Intersection Control Evaluation (ICE) Screening Evaluation

San Ysidro Road / US 101 Interchange

Santa Barbara, California

January 2017
Intersection Control Evaluation (ICE) Screening Evaluation

San Ysidro Road / US 101 Interchange
Santa Barbara, California

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EXECUTIVE SUMMARY
The purpose of this report is to conduct an Intersection Control Evaluation (ICE) to objectively evaluate and screen intersection control and access alternatives at the US 101 interchange with San Ysidro Road. Intersection control strategies evaluated in this study include stop, traffic signal, and roundabout control. The following intersections are included in the study:

- **US 101 Northbound Ramp Terminal Intersections**
  - San Ysidro Road at North Jameson Lane
  - San Ysidro Road at US 101 Northbound On-/Off-Ramp Terminals

- **US 101 Southbound Ramp Terminal Intersections**
  - San Ysidro Road at US 101 Southbound Off-Ramp Terminal/South Jameson Lane
  - San Ysidro Road at South Jameson Lane

The County of Santa Barbara and Caltrans jointly own and operate the ramp terminal intersections while the County of Santa Barbara own and operate the non-ramp terminal study intersections.

Intersection control types evaluated in this study include:

- Two-Way and All-Way Stop Control
- Signal Control
- Roundabout Control
- Combination of Roundabout and Stop Control
- Combination of Roundabout and Signal Control

KEY FINDINGS

- The Caltrans District 5 ICE coordinator has reviewed the initial roundabout concept and agrees the concept is a viable intersection control strategy that is suitable to advance for further analysis.
- No fatal flaws associated with the roundabout concepts have been identified in this phase.
- Roundabout control would provide superior AM/PM peak hour operations over the stop controlled or the signal controlled alternatives.
- Converting the southbound ramp terminal intersection to an all-way-stop combined with roundabout control at the northbound ramp terminal intersection will provide adequate AM/PM peak hour operations.
- The existing US 101 overpass bridge provides adequate storage capacity with roundabout control at the northbound ramp terminal intersection and either roundabout or all-way stop control at the southbound ramp terminal intersection. Traffic signal control requires widening the existing bridge to provide vehicle storage between ramp terminal intersections.
- Traffic signal operations would not be acceptable for the existing nor 2040 design year.
- Stop control operations would not be acceptable for the 2040 design year at North Jameson Lane.
- Roundabout control for the San Ysidro Road at US 101 Northbound Ramp Terminal / North Jameson Lane intersection appears to not require right of way acquisition (additional study is required to verify).
Traffic signal control at northbound and southbound ramp terminal intersections is the least feasible alternative in terms of operations, project cost, and right of way acquisition.

Table 1: Year 2040 Operations Comparison

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Northbound Ramp Terminal Intersection Year 2040</th>
<th>Southbound Ramp Terminal Intersection Year 2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing</td>
<td>Over capacity (North Jameson Lane)</td>
<td>Over capacity</td>
</tr>
<tr>
<td>Stop Sign Control</td>
<td>• LOS F in the a.m. peak hour with average delay of 53 seconds</td>
<td>• LOS D in the a.m. peak hour with average delay of 30 seconds</td>
</tr>
<tr>
<td></td>
<td>• LOS E in the p.m. peak hour with average delay of 36 seconds</td>
<td>• LOS D in the p.m. peak hour with average delay of 28 seconds</td>
</tr>
<tr>
<td></td>
<td>• Inadequate queue storage on San Ysidro Road between ramp terminals</td>
<td>• Inadequate queue storage on southbound off-ramp</td>
</tr>
</tbody>
</table>

Evaluated Intersection Control Options

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Northbound Ramp Terminal Intersection Year 2040</th>
<th>Southbound Ramp Terminal Intersection Year 2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop Sign Control (Convert southbound ramp terminal to all way stop control)</td>
<td>N/A: Same as Existing (All-way stop control on North Jameson Lane)</td>
<td>Adequate capacity (All-way stop control on North Jameson Lane)</td>
</tr>
<tr>
<td></td>
<td>• Over capacity</td>
<td>• Over capacity</td>
</tr>
<tr>
<td></td>
<td>• LOS C in the a.m. peak hour with average delay of 34 seconds</td>
<td>• LOS C in the a.m. peak hour with average delay of 23 seconds</td>
</tr>
<tr>
<td></td>
<td>• LOS D in the p.m. peak hour with average delay of 40 seconds</td>
<td>• LOS C in the p.m. peak hour with average delay of 24 seconds</td>
</tr>
<tr>
<td></td>
<td>• Inadequate queue storage</td>
<td>• Adequate queue storage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Northbound Ramp Terminal Intersection Year 2040</th>
<th>Southbound Ramp Terminal Intersection Year 2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Control (Convert northbound and southbound ramp terminals to signal control)</td>
<td>Adequate capacity</td>
<td>Adequate capacity</td>
</tr>
<tr>
<td></td>
<td>• Over capacity</td>
<td>• Over capacity</td>
</tr>
<tr>
<td></td>
<td>• LOS C in the a.m. peak hour with average delay of 11 seconds</td>
<td>• LOS C in the a.m. peak hour with average delay of 7 seconds</td>
</tr>
<tr>
<td></td>
<td>• LOS B in the p.m. peak hour with average delay of 11 seconds</td>
<td>• LOS A in the p.m. peak hour with average delay of 7 seconds</td>
</tr>
<tr>
<td></td>
<td>• Adequate queue storage</td>
<td>• Adequate queue storage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Northbound Ramp Terminal Intersection Year 2040</th>
<th>Southbound Ramp Terminal Intersection Year 2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roundabout Control (Convert northbound and southbound ramp terminals to roundabout control)</td>
<td>Adequate capacity</td>
<td>Adequate capacity</td>
</tr>
<tr>
<td></td>
<td>• Adequate capacity</td>
<td>• Adequate capacity</td>
</tr>
<tr>
<td></td>
<td>• LOS B in the a.m. peak hour with average delay of 11 seconds</td>
<td>• LOS A in the a.m. peak hour with average delay of 7 seconds</td>
</tr>
<tr>
<td></td>
<td>• LOS B in the p.m. peak hour with average delay of 11 seconds</td>
<td>• LOS A in the p.m. peak hour with average delay of 7 seconds</td>
</tr>
<tr>
<td></td>
<td>• Adequate queue storage</td>
<td>• Adequate queue storage</td>
</tr>
</tbody>
</table>

Bold indicates unacceptable operations
Operations are based on Year 2040 Build Alternative traffic volumes documented in the SC101 HOV PA-ED Traffic Study
NOTE: The traffic volumes used in this study are consistent with the US 101 HOV PA-ED (dated December 2011) traffic analysis. An updated traffic count was performed at the interchange (2008 vs. 2014).

Signal control is the least feasible control strategy considering the project constraints. There may be other considerations, constraints, and project factors identified in future design evaluations that could affect the prioritization of a specific configuration.

RECOMMENDATIONS
The intersection evaluation considered Year 2040 Build Alternative traffic volumes documented in the SC101 HOV PA-ED Traffic Study. Based on traffic operations and project constraints evaluated in this study, the following traffic control options are the most feasible alternatives to serve forecast traffic:

- Northbound Ramp Terminal Intersection – Roundabout
- Southbound Ramp Terminal Intersection – Modified Stop Control or Roundabout

Either a combination of a roundabout at the northerly intersections combined with all-way-stop-control or roundabout at the southerly intersections are feasible intersection control alternatives.
The combination of roundabout at the north intersections and all-way-stop-control at the south intersections is the most cost effective solution to accommodate forecast year 2040 peak hour demand.

The following table summarizes the traffic operations for the recommended intersection control alternatives.

**Table 2: Year 2040 Operations of Recommended Alternatives**

<table>
<thead>
<tr>
<th>Intersection Control Type</th>
<th>Time Period</th>
<th>Volume to Capacity Ratio</th>
<th>Delay (seconds/vehicle)</th>
<th>Queue Length (feet)</th>
<th>Volume to Capacity Ratio</th>
<th>Delay (seconds/vehicle)</th>
<th>Queue Length (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM</td>
<td>0.65</td>
<td>11.4 (LOS B)</td>
<td>150 (SB)</td>
<td>0.68</td>
<td>14.7 (LOS B)</td>
<td>150 (EB)</td>
</tr>
<tr>
<td>Roundabout + Modified Stop Control (Alternative R1-2B)</td>
<td>PM</td>
<td>0.69</td>
<td>11.2 (LOS B)</td>
<td>175 (SB)</td>
<td>0.59</td>
<td>13.0 (LOS B)</td>
<td>100 (EB)</td>
</tr>
<tr>
<td>Roundabout + Roundabout</td>
<td>AM</td>
<td>0.65</td>
<td>11.4 (LOS B)</td>
<td>150 (SB)</td>
<td>0.50</td>
<td>7.3 (LOS A)</td>
<td>75 (EB)</td>
</tr>
<tr>
<td>(Alternative R2)</td>
<td>PM</td>
<td>0.69</td>
<td>11.2 (LOS B)</td>
<td>175 (SB)</td>
<td>0.47</td>
<td>6.7 (LOS A)</td>
<td>75 (EB)</td>
</tr>
</tbody>
</table>

Notes:
1. Modified stop control operations is presented for all-way-stop-control alternative at the Southbound Off-Ramp Terminal Intersection.
   Example: (SB) = Vehicle traveling in the southbound (SB) direction on San Ysidro Road and approaching the study intersection.
3. Queue Length: 95% queues rounded up to the nearest 25 feet. 1 car length=25 feet.
4. Refer to Tables 4 and 5 for additional detail of intersection operations.

Figures 1 and 2 illustrate the basic intersection control options studied that are viable alternatives to serve forecast traffic at the San Ysidro Interchange. Variations of these basic intersection control options were developed in response to the community’s request to evaluate Southbound On-Ramp improvements and reduced impacts to the site of the proposed Miramar development.

This ICE document presents concept design options sufficient to evaluate and compare traffic control strategies. Elements such as landscape, hardscape details and other aesthetic considerations will be developed with input from the community during later phases of design and engineering. The Montecito community values its semi-rural character and the completed project must complement the community.

The project recommendations described in this ICE will be advanced within the framework of the Caltrans Project Development and Procedures Manual (PDPM) and additional geometric development. Milestone project development studies including a Project Study Report – Project Development Support (PSR-PDS), Step 2 ICE, and Project Approval and Environmental Document (PA/ED) are needed.

A Step 2 ICE document should include roundabout performance checks such as speed control, sight distance, and design vehicle checks for California Legal, Bus 45, and emergency response design vehicles. Additional intersection traffic operations evaluations of these ICE alternatives should include microsimulation analysis to evaluate intersection operations between and including South and North Jameson Lane.
Figure 1: Roundabout with Modified Stop Control (Alternative R1-2B shown)
Figure 2: Roundabout with Roundabout (Alternative R2 shown)
PROJECT OVERVIEW

INTRODUCTION

This purpose of this Intersection Control Evaluation (ICE) is to objectively evaluate alternatives for the intersection control strategies at the San Ysidro Road / US 101 interchange and nearby intersections at San Ysidro Road / North Jameson Lane and San Ysidro Road / South Jameson Lane. Refer to Figure 3 for an aerial view of the project area.

This document explores intersection control alternatives at the study intersections. Twelve project alternatives were analyzed as described in this ICE:

- Alternative E1: Stop Control Intersection (Existing Condition)
- Alternative S1: Signalized Intersections
- Roundabout Intersections with four variations
  - Alternative R1: Roundabout at northbound US 101 ramp terminal intersection. The following traditional intersection control alternatives were studied at the US 101 southbound ramp terminal intersection:
    - R1: Existing stop control
    - R1-1A: Signal with new southbound on-ramp
    - R1-1B: Signal
    - R1-2A: All-Way-Stop-Control with new southbound on-ramp
    - R1-2B: All-Way-Stop-Control
  - Alternative R2: Roundabouts at northbound and southbound US 101 ramp terminal intersections
  - Alternative R3: Roundabouts at northbound and southbound US 101 ramp terminal intersections. New southbound on-ramp
  - Alternative R4: Roundabout at existing US 101 northbound ramp terminal intersections with new bridge and new southbound off-ramp terminal roundabout intersection west of existing intersection.
  - Alternative R5: Roundabout at existing US 101 northbound ramp terminal intersection with new bridge, new southbound off-ramp and on-ramp terminal roundabout intersection west of existing intersection. This alternative is the same as R4 but with new southbound on-ramp.

PROJECT NEED AND PURPOSE

Project Need

Traffic volumes exceed existing capacity of the existing San Ysidro Road / US 101 interchange and surrounding intersections during peak periods. During peak periods, the ramp intersections and local road intersections operate below LOS D which results in significant congestion. Intersection operations at North Jameson Lane results in vehicle queues that exceed available storage between ramp terminal intersections, thereby impacting southbound off-ramp operations. The 1950-60s design configuration of the ramp
terminal intersections and local intersections (i.e. close proximity of local road and ramp terminal intersections) result in inefficient traffic flow. In addition, the multiple roads and ramps leading into intersections create right of way confusion for cyclists. Pedestrians and cyclists have incomplete facilities on which to travel through the study intersections.

Project Purpose
The purpose of the project is to reduce congestion, improve public access to coastal resources, and improve circulation at the San Ysidro Road / US 101 interchange and adjacent local roads. This includes reducing delays along San Ysidro Road, North Jameson Lane, South Jameson Lane, and the US 101 on- and off-ramps as well as providing ADA compliant pedestrian circulation through the interchange. Additionally, the purpose is to enhance access through the study intersections for cyclists destined to the California Coastal Trail on North Jameson Lane and Class II bike lanes on San Ysidro Road. Intersections would operate at LOS D or better, consistent with Montecito Community Plan Policy CIRC-M-1.6 and Caltrans policy.

PROJECT CONTEXT
This section documents the transportation facilities and geometric characteristics of the roadways within the study area. Table 2 describes the study area roadways.

The existing San Ysidro Road / US 101 interchange is a diamond interchange controlled by stop signs at the ramp terminal intersections. Additional stop control is provided at the N. / S. Jameson Lane frontage road that parallels US 101. The proximity of the frontage road intersections with the ramp terminal intersections effectively create a single intersection with six legs at N. Jameson Lane and five legs at S. Jameson Lane.

San Ysidro Road is a gateway to Montecito, an unincorporated community. The center of the community is located north of US 101. South of US 101, San Ysidro Road provides public beach access.

There are limited parallel, alternate routes to US 101 near the project area. N. Jameson Lane provides an alternate connection between City of Santa Barbara and Summerland. PM peak hour queue jumping has been observed on N. Jameson Lane through the project site when there is congestion on US 101. A secondary alternate route is State Route (SR) 192, locally named as East Valley Road / Sycamore Canyon Road. SR 192 is a winding, two-lane road passing through the Montecito Village approximately one-mile north of US 101.

All parcels in the vicinity of the project are developed north of N. Jameson Lane. All parcels west of San Ysidro Road, south of S. Jameson Lane are developed. Redevelopment of the Miramar Resort is planned for the vacant parcel southeast of the San Ysidro Road / S. Jameson Lane intersection.

NOTE: A schematic rendering of the Miramar development is provided with each alternative for illustrative purposes only. The schematic is illustrative and may not represent the final form of project currently under construction.

The project site is located within the Montecito Plan Area and within the Coastal Zone. The Montecito Association is a nonprofit community association that serves as a community voice to maintain the character of the community and advocates adherence to the Montecito Community Plan.
<table>
<thead>
<tr>
<th>Roadway</th>
<th>Cross Section</th>
<th>Functional Classification</th>
<th>Speed Limit</th>
<th>Regional Context</th>
<th>Multimodal Transportation</th>
<th>Active Transportation Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Ysidro Road (County of Santa Barbara)</td>
<td>Undivided two-lane, shoulder, no sidewalk</td>
<td>Semi-rural</td>
<td>40 mph North of US Hwy 101</td>
<td>Serves local communities and two schools north of the study area</td>
<td>North of N. Jameson Lane - Local transit service is operated by MTD Santa Barbara in the study area. Service is provided via the Line 14 – Montecito. A bus stop is located just north of N. Jameson Road.</td>
<td>Shoulders and occasional decomposed granite paths</td>
</tr>
<tr>
<td>North Jameson Lane (County of Santa Barbara)</td>
<td>Undivided two-lane, shoulder, no sidewalk</td>
<td>Semi-rural</td>
<td>40 mph</td>
<td>Serves local communities to the east and west Alternate, parallel route to US 101</td>
<td>East of San Ysidro Road - Local transit service is operated by MTD Santa Barbara in the study area. Service is provided via the Line 14 – Montecito.</td>
<td>Shoulders</td>
</tr>
<tr>
<td>South Jameson Lane (County of Santa Barbara)</td>
<td>Undivided two-lane, shoulder, no sidewalk</td>
<td>Semi-rural</td>
<td>30 mph</td>
<td>East of San Ysidro Road – Feeds southbound US 101 on-ramp at Posilipo Lane Proposed Miramar resort development south of road. Proposed development includes on-street public parking improvements to enhance beach access.</td>
<td>None</td>
<td>Shoulders</td>
</tr>
<tr>
<td>US 101</td>
<td>Four-lane divided highway</td>
<td>Highway</td>
<td>Provides north-south access through the South Coast and to regional destinations.</td>
<td>None</td>
<td>None</td>
<td>Bicycles prohibited on freeway. Bicycle access occurs on local roadways.</td>
</tr>
</tbody>
</table>
Figure 3: Project Area (© 2013 Google)
TRAFFIC CONTROL STRATEGIES AND PERFORMANCE ANALYSES

TRAFFIC CONTROL ALTERNATIVES

Stop, signal, and roundabout traffic control strategies were evaluated at the study intersections. The proximity of the ramp terminal intersections to the frontage roads of North and South Jameson Lane required consolidating two intersections into a single roundabout with 5 or 6 legs. Alternatives for the southbound ramp configurations include scenarios with and without closure of the southbound on-ramp at Posilipo Lane and construction of a new southbound on-ramp at San Ysidro Road. The following table summarizes the traffic control strategies evaluated:

<table>
<thead>
<tr>
<th>Description</th>
<th>Alternative Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain the existing intersection controls and geometry. This alternative would maintain the existing stop control configurations at the study intersections.</td>
<td>E1</td>
</tr>
<tr>
<td>Convert all study intersections to signal control.</td>
<td>S1</td>
</tr>
<tr>
<td>Convert the northbound intersections to a roundabout combined with the following combination of stop and signal control alternatives at the southbound ramp intersections:</td>
<td>R1</td>
</tr>
<tr>
<td>• Maintain the existing two-way stop control.</td>
<td>R1-1A, R1-1B</td>
</tr>
<tr>
<td>• Convert the intersections to signal control.</td>
<td>R1-2A, R1-2B</td>
</tr>
<tr>
<td>• Modify the existing southbound ramp terminal intersection to all-way stop control.</td>
<td>R2, R3, R4, R5, R6</td>
</tr>
<tr>
<td>Convert all study intersections to roundabouts.</td>
<td></td>
</tr>
</tbody>
</table>

ANALYSIS RESULTS

The methodologies and approach used for this San Ysidro ICE analysis are consistent with the US 101 HOV PA-ED (dated December 2011) traffic analysis. An updated traffic count was performed at the interchange (2008 vs. 2015).

Traffic control alternatives were evaluated consistent with the US 101 HOV PA&ED (dated December 2011) and are described in Appendix B. A summary of the analysis results for each intersection are presented below. Supporting material, including detailed operations results by movement and the operations analysis worksheets, are presented in Appendix C. Alternative E1: Stop Control with Existing Geometry

The existing stop control with existing geometry alternative assumes the lane configuration remains the same under year 2040 conditions for all study intersections. Under year 2040 conditions, the study intersections are projected to operate over capacity. Queues on the US 101 Southbound Off-Ramp will exceed available storage during the weekday a.m. peak hours. The analysis shows that northbound San Ysidro Road queues at the N. Jameson Lane intersection spillback to the US 101 Southbound Off-Ramp. The
spillback condition contributes to the length of off-ramp queues and deteriorates operations at the US 101 Southbound Off-Ramp intersection.

Refer to Figures 4 and 5 for illustrations of the existing conditions with and without the proposed Miramar development.
Figure 4: Alternative E1 (Existing Intersection)

Figure 5: Alternative E1 (Existing Condition with Proposed Miramar Development)
Alternative S1: Signal Control
The signal control alternative was first evaluated with existing geometry; assuming the existing intersection lane configurations remained the same under year 2040 conditions. Under year 2040 conditions, the intersection was projected to operate over capacity with significant queuing during the weekday a.m. and p.m. peak hours.

Alternative S1 was developed with lane configurations that would result in acceptable signal operations under year 2040 conditions. Alternative S1, is illustrated in Figure 6. The signal control alternative requires adding new lanes to the intersection, including widening or replacing the existing bridge, and acquiring right of way north of N. Jameson Lane. Each of these impacts is considered a fatal flaw.

Figure 6: Alternative S1

Alternatives R1 through R6: Roundabout Control
Several roundabout configurations were evaluated to determine lane configurations needed to support the 2040 design year conditions and existing site conditions. Each roundabout alternative can be identified as US 101 Northbound Ramp Terminal Intersection Operations and US 101 Southbound Ramp Terminal Intersection Operations.

**US 101 Northbound Ramp Terminal Intersection Operations**

**Alternative R1**
The operations at the US 101 northbound ramp terminal intersection are consistent for Alternatives R1 through R6. With the exception of alternatives R1-1A and R1-1B, geometric variations and the intersection
control variations identified at the US 101 southbound ramp terminal intersection are not expected to influence the overall operations at the roundabout. However, signal control alternatives R1-1A and R1-1B at the southbound ramp terminal intersection are expected to generate vehicle queue extending back into the circulatory roadway. This would degrade roundabout operations.

The proposed roundabout alternative, R1, is illustrated in Figure 7. The proposed roundabout alternatives are projected to operate with a volume to capacity (v/c) ratio of 0.69 or less on all approaches for year 2040 build conditions, with southbound San Ysidro Road as the critical approach during the p.m. peak hour.

Northbound San Ysidro Road queues at the proposed roundabout are projected to extend 100 feet, less than the available storage of 150 feet between intersections.

Figure 7: Alternative R1

US 101 at Southbound Ramp Terminal Intersection Operations

Alternative R1
Alternative R1 maintains the existing stop control and intersection geometry. Operations are improved at the intersection by eliminating queue spillback from the northbound San Ysidro Road approach at the US 101 northbound ramp terminal intersection. Near-term construction of the US 101 northbound ramp terminal intersection may prolong the operational service life of the existing US 101 southbound ramp terminal intersection. However, converting the existing intersection to all-way-stop-control at the southbound off-ramp terminal intersection will improve operations for the southbound off-ramp.
The following alternatives R1-1A, R1-1B, R1-2A, and R1-2B are variations of alternative R1 with differing traffic control treatments at the US 101 southbound ramp terminal intersection. Without consideration of southbound San Ysidro Road queues at the southbound ramp terminal intersection, roundabout operations at the northerly ramp terminal are expected to operate in a similar manner as described for alternative R1.

**Alternatives R1-1A and R1-1B**

Alternatives R1-1A and R1-1B convert the existing southbound ramp intersections to signal control. Each of these alternatives includes constructing a right turn lane on the southbound off-ramp. Alternative R1-1A (Figure 8) includes a new southbound on-ramp at San Ysidro Road while R1-1B (Figure 9) retains the southbound on-ramp at Posilipo Lane.

The southbound off-ramp terminal intersection, either with or without the relocated southbound on-ramp, would operate at an overall LOS that exceeds the LOS D standard with 36 seconds or more of average intersection delay during the AM peak hour. The southbound off-ramp terminal intersection would operate with 45 or more seconds of delay in the AM peak hour. In addition, southbound San Ysidro Road queues will exceed available storage and spill back into the roundabout at the northbound ramp terminal intersection. Queue spillback into the roundabout is considered a fatal flaw.

**Alternative R1-2A and R1-2B**

Alternatives R1-2A and R1-2B modify the existing stop control intersection to all-way-stop-control. Alternative R1-2A (Figure 10) includes a new southbound on-ramp at San Ysidro Road while R1-2B (Figure 11) retains the southbound on-ramp at Posilipo Lane. Modifications for each of these intersections will likely be limited to signing and striping. The modified intersection is expected to operate at an acceptable LOS B with 15 or less seconds of average intersection delay. Southbound San Ysidro Road queues are not expected to exceed 50 feet.
Figure 8: Alternative R1-1A

Figure 9: Alternative R1-1B
Figure 10: Alternative R1-2A

Figure 11: Alternative R1-2B
Alternative R2

Alternative R2 converts the existing stop controlled ramp terminal intersection to a single lane roundabout. Figure 12 illustrates the concept.

The proposed roundabout is projected to operate with a v/c ratio of 0.50 or less on all approaches for year 2040 build conditions, with the southbound off-ramp as the critical approach during the AM peak hour. Off-ramp queues are projected to extend approximately 3 car lengths, or 75 feet.

Alternatives R3 and R6

Alternatives R3 and R6 are similar to R2 except a sixth leg is added to provide a southbound on-ramp entry at San Ysidro Road to replace the southbound on-ramp at Posilipo Lane. Alternative R3 is illustrated in Figure 13. Alternative R6, illustrated in Figure 14, assumes no development at the Miramar property and provides greater separation between the proposed southbound on-ramp and the realigned South Jameson Lane.

Similar to Alternative R2, the proposed roundabout is projected to operate with a v/c ratio of 0.50 or less on all approaches for year 2040 build conditions, with the southbound off-ramp as the critical approach during the AM peak hour. Off-ramp queues are projected to extend approximately 3 car lengths, or 75 feet.

The right turn for westbound S. Jameson Lane is provided to accommodate right turning design vehicles and is unnecessary for intersection capacity.
Figure 12: Alternative R2

Figure 13: Alternative R3
Figure 14: Alternative R6

Alternatives R4 and R5

Alternative R4 reduces the number of intersection legs by shifting the US 101 southbound ramp terminal intersection west of the existing San Ysidro Road. Alternative R5 includes a new southbound on-ramp at San Ysidro Road while R4 retains the southbound on-ramp at Posilipo Lane. For both alternatives, the proposed single lane roundabout eliminates the southerly San Ysidro Road leg from the ramp terminal intersection and creates a new T intersection with S. Jameson Lane.

Similar to Alternatives R2 and R3, the proposed roundabout is projected to operate with a v/c ratio of 0.49 or less on all approaches for year 2040 build conditions, with the southbound off-ramp as the critical approach during the AM peak hour. Off-ramp queues are projected to extend approximately 3 car lengths, or 75 feet.

The proposed T intersection with side-stop control on San Ysidro Road is projected to operate with a v/c ratio of 0.16 or less on all approaches for year 2040 build conditions, with the northbound San Ysidro Road stop as the critical approach during the PM peak hour. Queues for the westbound S. Jameson Lane at the roundabout are projected to extend approximately one car length, or 25 feet, less than the available storage of 65 feet between intersections.

Figures 15 and 16 illustrate Alternatives R4 and R5, respectively.
Figure 15: Alternative R4

Figure 16: Alternative R5
Comparison of Roundabout vs. Stop and Signal Control Alternatives

Comparing the intersection control strategies for year 2040 intersection operations shows the roundabout control strategies (R1-R6) are predicted to provide better operational performance than stop or signalized strategies. Based on operations for northbound and southbound ramp terminal intersections, the northbound ramp operations are the primary consideration in determining intersection control alternatives. Improving intersection efficiency at the northbound ramp intersections allows consideration of stop control strategies at the southbound ramp intersection (R1-2A, R1-2B).

Service life for the existing southbound ramp stop controlled intersection could be prolonged by constructing the northerly roundabout as identified in alternative R1. However, AM peak hour queues are projected to extend to the US 101 ramp gore thereby reducing deceleration length as volumes approach year 2040 conditions. As operations deteriorate, consideration should be given to modifying the stop control intersection identified in alternatives R1-2A and R1-2B or construct the southerly roundabout identified in alternatives R2, R3, R4, R5, or R6 prior to 2040.

The northbound ramp terminal intersection under stop control conditions (E1) and signalized control conditions at any of the ramp terminal intersections (S1, R1-1A, R1-1B) are expected to be over capacity and create significantly greater delays than under the roundabout alternatives. Further, any mitigated geometry alternatives to the stop (E1) and signal (S1) control options would exceed given right of way constraints and would be considered fatally flawed.
Table 4: 2040 Operations Summary for Northbound Ramp Terminal Intersections

<table>
<thead>
<tr>
<th>Intersection Control Type (Alternative Number)</th>
<th>Time Period</th>
<th>North Jameson Lane at San Ysidro Road Intersection 1A</th>
<th>Northbound Ramp at San Ysidro Road Intersection 1B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Volume to Capacity Ratio</td>
<td>Delay (seconds/vehicle)</td>
</tr>
<tr>
<td>All Way Stop Control (E1)</td>
<td>AM</td>
<td>&gt; 1.00</td>
<td>52.5 (LOS F)</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>&gt; 1.00</td>
<td>36.3 (LOS E)</td>
</tr>
<tr>
<td>Two Way Stop Control (E1)</td>
<td>AM</td>
<td>Not Applicable</td>
<td>0.28 (WB)</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td></td>
<td>0.55 (WB)</td>
</tr>
<tr>
<td>Traffic Signal (S1)</td>
<td>AM</td>
<td>0.91 (SBT)</td>
<td>34.0 (LOS C)</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>0.91 (SBT)</td>
<td>39.4 (LOS D)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>North Jameson Lane / Northbound Ramp at San Ysidro Road Intersection 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume to Capacity Ratio</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Roundabout (R1**, R2, R3, R4, R5, R6)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*Overall intersection operations shown for the two- and all-way stop control and signalized alternatives. Individual approach movement may be higher.
** Indicates alternative data used in operations summary. Results are similar for each alternative.

Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1.0
## Table 5: 2040 Operations Summary for Southbound Ramp Terminal Intersections

<table>
<thead>
<tr>
<th>Intersection Control Type (Alternative Number)</th>
<th>Time Period</th>
<th>Intersection 2A</th>
<th></th>
<th>Intersection 2B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Southbound Ramp / South Jameson Lane at San Ysidro Road</td>
<td></td>
<td>South Jameson Lane at San Ysidro Road</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Volume to Capacity Ratio</td>
<td>Delay (seconds/vehicle)</td>
<td>Queue Length (feet)</td>
<td>Volume to Capacity Ratio</td>
</tr>
<tr>
<td>Two Way Stop Control (E1)</td>
<td>AM</td>
<td>&gt;1.0</td>
<td>29.9 (LOS D)</td>
<td>275 (EB)</td>
<td>0.08 (EB)</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>&gt;1.0</td>
<td>28.0 (LOS D)</td>
<td>275 (EB)</td>
<td>0.03 (EB)</td>
</tr>
<tr>
<td>All Way Stop Control (R1-2A, R1-2B**)</td>
<td>AM</td>
<td>0.68 (EB)</td>
<td>14.7 (LOS B)</td>
<td>150 (EB)</td>
<td>0.15 (SB)</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>0.59 (EB)</td>
<td>13.0 (LOS B)</td>
<td>100 (EB)</td>
<td>0.26 (SB)</td>
</tr>
<tr>
<td>Traffic Signal (S1)</td>
<td>AM</td>
<td>0.56 (SB)</td>
<td>23.2 (LOS C)</td>
<td>200 (EBL)</td>
<td>0.38 (EB)</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>0.54 (SB)</td>
<td>23.5 (LOS C)</td>
<td>200 (EBL)</td>
<td>0.47 (SB)</td>
</tr>
<tr>
<td>Traffic Signal (R1-1A, R1-1B**)</td>
<td>AM</td>
<td>0.90 (EB)</td>
<td>36.0 (LOS D)</td>
<td>400 (EB)</td>
<td>0.36 (EB)</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>0.82 (EB)</td>
<td>33.2 (LOS C)</td>
<td>250 (SB)</td>
<td>0.26 (NB)</td>
</tr>
</tbody>
</table>

*Overall intersection operations shown for the two- and all-way stop control and signalized alternatives. Individual approach movement may be higher.
**Indicates alternative data used in operations summary. Results are similar for each alternative.

### Notes
- Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1.0

## Table 6: Operation Table Notes

- Movement Key: WB=Westbound, SB=Southbound, EB=Eastbound, NB=Northbound, L=Left turn, T=Through, R=Right turn
  Example: NBTL = Northbound traveling vehicle (NB) on San Ysidro travels through first intersection (T) at US 101 ramp terminals and makes a left at next intersection (L) onto westbound N. Jameson Lane.
- 95% queues are rounded up to the nearest 25 feet. 1 car length=25 feet.
PLANNING AND DESIGN FRAMEWORK

EXISTING CONDITIONS AND DESIGN CONSTRAINTS

The following section and Table 7 describe the existing conditions and constraints identified in Figures 17 through 20.

Alternative S1 is not described in this section because of deficient operations compared to other alternatives, the cost of widening the San Ysidro Road overcrossing, and fatal flaw impacts to right of way along San Ysidro Road north of N. Jameson Lane.

Alternatives R1-1A, R1-1B, R1-2A, R1-2B, R5, and R6 are not specifically identified in the existing conditions and design constraints table. Consider the following when reviewing the existing conditions and design constraints for Alternatives R1 through R4:

- Alternatives R1-1A through R1-2B have similar existing conditions and design constraints as Alternative R1.
- Alternative R5 is similar to Alternative R4 except that South Jameson Lane west of San Ysidro Road would be realigned farther south.
- Alternative R6 is similar to Alternative R3. This concept illustrates the probable alignment if the Miramar property was not a constraint.

Refer to Appendix A for illustrations of each concept layout.

MONTECITO COMMUNITY PLAN

The project area is within coverage of the Montecito Community Plan. Key considerations for improvements within the plan area include consistency with Montecito community values as well as design that complements the community and maintains the semi-rural character.

RIGHT OF WAY

The project is entirely within unincorporated Santa Barbara County. The project intersections are bisected by Caltrans right of way between North Jameson Lane and the US 101 northbound ramps, and between South Jameson Lane and the US 101 southbound off-ramp west of San Ysidro Road, and by the US 101 mainline east of San Ysidro Lane. Caltrans right of way generally follows the southerly fence line of N. Jameson Lane and the northerly fence line of S. Jameson Lane.

Acquisition of certain residential properties has been identified as project constraints and/or fatal flaws. Unless noted otherwise, it is the intent of the project concepts to avoid significant right of way takes. As concepts are developed and refined through project approval and design, additional data, sight line evaluations, and other design considerations may trigger the need to acquire right of way and/or place restrictions on access to private property.

Potential right of way impacts to the proposed Miramar development are identified for each alternative. Alternatives R4 and R5 were developed as a potential mitigation to acquiring right of way from the Miramar parcel.
STRUCTURES
The existing San Ysidro Road bridge (overcrossing) over US 101 has been identified as a significant project constraint and likely fatal flaw due to the cost of modifying the existing structure. Alternatives R1 (including R1-1A, R1-1B, R1-2A, and R1-2B), R2, R3, and R6 were developed with the intent to preserve the existing bridge structure and abutments. Topographic survey and additional study is required to evaluate the cost of modifying the existing wing walls and/or retaining structures to accommodate the proposed improvements.

CRASH DATA AND OPERATING SPEEDS
Existing crash data was not reviewed as part of this effort. Vehicle speed data was not collected as part of this effort. If physical and operational constraints assessments presented within this ICE do not allow a clear differentiation of alternatives crash data and operating speeds could be used in Step 2 ICE evaluations.

DESIGN VEHICLE
The California Legal truck tractor-semitrailer was the design vehicle used to evaluating turning movements at the project intersections. Additional design vehicle evaluations should be investigated in later phases of design development. Consideration should be given to the 45-foot Bus and STAA design vehicles.

US 101 SOUTHBOUND ON-RAMP
The acceleration length to merge with mainline traffic at the existing US 101 Southbound Posilipo Lane On-Ramp is a concern frequently expressed by the Montecito Community. Modifications to the existing ramp are being considered by Caltrans and are not part of this ICE evaluation.

SPECIAL EVENTS
The Santa Barbara Triathlon course goes through the study area on S. Jameson Road to the west, across US 101 on San Ysidro Road, and N. Jameson Lane to the east.
Table 7: Existing Conditions and Design Constraints

**BOLD** indicates either a fatal flaw identified by the City of Santa Barbara or a deviation from Caltrans Highway Design Manual (HDM) advisory or mandatory design standards effective September 22, 2014.

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Description</th>
<th>HDM Design Deviation</th>
<th>Description of Existing Condition / Constraint / Fatal Flaw (Figure 17)</th>
<th>Alternative R1 Proposed Roundabout (Figure 18)</th>
<th>Alternative R2 Proposed Roundabout (Figure 19)</th>
<th>Alternative R3 Proposed Roundabout</th>
<th>Alternative R4 Proposed Roundabout (Figure 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>San Ysidro Bridge</td>
<td>Not Evaluated / No</td>
<td>• Potential Design Constraint / Fatal Flaw if altered</td>
<td>• Alternative assumes conform at existing bridge abutment</td>
<td>• Alternative assumes conform at existing bridge abutment</td>
<td>• Alternative assumes conform at existing bridge abutment</td>
<td>• New bridge west of existing bridge.</td>
</tr>
<tr>
<td>2</td>
<td>Tree at northeast corner of San Ysidro Road and North Jameson Lane</td>
<td>No / No</td>
<td>• Identified as a natural feature to preserve in place</td>
<td>• Additional study is needed to determine impact when considering sight lines for stopping sight distance. May preserve existing condition.</td>
<td>• Additional study is needed to determine impact when considering sight lines for stopping sight distance. May preserve existing condition.</td>
<td>• Additional study is needed to determine impact when considering sight lines for stopping sight distance. May preserve existing condition.</td>
<td>• Likely preserves existing condition.</td>
</tr>
<tr>
<td>3</td>
<td>Private Residence Parcels 009-263-011 and 009-263-012</td>
<td>No / No</td>
<td>• Potential Right of Way Constraint / Fatal Flaw if additional Right of Way needed</td>
<td>• Unlikely right of way take – pending sight line evaluations. Parcel will be subject to access control requirements per HDM Topic 504.8</td>
<td>• Unlikely right of way take – pending sight line evaluations. Parcel will be subject to access control requirements per HDM Topic 504.8</td>
<td>• Unlikely right of way take – pending sight line evaluations. Parcel will be subject to access control requirements per HDM Topic 504.8</td>
<td>• No right of way take</td>
</tr>
<tr>
<td>4</td>
<td>Private Residence Parcel 009-263-008</td>
<td>No / No</td>
<td>• Potential Right of Way Constraint / Fatal Flaw if additional Right of Way needed</td>
<td>• No impact - preserves existing condition.</td>
<td>• No impact - preserves existing condition.</td>
<td>• No impact - preserves existing condition.</td>
<td>• No impact - preserves existing condition.</td>
</tr>
<tr>
<td>5</td>
<td>Private Residence Parcel 009-263-003</td>
<td>No / No</td>
<td>• Potential Right of Way Constraint / Fatal Flaw if additional Right of Way needed</td>
<td>• No right of way take Parcel will be subject to access control requirements per HDM Topic 504.8</td>
<td>• No right of way take Parcel will be subject to access control requirements per HDM Topic 504.8</td>
<td>• No right of way take Parcel will be subject to access control requirements per HDM Topic 504.8</td>
<td>• No right of way take</td>
</tr>
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</tr>
<tr>
<td>6</td>
<td>Private Residence Parcel 009-332.007</td>
<td>No / No</td>
<td>• Potential Right of Way Constraint / Fatal Flaw if additional Right of Way needed</td>
<td>• N/A. Improvements are not proposed at the southbound ramp terminals.</td>
<td>• No right of way take</td>
<td>• No right of way take</td>
<td>• No right of way take</td>
</tr>
<tr>
<td>7</td>
<td>Private Residence Parcel 009-332.007</td>
<td>No / No</td>
<td>• Potential Right of Way Constraint / Fatal Flaw if additional Right of Way needed</td>
<td>• N/A. Improvements are not proposed at the southbound ramp terminals.</td>
<td>• No right of way take</td>
<td>• No right of way take</td>
<td>• No right of way take</td>
</tr>
<tr>
<td>8</td>
<td>Miramar Hotel Parcel 009-333-010</td>
<td>No / No</td>
<td>• Potential Right of Way Constraint</td>
<td>• N/A. Improvements are not proposed at the southbound ramp terminals.</td>
<td>• Requires Right of Way approximately 10,000 sf</td>
<td>• Requires Right of Way approximately 22,000 sf</td>
<td>• Requires Right of Way approximately 700 sf</td>
</tr>
</tbody>
</table>
| 9          | Miramar Hotel Northwest Parking Lot  | No / No              | • The number of on-site, surface parking spaces is of significant concern to the developer.  
• The actual number of parking spaces that may be impacted will require additional study when a detailed site plan is available. | • N/A. Improvements are not proposed at the southbound ramp terminals. | • Approximately 22 spaces may be impacted. | • Approximately 44 spaces may be impacted. | • No impact |
<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Description</th>
<th>HDM Design Deviation Exist. / New</th>
<th>Description of Existing Condition / Constraint / Fatal Flaw (Figure 17)</th>
<th>Alternative R1 Proposed Roundabout (Figure 18)</th>
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<th>Alternative R3 Proposed Roundabout</th>
<th>Alternative R4 Proposed Roundabout (Figure 20)</th>
</tr>
</thead>
</table>
| 10         | Miramar Hotel Public Access Parking along S. Jameson Ln | No / No | • Angled parking along S. Jameson Ln. is provided as mitigation for public beach access.  
• The actual number of parking spaces that may be impacted will require additional study when a detailed site plan is available that identifies Right of Way, shoulder and lane widths, parking depth, and sidewalk width.  
N/A. Improvements are not proposed at the southbound ramp terminals | • Approximately 13 spaces may be impacted | • Approximately 47 spaces may be impacted | No impact (Based on location where S. Jameson Ln. conforms to existing) | |
| 11         | Distance to N. Jameson Ln. from northbound US 101 ramp terminal | Yes / No | • Existing deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet | • Deviation from Mandatory Design Standard is not needed with this alternative  
N. Jameson Ln. is realigned to become a part of the ramp terminal intersection | • Deviation from Mandatory Design Standard is not needed with this alternative  
N. Jameson Ln. is realigned to become a part of the ramp terminal intersection | Deviation from Mandatory Design Standard is not needed with this alternative  
N. Jameson Ln. is realigned to become a part of the ramp terminal intersection | |
| 12         | Distance to San Leandro Ln. from northbound US 101 ramp terminal | Yes / Yes | • Existing deviation from Advisory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 500 feet but greater than 400 feet. | • Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet  
• Proposed roundabout ICD to curb return is 310 feet | • Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet  
• Proposed roundabout ICD to curb return is 310 feet | • Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet  
• Proposed roundabout ICD to curb return is 310 feet | • Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet  
• Proposed roundabout ICD to curb return is 310 feet |
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<th>Focus Area</th>
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<th>Alternative R2 Proposed Roundabout (Figure 19)</th>
<th>Alternative R3 Proposed Roundabout</th>
<th>Alternative R4 Proposed Roundabout (Figure 20)</th>
</tr>
</thead>
</table>
| **13**     | Distance to La Verada Rd. from San Ysidro Ln. | No / Yes | • Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet  
• Proposed roundabout ICD to curb return is 370 feet | • Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet  
• Proposed roundabout ICD to curb return is 370 feet | • Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet  
• Proposed roundabout ICD to curb return is 370 feet | • Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet  
• Proposed roundabout ICD to curb return is 370 feet | • Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet  
• Proposed roundabout ICD to curb return is 370 feet |
| **14**     | Distance to Miramar Ave. from San Ysidro Ln. | No / Yes | • Curb return to curb return distance is 470 feet. | • Requires deviation from Advisory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 500 feet but greater than 400 feet.  
• Proposed roundabout ICD to curb return is 420 feet | • Requires deviation from Advisory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 500 feet but greater than 400 feet.  
• Proposed roundabout ICD to curb return is 420 feet | • Requires deviation from Advisory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 500 feet but greater than 400 feet.  
• Proposed roundabout ICD to curb return is 420 feet | • Requires deviation from Advisory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 500 feet but greater than 400 feet.  
• Proposed roundabout ICD to curb return is 420 feet |
| **15**     | Distance to S. Jameson Ln. from southbound US 101 off-ramp terminal | Yes / Yes | • Existing deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet | • Deviation from Mandatory Design Standard is not needed with this alternative  
• S. Jameson Ln. is realigned to become a part of the ramp terminal intersection | • Deviation from Mandatory Design Standard is not needed with this alternative  
• S. Jameson Ln. is realigned to become a part of the ramp terminal intersection | • Deviation from Mandatory Design Standard is not needed with this alternative  
• S. Jameson Ln. is realigned to become a part of the ramp terminal intersection | • Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)  
• Curb return to curb return distance is less than 400 feet  
• Proposed roundabout ICD to San Ysidro Rd. curb return is 60 feet |
<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Description</th>
<th>HDM Design Deviation Existing / New</th>
<th>Description of Existing Condition / Constraint / Fatal Flaw (Figure 17)</th>
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<th>Alternative R3 Proposed Roundabout</th>
<th>Alternative R4 Proposed Roundabout (Figure 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Distance to Humphrey Rd. from San Ysidro Ln.</td>
<td>No / Yes</td>
<td>• Curb return to curb return distance is 280 feet.</td>
<td>• Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)</td>
<td>• Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)</td>
<td>• Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)</td>
<td>• Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Curb return to curb return distance is less than 400 feet</td>
<td>• Curb return to curb return distance is less than 400 feet</td>
<td>• Curb return to curb return distance is less than 400 feet</td>
<td>• Curb return to curb return distance is less than 400 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Proposed roundabout ICD to curb return is 260 feet</td>
<td>• Proposed roundabout ICD to curb return is 260 feet</td>
<td>• Proposed roundabout ICD to curb return is 260 feet</td>
<td>• Proposed roundabout ICD to curb return is 260 feet</td>
</tr>
<tr>
<td>17</td>
<td>Residential Driveway APN 009-263-011</td>
<td>No / Yes</td>
<td>• N. Jameson Ln. Curb return to driveway is 60 feet</td>
<td>• Requires deviation from Advisory Design Standard for HDM Topic 504.8</td>
<td>• Requires deviation from Advisory Design Standard for HDM Topic 504.8</td>
<td>• Requires deviation from Advisory Design Standard for HDM Topic 504.8</td>
<td>• Requires deviation from Advisory Design Standard for HDM Topic 504.8</td>
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<tr>
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<td></td>
<td>• Curb return to curb return distance is less than 100 feet but greater than 50 feet (Urban area)</td>
<td>• Curb return to curb return distance is less than 100 feet but greater than 50 feet (Urban area)</td>
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<td></td>
<td>• Proposed roundabout ICD to curb return is 55 feet</td>
<td>• Proposed roundabout ICD to curb return is 55 feet</td>
<td>• Proposed roundabout ICD to curb return is 55 feet</td>
<td>• Proposed roundabout ICD to curb return is 55 feet</td>
</tr>
<tr>
<td>18</td>
<td>Residential Driveway APN 009-332-007</td>
<td>No / Yes</td>
<td>• S. Jameson Ln. Curb return to driveway is 10 feet</td>
<td>• Requires deviation from Mandatory Design Standard for HDM Topic 504.8</td>
<td>• Requires deviation from Mandatory Design Standard for HDM Topic 504.8</td>
<td>• Requires deviation from Mandatory Design Standard for HDM Topic 504.8</td>
<td>• Requires deviation from Mandatory Design Standard for HDM Topic 504.8</td>
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<tr>
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<td></td>
<td></td>
<td>• Assumed driveway location along northerly parcel line</td>
<td>• Curb return to curb return distance is less than 50 feet (Urban area)</td>
<td>• Curb return to curb return distance is less than 50 feet (Urban area)</td>
<td>• Curb return to curb return distance is less than 50 feet (Urban area)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• Proposed roundabout ICD to curb return is 0 feet</td>
<td>• Proposed roundabout ICD to curb return is 0 feet</td>
<td>• Proposed roundabout ICD to curb return is 0 feet</td>
<td>• Proposed roundabout ICD to curb return is 0 feet</td>
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<tr>
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<td></td>
<td></td>
<td>• Driveway relocation to S. Jameson Ln. should be investigated</td>
<td>• Driveway relocation to S. Jameson Ln. should be investigated</td>
<td>• Driveway relocation to S. Jameson Ln. should be investigated</td>
<td>• Driveway relocation to S. Jameson Ln. should be investigated</td>
</tr>
</tbody>
</table>

- **16**: Requires deviation from Mandatory Design Standard for HDM Topic 504.3 (3) and deviates from Mandatory Design Standard for HDM Topic 504.3 (3) and curb return to curb return distance is less than 400 feet and proposed roundabout ICD to curb return is 260 feet.
- **17**: Requires deviation from Advisory Design Standard for HDM Topic 504.8 and deviates from Advisory Design Standard for HDM Topic 504.8 and curb return to curb return distance is less than 100 feet but greater than 50 feet (Urban area) and proposed roundabout ICD to curb return is 55 feet.
- **18**: Requires deviation from Mandatory Design Standard for HDM Topic 504.8 and deviates from Mandatory Design Standard for HDM Topic 504.8 and curb return to curb return distance is less than 50 feet (Urban area) and proposed roundabout ICD to curb return is 0 feet and driveway relocation to S. Jameson Ln. should be investigated.

- **No impact**: No deviation necessary.
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Residential Driveway APN 009-332-006</td>
<td>No / Yes</td>
<td>• San Ysidro Rd. Curb return to driveway is 210 feet</td>
<td>• No impact</td>
<td>• No impact</td>
<td>• No impact</td>
<td>• Requires deviation from Mandatory Design Standard for HDM Topic 504.8</td>
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<td>• Proposed roundabout ICD to driveway is 140 feet</td>
<td>• Proposed roundabout ICD to driveway is 140 feet</td>
<td>• Proposed roundabout ICD to driveway is 140 feet</td>
<td>• Curb return to curb return distance is less than 50 feet (Urban area)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• No impact</td>
<td>• No impact</td>
<td>• No impact</td>
<td>• Proposed roundabout ICD to curb return is 0 feet</td>
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<td></td>
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<td></td>
<td>• Requires deviation from Advisory Design Standard for HDM Topic 504.8</td>
<td>• Requires deviation from Advisory Design Standard for HDM Topic 504.8</td>
<td>• Requires deviation from Advisory Design Standard for HDM Topic 504.8</td>
<td>• Driveway relocation to Humphrey Rd. should be investigated</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• N/A. Improvements are not proposed at the southbound ramp terminals.</td>
<td>• Curb return to curb return distance is less than 100 feet but greater than 50 feet (Urban area)</td>
<td>• Proposed roundabout ICD to curb return is 60 feet</td>
<td>• No impact</td>
</tr>
<tr>
<td>20</td>
<td>Commercial Driveway APN 009-332-008</td>
<td>No / Yes</td>
<td>• S. Jameson Ln. Curb return to driveway is 70 feet</td>
<td>• Requires deviation from Advisory Design Standard for HDM Topic 504.8</td>
<td>• Curb return to curb return distance is less than 100 feet but greater than 50 feet (Urban area)</td>
<td>• Proposed roundabout ICD to curb return is 60 feet</td>
<td>• No impact</td>
</tr>
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<td></td>
<td>• N/A. Improvements are not proposed at the southbound ramp terminals.</td>
<td>• Proposed roundabout ICD to curb return is 60 feet</td>
<td>• Proposed roundabout ICD to curb return is 60 feet</td>
<td>• No impact</td>
</tr>
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</tr>
<tr>
<td>21</td>
<td>Pedestrian access north of US 101</td>
<td>No / No</td>
<td>• Pedestrian facilities are limited to a decomposed granite path with concrete curb ramps along the westerly side of San Ysidro Road. This condition is consistent with the Montecito Community Plan. • Crosswalk pavement markings are not present. • There are no pedestrian facilities between the US 101 northbound ramps and N. Jameson Lane</td>
<td>• New pedestrian facilities consistent with roundabout design guidance. Facilities include accessible paths, curb ramps, crosswalk pavement markings, and pedestrian refuge in medians.</td>
<td>• New pedestrian facilities consistent with roundabout design guidance. Facilities include accessible paths, curb ramps, crosswalk pavement markings, and pedestrian refuge in medians.</td>
<td>• New pedestrian facilities consistent with roundabout design guidance. Facilities include accessible paths, curb ramps, crosswalk pavement markings, and pedestrian refuge in medians.</td>
<td>• New pedestrian facilities consistent with roundabout design guidance. Facilities include accessible paths, curb ramps, crosswalk pavement markings, and pedestrian refuge in medians.</td>
</tr>
<tr>
<td>22</td>
<td>Pedestrian access on San Ysidro Road bridge</td>
<td>No / No</td>
<td>• 6 foot sidewalk (including railing) on both sides of bridge.</td>
<td>• No change</td>
<td>• No change</td>
<td>• No change</td>
<td>• New bridge construction with 6 foot minimum width sidewalks on both sides of bridge.</td>
</tr>
<tr>
<td>23</td>
<td>Pedestrian access south of US 101</td>
<td>No / No</td>
<td>• There are no pedestrian facilities immediately south of S. Jameson Lane. • Pedestrian facilities exist approximately 140 feet south of S. Jameson Lane on east side of San Ysidro Road. • Crosswalk pavement markings are not present. • There are no pedestrian facilities between the US 101 southbound ramp and S. Jameson Lane</td>
<td>• New pedestrian facilities consistent with roundabout design guidance. Facilities include accessible paths, curb ramps, crosswalk pavement markings, and pedestrian refuge in medians.</td>
<td>• New pedestrian facilities consistent with roundabout design guidance. Facilities include accessible paths, curb ramps, crosswalk pavement markings, and pedestrian refuge in medians.</td>
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</tbody>
</table>
| 24         | San Ysidro Road, South Leg | • 15 foot lanes  
• No shoulders  
• Some sidewalk and decomposed granite path facilities for pedestrians. None provided at study intersection.  
• No bicycle facilities  
• No on-street parking  
• No crosswalk at study intersection | • N/A. Improvements are not proposed at the southbound ramp terminals. | • 12 foot lanes  
• 2-3 foot shoulders  
• Extend sidewalk and decomposed granite path facilities to study intersection.  
• No Change  
• No Change  
• New crosswalk at study intersection  
• Mountable splitter island with pedestrian refuge | • No Change  
• No Change  
• New crosswalk at study intersection  
• Mountable splitter island with pedestrian refuge | • No Change  
• No Change  
• New crosswalk at study intersection  
• Mountable splitter island with pedestrian refuge | • 12 foot lanes  
• 2-3 foot shoulders  
• Extend sidewalk and decomposed granite path facilities to study intersection.  
• No Change  
• No Change  
• New crosswalk at study intersection  
• Mountable splitter island with pedestrian refuge | |
| 25         | S. Jameson Lane, West Leg | • 12 foot lanes  
• No shoulders  
• No sidewalks  
• No bicycle facilities  
• No on-street parking  
• No crosswalk at study intersection | • N/A. Improvements are not proposed at the southbound ramp terminals. | • No Change  
• No Change  
• New at intersection – beginning 100’ on south side.  
• No Change  
• No Change  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • No Change  
• No Change  
• New at intersection – beginning 100’ on south side.  
• No Change  
• No Change  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • No Change  
• No Change  
• New at intersection – beginning 100’ on south side.  
• No Change  
• No Change  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • 10 to 12 foot lanes  
• No Change  
• New at intersection – beginning 100’ on south side.  
• No Change  
• No Change  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge | |
| 26         | S. Jameson Lane, East Leg | • 15 foot lanes  
• No shoulders  
• No sidewalks  
• No bicycle facilities  
• No on-street parking  
• No crosswalk at study intersection | • N/A. Improvements are not proposed at the southbound ramp terminals. | • 12 foot lanes  
• 2 foot shoulders  
• New at intersection – Southerly sidewalk proposed with Miramar development.  
• No Change  
• Angled parking along southerly side is proposed with Miramar development New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • 10 foot lanes  
• 2 foot shoulders  
• New at intersection – Southerly sidewalk proposed with Miramar development.  
• No Change  
• Angled parking along southerly side is proposed with Miramar development New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • 12 foot lanes  
• 2 foot shoulders  
• New at intersection – Southerly sidewalk proposed with Miramar development.  
• No Change  
• Angled parking along southerly side is proposed with Miramar development New crosswalk at study intersection  
• Splitter island with pedestrian refuge | |

**Notes:**
- **24:** San Ysidro Road, South Leg
- **25:** S. Jameson Lane, West Leg
- **26:** S. Jameson Lane, East Leg

**Improvements at Southbound Ramp Terminals:**
- **24:** No improvements proposed.
- **25:** No improvements proposed.
- **26:** No improvements proposed.

**Current Condition:**
- **24:** 15 foot lanes, no shoulders, some sidewalk and decomposed granite path facilities, no bicycle facilities, no on-street parking, no crosswalk at study intersection.
- **25:** 12 foot lanes, no shoulders, no sidewalks, no bicycle facilities, no on-street parking, no crosswalk at study intersection.
- **26:** 15 foot lanes, no shoulders, no sidewalks, no bicycle facilities, no on-street parking, no crosswalk at study intersection.

**Proposed Alternatives:**
- **R1:** Proposed roundabout.
- **R2:** Proposed roundabout.
- **R3:** Proposed roundabout.
- **R4:** Proposed roundabout.

**Current Improvements at Study Intersection:**
- **24:** Not provided.
- **25:** Not provided.
- **26:** Not provided.

**Proposed Improvements at Study Intersection:**
- **24:** 12 foot lanes, 2-3 foot shoulders, extend sidewalk and decomposed granite path facilities, new crosswalk at study intersection, mountable splitter island with pedestrian refuge.
- **25:** No change.
- **26:** 10 foot lanes, 2 foot shoulders, extend sidewalk and decomposed granite path facilities, new crosswalk at study intersection, mountable splitter island with pedestrian refuge.

**Other Notes:**
- **24:** Improvements not proposed at the southbound ramp terminals.
- **25:** No change.
- **26:** New crosswalk at study intersection.
<table>
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</tr>
</thead>
</table>
| 27         | US 101 Southbound On-Ramp | Unk / YES | • Existing on-ramp is at Posilipo Lane  
• 12 foot lane  
• 8 foot right shoulder  
• NOTE: Improvements to modify and lengthen the on-ramp are currently under development by Caltrans. | • N/A. Improvements are not proposed at the southbound ramp terminals. | • No Change | • Close existing on-ramp at Posilipo Lane.  
• Construct new southbound on-ramp at San Ysidro Road.  
• 4 foot right shoulder. Requires deviation from Mandatory Design Standard for HDM Topic 302.1 Shoulder Width. Shoulder is less than 8 feet.  
• Requires deviation from Mandatory Design Standard for HDM Topic 302.1 Shoulder Width. Shoulder is less than 10 feet from retaining wall in cut.  
• 4 foot left shoulder  
• 8.5 feet ETW to ETW between on-ramp and S. Jameson Lane. Requires deviation from Advisory Design Standard for HDM Topic 310.2 Outer Separation. Standard ETW to ETW distance is less than 26 feet. | • No Change |
<table>
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<tbody>
<tr>
<td>28</td>
<td>US 101 Southbound Off-Ramp</td>
<td>YES / YES</td>
<td>• 12 foot lane • 8 foot right shoulder • 2 foot left shoulder* • No crosswalk at intersection • Existing deviation from Advisory Design Standard for HDM Topic 310.2 Outer Separation. ETW to ETW distance is less than 26 feet. o Existing ETW to ETW distance is 19 feet. * Assumes concurrence for restrictive condition per Note (2), Table 302.1 in HDM</td>
<td>• No Change • No Change • New crosswalk at study intersection • Maintains deviation from Advisory Design Standard for HDM Topic 310.2 Outer Separation.</td>
<td>• No Change • No Change • New crosswalk at study intersection • Maintains deviation from Advisory Design Standard for HDM Topic 310.2 Outer Separation.</td>
<td>• No Change • No Change • No Change* • New crosswalk at study intersection • Maintains deviation from Advisory Design Standard for HDM Topic 310.2 Outer Separation.</td>
<td>• No Change • No Change • No Change* • New crosswalk at study intersection • Maintains deviation from Advisory Design Standard for HDM Topic 310.2 Outer Separation.</td>
</tr>
<tr>
<td>29</td>
<td>US 101 Northbound On-Ramp</td>
<td></td>
<td>• 12 foot lane • 8 foot right shoulder • 2 foot left shoulder* • No crosswalk at intersection • * Assumes concurrence for restrictive condition per Note (2), Table 302.1 in HDM</td>
<td>• No Change • No Change • New crosswalk at study intersection</td>
<td>• No Change • No Change • New crosswalk at study intersection</td>
<td>• No Change • No Change • New crosswalk at study intersection</td>
<td>• No Change • No Change • No Change* • New crosswalk at study intersection</td>
</tr>
<tr>
<td>30</td>
<td>N. Jameson Lane, West Leg</td>
<td></td>
<td>• 11 foot lanes • 5 foot Class II bicycle lanes • No sidewalks • No on-street parking • No crosswalk at study intersection</td>
<td>• 12 foot lanes • No change • New at intersection – beginning 120’ west • No Change • New crosswalk at study intersection • Splitter island with pedestrian refuge</td>
<td>• 12 foot lanes • No change • New at intersection – beginning 120’ west • No Change • New crosswalk at study intersection • Splitter island with pedestrian refuge</td>
<td>• 12 foot lanes • No change • New at intersection – beginning 120’ west • No Change • New crosswalk at study intersection • Splitter island with pedestrian refuge</td>
<td>• 12 foot lanes • No change • New at intersection – beginning 120’ west • No Change • New crosswalk at study intersection • Splitter island with pedestrian refuge</td>
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</table>
| 31         | San Ysidro Road, North Leg | Exist. / New | • 12 foot lanes  
• Class II bicycle lanes  
• Decomposed granite path westerly side of street.  
• No on-street parking  
• No crosswalk at study intersection | • 12 foot lanes  
• Class II bicycle lanes  
• Decomposed granite path westerly side of street.  
• No on-street parking  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • 12 foot lanes  
• Class II bicycle lanes  
• Decomposed granite path westerly side of street.  
• No on-street parking  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • 12 foot lanes  
• Class II bicycle lanes  
• Decomposed granite path westerly side of street.  
• No on-street parking  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • 12 foot lanes  
• Class II bicycle lanes  
• Decomposed granite path westerly side of street.  
• No on-street parking  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge |
| 32         | N. Jameson Lane, East Leg | Exist. / New | • 11 foot lanes  
• 5 foot Class II bicycle lanes  
• No sidewalks  
• No on-street parking  
• No crosswalk at study intersection | • 12 foot lanes  
• No change  
• New at intersection – beginning 75' east  
• No Change  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • 12 foot lanes  
• No change  
• New at intersection – beginning 75' east  
• No Change  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • 12 foot lanes  
• No change  
• New at intersection – beginning 75' east  
• No Change  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge | • 12 foot lanes  
• No change  
• New at intersection – beginning 75' east  
• No Change  
• New crosswalk at study intersection  
• Splitter island with pedestrian refuge |
| 33         | US 101 Northbound Off-Ramp | Exist. / New | • 12 foot lane  
• 8 foot right shoulder  
• 2 foot left shoulder*  
• No crosswalk at intersection | • No Change  
• No Change  
• No Change*  
• New crosswalk at study intersection | • No Change  
• No Change  
• No Change*  
• New crosswalk at study intersection | • No Change  
• No Change  
• No Change*  
• New crosswalk at study intersection | • No Change  
• No Change  
• No Change*  
• New crosswalk at study intersection |
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</table>
| 34         | Design Vehicle (DV) at US 101 Northbound Ramp Terminals Refer to Figures in Appendix B | • DV: CA Truck  
  o Right turns: Limited - DV will encroach into oncoming traffic lane.  
  o Left turns: Limited - DV will encroach into oncoming traffic lane. | • DV: CA Truck  
  o Right turns: Possible  
  NOTE - DV will need to circulate through roundabout (U-turn) for the following movements:  
  1. US 101 Northbound Off-Ramp to eastbound N. Jameson Lane  
  2. Eastbound N. Jameson Lane to US 101 Northbound On-Ramp  
  o Left turns: - Possible. | • DV: CA Truck  
  o Right turns: Possible  
  NOTE - DV will need to circulate through roundabout (U-turn) for the following movements:  
  1. US 101 Northbound Off-Ramp to eastbound N. Jameson Lane  
  2. Eastbound N. Jameson Lane to US 101 Northbound On-Ramp  
  • Left turns: - Possible. | • DV: CA Truck  
  o Right turns: Possible  
  NOTE - DV will need to circulate through roundabout (U-turn) for the following movements:  
  1. US 101 Northbound Off-Ramp to eastbound N. Jameson Lane  
  2. Eastbound N. Jameson Lane to US 101 Northbound On-Ramp  
  • Left turns: - Possible. | • DV: CA Truck  
  o Right turns: Possible  
  NOTE - DV will need to circulate through roundabout (U-turn) for the following movements:  
  1. US 101 Northbound Off-Ramp to eastbound N. Jameson Lane  
  2. Eastbound N. Jameson Lane to US 101 Northbound On-Ramp  
  • Left turns: - Possible. |
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</table>
| 35        | Design Vehicle (DV) at US 101 Southbound Ramp Terminal | • DV: CA Truck  
  o Right turns: Limited - DV will encroach into oncoming traffic lane.  
  Exceptions - Right turn is unlikely or not possible:  
  1. US 101 Southbound Off-Ramp to westbound S. Jameson Road  
  2. S. Jameson Lane to southbound San Ysidro Road  
  o Left turns: Limited - DV will encroach into oncoming traffic lane. | • N/A. Improvements are not proposed at the southbound ramp terminals. | • DV: CA Truck  
  o Right turns: Possible  
  NOTE - DV will need to circulate through roundabout (U-turn) for the following movements:  
  1. US 101 Southbound Off-Ramp to westbound S. Jameson Lane | • DV: CA Truck  
  o Right turns: Possible  
  NOTE - DV will need to circulate through roundabout (U-turn) for the following movements:  
  1. US 101 Southbound Off-Ramp to westbound S. Jameson Lane | • DV: CA Truck  
  o Right turns: Possible  
  NOTE - DV will need to circulate through roundabout (U-turn) for the following movements:  
  1. US 101 Southbound Off-Ramp to westbound S. Jameson Lane | • DV: CA Truck  
  o Right turns: Possible  
  NOTE - DV will need to circulate through roundabout (U-turn) for the following movements:  
  1. US 101 Southbound Off-Ramp to westbound S. Jameson Lane  
  o Left turns: Possible  
  • Intersection at southbound San Ysidro Road: Limited – DV will encroach into oncoming traffic lanes. |
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Figure 17: Conditions and Constraints
Figure 18: Conditions and Constraints with Roundabout Alternative R1
Figure 19: Conditions and Constraints with Roundabout Alternative R2
Figure 20: Existing Conditions and Constraints with Roundabout Alternative R4
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY
An Intersection Control Evaluation (ICE) was completed to objectively evaluate and screen intersection control strategies and access alternatives at the following intersections that contribute to the overall performance of the US 101 / San Ysidro Road interchange:

- San Ysidro Road at North Jameson Lane
- San Ysidro Road at US 101 Northbound On-/Off-Ramp Intersections
- San Ysidro Road at US 101 Southbound Off-Ramp Terminal Intersection/South Jameson Lane
- San Ysidro Road at South Jameson Lane

Intersection control strategies evaluated in this study include stop control, traffic signal control, and yield (roundabout) control. Combinations of traffic control options were evaluated to determine cost-effective solutions for the interchange. The following concepts were evaluated:

- Alternative E1: Stop Control Intersection (Existing Condition);
- Alternative S1: Signalized Intersections;
- Roundabout Intersections with four variations:
  - Alternative R1: Roundabout at northbound US 101 ramp terminal intersection. The following traditional intersection control alternatives were studied at the US 101 southbound ramp terminal intersection:
    - R1: Existing stop control
    - R1-1A: Signal with new southbound on-ramp
    - R1-1B: Signal
    - R1-2A: All-Way-Stop-Control with new southbound on-ramp
    - R1-2B: All-Way-Stop-Control
  - Alternative R2: Roundabouts at northbound and southbound US 101 ramp terminal intersection.
  - Alternative R4: Roundabout at existing US 101 northbound ramp terminal intersection with new bridge and new southbound off-ramp terminal roundabout intersection west of existing intersection.
  - Alternative R5: Roundabout at existing US 101 northbound ramp terminal intersection with new bridge, new southbound off-ramp and on-ramp terminal roundabout intersection west of existing intersection. This alternative is the same as R4 but with new southbound on-ramp.

The following summarizes the feasibility of the alternatives described in this study.
### Table 8: Feasibility of Project Alternatives

<table>
<thead>
<tr>
<th>Description</th>
<th>Alternative Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOST FEASIBLE</td>
<td></td>
</tr>
<tr>
<td>Convert the northbound ramp terminal intersection to a roundabout and modify the existing southbound ramp terminal intersection to all-way stop control.</td>
<td>R1-2B</td>
</tr>
<tr>
<td>FEASIBLE</td>
<td></td>
</tr>
<tr>
<td>Convert the northbound ramp terminal intersection to a roundabout and maintain the existing southbound ramp terminal intersection stop control.</td>
<td>R1</td>
</tr>
<tr>
<td>Convert the northbound and southbound ramp terminal intersections to roundabout control.</td>
<td>R2</td>
</tr>
<tr>
<td>LEAST FEASIBLE</td>
<td></td>
</tr>
<tr>
<td>Maintain the existing intersection controls and geometry. This alternative would maintain the existing stop control configurations at the study intersections.</td>
<td>E1</td>
</tr>
<tr>
<td>Convert all study intersections to signal control.</td>
<td>S1</td>
</tr>
<tr>
<td>Alternatives with a new southbound on-ramp at San Ysidro Road.</td>
<td>S1, R1-1A, R1-2A, R3, R5, R6</td>
</tr>
<tr>
<td>Convert the northbound ramp terminal intersection to a roundabout and modify the existing southbound ramp terminal intersection to signal control.</td>
<td>R1-1B</td>
</tr>
<tr>
<td>Convert the northbound ramp terminal intersection to roundabout control, construct new southbound ramp terminal intersection with roundabout control west of existing intersection, construct new bridge.</td>
<td>R4</td>
</tr>
</tbody>
</table>

### INTERAGENCY COORDINATION

Review of the project concept geometry and operations were conducted with project stakeholders and KAI. Project stakeholders include County of Santa Barbara, Santa Barbara County Association of Governments (SBCAG), Montecito Association, and Caltrans. The following reviews were conducted:

1. Meeting, July 9, 2014. Santa Barbara North County Public Works Conference Room, Orcutt, CA. County of Santa Barbara, City of Santa Barbara, Caltrans, SBCAG.
2. Preliminary concept review by Caltrans, August 2014.
3. Meeting/Conference Call, November 10, 2014. County of Santa Barbara, Chief of Staff of 1st District County Supervisor.
CONCLUSIONS

Key findings include:

- The Caltrans District 5 ICE coordinator has reviewed the initial roundabout concept and agrees the concept is a viable intersection control strategy that is suitable to advance for further analysis.
- No fatal flaws associated with the roundabout concepts have been identified in this phase.
- Roundabout control would provide superior AM/PM peak hour operations over the stop controlled or the signal controlled alternatives.
- Converting the southbound ramp terminal intersection to an all-way stop combined with roundabout control at the northbound ramp terminal intersection will provide adequate AM/PM peak hour operations.
- The existing US 101 overpass bridge provides adequate storage capacity with roundabout control at the northbound ramp terminal intersection and either roundabout or all-way stop control at the southbound ramp terminal intersection. Traffic signal control requires widening the existing bridge to provide vehicle storage between ramp terminal intersections.
- Traffic signal operations would not be acceptable for the existing nor 2040 design year.
- Stop control operations would not be acceptable for the 2040 design year at North Jameson Lane.
- Roundabout control for the San Ysidro Road at US 101 Northbound Ramp Terminal / North Jameson Lane intersection appears to not require right of way acquisition (additional study is required to verify).
- Traffic signal control at the northbound and southbound ramp terminal intersections is the least feasible alternative in terms of operations, project cost, and right of way acquisition.

RECOMMENDATIONS

The following intersection control options are recommended for additional study and should be considered viable intersection control forms and access strategies for the San Ysidro Road / US-101 Interchange intersections:

- Northerly Intersections – Roundabout
- Southerly Intersections – Modified Stop Control or Roundabout

Either a combination of a roundabout at the northerly intersections combined with all-way-stop-control or roundabout at the southerly intersections are feasible intersection control alternatives.

*The combination of roundabout at the north intersections and all-way-stop-control at the south intersections is the most cost effective solution to accommodate forecast year 2040 peak hour demand.*

A Step 2 ICE document should include roundabout performance checks such as speed control, sight distance, and design vehicle checks for California Legal, Bus 45, and emergency response design vehicles. Additional intersection traffic operations evaluations of the these ICE alternatives should include microsimulation analysis to evaluate intersection operations between and including South and North Jameson Lane.

Alternatives R3 and R6 may not be feasible with the current Miramar property constraints along S. Jameson Lane. Detailed study is required to evaluate the need for a retaining structure between the US 101
Southbound On-Ramp and S. Jameson Lane. Additional, detailed information for proposed off- and on-site improvement drawings for the proposed Miramar development are required to adequately evaluate the feasibility of constructing the proposed on-ramp with minimal separation to S. Jameson Lane.

Future evaluations of this study’s conclusions recommendations should be performed within the framework of the Caltrans Project Development and Procedures Manual (PDPM). Typical milestone studies include:

   Duration: 12-18 months.

2. Project Approval and Environmental Document (PA/ED) – Project Report (PR) and Step 2 ICE.
   Duration: 18-30 months.

   Duration: 24-48 months.

The total duration based on typical milestone assumptions noted above is roughly 5 to 10 years before the start of construction, assuming continuous development of the project. Several factors that will contribute to the duration of the project approval process include environmental sensitivity and clearance, community support, right of way acquisition, number and complexity of deviations from mandatory and advisory design standards, and overall complexity of the project.

Opportunities may exist to streamline project approval based on this study and studies completed with the South Coast 101 HOV Project. Potential opportunities within the PDPM include preparation of a Combined Project Study Report – Project Report (PSR-PR) or a Permit Engineering Evaluation Report (PEER). These processes may not be suited for this project, depending on the alternative, based on complexity (roundabouts, structures, etc.), right of way, cost, funding, environmental impact, and location within the coastal zone. The potential to streamline this project should be discussed with Caltrans and other stakeholders to determine the feasibility of using the PSR-PR or PEER project approvals within the Caltrans approval framework.

Subsequent evaluations should consider the potential value of expediting roundabout alternative R1 for opening prior to US 101 HOV project construction within the vicinity of the San Ysidro Road Interchange. Alternative R1 intersection improvements will increase intersection capacity and mitigate potential traffic diversions caused by US 101 mainline construction. The effectiveness of this mitigation is dependent on the work zone traffic control strategies for the US 101 corridor project elements and cannot be determined at this time.
REFERENCES

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APPENDIX A
Select Design Vehicle Movements
Roundabout Layouts
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NOTE: The design vehicle indicated below is provided to show feasibility of concept roundabout geometry. Minor adjustments to truck apron width, entry and exit curves may be required in future phases of project development.
NOTE:

Swept path of the design vehicle indicated below is provided to show feasibility of concept roundabout geometry. Minor adjustments to truck apron width, entry and exit curves may be required in future phases of project development.
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APPENDIX B

Summary of Operations for Interchange Alternatives at US 101
Kittelson & Associates, Inc. (KAI) has completed an evaluation of the performance of existing and proposed intersection control alternatives at the intersection of US 101 and San Ysidro Road. The purpose of this analysis is to summarize the existing and design year (2040) operations at this interchange assuming different intersection control options and their combination for the following control types: 1) stop control; 2) signal control; and, 3) roundabout. This analysis was conducted in support of, and in accordance with, the Caltrans Traffic Operations Policy Directive 13-02 (TOPD 13-02) for Intersection Control Evaluations (ICE) effective August 30, 2013. The purpose of TOPD 13-02 is to apply a performance based assessment to test the full range of intersection control options to identify the most cost-effective solution.

The analysis tools and methodologies described herein were based on and are consistent with those documented in the SC101 HOV PA-ED Traffic Study (Kittelson & Associates, formally Dowling Associates, December 2011). The analysis for the SC101 HOV PA-ED Traffic Study reflected a 2008 baseline and a 2040 design year. This intersection control analysis of the San Ysidro interchange at US 101 reflects the same 2040 design year but includes an updated 2014 baseline.

INTERSECTION CONTROL ALTERNATIVES

The intersection control types included in this analysis consist of eight primary alternatives, with a number of variations for some alternatives as shown in Table 1 below:
#### Table 1 Design and Traffic Control Alternatives

<table>
<thead>
<tr>
<th>Alternative Name</th>
<th>NB Ramps/N. Jameson</th>
<th>SB Ramp/S. Jameson</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>• Existing Condition • Stop Control</td>
<td>• Existing Condition • Stop Control</td>
</tr>
<tr>
<td>S1</td>
<td>• Signal</td>
<td>• Signal • New On-Ramp</td>
</tr>
<tr>
<td>R1</td>
<td>• Roundabout</td>
<td>• Same as E1</td>
</tr>
<tr>
<td>R1-1A</td>
<td>• Same as R1</td>
<td>• Signal • New On-Ramp</td>
</tr>
<tr>
<td>R1-1B</td>
<td>• Same as R1</td>
<td>• Signal</td>
</tr>
<tr>
<td>R1-2A</td>
<td>• Same as R1</td>
<td>• AWSC • New On-Ramp</td>
</tr>
<tr>
<td>R1-2B</td>
<td>• Same as R1</td>
<td>• AWSC</td>
</tr>
<tr>
<td>R2</td>
<td>• Same as R1</td>
<td>• Roundabout</td>
</tr>
<tr>
<td>R3</td>
<td>• Same as R1</td>
<td>• Same as R2 • New On-Ramp</td>
</tr>
<tr>
<td>R4</td>
<td>• Similar to R1 • New Bridge west of existing bridge</td>
<td>• Roundabout west of existing intersection • New Bridge • Realign SB Off-Ramp</td>
</tr>
<tr>
<td>R5</td>
<td>• Same as R4</td>
<td>• Same as R4 • New On-Ramp</td>
</tr>
<tr>
<td>R6</td>
<td>• Same as R1</td>
<td>• Similar to R3 • Realign SJL • No Miramar Development • New On-Ramp</td>
</tr>
</tbody>
</table>

**LEVEL OF SERVICE CONCEPT**

Level of service (LOS) is a concept developed to quantify the degree of comfort (including such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles) afforded to drivers as they travel through an intersection or roadway segment. Six grades are used to denote the various LOS from “A” to “F” – with LOS “A” representing the highest quality of service (e.g., little to no delay) and LOS “F” denoting poorest quality of service (i.e., high delay).
SIGNALIZED INTERSECTIONS

The six LOS grades are described qualitatively for signalized intersections in Table 2. Additionally, Table 3 identifies the relationship between LOS and average control delay per vehicle. Control delay reflects initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

Table 2 Level of Service Definitions for Signalized Intersections

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Average Delay per Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Very low average control delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.</td>
</tr>
<tr>
<td>B</td>
<td>Average control delay is greater than 10 seconds per vehicle and less than or equal to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for a level of service A, causing higher levels of average delay.</td>
</tr>
<tr>
<td>C</td>
<td>Average control delay is greater than 20 seconds per vehicle and less than or equal to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.</td>
</tr>
<tr>
<td>D</td>
<td>Average control delay is greater than 35 seconds per vehicle and less than or equal to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.</td>
</tr>
<tr>
<td>E</td>
<td>Average control delay is greater than 55 seconds per vehicle and less than or equal to 80 seconds per vehicle. This is usually considered to be the limit of acceptable delay. These high delay values generally (but not always) indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences.</td>
</tr>
<tr>
<td>F</td>
<td>Average control delay is in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation. It may also occur at high volume/capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values.</td>
</tr>
</tbody>
</table>

Table 3 Level of Service Criteria for Signalized Intersections

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Average Control Delay per Vehicle (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&lt;10.0</td>
</tr>
<tr>
<td>B</td>
<td>&gt;10 and ≤20</td>
</tr>
<tr>
<td>C</td>
<td>&gt;20 and ≤35</td>
</tr>
<tr>
<td>D</td>
<td>&gt;35 and ≤55</td>
</tr>
<tr>
<td>E</td>
<td>&gt;55 and ≤80</td>
</tr>
<tr>
<td>F</td>
<td>&gt;80</td>
</tr>
</tbody>
</table>

1 Most of the material in this appendix is adapted from the Transportation Research Board, Highway Capacity Manual, (2000).

UN SIGNALIZED INTERSECTIONS

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The 2010 Highway Capacity Manual (HCM) provides models for estimating control delay at both TWSC and AWSC intersections. A qualitative description of the various service levels associated with an unsignalized intersection is presented in Table 4. A quantitative definition of level of service for unsignalized intersections is presented in Table 5.
Table 4 Level of Service Definition for Unsignalized Intersections

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Average Delay per Vehicle to Minor Street</th>
</tr>
</thead>
</table>
| A                | Nearly all drivers find freedom of operation.  
                    Very seldom is there more than one vehicle in queue. |
| B                | Some drivers begin to consider the delay an inconvenience.  
                    Occasionally there is more than one vehicle in queue. |
| C                | Many times there is more than one vehicle in queue.  
                    Most drivers feel restricted, but not objectionably so. |
| D                | Often there is more than one vehicle in queue.  
                    Drivers feel quite restricted. |
| E                | Represents a condition in which the demand is near or equal to the probable maximum number of vehicles that can be accommodated by the movement.  
                    There is almost always more than one vehicle in queue.  
                    Drivers find the delays approaching intolerable levels. |
| F                | Forced flow.  
                    Represents an intersection failure condition that is caused by geometric and/or operational constraints external to the intersection. |

Table 5 Level of Service Criteria for Unsignalized Intersections

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Average Control Delay per Vehicle (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&lt;10.0</td>
</tr>
<tr>
<td>B</td>
<td>&gt;10.0 and ≤ 15.0</td>
</tr>
<tr>
<td>C</td>
<td>&gt;15.0 and ≤ 25.0</td>
</tr>
<tr>
<td>D</td>
<td>&gt;25.0 and ≤ 35.0</td>
</tr>
<tr>
<td>E</td>
<td>&gt;35.0 and ≤ 50.0</td>
</tr>
<tr>
<td>F</td>
<td>&gt;50.0</td>
</tr>
</tbody>
</table>

The LOS criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that motorists expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections more tolerable than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, the control delay threshold for any given LOS grade is less for an unsignalized intersection than for a signalized intersection. While overall intersection LOS is calculated for AWSC intersections. At TWSC intersections, LOS is only calculated for the minor approaches and the major street left turn movements (i.e., no delay is assumed for the uncontrolled major street through movements).

In the performance evaluation of TWSC intersections, other measures of effectiveness (MOEs) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th-percentile queue lengths should be considered because of their impacts on the operational and safety
performance of the intersection. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left turn, inappropriate choice of traffic control can result. The potential for making inappropriate intersection control type decisions is more likely when the HCM LOS thresholds are adopted as standards, as is the case in many public agencies.

ROUNDABOUT INTERSECTIONS

The LOS criteria for automobiles in roundabouts are given in Table 6. As the table notes, LOS F is assigned if the volume-to-capacity ratio of a lane exceeds 1.0 regardless of the control delay. For assessment of LOS at the approach and intersection levels, LOS is based solely on control delay. The thresholds in Table 6 are based on the considered judgment of the Transportation Research Board Committee on Highway Capacity and Quality of Service.

Table 6 Level of Service Criteria for Roundabout Intersections

<table>
<thead>
<tr>
<th>Control Delay (s/veh)</th>
<th>Level of Service by Volume-to-Capacity Ratio*</th>
</tr>
</thead>
<tbody>
<tr>
<td>v/c ≤ 1.0</td>
<td></td>
</tr>
<tr>
<td>0-10</td>
<td>A</td>
</tr>
<tr>
<td>10-15</td>
<td>B</td>
</tr>
<tr>
<td>15-25</td>
<td>C</td>
</tr>
<tr>
<td>25-35</td>
<td>D</td>
</tr>
<tr>
<td>35-50</td>
<td>E</td>
</tr>
<tr>
<td>&gt;50</td>
<td>F</td>
</tr>
<tr>
<td>v/c &gt; 1.0</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
</tr>
</tbody>
</table>

*For approaches and intersection-wide assessment, LOS is defined solely by control delay

Roundabouts share the same basic control delay formulation with two-way and AWSC intersections, adjusting for the effect of YIELD control. However, at the time of publication of 2010 edition of the Highway Capacity Manual (HCM), no research was available on traveler perception of quality of service at roundabouts. In the absence of such research, the service measure and thresholds have been made consistent with those for other unsignalized intersections, primarily on the basis of this similar control delay formulation.

TRAFFIC ANALYSIS METHODOLOGY

This subsection summarizes operational analysis methodology used in this study.

ANALYSIS METHODOLOGY AND TOOLS

A site visit was performed and aerial imagery examined to document the physical, geometric and operational characteristics of each of the study area intersections and roadway approach segments. This included observed queue lengths and back of queue distances at each approach.

Field reconnaissance was undertaken to ascertain the operational characteristics of each of the study area intersections and roadway segments. Roadway operations are typically governed by, and most constrained at, intersections.
Stop Controlled and Signalized Intersections

For stop controlled and signalized intersection analysis, the HCM2010 methodology in SYNCHRO-8.0 was used to calculate intersection LOS and 95th percentile queue lengths. With a limitation of SYNCHRO-8.0, HCM2000 methodology was used for some non-typical configurations and signal phasing.

Roundabout

Roundabout operations were analyzed using HCM2010 model in SIDRA Intersections 6.0 software. Based on Caltrans’ Roundabout Geometric Design Guidance (June 2007), HCM Parameters A and B were calibrated to better reflect gap acceptance behavior of California drivers for critical headway and follow-up headway. The calibration factors, or HCM Parameters A and B, were derived based on field observations to more accurately reflect operational performance of California roundabouts. The differences among the default parameters used in the HCM 2010 model and recommended values for California roundabouts are shown in Table 7.

Table 7: Roundabout Model Parameters for Entry Capacity

<table>
<thead>
<tr>
<th></th>
<th>Default 2010 HCM Parameters</th>
<th>Modified HCM Parameters based on Caltrans guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Single-lane circulating stream ($n_c=1$)</td>
<td>1130</td>
<td>0.00100</td>
</tr>
<tr>
<td>Single-lane entry ($n_e=1$, $n_c=1$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-lane entry ($n_e&gt;1$, $n_c=1$): apply to all lanes</td>
<td>1130</td>
<td>0.00100</td>
</tr>
<tr>
<td>Multi-lane circulating stream ($n_c&gt;1$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-lane entry ($n_e=1$, $n_c=1$)</td>
<td>1130</td>
<td>0.00070</td>
</tr>
<tr>
<td>Multi-lane entry ($n_e&gt;1$, $n_c=1$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dominate lane (right lane)</td>
<td>1130</td>
<td>0.00075</td>
</tr>
<tr>
<td>Subdominate lane (left lane)</td>
<td>1130</td>
<td>0.00075</td>
</tr>
</tbody>
</table>

Source: Roundabout Geometric Design Guidance, California Department of Transportation, June 2007

LOS criteria specified in the HCM2010 was used to establish the quality of service for the roundabout from a user’s perspective. The HCM2010 uses the average control delay (sec./veh.) and volume-to-capacity ratio (v/c) to establish thresholds for LOS.

For roundabouts, v/c ratios in the range of 0.85 to 0.90 represent an approximate threshold for satisfactory operations. Individual lanes with v/c ratios near this threshold should be evaluated to determine the sensitivity of the lane to varying traffic conditions and/or driver behavior.

Estimated 95th percentile queues were used to evaluate all existing and alternative scenarios. The 95th percentile queues are defined as the queue length that has only a 5-percent probability of being exceeded during the analysis time period.
LEVEL OF SERVICE CRITERIA

STATE OPERATED FACILITIES

State operated facilities that are operating at the transition of LOS C and LOS D or better are considered to meet the state standards. This translates to freeway mainline segments and merge-diverge sections that operate with densities greater than 26 passenger cars per lane per mile (pcplpm) and 28 pcplpm, respectively. State operated intersections experiencing movements with over 35 seconds of delay would also be considered as not meeting state standards\(^1\).

LOCAL FACILITIES

Consistent with Santa Barbara County, all local facilities analyzed herein were evaluated against the acceptable LOS C threshold. This means that facilities operating in the LOS A through C range are considered to provide acceptable quality of service while those operating in the LOS D through F range would exceed the County’s LOS standard\(^2\).

EXISTING TRAFFIC CONDITIONS

To establish existing baseline operations conditions, both NB and SB ramp were analyzed using turning movement counts collected in April 2014. The 2014 count was performed during the 7:00 AM – 9:00 AM and 4:00 PM – 6:00 PM peak periods. The true AM/PM peak hour volumes were identified from this four hour count. Existing traffic counts for both intersections are presented in Figure 1. Existing traffic controls are also shown in Figure 1.

For illustration purposes and to enable a comparison with the roundabout control, the NB ramp and N. Jameson Road intersections are shown as one unified stop sign control intersection. The analysis was performed for two intersections: 1A) San Ysidro Road/N Jameson Lane as all-way stop control and 1B) San Ysidro Road/US 101 ramps as side-street stop control.

\(^1\) Guide for the Preparation of Traffic Impact Studies, California Department of Transportation, December 2002.

\(^2\) Environmental Thresholds and Guidelines Manual, County of Santa Barbara, October 2008.
LEVEL OF SERVICE ANALYSIS

Table 8 presents the results of the intersection LOS analysis for the existing traffic conditions. The N. Jameson Lane intersection and the SB ramp intersection were determined to exceed Caltrans’s LOS standard except for the SB ramp during the PM peak hour. The 95th percentile queue was also found to be longer than available storage for two approaches at the N. Jameson Lane intersection including NB San Ysidro Road (AM peak hour) and SB San Ysidro Road (AM and PM peak hours).
### Table 8. Intersection LOS and Queue Summary – Existing Traffic Conditions

<table>
<thead>
<tr>
<th>#</th>
<th>Intersection</th>
<th>Control</th>
<th>Movement</th>
<th>Available Storage (ft.)</th>
<th>95th Percentile Queue (ft.)</th>
<th>v/c</th>
<th>Delay (sec.) / LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
<td>AM / PM</td>
</tr>
<tr>
<td>1A</td>
<td>San Ysidro Rd./N Jameson Ln</td>
<td>AWSC</td>
<td>WB</td>
<td>490</td>
<td>145</td>
<td>30</td>
<td>0.73 / 0.295</td>
</tr>
<tr>
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<td></td>
<td>NTBL</td>
<td>210</td>
<td>318</td>
<td>38</td>
<td>1.331 / 0.347</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>NBR</td>
<td>30</td>
<td>8</td>
<td>23</td>
<td>0.094 / 0.237</td>
</tr>
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<td></td>
<td>SB</td>
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<td>323</td>
<td>348</td>
<td>1 / 1.1</td>
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<td>20</td>
<td>0.405 / 0.202</td>
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<td>NBL</td>
<td>210</td>
<td>3</td>
<td>5</td>
<td>0.042 / 0.058</td>
</tr>
<tr>
<td>2A</td>
<td>San Ysidro Rd./US101 SB Off-Ramp</td>
<td>Stop</td>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td>36/D / 9.1/A</td>
</tr>
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<td></td>
<td></td>
<td>EB (Off-Ramp)</td>
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<td>80</td>
<td>0.974 / 0.551</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WB</td>
<td>460</td>
<td>3</td>
<td>2.5</td>
<td>0.037 / 0.037</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SB</td>
<td>180</td>
<td>5</td>
<td>10</td>
<td>0.066 / 0.107</td>
</tr>
<tr>
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<td>San Ysidro Rd./S Jameson Ln</td>
<td>Stop</td>
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<td>0</td>
<td>0.006 / 0.005</td>
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<td></td>
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<td>EB</td>
<td>330</td>
<td>8</td>
<td>20</td>
<td>0.085 / 0.218</td>
</tr>
</tbody>
</table>

*Indicates deficient operations based on Caltrans’s LOS Standard, or queues exceeding storage, or v/c > 1.0*

Results are based on HCM2010 in SYNCHRO-8.0

### FUTURE TRAFFIC FORECASTS

The basis for the 2040 design year volume set were the traffic and turn movement projections developed for the *SC101 HOV PA-ED Traffic Study (December 2011)*. These future year intersection turn movement volume sets were generated using 2008 traffic counts adjusted to reflect 2040 conditions using the Santa Barbara County Association of Governments (SBCAG) travel demand model. The AM/PM hour models were used to forecast 2040 year volumes appropriate for peak hour operational analysis.

Through the use of video, the 2014 turning movement counts allowed the origin (OD) and destination of trips through the interchange to be determined. These OD distributions were then applied to the *SC101 HOV PA-ED Traffic Study* future volume sets to distribute turn movements under the signalized and roundabout control alternatives.

The resulting 2040 AM/PM peak hour turn movements are shown in Figure 2. These volumes were used for both NB ramp and SB ramp intersections in the Alternatives E1, S1, R1, R1-1b, R1-2b and R2. Similar to Figure 1, the NB ramp and N. Jameson Road intersections are shown as one unified stop sign control intersection. For stop and signal controls, the analysis was performed for two separate intersections.
While holding total demand and origin-destination of movements constant, the SB ramp terminal volume was manually adjusted to reflect the different design configurations under Alternatives R1-1a, R1-2a, R3, R4, R5 and R6. Figure 3 presents 2040 AM/PM peak hour turning movements for Alternative R1-1a and R1-2a. Figure 4 presents 2040 AM/PM peak hour turn movements used for Alternative R3 and R6. Figure 5 and Figure 6 presents turn movements used for Alternative R4 and R5 respectively.

**Figure 2: 2040 AM (PM) Volumes at Northbound Ramp Terminal (Left) and Southbound Ramp Terminal (Right) for Alternatives E1, S1, R1, R1-1b, R1-2b and R2**

**Figure 3: 2040 AM (PM) Volumes at Northbound Ramp Terminal (Left) and Southbound Ramp Terminal (Right) for Alternatives R1-1a, R1-2a**
Figure 4: 2040 AM(PM) Volumes at Northbound Ramp Terminal (left) and Southbound Ramp Terminal (Right) for Alternatives R3 and R6

Figure 5: 2040 AM(PM) Volumes at Northbound Ramp Terminal (left) and Southbound Ramp Terminal (Right) for Alternatives R4

LEGEND: XX (YY) – AM (PM) Peak Hour
PEAK HOUR FACTOR

A key parameter that factors into LOS calculations is called the peak hour factor (PHF). The PHF is used to convert the hourly traffic volume into the flow rate that represents the busiest 15 minutes of the rush hour. Given that substantial short-term (i.e., peak 15 minutes) fluctuations in traffic can occur during the peak hour, application of the PHF is a requisite input for engineering based operational assessments. Choice of PHF can have significant impact on LOS results.

In general the morning peak hour is typically characterized by more pronounced 15 minute peaks than the afternoon peak hour. Afternoon peaks tend to be longer and flatter than morning peaks given that most morning trips are non-discretionary and more time sensitive – particularly school and work-related trips. Conversely, afternoon trips are made up of a broader range of trip types (e.g., shopping, errands, visiting friends, return home commute trips etc.,) that allow the motorist more discretion when to start the trip.

PHF values approaching 1.00 denote a smooth distribution of traffic throughout the peak hour while values less than one indicate are more pronounced 15 minute spike in demand during the peak hour. Typical peak-hour factors for freeway facilities range between 0.80 and 0.95 – however lower factors can be common in rural areas or for facilities serving atypical land uses such as schools. Based on traffic counts, some movements at the northbound and southbound ramp terminals at the San Ysidro US 101 interchange experienced PHFs ranging from .40 to .80. These PHFs can be attributable to several schools being located in the area served by this interchange (i.e., parents driving their kids to school).

While base year PHFs are empirically derived from traffic count data, they are very difficult to forecast. Analysis tools for predicting future year PHFs are generally cost-prohibitive and therefore limited for this purpose (mesoscopic simulation using dynamic traffic assignment is one). For this reason, Caltrans
recommends applying a future year (design year) default PHF of 0.92 in urban areas and a PHF of 0.88 in rural areas. Consistent with this directive, the SC101 HOV PA-ED Traffic Study (December 2011) applied a PHF of 0.92 for all movements at the San Ysidro interchange under 2040 conditions. This is logical to assume given that as an area grows and vehicle densities increase, the peaking of traffic within the peak hour will tend to flatten out (peak spreading). Hence, the increment of new demand projected to occur in 2040 at the San Ysidro interchange will tend to spread demand more evenly throughout the hour. This is especially relevant given that school enrollment is not projected to increase in the area.

As stated above, the 2040 design year volume set including the heavy duty truck percentage and peak hour factors were based on the SC101 HOV PA-ED Traffic Study (December 2011). A summary of peak hour turning movements, peak hour factors, and heavy vehicle percentages associated with the 2040 forecast year used in this study is provided in Attachment 1.

SUMMARY OF OPERATIONS

Figure 7 shows a summary of 2040 operational analysis for all alternatives studied. Alternatives R1-2B through R6 resulted in operations that meet Caltrans standards at all study intersections during AM and PM peak hours. Other alternatives showed operational deficiencies at one or more intersections during one or both study peak hours.

3 Guide for the Preparation of Traffic Impact Studies, California Department of Transportation, December 2002
## Figure 7: Intersection LOS and Queue Summary

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Alternatives</th>
<th>E1</th>
<th>S1</th>
<th>R1</th>
<th>R1-1A</th>
<th>R1-1B</th>
<th>R1-2A</th>
<th>R1-2B</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Ysidro Rd/N. Jameson Ln</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>San Ysidro Rd/NB Ramps</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Ysidro Rd/SB Ramp(s)</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Ysidro Rd/S. Jameson Ln</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S Jameson Ln/Eucalyptus Ln</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- Green: Both LOS (overall) and Queues (individual movements) meet thresholds
- Yellow: Potential for LOS (overall) or Queues (individual movements) to exceed thresholds or available storage
- Red: Both LOS (overall) and Queues (individual movements) to exceed thresholds or available storage
- NA: Not Applicable
ALTERNATIVE E1 TRAFFIC OPERATIONS

Alternative E1 was analyzed to establish operational conditions of the existing geometric configurations under future traffic conditions. For this Alternative, the existing configurations were used for both NB and SB ramp intersections with stop control. The forecasted 2040 traffic volumes identified in the previous section (Figure 2) were applied to the study intersections.

LEVEL OF SERVICE ANALYSIS

Table 9 presents the results of the intersection LOS analysis for Alternative E1. All study intersections, with exception to the NB ramps intersection and the S. Jameson Lane intersection would operate at overall LOS exceeding Caltrans’s LOS standard. Based on the 95th percentile queue report, there is a potential queue exceeding storage at the N. Jameson Lane intersection for NB San Ysidro (AM peak hour) and SB San Ysidro (AM and PM peak hours).

Table 9. 2040 Intersection LOS and Queue Summary – Alternative E1

<table>
<thead>
<tr>
<th>#</th>
<th>Intersection</th>
<th>Control</th>
<th>Movement</th>
<th>Available Storage (ft.)</th>
<th>Alternative E1</th>
<th>Delay (sec.) / LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>95th Percentile Queue (ft.)</td>
<td>v/c</td>
</tr>
<tr>
<td>1A</td>
<td>San Ysidro Rd./N Jameson Ln</td>
<td>AWSC</td>
<td>Overall</td>
<td></td>
<td>52.2/F 35.9/E</td>
<td>17.9/C 15.1/C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WB</td>
<td>490 60 43</td>
<td>0.46 0.38</td>
<td>17.9/C 15.1/C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NBTL</td>
<td>210 340 75</td>
<td>1.052 0.52</td>
<td>67.2/F 17.9/C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NBR</td>
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<td>9.7/A 11.6/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EB</td>
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<td>17.6/C 17.1/C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SB</td>
<td>320 350 363</td>
<td>1.042 1.065</td>
<td>65.5/F 63.2/F</td>
</tr>
<tr>
<td>1B</td>
<td>San Ysidro Rd./US 101 NB Ramps</td>
<td>Stop</td>
<td>Overall</td>
<td>800 23 35</td>
<td>0.23 0.329</td>
<td>14.5/B 14.4/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WB (Off-Ramp)</td>
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<td>0.051 0.064</td>
<td>7.6/A 7.8/A</td>
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<tr>
<td>2A</td>
<td>San Ysidro Rd./US 101 SB Off-Ramp</td>
<td>Stop</td>
<td>Overall</td>
<td>640 308 273</td>
<td>0.958 0.933</td>
<td>58.3/F 57.1/F</td>
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<td>460 5 5</td>
<td>0.051 0.055</td>
<td>10.1/B 10.9/B</td>
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<td></td>
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<td>0.068 0.137</td>
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<td>0.004 0.012</td>
<td>7.5/A 7.7/A</td>
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<td></td>
<td>EB</td>
<td>330 5 5</td>
<td>0.07 0.066</td>
<td>10.1/B 10.7/B</td>
</tr>
</tbody>
</table>

Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or V/C > 1

Results are based on HCM2010 in SYNCHRO-8.0

ALTERNATIVE S1 TRAFFIC OPERATIONS

Alternative S1 represents a scenario with traffic signal control assumed at all four study intersections with following major modifications:
- Adding WBR turn lane (150 ft.) on US101 NB off-ramp at NB ramp intersection
- Adding SBR turn lane (150 ft.) on SB San Ysidro Road at N. Jameson Lane intersection
- Adding EBL turn lane (150 ft.) on US101 SB off-ramp at SB ramp intersection
- Widening NB San Ysidro to 2 lanes from north of SB ramp intersection to north of NB ramp intersection (the overcrossing bridge would have a total of 3 travel lanes)

The forecasted 2040 traffic volumes identified in the previous section (Figure 2) were applied to both intersections.

**LEVEL OF SERVICE ANALYSIS**

Table 10 presents the results of the intersection LOS analysis for Alternative S1. With a traffic signal control, N. Jameson and SB ramp intersections would operate with less delay than Alternative E1. The overall LOS at the N. Jameson Lane intersection would still be exceeding Caltrans standard during the PM peak hour. Based on 95th percentile queue estimates, there are potential queues that would exceed storage at the NB ramp intersection for NB San Ysidro (AM peak hour), at the N. Jameson Lane intersection for SB San Ysidro (AM and PM peak hours), and at the SB ramp intersection for EBL US101 off-ramp (AM and PM peak hours).
### Table 10. 2040 Intersection LOS and Queue Summary – Alternative S1

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<th>Available Storage (ft.)</th>
<th>AM</th>
<th>PM</th>
<th>AM</th>
<th>PM</th>
<th>v/c</th>
<th>Delay (sec.) / LOS</th>
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<td></td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A</td>
<td>San Ysidro Rd./N Jameson Ln</td>
<td>Signal</td>
<td>Overall</td>
<td></td>
<td>34.6/C</td>
<td>38.1/D</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EB</td>
<td>430 229 275</td>
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<td>0.91</td>
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<td>69.7/E</td>
<td></td>
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<tr>
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<td>0.83</td>
<td>56.1/E</td>
<td>57.3/E</td>
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<td>1.4/A</td>
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<td>0.91</td>
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<td>47.1/D</td>
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<td>21.1/C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1B</td>
<td>San Ysidro Rd./NB Ramps</td>
<td>Signal</td>
<td>Overall</td>
<td></td>
<td>17.0/B</td>
<td>16.2/B</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WBL (Off-Ramp)</td>
<td>800 39 75</td>
<td>0.15</td>
<td>0.34</td>
<td>36.3/D</td>
<td>37.4/D</td>
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<td></td>
</tr>
<tr>
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<td>WBR (Off-Ramp)</td>
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<td>0.65</td>
<td>39.3/D</td>
<td>45.5/D</td>
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<td>29.3/C</td>
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<td>0.8/A</td>
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<td></td>
<td>SBR</td>
<td>32 10 9</td>
<td>0.52</td>
<td>0.49</td>
<td>1.3/A</td>
<td>0.9/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2A</td>
<td>San Ysidro Rd./US101 SB Off-Ramp</td>
<td>Signal</td>
<td>Overall</td>
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<td>21.5/C</td>
<td>22.0/C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EBL (Off-Ramp)</td>
<td>150 208 191</td>
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<td>0.53</td>
<td>27.7/C</td>
<td>32.9/C</td>
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<td>EBLTR (Off-Ramp)</td>
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<td>24.7/C</td>
<td>27.0/C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NB</td>
<td>25 3 4</td>
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<td>0.33</td>
<td>3.5/A</td>
<td>3.8/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SB</td>
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<td>26.1/C</td>
<td>19.5/B</td>
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</tr>
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<td>San Ysidro Rd./S Jameson Ln</td>
<td>Signal</td>
<td>Overall</td>
<td></td>
<td>21.0/C</td>
<td>15.7/B</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>EB</td>
<td>330 60 53</td>
<td>0.34</td>
<td>0.33</td>
<td>38.9/D</td>
<td>40.2/D</td>
<td></td>
<td></td>
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<tr>
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<td></td>
<td></td>
<td>WB</td>
<td>460 59 60</td>
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<td>38.8/D</td>
<td>41.0/D</td>
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<td>34.6/C</td>
<td>35.3/D</td>
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<tr>
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<td></td>
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<td>SB</td>
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<td>0.41</td>
<td>3.4/A</td>
<td>5.0/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1

Results are based on HCM2000 in SYNCHRO-8.0

**ALTERNATIVE R1 TRAFFIC OPERATIONS**

Alternative R1 consists of the existing geometric and traffic control for the SB ramp and S. Jameson Lane intersections with the NB ramp and N. Jameson Lane intersections converted to a single-lane roundabout with four legs. The forecasted 2040 traffic volumes identified in the previous section (Figure 2) applied to both ramp terminals.
LEVEL OF SERVICE ANALYSIS

Table 11 presents the results of the intersection LOS analysis for Alternative R1. The NB ramp/N. Jameson Lane roundabout would operate within standards during both AM and PM peak hours. The SB ramp intersection would operate at overall LOS exceeding standard during both peak hours. Based on 95\textsuperscript{th} percentile queue estimates, sufficient queue storage would be provided for both intersections.

### Table 11. 2040 Intersection LOS and Queue Summary – Alternative R1

<table>
<thead>
<tr>
<th>#</th>
<th>Intersection</th>
<th>Control</th>
<th>Movement</th>
<th>Available Storage (ft.)</th>
<th>Alternative R1</th>
<th>Delay (sec.) / LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td>95\textsuperscript{th} Percentile Queue (ft.)</td>
<td>v/c</td>
</tr>
<tr>
<td>1</td>
<td>San Ysidro Rd./US101 NB Off-Ramp/N Jameson Ln\textsuperscript{1}</td>
<td>RB</td>
<td>Overall</td>
<td></td>
<td>0.651</td>
<td>0.668</td>
</tr>
<tr>
<td></td>
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<td>800</td>
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<td></td>
<td>300</td>
<td>145</td>
</tr>
<tr>
<td>2A</td>
<td>San Ysidro Rd./US101 SB Off-Ramp\textsuperscript{1}</td>
<td>Stop</td>
<td>Overall</td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
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<td></td>
<td>34.9/D</td>
<td>30.5/D</td>
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<td>180</td>
<td>5</td>
</tr>
<tr>
<td>2B</td>
<td>San Ysidro Rd./S Jameson Ln\textsuperscript{1}</td>
<td>Stop</td>
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</tbody>
</table>

\textsuperscript{1} Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1
\textsuperscript{2} Results are based on SIDRA-6.0

ALTERNATIVE R1-1A TRAFFIC OPERATIONS

Alternative R1-1A consists of adding a SB on-ramp and EBR turn lane (50 ft.) on US101 SB off-ramp and modifying traffic control to signal for the SB ramp and S. Jameson Lane intersections. The NB ramp and N. Jameson Lane intersections are converted to a single-lane roundabout with four legs. The forecasted 2040 traffic volumes identified in the previous section (Figure 3) were applied to the study intersections.

LEVEL OF SERVICE ANALYSIS

Table 12 presents the results of the intersection LOS analysis for Alternative R1-1A. The NB ramp/N. Jameson Lane roundabout would operate within standard LOS during both AM and PM peak hours. The S. Jameson Lane intersection would operate at LOS exceeding standard for EB S. Jameson Lane (AM and PM peak hours), WB S. Jameson Lane (AM and PM peak hours), and NB San Ysidro (PM peak hour).
Based on the 95th percentile queue estimates, queues would exceed storage at the SB ramp intersection for EBR US101 off-ramp (AM and PM peak hours).

**Table 12. 2040 Intersection LOS and Queue Summary – Alternative R1-1A**

<table>
<thead>
<tr>
<th>#</th>
<th>Intersection</th>
<th>Control</th>
<th>Movement</th>
<th>Available Storage (ft.)</th>
<th>95th Percentile Queue (ft.)</th>
<th>v/c</th>
<th>Delay (sec.) / LOS</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>AM</td>
<td>PM</td>
<td></td>
<td>AM</td>
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<tr>
<td>1</td>
<td>San Ysidro Rd./N Jameson Ln/NB Ramps</td>
<td>RB</td>
<td>Overall</td>
<td>0.651</td>
<td>0.668</td>
<td>11.4/B</td>
<td>10.7/B</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>WB (Off-Ramp)</td>
<td></td>
<td>8.1/A</td>
<td>9.1/A</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.3/A</td>
<td>6.9/A</td>
</tr>
<tr>
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<td></td>
<td>NB</td>
<td>0.518</td>
<td>0.332</td>
<td>9.6/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EB</td>
<td>0.478</td>
<td>0.445</td>
<td>13.2/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>WB</td>
<td>0.382</td>
<td>0.277</td>
<td>10.5/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SB</td>
<td>0.651</td>
<td>0.668</td>
<td>13.1/B</td>
</tr>
<tr>
<td>2A</td>
<td>San Ysidro Rd./US101 SB Off-Ramp</td>
<td>Signal</td>
<td>Overall</td>
<td>21.5/C</td>
<td>22.0/C</td>
<td></td>
<td>21.5/C</td>
</tr>
<tr>
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<td></td>
<td></td>
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<td></td>
<td>27.7/C</td>
<td>32.9/C</td>
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<td></td>
<td></td>
<td></td>
<td>EBR (Off-Ramp)</td>
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<td>27.0/C</td>
<td>27.0/C</td>
</tr>
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<td>0.34</td>
<td>0.33</td>
<td>3.5/A</td>
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<td>SB</td>
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<td>0.54</td>
<td>26.1/C</td>
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<td>2B</td>
<td>San Ysidro Rd./S Jameson Ln</td>
<td>Signal</td>
<td>Overall</td>
<td>21.0/C</td>
<td>15.7/B</td>
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<td>21.0/C</td>
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<td>EB</td>
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<td>0.33</td>
<td>38.9/D</td>
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<td>WB</td>
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<td>0.37</td>
<td>38.8/D</td>
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<td>0.32</td>
<td>34.6/C</td>
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<td>0.21</td>
<td>0.41</td>
<td>3.4/A</td>
</tr>
</tbody>
</table>

Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1

1 Results are based on SIDRA-6.0

2 Results are based on HCM2000 in SYNCHRO-8.0

**ALTERNATIVE R1-1B TRAFFIC OPERATIONS**

Alternative R1-1B consists of adding EBR turn lane (50 ft.) on US 101 SB off-ramp and modifying traffic control to signal for the SB ramp and S. Jameson Lane intersections. The NB ramp and N. Jameson Lane intersections are converted to a single-lane roundabout with four legs. The forecasted 2040 traffic volumes identified in the previous section (Figure 2) were applied to both the study intersections.

**LEVEL OF SERVICE ANALYSIS**

Table 13 presents the results of the intersection LOS analysis for Alternative R1-1B. The NB ramp/N. Jameson Lane roundabout would operate within standard LOS during both AM and PM peak hours. The SB ramp intersection would operate at LOS exceeding standard for SB San Ysidro (AM and PM peak hours). The S. Jameson Lane intersection would operate at LOS exceeding standard for EB S. Jameson.
Lane (AM and PM peak hours) and NB San Ysidro (AM and PM peak hours). Based on the 95th percentile queue estimates, queues would exceed storage at the SB ramp intersection for EBR US101 off-ramp and SB San Ysidro Road approach during the PM peak hour.

Table 13. 2040 Intersection LOS and Queue Summary – Alternative R1-1B

<table>
<thead>
<tr>
<th>#</th>
<th>Intersection</th>
<th>Control</th>
<th>Movement</th>
<th>Available Storage (ft.)</th>
<th>AM</th>
<th>PM</th>
<th>AM</th>
<th>PM</th>
<th>AM</th>
<th>PM</th>
<th>v/c</th>
<th>Delay (sec.) / LOS</th>
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</thead>
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<td>1</td>
<td>San Ysidro Rd./N Jameson Ln/NB Ramps</td>
<td>RB</td>
<td>Overall</td>
<td>0.651</td>
<td>0.668</td>
<td>11.4/B</td>
<td>10.7/B</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
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<td></td>
<td></td>
<td>WB (Off-Ramp)</td>
<td>800 20 48</td>
<td>0.203 0.394</td>
<td>8.1/A</td>
<td>9.1/A</td>
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<tr>
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<td></td>
<td>NB</td>
<td>180 86 46</td>
<td>0.518 0.332</td>
<td>9.6/A</td>
<td>6.5/A</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>EB</td>
<td>380 65 57</td>
<td>0.478 0.445</td>
<td>13.2/B</td>
<td>12.7/B</td>
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<tr>
<td></td>
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<td></td>
<td>WB</td>
<td>410 44 30</td>
<td>0.382 0.277</td>
<td>10.5/B</td>
<td>7.8/A</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>SB</td>
<td>300 145 149</td>
<td>0.651 0.668</td>
<td>13.1/B</td>
<td>13.9/B</td>
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</tr>
<tr>
<td>2A</td>
<td>San Ysidro Rd./US101 SB Off-Ramp</td>
<td>Signal</td>
<td>Overall</td>
<td>28.1/C</td>
<td>26.9/C</td>
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<td>EBLT (Off-Ramp)</td>
<td>640 368 227</td>
<td>0.76 0.62</td>
<td>31.1/C</td>
<td>32.2/C</td>
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<tr>
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<td></td>
<td>EBR (Off-Ramp)</td>
<td>50 0 54</td>
<td>0.06 0.26</td>
<td>14.6/B</td>
<td>21.8/C</td>
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<td></td>
<td></td>
<td></td>
<td>WB</td>
<td>460 0 0</td>
<td>0.05 0.06</td>
<td>14.5/B</td>
<td>20.4/C</td>
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<td></td>
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<td></td>
<td>NB</td>
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<td>0.33 0.33</td>
<td>0.5/A</td>
<td>0.8/A</td>
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<td>0.64 0.61</td>
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<td>36.4/D</td>
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</tr>
<tr>
<td>2B</td>
<td>San Ysidro Rd./S Jameson Ln</td>
<td>Signal</td>
<td>Overall</td>
<td>26.2/C</td>
<td>19.3/B</td>
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<td></td>
<td></td>
<td></td>
<td>EB</td>
<td>460 81 56</td>
<td>0.52 0.35</td>
<td>50.4/D</td>
<td>43.6/D</td>
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<td></td>
<td></td>
<td>NB</td>
<td>750 119 109</td>
<td>0.41 0.43</td>
<td>43.4/D</td>
<td>43.7/D</td>
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<td></td>
<td></td>
<td></td>
<td>SB</td>
<td>25 13 14</td>
<td>0.11 0.22</td>
<td>1.9/A</td>
<td>4.1/A</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1

1 Results are based on SIDRA-6.0
2 Results are based on HCM2000 in SYNCHRO-8.0

ALTERNATIVE R1-2A TRAFFIC OPERATIONS

Alternative R1-2A consists of adding a SB on-ramp, closing Posilipo Lane on-ramp and modifying traffic control to all-way stop control for the SB ramp and S. Jameson Lane intersections. The NB ramp and N. Jameson Lane intersections are converted to a single-lane roundabout with four legs. The forecasted 2040 traffic volumes identified in the previous section (Figure 3) were applied to the study intersections.

LEVEL OF SERVICE ANALYSIS

Table 14 presents the results of the intersection LOS analysis for Alternative R1-2A. The NB ramp/N. Jameson Lane roundabout would operate within standard LOS during both AM and PM peak hours. The SB ramp and S. Jameson Lane intersections would operate at acceptable LOS during both AM and PM
peak hours. Based on the 95th percentile queue report, queues would exceed storage at the S. Jameson Lane intersection for SB San Ysidro Road (PM peak).

Table 14. 2040 Intersection LOS and Queue Summary – Alternative R1-2A

<table>
<thead>
<tr>
<th>#</th>
<th>Intersection</th>
<th>Control</th>
<th>Movement</th>
<th>Available Storage (ft.)</th>
<th>Alternative R1-2A</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td>AM</td>
</tr>
<tr>
<td>1</td>
<td>San Ysidro Rd./N Jameson Ln/NB Ramps1</td>
<td>RB</td>
<td>Overall</td>
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<td>0.651</td>
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<tr>
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<td></td>
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<td>WB (Off-Ramp)</td>
<td>800</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>SB</td>
<td>300</td>
<td>145</td>
</tr>
<tr>
<td>2A</td>
<td>San Ysidro Rd./US101 SB Off-Ramp2</td>
<td>AWSC</td>
<td>Overall</td>
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<td>15.1/C</td>
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<td></td>
<td>NB</td>
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</tr>
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<td></td>
<td></td>
<td></td>
<td>SB</td>
<td>180</td>
<td>28</td>
</tr>
<tr>
<td>2B</td>
<td>San Ysidro Rd./S Jameson Ln2</td>
<td>AWSC</td>
<td>Overall</td>
<td></td>
<td>8.2/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NB</td>
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<td></td>
<td></td>
<td></td>
<td>SB</td>
<td>25</td>
<td>20</td>
</tr>
</tbody>
</table>

Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1

1 Results are based on SIDRA-6.0
2 Results are based on HCM2000 in SYNCHRO-8.0

ALTERNATIVE R1-2B TRAFFIC OPERATIONS

Alternative R1-2B consists of modifying traffic control to all-way stop control for the SB ramp and S. Jameson Lane intersections. The NB ramp and N. Jameson Lane intersections are converted to a single-lane roundabout with four legs. The forecasted 2040 traffic volumes identified in the previous section (Figure 2) were applied to the study intersections.

LEVEL OF SERVICE ANALYSIS

Table 15 presents the results of the intersection level of service analysis for Alternative R1-2B. The NB ramp/N. Jameson Lane roundabout would operate at acceptable LOS during both AM and PM peak hours. The SB ramp and S. Jameson Lane intersections would operate within standard LOS during both AM and PM peak hours. The 95th percentile queue estimate indicates sufficient queue storage for the study intersections except for the S. Jameson Lane intersection for SB Jameson Lane during the PM peak hour.
Table 15. 2040 Intersection LOS and Queue Summary – Alternative R1-2B

<table>
<thead>
<tr>
<th>#</th>
<th>Intersection</th>
<th>Control</th>
<th>Movement</th>
<th>Available Storage (ft.)</th>
<th>95th Percentile Queue (ft.)</th>
<th>v/c</th>
<th>Delay (sec.) / LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
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<tr>
<td>1</td>
<td>San Ysidro Rd./N Jameson Ln/NB Ramps¹</td>
<td>RB</td>
<td>Overall</td>
<td>0.651</td>
<td>0.668</td>
<td>11.4/B</td>
<td>10.7/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WB (Off-Ramp)</td>
<td>800</td>
<td>20</td>
<td>48</td>
<td>0.203</td>
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<td></td>
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<td></td>
<td>NB</td>
<td>180</td>
<td>86</td>
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<tr>
<td></td>
<td></td>
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<td>EB</td>
<td>380</td>
<td>65</td>
<td>57</td>
<td>0.478</td>
</tr>
<tr>
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<td>2A</td>
<td>San Ysidro Rd./US101 SB Off-Ramp²</td>
<td>AWSC</td>
<td>Overall</td>
<td>15.2/C</td>
<td>13.2/B</td>
<td></td>
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<td>5</td>
<td>0.055</td>
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<tr>
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<td></td>
<td>SB</td>
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<td>30</td>
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<td>San Ysidro Rd./S Jameson Ln²</td>
<td>AWSC</td>
<td>Overall</td>
<td>7.8/A</td>
<td>8.2/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>750</td>
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<td>0.127</td>
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<td></td>
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<td>EB</td>
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<td></td>
<td>SB</td>
<td>25</td>
<td>13</td>
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<td>0.148</td>
</tr>
</tbody>
</table>

Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1
¹ Results are based on SIDRA-6.0
² Results are based on HCM2000 in SYNCHRO-8.0

ALTERNATIVE R2 TRAFFIC OPERATIONS

Alternative R2 consists of a single-lane roundabout control for both NB and SB ramp intersections. The forecasted 2040 traffic volumes identified in the previous section (Figure 2) were applied to both roundabouts.

LEVEL OF SERVICE ANALYSIS

Table 16 presents the results of the LOS analysis for Alternative R2. Both roundabouts would operate within standard LOS for all approaches during both peak hours. Queue analysis indicates sufficient storage for both roundabouts.
Table 16. 2040 Intersection LOS and Queue Summary – Alternative R2

<table>
<thead>
<tr>
<th>#</th>
<th>Intersection</th>
<th>Control</th>
<th>Movement</th>
<th>Available Storage (ft.)</th>
<th>Alternative R2 95th Percentile Queue (ft.)</th>
<th>v/c^1</th>
<th>Delay [sec.] / LOS^1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
</tr>
<tr>
<td>1</td>
<td>San Ysidro Rd./US101 NB Off-Ramp/N Jameson Ln</td>
<td>RB</td>
<td>Overall</td>
<td></td>
<td>0.651</td>
<td>0.668</td>
<td>11.4/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WB (Off-Ramp)</td>
<td>800</td>
<td>20</td>
<td>48</td>
<td>0.203</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NB</td>
<td>180</td>
<td>86</td>
<td>46</td>
<td>0.518</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EB</td>
<td>380</td>
<td>65</td>
<td>57</td>
<td>0.478</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WB</td>
<td>410</td>
<td>44</td>
<td>30</td>
<td>0.382</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SB</td>
<td>300</td>
<td>145</td>
<td>149</td>
<td>0.651</td>
</tr>
<tr>
<td>2</td>
<td>San Ysidro Rd./US101 SB Off-Ramp/S Jameson Ln</td>
<td>RB</td>
<td>Overall</td>
<td></td>
<td>0.503</td>
<td>0.466</td>
<td>7.3/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EB (Off-Ramp)</td>
<td>600</td>
<td>68</td>
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<td>0.07</td>
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<td></td>
<td></td>
<td></td>
<td>SB</td>
<td>180</td>
<td>18</td>
<td>34</td>
<td>0.147</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NB</td>
<td>700</td>
<td>15</td>
<td>12</td>
<td>0.149</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EB</td>
<td>280</td>
<td>9</td>
<td>9</td>
<td>0.096</td>
</tr>
</tbody>
</table>

Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1

^1 Results are based on SIDRA-6.0

ALTERNATIVE R3 TRAFFIC OPERATIONS

Alternative R3 consists of a single-lane roundabout for the NB and SB ramp terminals with a new existing leg serving as an on-ramp at the SB ramp roundabout. Under this Alternative, turn movement volumes at the SB ramp terminal were modified to reflect the SB on-ramp addition. The forecasted 2040 traffic volumes used for this Alternative were identified in Figure 4 in the previous section.

LEVEL OF SERVICE ANALYSIS

Table 17 presents the results of the LOS analysis for Alternative R3. Both roundabouts would operate within standard LOS for all approaches for both AM and PM peak hours. A queue analysis indicates sufficient storage for both roundabouts.
### Table 17. 2040 Intersection LOS and Queue Summary – Alternative R3

<table>
<thead>
<tr>
<th>#</th>
<th>Intersection</th>
<th>Control</th>
<th>Movement</th>
<th>Available Storage (ft.)</th>
<th>95th Percentile Queue (ft.)</th>
<th>v/c^2</th>
<th>Delay (sec.) / LOS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>AM    PM</td>
</tr>
<tr>
<td>1</td>
<td>San Ysidro Rd./US101 NB Off-Ramp/N</td>
<td>RB</td>
<td>Overall</td>
<td></td>
<td>0.651</td>
<td>0.668</td>
<td>11.4/B 10.7/B</td>
</tr>
<tr>
<td></td>
<td>Jameson Ln</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AM    PM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WB (Off-Ramp)</td>
<td>800 20 48</td>
<td>0.203</td>
<td>0.394</td>
<td>8.1/A  9.1/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NB</td>
<td></td>
<td>0.518</td>
<td>0.332</td>
<td>9.6/A  6.5/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EB</td>
<td></td>
<td>0.478</td>
<td>0.445</td>
<td>13.2/B 12.7/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WB</td>
<td></td>
<td>0.382</td>
<td>0.277</td>
<td>10.5/B  7.8/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SB</td>
<td></td>
<td>0.651</td>
<td>0.668</td>
<td>13.1/B 13.9/B</td>
</tr>
<tr>
<td>2</td>
<td>San Ysidro Rd./US101 SB Off-Ramp/S</td>
<td>RB</td>
<td>Overall</td>
<td></td>
<td>0.503</td>
<td>0.466</td>
<td>7.3/A  6.7/A</td>
</tr>
<tr>
<td></td>
<td>Jameson Ln</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AM    PM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EB (Off-Ramp)</td>
<td>600 68 62</td>
<td>0.503</td>
<td>0.466</td>
<td>8.9/A  8.8/A</td>
</tr>
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<td></td>
<td>WB</td>
<td></td>
<td>0.076</td>
<td>0.081</td>
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<td></td>
<td>SB</td>
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<td>0.146</td>
<td>0.244</td>
<td>3.9/A  4.7/A</td>
</tr>
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<td></td>
<td></td>
<td>NB</td>
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<td></td>
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<td>0.092</td>
<td>0.095</td>
<td>6.4/A  6.2/A</td>
</tr>
</tbody>
</table>

^1 Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1

1 Results are based on SIDRA-6.0

### ALTERNATIVE R4 TRAFFIC OPERATIONS

Alternative R4 consists of a single-lane roundabout for the NB and SB ramp terminals. In this Alternative, a new bridge will be required and Eucalyptus Ln will no longer have access to the SB ramp terminal. Instead, a new T-intersection (Eucalyptus Ln/S Jameson Ln) will be constructed and provide access between Eucalyptus Ln and the SB ramp terminal. A stop control would be provided on Eucalyptus Ln at the new T-intersection. The forecasted 2040 traffic volumes identified in the previous section (Figure 5) were applied to the study intersections.

### LEVEL OF SERVICE ANALYSIS

Table 18 presents the results of the LOS analysis for Alternative R4. Both roundabouts and the new T-intersection would operate within standard LOS. A queue analysis indicates sufficient storage for both roundabouts.
Table 18. 2040 Intersection LOS and Queue Summary – Alternative R4

<table>
<thead>
<tr>
<th>#</th>
<th>Intersection</th>
<th>Control</th>
<th>Movement</th>
<th>Available Storage (ft.)</th>
<th>95th Percentile Queue (ft.)</th>
<th>v/c</th>
<th>Delay (sec.) / LOS</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
</tr>
<tr>
<td>1</td>
<td>San Ysidro Rd./US101 NB Off-Ramp/N Jameson Ln¹</td>
<td>RB</td>
<td>Overall</td>
<td></td>
<td>0.651</td>
<td>0.668</td>
<td>11.4/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WB (Off-Ramp)</td>
<td></td>
<td>0.203</td>
<td>0.394</td>
<td>8.1/A</td>
</tr>
<tr>
<td></td>
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<td>NB</td>
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<td>0.518</td>
<td>0.332</td>
<td>9.6/A</td>
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<tr>
<td></td>
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<td>EB</td>
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<td>0.478</td>
<td>0.445</td>
<td>13.2/B</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>WB</td>
<td></td>
<td>0.382</td>
<td>0.277</td>
<td>10.5/B</td>
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<tr>
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<td>SB</td>
<td></td>
<td>0.651</td>
<td>0.668</td>
<td>13.1/B</td>
</tr>
<tr>
<td>2</td>
<td>San Ysidro Rd./US101 SB Off-Ramp/S Jameson Ln¹</td>
<td>RB</td>
<td>Overall</td>
<td></td>
<td>0.487</td>
<td>0.45</td>
<td>7.1/A</td>
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<td></td>
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<td>EB (Off-Ramp)</td>
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<td>0.487</td>
<td>0.45</td>
<td>8.4/A</td>
</tr>
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<td>0.088</td>
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<tr>
<td>3</td>
<td>S Jameson Ln/Eucalyptus Ln²</td>
<td>Stop</td>
<td>NB</td>
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<td>0.245</td>
<td>0.222</td>
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</table>

Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1

¹ Results are based on SIDRA-6.0
² Results are based on HCM2010 in SYNCHRO-8.0

ALTERNATIVE R5 TRAFFIC OPERATIONS

Alternative R5 consists of a single-lane roundabout for the NB and SB ramp terminals. In this Alternative, a new bridge will be required and Eucalyptus Ln will no longer have access to the SB ramp terminal. Instead, a new T-intersection (Eucalyptus Ln/S Jameson Ln) will be constructed and provide access between Eucalyptus Ln and the SB ramp terminal. A stop control would be provided on Eucalyptus Ln at the new T-intersection. In addition, a new SB on-ramp will be added as fifth leg to the roundabout. The forecasted 2040 traffic volumes identified in the previous section (Figure 6) were applied to the study intersections.

LEVEL OF SERVICE ANALYSIS

Table 18 presents the results of the LOS analysis for Alternative R5. Both roundabouts and the new T-intersection would operate within standard LOS. A queue analysis indicates sufficient storage for both roundabouts.
Table 19. 2040 Intersection LOS and Queue Summary – Alternative R5

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<tr>
<th>#</th>
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<th>Available Storage (ft.)</th>
<th>95th Percentile Queue (ft.)</th>
<th>v/c</th>
<th>Delay (sec.) / LOS</th>
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</thead>
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<td></td>
<td></td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
</tr>
<tr>
<td>1</td>
<td>San Ysidro Rd./US101 NB Off-Ramp/N Jameson Ln¹</td>
<td>RB</td>
<td>Overall</td>
<td></td>
<td>0.651</td>
<td>0.668</td>
<td>11.4/B</td>
</tr>
<tr>
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<td></td>
<td>WB (Off-Ramp)</td>
<td></td>
<td>800</td>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NB</td>
<td></td>
<td>180</td>
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<td>EB</td>
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<td>380</td>
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<td>WB</td>
<td></td>
<td>410</td>
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<td>SB</td>
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<td>300</td>
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<td>149</td>
</tr>
<tr>
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<td>San Ysidro Rd./US101 SB Off-Ramp/S Jameson Ln¹</td>
<td>RB</td>
<td>Overall</td>
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<td>0.487</td>
<td>0.45</td>
<td>7.1/A</td>
</tr>
<tr>
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<td></td>
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<td>EB (Off-Ramp)</td>
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<td>460</td>
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<td>55</td>
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<td>EB</td>
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<td>125</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>S Jameson Ln/Eucalyptus Ln²</td>
<td>Stop</td>
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<td></td>
<td>0.134</td>
<td>0.156</td>
<td>10.1/B</td>
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<td>WB</td>
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<td>750</td>
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</tbody>
</table>

1 Results are based on SIDRA-6.0
2 Results are based on HCM2010 in SYNCHRO-8.0

Indicates deficient operations based on Caltrans’s LOS Standard, queues exceeding storage, or v/c > 1

ALTERNATIVE R6 TRAFFIC OPERATIONS

Alternative R6 is similar to R3 with alignment and minor geometric modifications. These changes are not likely to affect traffic volumes and operations from those of Alternative R3. Figure 4 shows the 2040 forecast volumes for Alternative 6. The operations results are provided in Table 17.
ATTACHMENTS

1. Traffic Counts
2. Calculation Worksheets for Existing Traffic Operations
3. Calculation Worksheets for Alternative E1 Traffic Operations
4. Calculation Worksheets for Alternative S1 Traffic Operations
5. Calculation Worksheets for Alternative R1 Traffic Operations
6. Calculation Worksheets for Alternative R1-1A Traffic Operations
7. Calculation Worksheets for Alternative R1-1B Traffic Operations
10. Calculation Worksheets for Alternative R2 Traffic Operations
11. Calculation Worksheets for Alternative R3 and R6 Traffic Operations
13. Calculation Worksheets for Alternative R5 Traffic Operations
### Attachment 1: Traffic Counts

#### Detailed 2014 Traffic Counts

<table>
<thead>
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<th>Year</th>
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<th>PM</th>
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<tbody>
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</tbody>
</table>

#### Allocation of movements for Intersection O/D

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</tbody>
</table>

#### Allocated Values (Based on 2014 split)

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<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
</tbody>
</table>

#### Original counts and forecasts

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<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

---

Kittelson & Associates, Inc.  
Sacramento, California
# US 101 at San Ysidro Intersection/Interchange Control Evaluation

**January 24, 2017**

**Project #: 17491**

### Detailed 2014 Traffic Counts

**2014**

|          | FB/SY ED | WB/SW ED | SB/SN ED | EB OR US 803 Ramps | SB 1 Lane
|----------|----------|----------|----------|--------------------|-----------
| **AM**   |          |          |          |                    |           |
| Volume   |          |          |          |                    |           |
| PHF      |          |          |          |                    |           |
| Traffic %|          |          |          |                    |           |
| Pedestrian |        |          |          |                    |           |
| **PM**   |          |          |          |                    |           |
| Volume   |          |          |          |                    |           |
| PHF      |          |          |          |                    |           |
| Traffic %|          |          |          |                    |           |
| Pedestrian |        |          |          |                    |           |

### Allocation of movements for intersection O/D

**AM Allocation**

|          | FB/SY ED | WB/SW ED | SB/SN ED | EB OR US 803 Ramps | SB 1 Lane
|----------|----------|----------|----------|--------------------|-----------
|          |          |          |          |                    |           |

**PM Allocation**

|          | FB/SY ED | WB/SW ED | SB/SN ED | EB OR US 803 Ramps | SB 1 Lane
|----------|----------|----------|----------|--------------------|-----------
|          |          |          |          |                    |           |

### Allocated Values Based on 2014 split, see method below

**2008**

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**2040**

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### Original counts and forecasts

**2008**

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**2040**

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### Sources

- ALVPA1 Traffic Data CSV File
- Kittelson & Associates, Inc.

Sacramento, California
Attachment 2: Calculation Worksheets for Existing Traffic Operations
### Intersection

**Int Delay, s/veh**

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### Approach

**SB**

- Opposing Approach: NB
- Opposing Lanes: 2
- Conflicting Approach Left: WB
- Conflicting Lanes Left: 1
- Conflicting Approach Right: EB
- Conflicting Lanes Right: 1
- HCM Control Delay: 71.3
- HCM LOS: F

### Lane
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## Approach

| HCM Control Delay, s | 64.6  | 9.6   | 0     | 3.4   |

## Minor Lane/Major Mvmt

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<th>NBT</th>
<th>NBR EBLn1WBLn1</th>
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## Intersection

| Int Delay, s/veh | 1.8 |

## Movement

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| Conflicting Peds, #/hr | 1   | 2   | 1   | 0   | 1   |     |

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<th>Stop</th>
<th>Free</th>
<th>Free</th>
<th>Free</th>
<th>Free</th>
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<td>-</td>
<td>None</td>
<td>-</td>
<td>None</td>
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| Storage Length | 0    | -    | -    | -    | -    | -    |

| Veh in Median Storage, # | 0    | -    | -    | 0    | -    | -    |

| Grade, % | 0    | -    | -    | 0    | -    | -    |

| Peak Hour Factor | 84   | 75   | 50   | 54   | 72   | 66   |

| Heavy Vehicles, % | 2    | 0    | 0    | 2    | 3    | 14   |

| Mvmt Flow | 48   | 12   | 8    | 128  | 157  | 32   |

## Major/Minor

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| Critical Hdwy | 6.42 | 6.2  | 4.1  | -    | -    | -    |

| Critical Hdwy Stg 1 | 5.42 | -    | -    | -    | -    | -    |
| Critical Hdwy Stg 2 | 5.42 | -    | -    | -    | -    | -    |
| Follow-up Hdwy | 3.518 | 3.3  | 2.2  | -    | -    | -    |

| Pot Cap-1 Maneuver | 674  | 872  | 1395 | -    | -    | -    |
| Stage 1            | 855  | -    | -    | -    | -    | -    |
| Stage 2            | 883  | -    | -    | -    | -    | -    |

| Platoon blocked, % | -    | -    | -    | -    | -    | -    |

| Mov Cap-1 Maneuver | 668  | 870  | 1394 | -    | -    | -    |
| Mov Cap-2 Maneuver | 668  | -    | -    | -    | -    | -    |

| Stage 1            | 854  | -    | -    | -    | -    | -    |
| Stage 2            | 876  | -    | -    | -    | -    | -    |

## Approach

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## Minor Lane/Major Mvmt

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<td>A</td>
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| Int Delay, s/veh | 2.2 |

### Movement

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<th>WBT</th>
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### Major/Minor Minor1 Minor1 Major1 Major1|

| Conflicting Flow All | 508 | 508 | 152 | 198 | 0 | 0 | 150 | 0 | 0 |
| Stage 1               | 310 | 310 | -   | -   | - | - | -   | - | - |
| Stage 2               | 198 | 198 | -   | -   | - | - | -   | - | - |

### Critical Hdyw

| Critical Hdyw Stg 1 | 6.4 | 6.5 | 6.2 | 4.1 | - | - | 4.1 | - |
| Critical Hdyw Stg 2 | 5.4 | 5.5 | -   | -   | - | - | -   | - |

### Follow-up Hdyw

| Follow-up Hdyw | 3.5 | 4   | 3.3 | 2.2 | - | - | 2.2 | - |

### Pot Cap-1 Maneuver

| Pot Cap-1 Maneuver | 528 | 471 | 900 | 1387 | - | - | 1444 | - |
| Stage 1            | 748 | 663 | -   | -   | - | - | -   | - |
| Stage 2            | 840 | 741 | -   | -   | - | - | -   | - |

### Platoon blocked, %

| - | - | - | - | - | - | - | - | - | - | - | - | - | - |

### Mov Cap-1 Maneuver

| Mov Cap-1 Maneuver | 493 | 0   | 896 | 1385 | - | - | 1442 | - |
| Stage 1            | 699 | 0   | -   | -   | - | - | -   | - |
| Stage 2            | 839 | 0   | -   | -   | - | - | -   | - |

### Approach

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### Minor Lane/Major Mvmt

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### Intersection Delay, s/veh

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## Approach

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- Opposing Approach: NB
- Opposing Lanes: 2
- Conflicting Approach Left: WB
- Conflicting Lanes Left: 1
- Conflicting Approach Right: EB
- Conflicting Lanes Right: 1

### Number of Lanes

- HCM Control Delay: 66.1
- HCM LOS: F

## Lane
### HCM 2010 TWSC

#### Existing - PM Peak

37: San Ysidro Rd & SB Off Ramp

**1/15/2016**

#### Intersection

**Int Delay, s/veh** 9.1

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**Int Delay, s/veh** 4.8

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### Minor Lane/Major Mvmt

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Attachment 3: Calculation Worksheets for Alternative E1 Traffic Operations
## Intersection

**Int Delay, s/veh**: 1.8

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Kittelson & Associates
Sacramento, California
### Intersection

- **Intersection Delay, s/veh**: 52.2
- **Intersection LOS**: F

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**Approach**

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**Lane**
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| Int Delay, s/veh | 2 |

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**Int Delay, s/veh** | 2.8

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**HCM LOS**

B

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<td>C</td>
<td>C</td>
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### Lane

| Vol Left, % | 13% | 0%  | 30% | 40% | 3%  |
| Vol Thru, % | 87% | 0%  | 51% | 29% | 86% |
| Vol Right, % | 0%  | 100%| 20% | 31% | 12% |
| Sign Control | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 235 | 136 | 223 | 167 | 558 |
| LT Vol | 31  | 0   | 66  | 67  | 15  |
| Through Vol | 204 | 0   | 113 | 49  | 478 |
| RT Vol | 0   | 136 | 44  | 51  | 65  |
| Lane Flow Rate | 255 | 148 | 242 | 182 | 607 |
| Geometry Grp | 7   | 7   | 2   | 2   | 5   |
| Degree of Util (X) | 0.521 | 0.266 | 0.49 | 0.379 | 1 |
| Departure Headway (Hd) | 7.339 | 6.483 | 7.282 | 7.512 | 6.423 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes |
| Cap | 490 | 551 | 497 | 479 | 570 |
| Service Time | 5.091 | 4.256 | 5.312 | 5.554 | 4.423 |
| HCM Lane V/C Ratio | 0.52 | 0.269 | 0.487 | 0.38 | 1.065 |
| HCM Control Delay | 17.9 | 11.6 | 17.1 | 15.1 | 63.2 |
| HCM Lane LOS | C  | B  | C  | C  | F  |
| HCM 95th-tile Q | 3   | 1.1 | 2.7 | 1.7 | 14.5 |
**Intersection**

**Intersection Delay, s/veh**

**Intersection LOS**

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<td>0.92</td>
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**Approach**

**SB**

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**Lane**
## San Ysidro Road & SB Off Ramp

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<th>NBR</th>
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<td>92</td>
<td>92</td>
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### Major/Minor

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<th>Major1</th>
<th>Major2</th>
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<tr>
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### Approach

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<th>NB</th>
<th>SB</th>
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### HCM Lane/V/C

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<th>WBLn1</th>
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<td>B</td>
<td>A</td>
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### Intersection

**Int Delay, s/veh**  1.6

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<td>Stop</td>
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<td>Free</td>
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</tr>
<tr>
<td>RT Channelized</td>
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<td>None</td>
<td>None</td>
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### Major/Minor

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### Approach

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### Minor Lane/Major Mvmt

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<th>SBR</th>
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Attachment 4: Calculation Worksheets for Alternative S1 Traffic Operations
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### Queues
#### 35: San Ysidro Rd & NB On/Off Ramps

#### 2040 S1 AM Peak

**1/23/2017**

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#### Intersection Summary
- **#** 95th percentile volume exceeds capacity, queue may be longer.
- **m** Volume for 95th percentile queue is metered by upstream signal.
- Queue shown is maximum after two cycles.
### Movement Lane Configurations

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<th>EBR</th>
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<th>WBR</th>
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<th>NBT</th>
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<th>SBT</th>
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### Intersection Summary

- **HCM 2000 Control Delay**: 17.0
- **HCM 2000 Volume to Capacity ratio**: 0.61
- **Actuated Cycle Length (s)**: 90.0
- **Intersection Capacity Utilization**: 54.1%
- **Critical Lane Group**: 15

- **HCM 2000 Level of Service**: B
- **Sum of lost time (s)**: 20.0
- **ICU Level of Service**: A
- **Analysis Period (min)**: 15

---

**US 101 at San Ysidro Intersection/Interchange Control Evaluation**

January 24, 2017

**Project #: 17491**

Kittelson & Associates, Inc.
Sacramento, California
## Queues

**36: San Ysidro Rd & N Jameson Ln**

### 2040 S1 AM Peak

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### Intersection Summary

- 95th percentile volume exceeds capacity, queue may be longer.
- Queue shown is maximum after two cycles.
### HCM Signalized Intersection Capacity Analysis

#### 36: San Ysidro Rd & N Jameson Ln

**2040 S1 AM Peak**

**1/23/2017**

**US 101 ICE Synchro 9 Report**

**Kittelson & Associates Page 4**

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#### Movement Lane Configurations

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#### Intersection Summary

- **HCM 2000 Control Delay**: 34.6
- **HCM 2000 Level of Service**: C
- **HCM 2000 Volume to Capacity ratio**: 0.74
- **Actuated Cycle Length (s)**: 90.0
- **Sum of lost time (s)**: 20.0
- **Intersection Capacity Utilization**: 63.9%
- **ICU Level of Service**: B
- **Analysis Period (min)**: 15

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**US 101 ICE**

**Kittelson & Associates**

**Sacramento, California**

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**Synchro 9 Report**

**Page 4**
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**Intersection Summary**
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#### Intersection Summary

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### Intersection Summary

- Project #: 17491
- Kittelson & Associates, Inc.
- Sacramento, California
### Movement Lane Configurations

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### Intersection Summary

- **HCM 2000 Control Delay**: 21.0
- **HCM 2000 Level of Service**: C
- **HCM 2000 Volume to Capacity ratio**: 0.25
- **Actuated Cycle Length (s)**: 90.0
- **Sum of lost time (s)**: 18.0
- **Intersection Capacity Utilization**: 33.1%
- **ICU Level of Service**: A
- **Analysis Period (min)**: 15
- **Critical Lane Group**: c

---

**US 101 at San Ysidro Intersection/Interchange Control Evaluation**

- **Project #: 17491**
- **Kittelson & Associates, Inc.**
- **Sacramento, California**

---

**US 101 ICE**

Kittelson & Associates

**Synchro 9 Report**

Page 8
Queues
35: San Ysidro Rd & NB On/Off Ramps

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Intersection Summary
# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.
HCM Signalized Intersection Capacity Analysis

35: San Ysidro Rd & NB On/Off Ramps

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**Intersection Summary**

| HCM 2000 Control Delay | 16.2 |
| HCM 2000 Volume to Capacity ratio | 0.58 |
| Actuated Cycle Length (s) | 90.0 |
| HCM 2000 Level of Service | B |
| Sum of lost time (s) | 20.0 |
| ICU Level of Service | A |
| Analysis Period (min) | 15 |

---

US 101 ICE
Kittelson & Associates

Sacramento, California
Queues
36: San Ysidro Rd & N Jameson Ln

2040 S1 PM Peak
1/23/2017

<table>
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<tr>
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Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
### Movement

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### Intersection Summary

- **HCM 2000 Control Delay**: 38.1
- **HCM 2000 Volume to Capacity ratio**: 0.74
- **Actuated Cycle Length (s)**: 90.0
- **Intersection Capacity Utilization**: 60.0%
- **Analysis Period (min)**: 15
### Lane Group Summary

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### Intersection Summary
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### HCM Signalized Intersection Capacity Analysis

#### 38: S Jameson Ln & San Ysidro Rd

- **2040 S1 PM Peak**
- **1/23/2017**

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### Intersection Summary

- **HCM 2000 Control Delay**: 15.7
- **HCM 2000 Level of Service**: B
- **HCM 2000 Volume to Capacity ratio**: 0.39
- **Actuated Cycle Length (s)**: 90.0
- **Intersection Capacity Utilization**: 41.5%
- **Analysis Period (min)**: 15
- **Sum of lost time (s)**: 18.0

---

**US 101 ICE**

Kittelson & Associates
Attachment 5: Calculation Worksheets for Alternative R1 Traffic Operations
**LANE SUMMARY**

![Site: NB 2040 AM Alt 0.0 - R1 - .92PHF](image)

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

### Lane Use and Performance

<table>
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<tr>
<th></th>
<th>Demand Flows</th>
<th>Deg. Sat.</th>
<th>Lane Util.</th>
<th>Average Delay</th>
<th>Level of Service</th>
<th>95% Back of Queue Veh</th>
<th>Lane Config</th>
<th>Lane Length</th>
<th>Cap. Adj.</th>
<th>Prob. Block</th>
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<td>160</td>
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<td>100</td>
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<td>LOS A 3.4</td>
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<td>100</td>
<td>8.1</td>
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**Level of Service (LOS) Method:** Delay & v/c (HCM 2010).  
**Roundabout LOS Method:** Same as Sign Control.  
**Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.**  
**LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).**  
**Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).**  
**Roundabout Capacity Model:** US HCM 2010.  
**HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.**  
**Gap-Acceptance Capacity:** Traditional M1.  
**HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.**

<sup>d</sup> Dominant lane on roundabout approach
### Intersection

**Int Delay, s/veh** 34.9

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### Major/Minor

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### Minor Lane/Major Mvmt

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### Intersection

**Int Delay, s/veh**

- EBL: 0
- EBR: 0
- NBL: 0
- NBT: 0
- SBT: 0
- SBR: 0

### Movement

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### Minor Lane/Major Mvmt

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# LANE SUMMARY

## Site: NB 2040 PM_Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

## Lane Use and Performance

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<th>Demand Flows</th>
<th>Cap. HV %</th>
<th>Adj. Veh/h</th>
<th>Satn %</th>
<th>Lane Util. %</th>
<th>Average Delay sec</th>
<th>Level of Service</th>
<th>95% Back of Veh</th>
<th>Queue Dist ft</th>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).  
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
### Intersection

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### Minor Lane/Major Mvmt

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### Intersection

**Int Delay, s/veh** 1.6

### Movement

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<td>-</td>
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<tr>
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### Approach

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### Minor Lane/Major Mvmt

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<td>A</td>
<td>A</td>
<td>B</td>
<td>-</td>
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<tr>
<td>HCM 95th %tile Q(veh)</td>
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<td>-</td>
<td>0.2</td>
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Attachment 6: Calculation Worksheets for Alternative R1-1A Traffic Operations
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### Site: NB 2040 AM_Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

<table>
<thead>
<tr>
<th>Lane Use and Performance</th>
<th>Demand Flows</th>
<th>Cap. Veh/ft</th>
<th>Lane Length ft</th>
<th>Cap. Adj. %</th>
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<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>1065</td>
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<td>0.518</td>
<td>100</td>
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<td>0.518</td>
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<td>LOS A 3.4</td>
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<td>160.0 0.0</td>
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<td><strong>SouthEast: 101 NB Off-Ramp</strong></td>
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<td>0.203</td>
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<td>1600.0 0.0</td>
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<td>0.203</td>
<td>8.1</td>
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<td>LOS A 0.8</td>
<td>19.6</td>
<td>Full</td>
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<td><strong>East: N Jameson Ln</strong></td>
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<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>1600.0 0.0</td>
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<td><strong>North: San Ysidro Rd</strong></td>
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<td>1.6</td>
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<td><strong>West: N Jameson Ln</strong></td>
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<td>0.478</td>
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<td>Full</td>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).  
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
## Queues

### Route: 2040 R1-1a AM Peak

**Date:** 1/24/2017

### Lane Group Summary

<table>
<thead>
<tr>
<th>Lane Group</th>
<th>EBL (vph)</th>
<th>EBT (vph)</th>
<th>NBT (vph)</th>
<th>SBT (vph)</th>
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<tr>
<td>Flow</td>
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<td>243</td>
<td>174</td>
<td>174</td>
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<tr>
<td>v/c Ratio</td>
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<td>0.50</td>
<td>0.31</td>
<td>0.53</td>
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<td>31.9</td>
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<td>27</td>
<td>2</td>
<td>64</td>
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<td>Queue Length 95th (ft)</td>
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<td>94</td>
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<td>128</td>
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<td>Internal Link Dist (ft)</td>
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<td>171</td>
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<td>Turn Bay Length (ft)</td>
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<td>0.50</td>
<td>0.26</td>
<td>0.53</td>
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### Intersection Summary

- 95th percentile volume exceeds capacity, queue may be longer.
- Queue shown is maximum after two cycles.
## Movement EBL EBT EBR WBL WBT WBR NBL NBT NBR SBL SBT SBR

### Lane Configurations

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<th>0</th>
<th>0</th>
<th>125</th>
<th>35</th>
<th>61</th>
<th>99</th>
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<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
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<td>1900</td>
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<td>Total Lost time (s)</td>
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<td>4.5</td>
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<td>4.5</td>
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<td>4.5</td>
<td>4.5</td>
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<td>4.5</td>
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<td>0.97</td>
<td>1.00</td>
<td>0.97</td>
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<tr>
<td>Frl</td>
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<td>0.97</td>
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<td>1.00</td>
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<td>1.00</td>
<td>0.98</td>
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<td>Satd. Flow (prot)</td>
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<td>1545</td>
<td>1808</td>
<td>1817</td>
<td>1618</td>
<td>1545</td>
<td>1808</td>
<td>1817</td>
<td>1618</td>
<td>1545</td>
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<td>1817</td>
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<td>Satd. Flow (perm)</td>
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<td>1545</td>
<td>1808</td>
<td>1817</td>
<td>1618</td>
<td>1545</td>
<td>1808</td>
<td>1817</td>
<td>1618</td>
<td>1545</td>
<td>1808</td>
<td>1817</td>
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<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
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<td>0</td>
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<td>0</td>
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<td>136</td>
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<td>66</td>
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<td>0</td>
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<td>0</td>
<td>174</td>
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<td>0</td>
<td>174</td>
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<td>Heavy Vehicles (%)</td>
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<td>2%</td>
<td>10%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
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### Turn Type

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<th>NA</th>
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<td>2.8</td>
<td>6</td>
<td>6</td>
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</tr>
</tbody>
</table>

### Actuated Green, G (s)

| Actuated Green, G (s) | 15.5 | 15.5 | 20.8 | 12.0 |
| Effective Green, g (s) | 15.5 | 15.5 | 20.8 | 12.0 |
| Actuated g/C Ratio | 0.23 | 0.23 | 0.31 | 0.18 |
| Clearance Time (s) | 4.5 | 4.5 | 4.5 | 4.5 |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 |

### Lane Grp Cap (vph)

| Lane Grp Cap (vph) | 378 | 361 | 567 | 328 |
| v/s Ratio Prot | c0.10 | c0.10 | c0.10 | c0.10 |
| v/c Ratio | 0.67 | 0.33 | 0.31 | 0.53 |
| Uniform Delay, d1 | 23.1 | 21.1 | 17.3 | 24.6 |
| Progression Factor | 1.00 | 1.00 | 0.12 | 1.00 |
| Incremental Delay, d2 | 9.0 | 2.4 | 0.3 | 6.0 |
| Delay (s) | 32.0 | 23.4 | 2.4 | 30.6 |
| Level of Service | C | C | A | C |
| Approach Delay (s) | 27.8 | 0.0 | 2.4 | 30.6 |
| Approach LOS | C | A | A | C |

### Intersection Summary

| HCM 2000 Control Delay | 23.2 |
| HCM 2000 Volume to Capacity ratio | 0.48 |
| Actuated Cycle Length (s) | 66.3 |
| Intersection Capacity Utilization | 41.4% |
| Analysis Period (min) | 15 |

Kittelson & Associates, Inc.
## Intersection Summary

<table>
<thead>
<tr>
<th>Lane Group</th>
<th>EBT</th>
<th>WBT</th>
<th>NBT</th>
<th>SBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Group Flow (vph)</td>
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<td>189</td>
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<tr>
<td>v/c Ratio</td>
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<td>0.25</td>
<td>0.32</td>
<td>0.26</td>
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<tr>
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<tr>
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<td>Queue Length 50th (ft)</td>
<td>18</td>
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<td>5</td>
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<td>Queue Length 95th (ft)</td>
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<td>85</td>
<td>16</td>
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<td>Internal Link Dist (ft)</td>
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<td>Turn Bay Length (ft)</td>
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<td>Base Capacity (vph)</td>
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<td>343</td>
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<td>Starvation Cap Reductn</td>
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<tr>
<td>Spillback Cap Reductn</td>
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<tr>
<td>Storage Cap Reductn</td>
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<td>0.17</td>
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<td>EBT</td>
<td>EBR</td>
<td>WBL</td>
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<td>----------</td>
<td>-----</td>
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<tr>
<td>Volume (vph)</td>
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<td>Ideal Flow (vphpl)</td>
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<td>1900</td>
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<td>1900</td>
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<td>Total Lost time (s)</td>
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<td>1.00</td>
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<td>Frpb, ped/bikes</td>
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<td>0.92</td>
<td>0.92</td>
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<td>Adj. Flow (vph)</td>
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<td>RTOR Reduction (vph)</td>
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<td>2%</td>
<td>0%</td>
<td>2%</td>
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<tr>
<td>Permitted Phases</td>
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<td>8</td>
<td>8</td>
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<tr>
<td>Actuated Green, G (s)</td>
<td>8.3</td>
<td>8.3</td>
<td>8.3</td>
<td>8.3</td>
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<td>194</td>
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<td>1.00</td>
<td>1.00</td>
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<td>26.9</td>
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<tr>
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<td>C</td>
<td>C</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td>Approach Delay (s)</td>
<td>27.4</td>
<td>26.9</td>
<td>25.7</td>
<td>4.7</td>
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<tr>
<td>Approach LOS</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>A</td>
</tr>
</tbody>
</table>

**Intersection Summary**

- **HCM 2000 Control Delay**: 16.1
- **HCM 2000 Volume to Capacity ratio**: 0.28
- **Actuated Cycle Length (s)**: 66.3
- **Intersection Capacity Utilization**: 33.1%
- **Analysis Period (min)**: 15
- **HCM 2000 Level of Service**: B
- **ICU Level of Service**: A
- **Critical Lane Group**: c

---

**US 101 ICE**
Kittelson & Associates
Sacramento, California
# Lane Use and Performance

<table>
<thead>
<tr>
<th>Site: NB 2040 PM Alt 0.0 - R1 - .92PHF</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 101 NB Ramp Terminal at San Ysidro Road</td>
</tr>
<tr>
<td>Santa Barbara County, CA</td>
</tr>
<tr>
<td>Roundabout</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Lane Use and Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand Flows</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>South: San Ysidro Rd</td>
</tr>
<tr>
<td>Lane 1d</td>
</tr>
<tr>
<td>Approach</td>
</tr>
<tr>
<td>South East: 101 NB Off-Ramp</td>
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<tr>
<td>Lane 1d</td>
</tr>
<tr>
<td>Approach</td>
</tr>
<tr>
<td>East: N Jameson Ln</td>
</tr>
<tr>
<td>Lane 1d</td>
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<tr>
<td>Approach</td>
</tr>
<tr>
<td>North: San Ysidro Rd</td>
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<tr>
<td>Lane 1d</td>
</tr>
<tr>
<td>Approach</td>
</tr>
<tr>
<td>West: N Jameson Ln</td>
</tr>
<tr>
<td>Lane 1d</td>
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<tr>
<td>Approach</td>
</tr>
<tr>
<td>Intersection</td>
</tr>
</tbody>
</table>

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
### Lane Group Flow (vph)

<table>
<thead>
<tr>
<th>Lane Group</th>
<th>EBL</th>
<th>EBT</th>
<th>NBT</th>
<th>SBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>224</td>
<td>204</td>
<td>150</td>
<td>281</td>
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</tbody>
</table>

### v/c Ratio

<table>
<thead>
<tr>
<th>Lane Group</th>
<th>EBL</th>
<th>EBT</th>
<th>NBT</th>
<th>SBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio</td>
<td>0.56</td>
<td>0.42</td>
<td>0.26</td>
<td>0.71</td>
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</table>

### Control Delay

<table>
<thead>
<tr>
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<th>EBL</th>
<th>EBT</th>
<th>NBT</th>
<th>SBT</th>
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</thead>
<tbody>
<tr>
<td>Delay</td>
<td>28.0</td>
<td>8.4</td>
<td>2.8</td>
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</table>

### Queue Delay

<table>
<thead>
<tr>
<th>Lane Group</th>
<th>EBL</th>
<th>EBT</th>
<th>NBT</th>
<th>SBT</th>
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</thead>
<tbody>
<tr>
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<td>0.1</td>
<td>0.0</td>
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### Total Delay

<table>
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<th>EBT</th>
<th>NBT</th>
<th>SBT</th>
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</thead>
<tbody>
<tr>
<td>Delay</td>
<td>28.0</td>
<td>8.5</td>
<td>2.8</td>
<td>35.8</td>
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### Queue Length 50th (ft)

<table>
<thead>
<tr>
<th>Lane Group</th>
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<th>EBT</th>
<th>NBT</th>
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</thead>
<tbody>
<tr>
<td>Length</td>
<td>83</td>
<td>9</td>
<td>3</td>
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### Queue Length 95th (ft)

<table>
<thead>
<tr>
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<th>NBT</th>
<th>SBT</th>
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</thead>
<tbody>
<tr>
<td>Length</td>
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<td>58</td>
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<td>105</td>
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### Internal Link Dist (ft)

<table>
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<th>EBL</th>
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<th>NBT</th>
<th>SBT</th>
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<tr>
<td>Dist</td>
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<td>171</td>
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### Turn Bay Length (ft)

<table>
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<th>EBL</th>
<th>EBT</th>
<th>NBT</th>
<th>SBT</th>
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</thead>
<tbody>
<tr>
<td>Length</td>
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### Base Capacity (vph)

<table>
<thead>
<tr>
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<th>EBL</th>
<th>EBT</th>
<th>NBT</th>
<th>SBT</th>
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</thead>
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<tr>
<td>Capacity</td>
<td>399</td>
<td>485</td>
<td>579</td>
<td>396</td>
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### Starvation Cap Reductn

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<th>EBL</th>
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<th>NBT</th>
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</thead>
<tbody>
<tr>
<td>Reductn</td>
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### Spillback Cap Reductn

<table>
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<th>NBT</th>
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<td>Reductn</td>
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<td>19</td>
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### Storage Cap Reductn

<table>
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<tbody>
<tr>
<td>Reductn</td>
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### Reduced v/c Ratio

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### Intersection Summary

- 95th percentile volume exceeds capacity, queue may be longer.
- Queue shown is maximum after two cycles.
### Lane Configurations

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<tr>
<th>Movement</th>
<th>EBL</th>
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<th>EBR</th>
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<th>NBL</th>
<th>NBT</th>
<th>NBR</th>
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<th>SBT</th>
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<td>0</td>
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<td>31</td>
<td>51</td>
<td>208</td>
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<td>Ideal Flow (vphpl)</td>
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<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
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<td>4.5</td>
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<td>1428</td>
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<td>1618</td>
<td>1428</td>
<td>1806</td>
<td>1830</td>
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<td>1806</td>
<td>1830</td>
<td>1618</td>
<td>1428</td>
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<td>1806</td>
<td>1830</td>
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<td>10%</td>
<td>2%</td>
<td>2%</td>
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<td>3%</td>
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<td>13.7</td>
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### Intersection Summary

- **HCM 2000 Control Delay**: 23.5
- **HCM 2000 Level of Service**: C
- **HCM 2000 Volume to Capacity ratio**: 0.52
- **Actuated Cycle Length (s)**: 64.1
- **Sum of lost time (s)**: 18.0
- **Intersection Capacity Utilization**: 43.9%
- **ICU Level of Service**: A

**Analysis Period (min)**: 15
Queues
38: S Jameson Ln & San Ysidro Rd

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Intersection Summary

* Volume for 95th percentile queue is metered by upstream signal.
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Attachment 7: Calculation Worksheets for Alternative R1-1B Traffic Operations
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## Site: NB 2040 AM_Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

### Lane Use and Performance

<table>
<thead>
<tr>
<th>Lane Use</th>
<th>Demand Flows</th>
<th>Cap. Sat. v/c</th>
<th>Degree of Saturation</th>
<th>Lane Util.</th>
<th>Average Delay [sec]</th>
<th>Level of Service</th>
<th>95% Back of Queue Dist [ft]</th>
<th>Lane Config</th>
<th>Lane Length [ft]</th>
<th>Cap. Adj. [%]</th>
<th>Prob. Block [%]</th>
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<tbody>
<tr>
<td>South: San Ysidro Rd</td>
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<td>Approach</td>
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<td>0.518</td>
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<td>LOS A</td>
<td>3.4</td>
<td>86.2</td>
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<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>633</td>
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<td>LOS A</td>
<td>0.8</td>
<td>19.6</td>
<td>Full</td>
<td>1600</td>
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<tr>
<td>Approach</td>
<td>129</td>
<td>4.4</td>
<td>0.203</td>
<td>8.1</td>
<td>LOS A</td>
<td>0.8</td>
<td>19.6</td>
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<tr>
<td>East: N Jameson Ln</td>
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<tr>
<td>Approach</td>
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<td>LOS B</td>
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<td>44.1</td>
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<td>North: San Ysidro Rd</td>
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<td>LOS B</td>
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<td>144.5</td>
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<tr>
<td>West: N Jameson Ln</td>
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<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>1600</td>
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</table>

**Level of Service (LOS) Method:** Delay & v/c (HCM 2010).  
**Roundabout LOS Method:** Same as Sign Control.  
**Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.**  
**LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).**  
**Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).**  
**Roundabout Capacity Model:** US HCM 2010.  
**HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.**  
**Gap-Acceptance Capacity:** Traditional M1.  
**HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.**

<sup>d</sup> Dominant lane on roundabout approach
### Queues
#### 37: San Ysidro Rd & SB Off Ramp

#### 2040 R1-1b AM Peak

<table>
<thead>
<tr>
<th>Lane Group</th>
<th>EBT</th>
<th>EBR</th>
<th>WBT</th>
<th>NBT</th>
<th>SBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Group Flow (vph)</td>
<td>450</td>
<td>43</td>
<td>38</td>
<td>152</td>
<td>174</td>
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<tr>
<td>v/c Ratio</td>
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<td>0.06</td>
<td>0.05</td>
<td>0.33</td>
<td>0.64</td>
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<tr>
<td>Control Delay</td>
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<td>0.1</td>
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<td>Total Delay</td>
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<td>Turn Bay Length (ft)</td>
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<td>Base Capacity (vph)</td>
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<td>744</td>
<td>784</td>
<td>455</td>
<td>272</td>
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<td>0</td>
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<td>0</td>
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<td>Spillback Cap Reductn</td>
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<td>Storage Cap Reductn</td>
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<td>Reduced v/c Ratio</td>
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<td>0.06</td>
<td>0.05</td>
<td>0.33</td>
<td>0.64</td>
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**Intersection Summary**

- **95th percentile volume exceeds capacity, queue may be longer.**
- Queue shown is maximum after two cycles.
### HCM Signalized Intersection Capacity Analysis

#### 37: San Ysidro Rd & SB Off Ramp

<table>
<thead>
<tr>
<th>Movement</th>
<th>EBL</th>
<th>EBT</th>
<th>EBR</th>
<th>WBL</th>
<th>WBT</th>
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<td><strong>Lane Configurations</strong></td>
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<tr>
<td><strong>Volume (vph)</strong></td>
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<td>27</td>
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<td>97</td>
<td>43</td>
<td>88</td>
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<td><strong>Total Lost time (s)</strong></td>
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<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
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<td><strong>Lane Util. Factor</strong></td>
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<td><strong>Frt</strong></td>
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<td><strong>Ft Protected</strong></td>
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<td>1684</td>
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<td>1555</td>
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<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
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<td><strong>Adj. Flow (vph)</strong></td>
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<td>96</td>
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<td>16</td>
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<td><strong>Lane Group Flow (vph)</strong></td>
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<td>0</td>
<td>0</td>
<td>136</td>
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<td>0</td>
<td>174</td>
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<td><strong>Heavy Vehicles (%)</strong></td>
<td>6%</td>
<td>17%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>0%</td>
<td>7%</td>
<td>3%</td>
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#### Turn Type

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<th>Perm</th>
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<th>Perm</th>
<th>Perm</th>
<th>NA</th>
<th>Split</th>
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<td>Permitted Phases</td>
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<td>4</td>
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<td></td>
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</tbody>
</table>

| Actuated Green, G (s) | 46.5 | 46.5 | 46.5 | |
| Effective Green, g (s) | 46.5 | 46.5 | 46.5 | |
| Actuated g/C Ratio | 0.46 | 0.46 | 0.46 | |
| Clearance Time (s) | 4.5 | 4.5 | 4.5 | |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | |

| Lane Grp Cap (vph) | 591 | 682 | 723 | 440 | 272 |
| v/s Ratio Prot | c0.35 | 0.01 | 0.01 | |
| v/c Ratio | 0.76 | 0.03 | 0.02 | 0.31 | 0.64 |
| Uniform Delay, d1 | 22.2 | 14.5 | 14.5 | 30.8 | 39.6 |
| Progression Factor | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Incremental Delay, d2 | 9.0 | 0.1 | 0.1 | 0.4 | 11.0 |
| Delay (s) | 31.1 | 14.6 | 14.5 | 0.5 | 50.6 |
| Level of Service | C | B | B | A | D |
| Approach Delay (s) | 29.7 | 14.5 | 14.5 | 0.5 | 50.6 |
| Approach LOS | C | B | A | D | |

#### Intersection Summary

| HCM 2000 Control Delay | 28.1 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.64 | |
| Actuated Cycle Length (s) | 100.0 | Sum of lost time (s) | 18.0 |
| Intersection Capacity Utilization | 57.1% | ICU Level of Service | B |
| Analysis Period (min) | 15 | | |

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*San YsidroICE*

*January 24, 2017*

Project #: 17491

Sacramento, California
### Queues

#### 2040 R1-1b AM Peak

<table>
<thead>
<tr>
<th>Lane Group</th>
<th>EBL</th>
<th>NBT</th>
<th>SBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Group Flow (vph)</td>
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<td>110</td>
<td>131</td>
</tr>
<tr>
<td>v/c Ratio</td>
<td>0.52</td>
<td>0.41</td>
<td>0.11</td>
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<tr>
<td>Control Delay</td>
<td>63.0</td>
<td>44.0</td>
<td>1.7</td>
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<tr>
<td>Queue Delay</td>
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<td>0.0</td>
</tr>
<tr>
<td>Total Delay</td>
<td>63.0</td>
<td>44.0</td>
<td>1.7</td>
</tr>
<tr>
<td>Queue Length 50th (ft)</td>
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<td>7</td>
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<td>Queue Length 95th (ft)</td>
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<td>m13</td>
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<td>Internal Link Dist (ft)</td>
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<td>485</td>
<td>5</td>
</tr>
<tr>
<td>Turn Bay Length (ft)</td>
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</tr>
<tr>
<td>Base Capacity (vph)</td>
<td>101</td>
<td>269</td>
<td>1183</td>
</tr>
<tr>
<td>Starvation Cap Reductn</td>
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<td>Spillback Cap Reductn</td>
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<td>Storage Cap Reductn</td>
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<tr>
<td>Reduced v/c Ratio</td>
<td>0.52</td>
<td>0.41</td>
<td>0.11</td>
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#### Intersection Summary

- # 95th percentile volume exceeds capacity, queue may be longer.
- Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.
### Movement

#### Lane Configurations

<table>
<thead>
<tr>
<th>Movement</th>
<th>EBL</th>
<th>EBR</th>
<th>NBL</th>
<th>NBT</th>
<th>SBT</th>
<th>SBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume (vph)</td>
<td>45</td>
<td>4</td>
<td>6</td>
<td>95</td>
<td>102</td>
<td>18</td>
</tr>
<tr>
<td>Ideal Flow (vphpl)</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
</tr>
<tr>
<td>Total Lost time (s)</td>
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<td>4.5</td>
<td>4.5</td>
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<td></td>
</tr>
<tr>
<td>Lane Util. Factor</td>
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<td>1.00</td>
<td>1.00</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Fpbd, ped/bikes</td>
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<td>1.00</td>
<td>1.00</td>
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<td></td>
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</tr>
<tr>
<td>Fpbd, ped/bikes</td>
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<tr>
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<td>Satd. Flow (prot)</td>
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<td>1859</td>
<td>1771</td>
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<td>Satd. Flow (perm)</td>
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<td>1859</td>
<td>1771</td>
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#### Turn Type

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<th>Permitted Phases</th>
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#### Actuated Phases

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<th>Actuated g/C Ratio</th>
<th>Clearance Time (s)</th>
<th>Vehicle Extension (s)</th>
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#### Lane Group Cap (vph)

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<th>v/s Ratio Prot</th>
<th>v/s Ratio Perm</th>
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### Intersection Summary

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<th>HCM 2000 Volume to Capacity ratio</th>
<th>Actuated Cycle Length (s)</th>
<th>Intersection Capacity Utilization</th>
<th>Analysis Period (min)</th>
<th>Critical Lane Group</th>
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# LANE SUMMARY

**Site:** NB 2040 PM Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road
Santa Barbara County, CA
Roundabout

## Lane Use and Performance

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<tr>
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<tr>
<td>South: San Ysidro Rd</td>
</tr>
<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<tr>
<td>Approach</td>
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<tr>
<td>SouthEast: 101 NB Off-Ramp</td>
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<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>Approach</td>
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<tr>
<td>East: N Jameson Ln</td>
</tr>
<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<tr>
<td>Approach</td>
</tr>
<tr>
<td>North: San Ysidro Rd</td>
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<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<tr>
<td>Approach</td>
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<td>West: N Jameson Ln</td>
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<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<tr>
<td>Approach</td>
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<tr>
<td>Intersection</td>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach

---

Processed: Monday, January 23, 2017 8:05:12 PM
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www.sidrasolutions.com
Project: C:\Users\vikattikomol\Desktop\17491 San Ysidro\Sidra\17491 US 101 at San Ysidro with SB On-Ramp_updated volumes_PHF_0117.sip6
8001045, KITTELSON AND ASSOCIATES INC, PLUS / Floating
### Intersection Summary

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<th>EBR</th>
<th>WBT</th>
<th>NBT</th>
<th>SBT</th>
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<td>151</td>
<td>36</td>
<td>121</td>
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<td>Reduced v/c Ratio</td>
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<td>0.06</td>
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<td>0.61</td>
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HCM Signalized Intersection Capacity Analysis
37: San Ysidro Rd & SB Off Ramp

2040 R1-1b PM Peak
1/24/2017

San YsidroICE Synchro 8 Report
Kittelson & Associates Page 2

Lane Configurations

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<tr>
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<th>EBR</th>
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<th>NBL</th>
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<td>1900</td>
<td>1900</td>
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<td>1900</td>
<td>1900</td>
<td>1900</td>
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<td>0.97</td>
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<td>1677</td>
<td>1802</td>
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<td>0%</td>
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<td>7%</td>
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Turn Type

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<td>4</td>
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<td></td>
<td></td>
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</table>

Actuated Green, G (s) | 33.0 | 33.0 | 33.0 | 18.6 | 25.3 |
Effective Green, g (s) | 33.0 | 33.0 | 33.0 | 18.6 | 25.3 |
Actuated g/C Ratio | 0.35 | 0.35 | 0.35 | 0.20 | 0.27 |
Clearance Time (s) | 4.5 | 4.5 | 4.5 |
Vehicle Extension (s) | 3.0 | 3.0 | 3.0 |

Lane Group Capacity (vph) | 443 | 510 | 556 | 353 | 461 |

Intersection Summary

| Control Delay | 26.9 |
| Volume to Capacity ratio | 0.54 |
| Actuated Cycle Length (s) | 94.9 |
| Intersection Capacity Utilization | 49.0% |
| Analysis Period (min) | 15 |

Level of Service

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<th>HCM 2000 Level of Service</th>
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<td>Actuated Cycle Length (s)</td>
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<td>Sum of lost time (s)</td>
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<tr>
<td>Analysis Period (min)</td>
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Kittelson & Associates
Sacramento, California
### Queues

#### 38: S Jameson Ln & San Ysidro Rd

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<th>EBL</th>
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<th>SBT</th>
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### Intersection Summary
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<td>1900</td>
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**Intersection Summary**

| | HCM 2000 Control Delay | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.25 | | |
| Actuated Cycle Length (s) | 94.9 | Sum of lost time (s) | 18.0 |
| Intersection Capacity Utilization | 27.8% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |

*Critical Lane Group*
Attachment 8: Calculation Worksheets for Alternative R1-2A Traffic Operations
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# LANE SUMMARY

**Site: NB 2040 AM Alt 0.0 - R1 - .92PHF**

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

## Lane Use and Performance

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<th>Lane Use</th>
<th>Demand Flows</th>
<th>Cap.</th>
<th>Deg. Satn</th>
<th>Lane Util.</th>
<th>Average Delay</th>
<th>Level of Service</th>
<th>95% Back of Queue</th>
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<th>Lane Length</th>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).  
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
### Intersection

**Intersection Delay, s/veh**: 15.1  
**Intersection LOS**: C

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### Lane

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### Lane
### Intersection

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**LANE SUMMARY**

**Site: NB 2040 PM_Alt 0.0 - R1 - .92PHF**

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

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<th>Cap. veh/h</th>
<th>d</th>
<th>Satn v/c %</th>
<th>Average Delay sec</th>
<th>Level of Service</th>
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<th>Lane Length ft</th>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).  
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
### Intersection Delay, s/veh
13.3

### Intersection LOS
B

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## Intersection

### Intersection Delay, s/veh

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## Lane
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### Lane

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### Intersection

**Intersection Delay, s/veh**

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<td>0.92</td>
<td>0.92</td>
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### Approach

**Approach SB**

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### Lane
Attachment 9: Calculation Worksheets for Alternative R1-2B Traffic Operations
## LANE SUMMARY

**Site:** NB 2040 AM _Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

### Lane Use and Performance

<table>
<thead>
<tr>
<th>Lane Use</th>
<th>Demand Flows 95% Back of Queue</th>
<th>Lane Use and Performance</th>
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<tr>
<td><strong>South: San Ysidro Rd</strong></td>
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<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<tr>
<td><strong>SouthEast: 101 NB Off-Ramp</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<tr>
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<td><strong>East: N Jameson Ln</strong></td>
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<tr>
<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<td><strong>North: San Ysidro Rd</strong></td>
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<td><strong>West: N Jameson Ln</strong></td>
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**Level of Service (LOS) Method:** Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).  
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
## Intersection

<table>
<thead>
<tr>
<th>Movement</th>
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<th>EBT</th>
<th>EBR</th>
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<th>NBL</th>
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<td>0</td>
<td>0</td>
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<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
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<td>0.92</td>
<td>0.92</td>
<td>0.92</td>
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### Approach

#### Opposing Approach
- EB: WB
- WB: EB
- NB: SB

#### Conflicting Approach
- Left: NB
- Right: WB

#### HCM Control Delay
- 18.7
- 8.5
- 10.2

### Lane

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**San YsidroICE**

**Kittelson & Associates**

**Kittelson & Associates, Inc.**

**Sacramento, California**
### Intersection

<table>
<thead>
<tr>
<th>Movement</th>
<th>SBU</th>
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### Approach

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### Lane
**Intersection**

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**Approach**

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**Lane**

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**LANE SUMMARY**

**Site: NB 2040 PM_Alt 0.0 - R1 - .92PHF**

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

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<th>Lane Use and Performance</th>
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<th>Degree Saturation</th>
<th>Lane Util.</th>
<th>Average Delay</th>
<th>Level of Service</th>
<th>95% Back of Queue Length</th>
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<th>Lane Capacity</th>
<th>Cap. Block.</th>
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<td>veh/h</td>
<td>%</td>
<td>sec</td>
<td>ft</td>
<td>ft</td>
<td>%</td>
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<td>0.332</td>
<td>100</td>
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<td>0.332</td>
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<td>LOS A</td>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).  
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
## Intersection

**Intersection Delay, s/veh**: 13.2  
**Intersection LOS**: B

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<th>EBT</th>
<th>EBR</th>
<th>WBU</th>
<th>WBL</th>
<th>WBT</th>
<th>WBR</th>
<th>NBU</th>
<th>NBL</th>
<th>NBT</th>
<th>NBR</th>
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## Approach

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<td>EB</td>
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## Lane

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### Intersection

**Intersection Delay, s/veh**

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### Approach

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### Lane
### Intersection

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### Approach

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### Lane

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<th>SBLn1</th>
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Attachment 10: Calculation Worksheets for Alternative R2 Traffic Operations
Site: NB 2040 AM Alt 0.0 - R1 - .92PHF
US 101 NB Ramp Terminal at San Ysidro Road
Santa Barbara County, CA
Roundabout

### Lane Use and Performance

<table>
<thead>
<tr>
<th>Demand Flows</th>
<th>Lane Use and Performance</th>
<th>Cap. Satn v/c</th>
<th>Lane Util. %</th>
<th>Average Delay sec</th>
<th>Level of Service</th>
<th>95% Back of Veh</th>
<th>Queue Dist ft</th>
<th>Lane Config</th>
<th>Lane Length ft</th>
<th>Cap. Adj. %</th>
<th>Prob. Block. %</th>
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<td>1600  0.0  0.0</td>
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<td>Approach</td>
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<td>Approach</td>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
LANE LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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Processed: Monday, January 23, 2017 7:57:08 PM
Copyright © 2000-2014 Akcelik and Associates Pty Ltd
www.sidrasolutions.com
Project: C:\Users\vikatikomol\Desktop\17491 San Ysidro\Sidra\17491 US 101 at San Ysidro with SB On-Ramp_updated volumes_PHF_0117.sip6
8001045, KITTELSON AND ASSOCIATES INC, PLUS / Floating

Kittelson & Associates, Inc.
Sacramento, California
LANE SUMMARY

Site: 2040 AM_SB Ramp_Alt 0.0 - R2 - .92PHF

US 101 SB Ramp Terminal at San Ysidro Road
Santa Barbara County, CA
Roundabout

### Lane Use and Performance

<table>
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<th>Flows</th>
<th>Lane Use and Performance</th>
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<th>Lane Config</th>
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<th>Cap.</th>
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<th>Prob. Block.</th>
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**Level of Service (LOS) Method:** Delay & v/c (HCM 2010).
**Roundabout LOS Method:** Same as Sign Control.
**Lane LOS values** are based on average delay and v/c ratio (degree of saturation) per lane.
**LOS F** will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
**Intersection and Approach LOS values** are based on average delay for all lanes (v/c not used as specified in HCM 2010).
**Roundabout Capacity Model:** US HCM 2010.
**HCM Delay Formula option** is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
**Gap-Acceptance Capacity:** Traditional M1.
**HV (%) values** are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
# LANE SUMMARY

## Site: NB 2040 PM Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

## Lane Use and Performance

<table>
<thead>
<tr>
<th>Lane Use and Performance</th>
<th>Demand Flows</th>
<th>Lane Util.</th>
<th>Average Delay</th>
<th>Level of Service</th>
<th>95% Back of Queue</th>
<th>Lane Config</th>
<th>Lane Length</th>
<th>Cap. Adj.</th>
<th>Prob. Block.</th>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
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HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
**LANE SUMMARY**

**Site: 2040 PM_SB Ramp_Alternative 0.0 - R2 - .92PHF**

US 101 SB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

### Lane Use and Performance

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<th></th>
<th>Demand Flows</th>
<th>Total veh/h</th>
<th>HV %</th>
<th>Cap. veh/h</th>
<th>Satn Util. %</th>
<th>Average Delay sec</th>
<th>Level of Service</th>
<th>95% Back of Queue Veh Dist ft</th>
<th>Lane Config</th>
<th>Lane Length ft</th>
<th>Cap. Adj. %</th>
<th>Prob. Block. %</th>
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**Level of Service (LOS) Method:** Delay & v/c (HCM 2010).  
**Roundabout LOS Method:** Same as Sign Control.  
**Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.**  
**LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).**  
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**Roundabout Capacity Model:** US HCM 2010.  
**HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.**  
**Gap-Acceptance Capacity:** Traditional M1.  
**HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.**

<sup>d</sup> Dominant lane on roundabout approach

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Project: C:\Users\vikatikomol\Desktop\17491 San Ysidro\Sidra\17491 US 101 at San Ysidro with SB On-Ramp_updated_volumes_PHF_0117.sip6  
8001045, KITTELSON AND ASSOCIATES INC, PLUS / Floating
Attachment 11: Calculation Worksheets for Alternative R3 and R6 Traffic Operations
LANE SUMMARY

US 101 NB Ramp Terminal at San Ysidro Road
Santa Barbara County, CA
Roundabout

<table>
<thead>
<tr>
<th>Lane Use and Performance</th>
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<tbody>
<tr>
<td><strong>Demand Flows</strong></td>
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<tr>
<td>Approach</td>
</tr>
<tr>
<td><strong>SouthEast: 101 NB Off-Ramp</strong></td>
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<tr>
<td>Approach</td>
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<td><strong>East: N Jameson Ln</strong></td>
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<tr>
<td>Approach</td>
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<tr>
<td><strong>Intersection</strong></td>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
# LANE SUMMARY

## Site: 2040 AM_SB Ramp_Alt 2.1 - R3 - .92PHF

US 101 SB Ramp Terminal at San Ysidro Road  
Add SB On-Ramp  
Santa Barbara County, CA  
Roundabout

## Lane Use and Performance

<table>
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<tr>
<th></th>
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<th>Deg. Sat. v/c</th>
<th>Lane Util. %</th>
<th>Average Delay sec</th>
<th>Level of Service</th>
<th>95% Back of Queue Veh</th>
<th>Lane Config</th>
<th>Lane Length ft</th>
<th>Cap. Adj. %</th>
<th>Prob. Block. %</th>
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**Level of Service (LOS) Method:** Delay & v/c (HCM 2010).  
**Roundabout LOS Method:** Same as Sign Control.  
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**HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.**  
**Gap-Acceptance Capacity:** Traditional M1.  
**HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.**

- d Dominant lane on roundabout approach

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8001045, KITTELSON AND ASSOCIATES INC, PLUS / Floating

Kittelson & Associates, Inc.  
Sacramento, California
## LANE SUMMARY

### Site: NB 2040 PM_Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

### Lane Use and Performance

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<th>Satn Util. %</th>
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<th>Lane Length ft</th>
<th>Cap. Adj. %</th>
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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
### LANE SUMMARY

**Site:** 2040 PM_SB Ramp_Al1 2.1 - R3 - .92PHF

US 101 SB Ramp Terminal at San Ysidro Road
Add SB On-Ramp
Santa Barbara County, CA
Roundabout

#### Lane Use and Performance

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**Level of Service (LOS) Method:** Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if $v/c > 100$ irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes ($v/c$ not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

*d* Dominant lane on roundabout approach

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*www.sidrasolutions.com*  
*Project #: 17491*  
*US 101 at San Ysidro Intersection/Interchange Control Evaluation*  
*January 24, 2017*  
*Kittelson & Associates, Inc.*  
*Sacramento, California*
Attachment 12: Calculation Worksheets for Alternative R4 Traffic Operations
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# Site: NB 2040 AM_Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

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Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
Roundabout LOS Method: Same as Sign Control.  
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LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
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HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
LANE SUMMARY

Site: 2040 AM_SB Ramp_Concept 4 - R4 - .92PHF

US 101 SB Ramp Terminal at San Ysidro Road
Santa Barbara County, CA
Roundabout

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<th>Average Delay sec</th>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).
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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
### Intersection

| Int Delay, s/veh | 4.3 |

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### Major/Minor

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<td>Platoon blocked, %</td>
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<tr>
<td>Mov Cap-1 Maneuver</td>
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<td>Mov Cap-2 Maneuver</td>
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### Approach

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<tr>
<td>0</td>
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<td>11.3</td>
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### Minor Lane/Major Mvmt

| Capacity (veh/h) | 759 | - | 1307 | - |
| HCM Lane V/C Ratio | 0.245 | - | 0.01 | - |
| HCM Control Delay (s) | 11.3 | - | 7.8 | 0 |
| HCM Lane LOS | B | - | A | A |
| HCM 95th %tile Q(veh) | 1 | - | 0 | - |
# LANE SUMMARY

**Site:** NB 2040 PM Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

<table>
<thead>
<tr>
<th>Lane Use and Performance</th>
<th>Demand Flows</th>
<th>Deg. Sat. Satn</th>
<th>Average Delay</th>
<th>Level of Service</th>
<th>95% Back of Queue</th>
<th>Gap-Acceptance Capacity</th>
<th>Processed: Monday, January 23, 2017 8:05:12 PM</th>
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<td>1.8</td>
<td>Copyright © 2000-2014 Akcelik and Associates Pty Ltd</td>
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<tr>
<td>SouthEast: 101 NB Off-Ramp</td>
<td></td>
<td></td>
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<td></td>
<td><a href="http://www.sidrasolutions.com">www.sidrasolutions.com</a></td>
</tr>
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<td>327</td>
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<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>0.668</td>
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<td>LOB</td>
<td>5.9</td>
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<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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</tbody>
</table>

Level of Service (LOS) Method: Delay & v/c (HCM 2010).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).


HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.


HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
**LANE SUMMARY**

**Site: 2040 PM_SB Ramp_Concept 4 - R4 - .92PHF**

US 101 SB Ramp Terminal at San Ysidro Road
Santa Barbara County, CA
Roundabout

**Lane Use and Performance**

<table>
<thead>
<tr>
<th>Lane Use and Performance</th>
<th>Demand Flows 95% Back of Queue</th>
<th>Level of Service</th>
<th>95% Back of Queue</th>
<th>Lane Config</th>
<th>Lane Length</th>
<th>Cap. Adj. %</th>
<th>Prob. Block. %</th>
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</thead>
<tbody>
<tr>
<td>Lane Use</td>
<td>Total veh/h</td>
<td>Cap. veh/h</td>
<td>Deg. Satn v/c</td>
<td>Lane Util. %</td>
<td>Average Delay sec</td>
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<td>95% Back of Veh</td>
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</table>

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach
## Intersection

| Int Delay, s/veh | 2.4 |

## Movement

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<th>EBT</th>
<th>EBR</th>
<th>WBL</th>
<th>WBT</th>
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## Major/Minor

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<th>Minor1</th>
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</tr>
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<td>Critical Hdwy</td>
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<td>-</td>
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</tr>
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<td>Critical Hdwy Stg 1</td>
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<tr>
<td>Critical Hdwy Stg 2</td>
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<tr>
<td>Follow-up Hdwy</td>
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<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Stage 1</td>
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<tr>
<td>Platoon blocked, %</td>
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## Approach

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<th>NB</th>
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## Minor Lane/Major Mvmt

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<th>WBL</th>
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<td>A</td>
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<td>-</td>
<td>0.1</td>
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</table>
Attachment 13: Calculation Worksheets for Alternative R5 Traffic Operations
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## LANE SUMMARY

### Site: NB 2040 AM_Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

### Lane Use and Performance

<table>
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<tr>
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<th>Demand Flows</th>
<th>Lane Util.</th>
<th>Average Delay</th>
<th>Level of Service</th>
<th>95% Back of Queue</th>
<th>Lane Config</th>
<th>Lane Length</th>
<th>Cap. Adj.</th>
<th>Prob. Block</th>
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<td>Cap. veh/h</td>
<td>sec</td>
<td>Veh</td>
<td>ft</td>
<td>%</td>
<td>%</td>
<td>%</td>
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<tr>
<td><strong>South: San Ysidro Rd</strong></td>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).  
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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
**LANE SUMMARY**

**Site: 2040 AM_SB Ramp_Concept 4 - R5 - .92PHF**

US 101 SB Ramp Terminal at San Ysidro Road
Santa Barbara County, CA
Roundabout

### Lane Use and Performance

<table>
<thead>
<tr>
<th>Lane Use and Performance</th>
<th>Demand Flows</th>
<th>Cap. veh/h</th>
<th>Deg. Satn v/c</th>
<th>Lane Util. %</th>
<th>Average Delay sec</th>
<th>Level of Service</th>
<th>95% Back of Queue Veh Dist ft</th>
<th>Lane Config</th>
<th>Lane Length ft</th>
<th>Cap. Adj. %</th>
<th>Prob. Block. %</th>
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Level of Service (LOS) Method: Delay & v/c (HCM 2010).
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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
### Intersection

| Int Delay, s/veh | 3.5 |

### Movement

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<th>WBT</th>
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### Major/Minor

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### Minor Lane/Major Mvmt

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**LANE SUMMARY**

Site: NB 2040 PM Alt 0.0 - R1 - .92PHF

US 101 NB Ramp Terminal at San Ysidro Road
Santa Barbara County, CA
Roundabout

### Lane Use and Performance

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<th>Lane Length ft</th>
<th>Cap. Adj. %</th>
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<sup>d</sup> Dominant lane on roundabout approach
# LANE SUMMARY

## Site: 2040 PM_SB Ramp_Concept 4 - R5 - .92PHF

US 101 SB Ramp Terminal at San Ysidro Road  
Santa Barbara County, CA  
Roundabout

### Lane Use and Performance

<table>
<thead>
<tr>
<th>Lane Use and Performance</th>
<th>Demand Flows</th>
<th>Cap. veh/h</th>
<th>Cap. %</th>
<th>Deg. Satn</th>
<th>Lane Util.</th>
<th>Average Delay</th>
<th>Level of Service</th>
<th>95% Back of Queue Dist</th>
<th>Lane Config</th>
<th>Lane Length ft</th>
<th>Cap. Adj. %</th>
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<td>Lane 1&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>5.9</td>
<td>LOS A</td>
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<td>1600</td>
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**Level of Service (LOS) Method: Delay & v/c (HCM 2010).**  
Roundabout LOS Method: Same as Sign Control.  
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.  
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).  
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).  
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.  
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

<sup>d</sup> Dominant lane on roundabout approach
### Intersection

| Int Delay, s/veh | 2.3 |

### Movement

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<thead>
<tr>
<th>Movement</th>
<th>EBT</th>
<th>EBR</th>
<th>WBL</th>
<th>WBT</th>
<th>NBL</th>
<th>NBR</th>
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<td>193</td>
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### Major/Minor

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<th>Major2</th>
<th>Minor1</th>
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<td>Mov Cap-2 Maneuver</td>
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### Approach

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### Minor Lane/Major Mvmt

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<th>EBR</th>
<th>WBL</th>
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