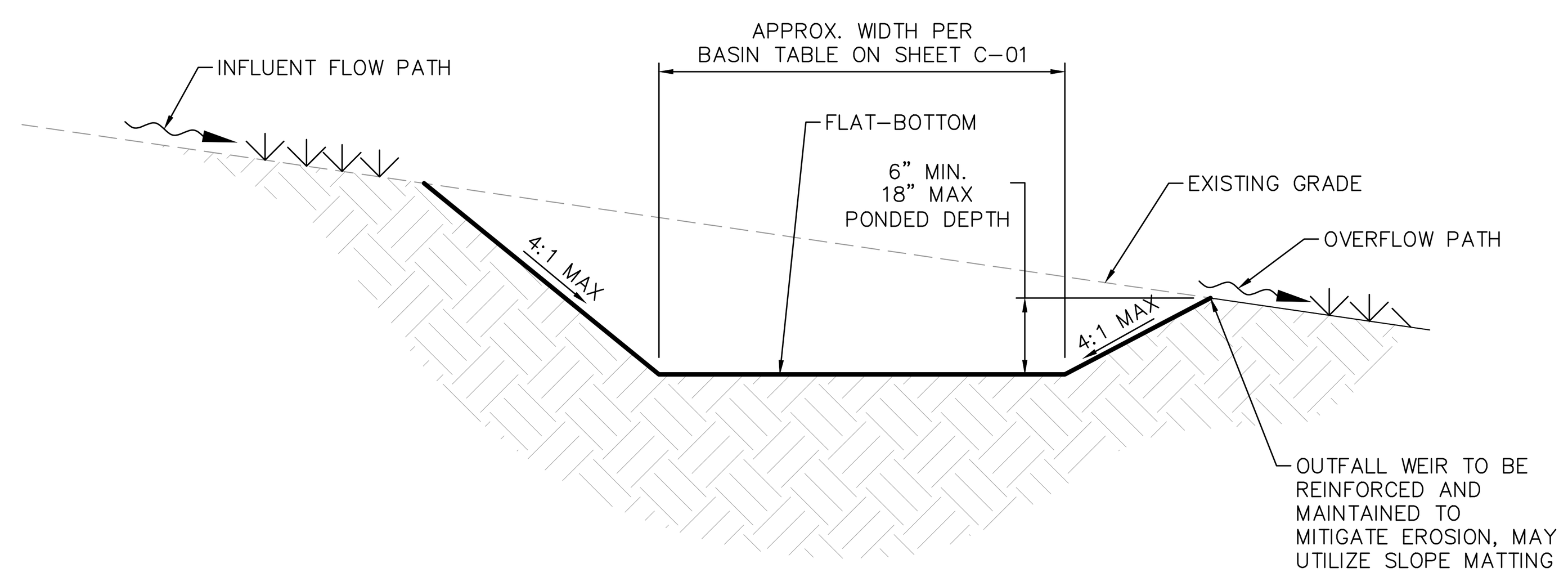
N.T.S.



NOTES:
1. FINAL ASPHALT AND BASE COURSE THICKNESS TO BE DETERMINED BY A CERTIFIED SOILS TEST REPORT.
2. MINIMUM DRIVEWAY STRUCTURAL CROSS SECTION SHALL BE AS SHOWN ABOVE ASPHALT PAVEMENT OVER CRUSHED AGGREGATE BASE DETERMINED PER R-VALUE TESTING. THE STRUCTURAL SECTION SHALL BE DETERMINED FROM "R" VALUES OBTAINED FROM AN ANALYSIS OF SPECIMENS GATHERED AT THE LEVEL OF THE PROPOSED SUBGRADES WITHIN THE DRIVEWAY IMPROVEMENT AREA. THE ANALYSIS SHALL BE PER STATE OF CALIFORNIA DIVISION OF HIGHWAYS DESIGN METHOD FOR CRUSHED AGGREGATE BASE. CRUSHED AGGREGATE BASE SHALL CONFORM TO SECTION 200-2.2 OF THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION
3. CONNECTION TO EXISTING PAVED ROAD SHALL INCLUDE 12" MINIMUM SAWCUT OF EXISTING PAVEMENT FOR FULL LENGTH OF JOIN. THE MINIMUM PAVEMENT SECTION OF THIS STREET REPLACEMENT IS 4" ASPHALT PAVEMENT OVER 6" CRUSHED AGGREGATE BASE OR THE EXISTING COURSE THICKNESSES AS OBSERVED IN THE FIELD PLUS ONE INCH FOR EACH COURSE, WHICHEVER IS GREATER. COURSE THICKNESS SHALL TRANSITION TO THAT SHOWN ABOVE FOR THE DRIVEWAY SECTION STARTING AT EDGE OF EXISTING PAVEMENT.

ASPHALT PAVED DRIVEWAY TYP SECTION

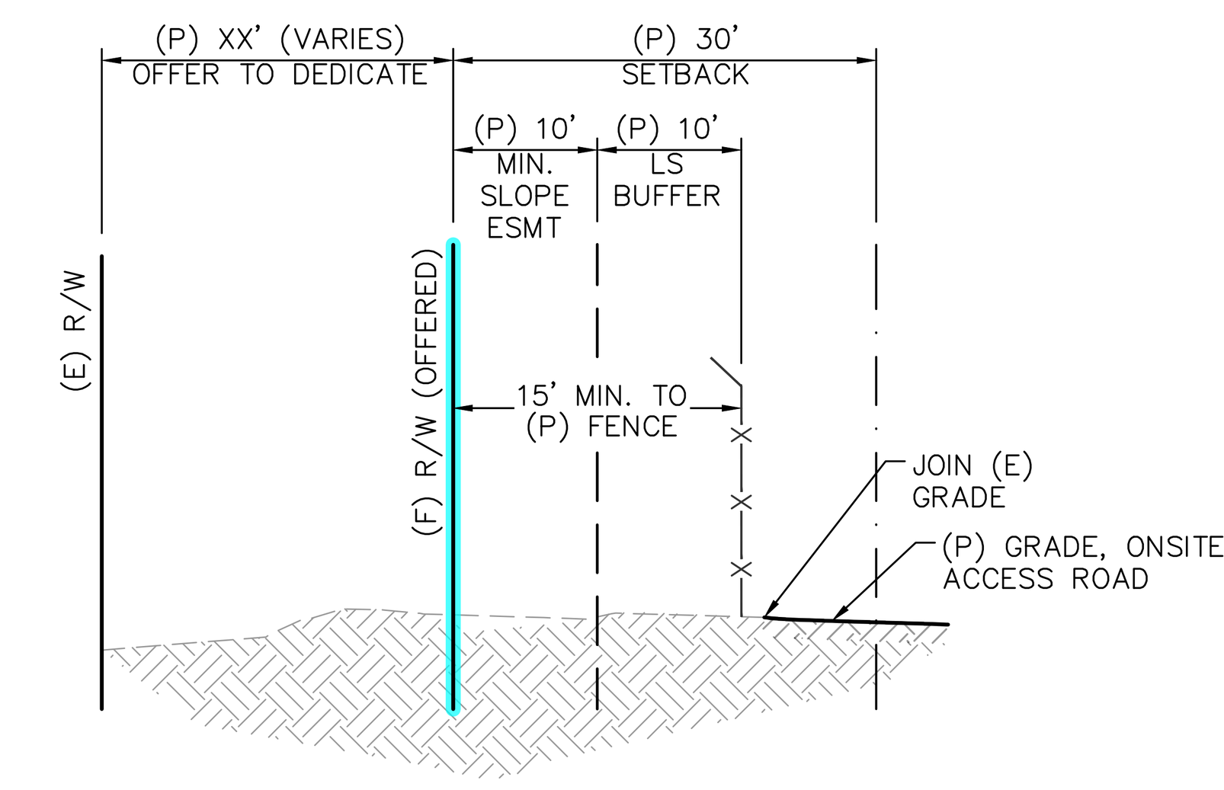
N.T.S.



NOTES:
1. THIS DETAIL REPRESENTS GENERAL INTENT; BASINS TO BE FURTHER DETAILED DURING FINAL DESIGN.
2. SPOILS FROM BASIN EXCAVATION ARE TO REMAIN ON-SITE OUTSIDE OF DEFINED FLOWPATHS, SHOULD BE PLACED ON RIDGELINES WHERE POSSIBLE.
3. BASINS TO BE CONSTRUCTED IN ELONGATED RECTANGULAR LAYOUT AS SHOWN PER PLAN, EXCLUDING DRAINAGE AREA 4 WHICH WILL USE THE NATURAL SUMP CONDITIONS.
4. PROPOSED ONSITE ACCESS ROADS SHALL REMAIN AT EXISTING GRADE, ELEVATED ABOVE BASIN INUNDATION ELEVATIONS IN ORDER TO DISCOURAGE INUNDATION OF TRAVELED WAY. BASIN SEGMENTS TO BE SIZED ACCORDING TO TRIBUTARY AREAS DURING FINAL DESIGN AND MAY BE CONNECTED IF NECESSARY WITH PIPE OR LOW WATER CROSSINGS TO EQUALIZE STORAGE.
5. EARTHWORK REQUIRED FOR BASIN GRADING AND DAYLIGHT SLOPES MAY EXCEED THE MINIMUM REQUIRED STORAGE OR RETENTION VOLUME AND IS SUBJECT TO CHANGE DURING THE FINAL DEISGN

TYPICAL INFILTRATION RETENTION BASIN

N.T.S.



TYPICAL LOT SECTION

N.T.S.

S·POWER
SUSTAINABLE POWER GROUP
5000 EAST SPRING ST.
SUITE 130
LONG BEACH, CA 90815

Kimley»Horn

765 The City Drive, Suite 200
Orange, CA 92868
(714) 939-1030

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CUP DETAILS

21 MW SOLAR PHOTOVOLTAIC GENERATION FACILITY
WEST OF 90TH STREET WEST AND SOUTH OF WEST AVENUE A
UNINCORPORATED LOS ANGELES COUNTY, CALIFORNIA

CUP -

DRAWN BY: DM	DATE:
CHECKED BY: TG	9/23/2020

C-02

Attachment D
Traffic Counts

Traffic Count Validation

Roadway Segment		ADT	Northbound		Southbound	
			AM	PM	AM	PM
West 90th Street, between West Avenue A and West Avenue B	March 2017	1240	34	59	60	59
	October 2020	1077	39	50	44	71
	Percent Difference	15%	-13%	18%	36%	-17%

Traffic Volume Growth Calculations

Roadway Segment		ADT	Northbound		Southbound	
			AM	PM	AM	PM
West 90th Street, between West Avenue A and West Avenue B	March 2017	1240	34	59	60	59
	Year 2022	1457	40	69	71	69

Equation	Sample Calculation
$Future\ Volume = Existing\ Volume \times \left(1 + \frac{annual\ growth\ rate}{100}\right)^{\#\ of\ years}$	$Year\ 2021\ (Northbound) = 34 \times \left(1 + \frac{3.29}{100}\right)^{3} \times \left(1 + \frac{3.27}{100}\right)^{2} = 40$

Table 2 - Traffic Volume Growth Factors

Representative City/Place	2010	Compound Annual Growth (%)	2015	Compound Annual Growth (%)	2020	Compound Annual Growth (%)	2025	Compound Annual Growth (%)	2030	Compound Annual Growth (%)	2035
Agoura Hills	1.000	0.40	1.020	0.41	1.041	0.21	1.052	0.21	1.063	0.22	1.075
Santa Clarita	1.000	2.75	1.145	2.43	1.291	0.87	1.348	0.83	1.405	0.78	1.461
Lancaster	1.000	3.95	1.214	3.29	1.427	3.27	1.676	2.80	1.924	2.45	2.172
Palmdale	1.000	2.55	1.134	2.24	1.267	1.47	1.363	1.36	1.458	1.27	1.553
Angeles Forest	1.000	2.85	1.151	2.48	1.301	1.39	1.394	1.30	1.487	1.22	1.580
West S.F. Valley	1.000	0.53	1.027	0.52	1.054	0.26	1.068	0.28	1.083	0.26	1.097
Burbank	1.000	0.48	1.024	0.48	1.049	0.27	1.063	0.26	1.077	0.28	1.092
Sylmar	1.000	0.48	1.024	0.48	1.049	0.42	1.071	0.41	1.093	0.38	1.114
Malibu	1.000	0.53	1.027	0.52	1.054	0.40	1.075	0.39	1.096	0.38	1.117
Santa Monica	1.000	0.28	1.014	0.27	1.028	0.19	1.038	0.21	1.049	0.19	1.059
West/Central L.A.	1.000	0.14	1.007	0.14	1.014	0.20	1.024	0.19	1.034	0.19	1.044
South Bay/LAX	1.000	0.26	1.013	0.26	1.026	0.17	1.035	0.17	1.044	0.17	1.053
Palos Verdes	1.000	0.50	1.025	0.50	1.051	0.19	1.061	0.19	1.071	0.19	1.081
Long Beach	1.000	1.48	1.076	1.37	1.152	0.14	1.160	0.14	1.168	0.15	1.177
Vernon	1.000	1.42	1.073	1.33	1.146	0.21	1.158	0.21	1.170	0.20	1.182
Downey	1.000	1.02	1.052	0.97	1.104	0.22	1.116	0.20	1.127	0.21	1.139
Downtown L.A.	1.000	0.18	1.009	0.18	1.018	0.23	1.030	0.23	1.042	0.23	1.054
Glendale	1.000	0.28	1.014	0.26	1.027	0.27	1.041	0.27	1.055	0.25	1.068
Pasadena	1.000	0.81	1.041	0.78	1.082	0.29	1.098	0.31	1.115	0.29	1.131
West Covina	1.000	0.46	1.023	0.45	1.046	0.38	1.066	0.37	1.086	0.37	1.106
Pomona	1.000	1.57	1.081	1.44	1.161	0.49	1.190	0.48	1.219	0.47	1.248

March 2017 Traffic Counts

Day: Tuesday
Date: 3/14/2017

Prepared by NDS/ATD
Prepared by National Data & Surveying Services

VOLUME

90th St West N/O Ave B

City: Lancaster
Project #: Historicaln

DAILY TOTALS	NB	SB	EB	WB	Total
	573	667	0	0	1,240

AM Period	NB		SB		EB	WB	TOTAL		PM Period	NB		SB		EB	WB	TOTAL	
0:00	1		1		0	0	2		12:00	8		12		0	0	20	
0:15	1		1		0	0	2		12:15	7		17		0	0	24	
0:30	1		1		0	0	2		12:30	9		11		0	0	20	
0:45	0	3	0	3	0	0		6	12:45	10	34	6	46	0	0	16	80
1:00	0		1		0	0	1		13:00	8		16		0	0	24	
1:15	0		0		0	0			13:15	12		11		0	0	23	
1:30	0		0		0	0			13:30	6		18		0	0	24	
1:45	1	1	0	1	0	0	1	2	13:45	8	34	10	55	0	0	18	89
2:00	0		0		0	0			14:00	16		13		0	0	29	
2:15	1		2		0	0	3		14:15	15		10		0	0	25	
2:30	0		1		0	0	1		14:30	12		7		0	0	19	
2:45	0	1	1	4	0	0	1	5	14:45	6	49	7	37	0	0	13	86
3:00	1		1		0	0	2		15:00	5		6		0	0	11	
3:15	1		3		0	0	4		15:15	10		10		0	0	20	
3:30	1		1		0	0	2		15:30	12		17		0	0	29	
3:45	0	3	5	10	0	0	5	13	15:45	16	43	12	45	0	0	28	88
4:00	0		3		0	0	3		16:00	14		17		0	0	31	
4:15	2		2		0	0	4		16:15	12		13		0	0	25	
4:30	1		1		0	0	2		16:30	17		12		0	0	29	
4:45	8	11	3	9	0	0	11	20	16:45	9	52	17	59	0	0	26	111
5:00	5		3		0	0	8		17:00	10		11		0	0	21	
5:15	3		9		0	0	12		17:15	12		16		0	0	28	
5:30	4		7		0	0	11		17:30	13		9		0	0	22	
5:45	5	17	8	27	0	0	13	44	17:45	7	42	10	46	0	0	17	88
6:00	4		6		0	0	10		18:00	10		9		0	0	19	
6:15	8		11		0	0	19		18:15	6		5		0	0	11	
6:30	7		19		0	0	26		18:30	12		5		0	0	17	
6:45	6	25	12	48	0	0	18	73	18:45	7	35	5	24	0	0	12	59
7:00	8		14		0	0	22		19:00	7		2		0	0	9	
7:15	6		15		0	0	21		19:15	9		9		0	0	18	
7:30	13		16		0	0	29		19:30	5		4		0	0	9	
7:45	6	33	8	53	0	0	14	86	19:45	1	22	2	17	0	0	3	39
8:00	4		8		0	0	12		20:00	6		3		0	0	9	
8:15	6		6		0	0	12		20:15	5		3		0	0	8	
8:30	3		9		0	0	12		20:30	10		4		0	0	14	
8:45	6	19	7	30	0	0	13	49	20:45	3	24	4	14	0	0	7	38
9:00	7		11		0	0	18		21:00	6		6		0	0	12	
9:15	5		9		0	0	14		21:15	3		3		0	0	6	
9:30	3		7		0	0	10		21:30	5		2		0	0	7	
9:45	6	21	6	33	0	0	12	54	21:45	3	17	4	15	0	0	7	32
10:00	8		8		0	0	16		22:00	5		4		0	0	9	
10:15	9		7		0	0	16		22:15	5		1		0	0	6	
10:30	6		10		0	0	16		22:30	3		3		0	0	6	
10:45	7	30	8	33	0	0	15	63	22:45	3	16	4	12	0	0	7	28
11:00	5		13		0	0	18		23:00	2		1		0	0	3	
11:15	15		10		0	0	25		23:15	3		3		0	0	6	
11:30	7		6		0	0	13		23:30	3		3		0	0	6	
11:45	4	31	7	36	0	0	11	67	23:45	2	10	3	10	0	0	5	20
TOTALS		195		287				482	TOTALS		378		380				758
SPLIT %		40.5%		59.5%				38.9%	SPLIT %		49.9%		50.1%				61.1%

DAILY TOTALS	NB	SB	EB	WB	Total
	573	667	0	0	1,240

AM Peak Hour	10:45	6:30			6:45	PM Peak Hour	15:45	15:30			15:30
AM Pk Volume	34	60			90	PM Pk Volume	59	59			113
Pk Hr Factor	0.567	0.789			0.776	Pk Hr Factor	0.706	0.868			0.911
7 - 9 Volume	52	83	0	0	135	4 - 6 Volume	94	105	0	0	199
7 - 9 Peak Hour	7:00	7:00			7:00	4 - 6 Peak Hour	16:00	16:00			16:00
7 - 9 Pk Volume	33	53	0	0	86	4 - 6 Pk Volume	52	59	0	0	111
Pk Hr Factor	0.635	0.828	0.000	0.000	0.741	Pk Hr Factor	0.765	0.868	0.000	0.000	0.895

Peak hour volumes used for opposing/advancing traffic

Counts Unlimited, Inc.

PO Box 1178
Corona, CA 92787
Phone: (951) 268-6268
email: counts@countsunlimited.com

City of Lancaster
West 90th Street
S/ West Avenue A
24 Hour Directional Volume Count

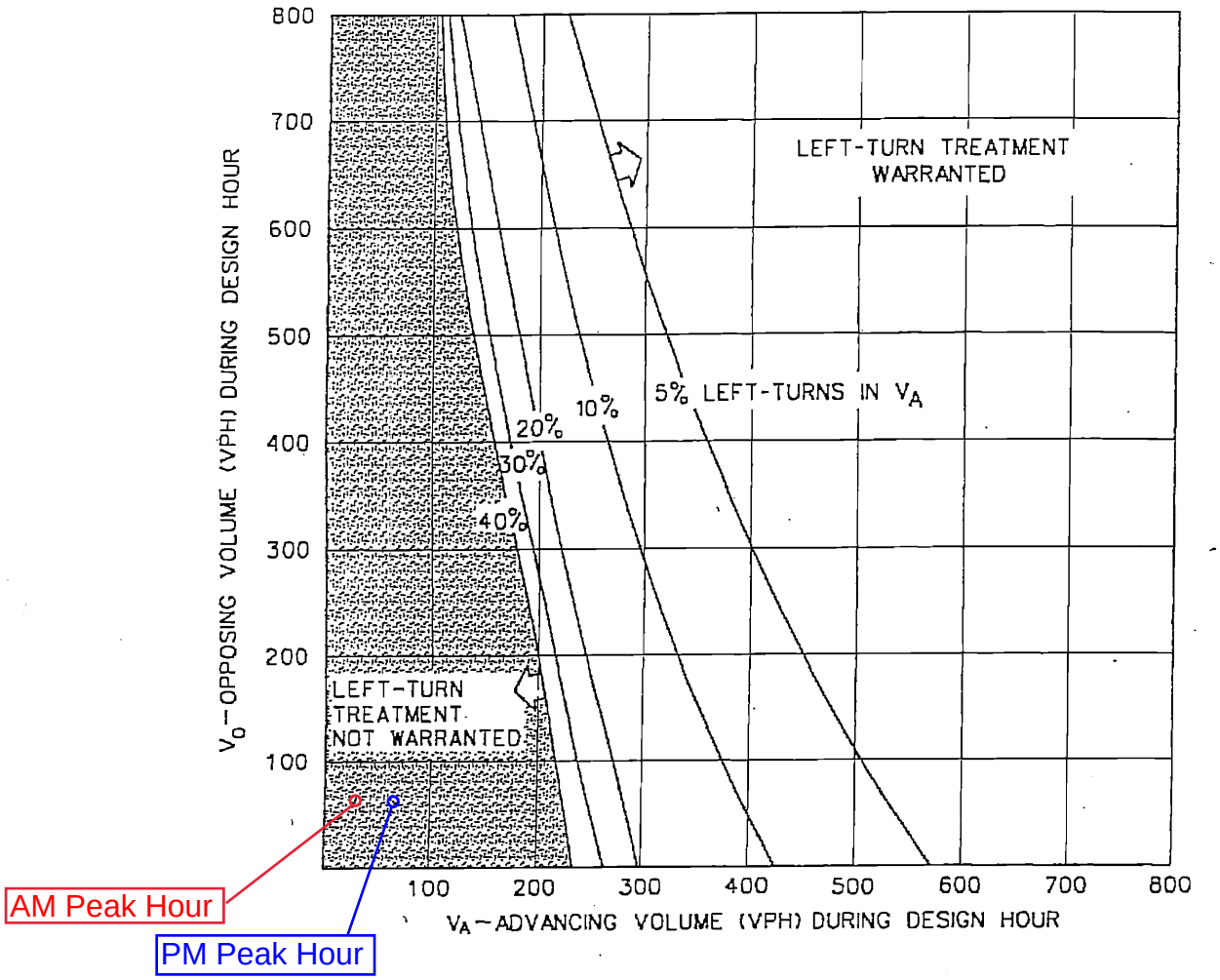
LAN001
Site Code: 229-20402

Start Time	21-Oct-20 Wed	Northbound Morning	Northbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Southbound Morning	Southbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		1	5			0	10				
12:15		2	9			0	10				
12:30		1	8			0	6				
12:45		0	10	4	32	2	6	2	32	6	64
01:00		1	5			0	5				
01:15		0	11			0	9				
01:30		0	10			1	6				
01:45		1	7	2	33	0	18	1	38	3	71
02:00		0	8			0	13				
02:15		0	8			0	8				
02:30		0	7			0	9				
02:45		0	9	0	32	0	9	0	39	0	71
03:00		0	9			1	3				
03:15		0	9			0	17				
03:30		0	**13**			2	10				
03:45		0	**12**	0	43	1	**17**	4	47	4	90
04:00		2	**13**			0	**17**				
04:15		0	**12**			6	**21**				
04:30		1	10			2	**16**				
04:45		6	9	9	44	7	11	15	65	24	109
05:00		5	10			1	11				
05:15		7	11			3	12				
05:30		6	8			14	8				
05:45		8	15	26	44	4	11	22	42	48	86
06:00		**11**	8			**7**	8				
06:15		**11**	14			**11**	14				
06:30		**7**	0			**13**	7				
06:45		**10**	10	39	32	**13**	7	44	36	83	68
07:00		2	4			6	7				
07:15		7	5			2	12				
07:30		6	7			8	2				
07:45		4	5	19	21	7	3	23	24	42	45
08:00		2	3			4	3				
08:15		2	7			12	2				
08:30		6	9			8	9				
08:45		4	1	14	20	6	1	30	15	44	35
09:00		5	6			8	0				
09:15		3	3			2	2				
09:30		4	0			2	0				
09:45		7	1	19	10	8	1	20	3	39	13
10:00		6	2			6	1				
10:15		6	0			8	4				
10:30		5	0			10	1				
10:45		3	2	20	4	8	1	32	7	52	11
11:00		8	1			11	0				
11:15		4	0			7	0				
11:30		8	1			8	0				
11:45		8	2	28	4	9	2	35	2	63	6
Total		180	319	180	319	228	350	228	350	408	669
Combined Total		499		499		578		578		1077	
AM Peak	-	06:00	-	-	-	06:00	-	-	-	-	-
Vol.	-	39	-	-	-	44	-	-	-	-	-
P.H.F.		0.886				0.846					
PM Peak	-	-	03:30	-	-	-	03:45	-	-	-	-
Vol.	-	-	50	-	-	-	71	-	-	-	-
P.H.F.			0.962				0.845				
Percentage		36.1%	63.9%			39.4%	60.6%				
ADT/AADT		ADT 1,077		AADT 1,077							

Attachment E
Nomographs

V_A = TOTAL ADVANCING TRAFFIC VOLUME INCLUDING ALL TURNING TRAFFIC

V_O = TOTAL OPPOSING TRAFFIC VOLUME INCLUDING ALL TURNING TRAFFIC



Instructions:

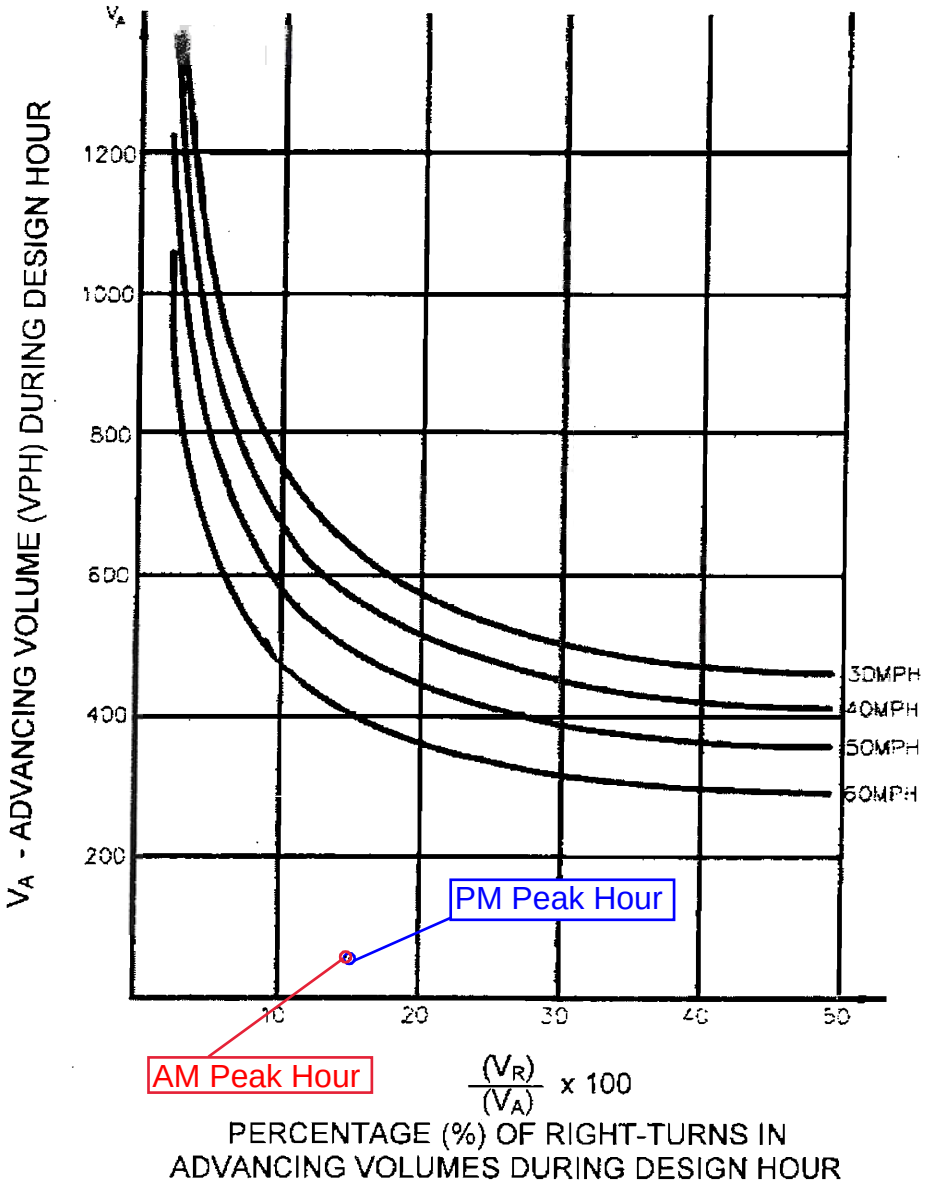
1. *The family of curves represent the percent of left turns in the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of 5, the designer should estimate where the curve lies.*

2. *Read V_A and V_O into the chart and locate the intersection of the two volumes.*

3. *Note the location of the point in #2 relative to the line in #1. If the point is to the right of the line, then a left-turn lane is warranted. If the point is to the left of the line, then a left-turn lane is not warranted based on traffic volumes.*

VOLUME WARRANTS FOR LEFT-TURN LANE AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (60 mph)

Figure 5



Instructions:

1. The family of curves represent the design speed of the roadway as determined by the designer in Step 1C.

2. Determine the percentage (%) of right-turns (V_R) in the advancing volumes (V_A) during the design hour by dividing V_R by V_A and multiplying this value by 100. Please note V_A is the total advancing traffic volume including all turning traffic.

3. Read V_A and the percentage into the chart and locate the intersection of the two values.

4. Note the location of the point found in no. 3 above relative to the line described in no. 1 above. If the point is above or to the right of the line, then a right-turn lane is warranted based on traffic volumes. If the point is below or to the left of the line, then a right-turn lane is not warranted based on traffic volumes.

Volume Warrant for Right-Turn Lane at Unsignalized Intersections on 2-lane Highways
Figure 1