I–5 / SR–56 Interchange Project

Traffic Volumes and Operations Report

Volume 2 of 2

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Prepared for
Dokken Engineering

Prepared by
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Caltrans

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EXECUTIVE SUMMARY

Linscott, Law & Greenspan Engineers has been retained by Dokken Engineering to evaluate the potential traffic impacts due to the *I–5/SR-56 Interchange Project* in the City of San Diego. The following report was completed in preparation of a Project Report (PR) and will form the basis for the transportation section of the Environmental Document (ED). The project study area includes approximately 5.5 miles of I-5 between Carmel Mountain Road and Via de la Valle and 2.5 miles of SR-56 between I-5 and Carmel Valley Road. The scenarios and study area were determined in conjunction with Caltrans, City of San Diego and Dokken Engineering.

Currently, local streets and the surrounding communities experience increased demand and congestion during peak hours from I-5 and SR-56 traffic. The current network forces drivers to exit the freeway to travel between SB I-5 to EB SR-56 and WB SR-56 to NB I-5. This causes congestion at the El Camino Real and Carmel Valley Road intersections. A recent widening to the westbound SR-56 off-ramp at El Camino Real has improved current operations. During peak hours, in order to avoid traffic congestion at the I-5/SR-56 interchange, drivers use alternate routes including El Camino Real, Carmel Valley Road and Carmel Creek Road causing increased traffic on surface streets near the project area. The increased congestion negatively impacts the surrounding communities by increasing the traffic through neighborhoods. Continued regional development and inter-regional travel will further increase traffic volumes and reduce traffic operational quality.

The alternatives under consideration for the Interstate 5 (I-5)/ State Route 56 (SR-56) Interchange Project include the No Build, Auxiliary Lane (local street improvements), Direct Connector (new SB I-5 to EB SR 56 and WB SR 56 to NB I-5 connectors), Hybrid (only WB SR 56 to NB I-5 connector) and Hybrid with Flyover (WB SR 56 to NB I-5 connector and flyover from SB I-5 to EB SR 56). The description of each of these alternatives is discussed in Section 2.2 of this report.

Forecast volumes were developed for each of these alternatives for the interim year – Year 2015 and horizon year – Year 2030. LLG coordinated extensively with Caltrans, City of San Diego and Dokken Engineering regarding forecasting of traffic volumes.

Traffic Operational analyses were conducted for the project alternatives for the interim and horizon year scenarios. The report presents the results as per the *Highway Capacity Manual (HCM)* methodology for signalized and unsignalized intersections, freeway merge/diverge, ramp capacity analysis and weave locations. Street segments and freeway mainline segments were analyzed using a volume/capacity (V/C) method consistent with City of San Diego and Caltrans standards of practice, respectively. Finally, signalized intersections under Caltrans' jurisdiction were analyzed using the Intersecting Lane Vehicles (ILV) methodology required by Caltrans.

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5.0 ANALYSIS APPROACH AND METHODOLOGY

5.1 Approach

The analyses in this traffic study has been prepared to measure the operational effects of the "No Build", "Auxiliary Lane" (minimum build) condition, "Hybrid" (half-connector) and Direct Connectors for several scenarios ranging from interim (Year 2015) to horizon year (Year 2030). This comparison of "without" and "with" project allows for a determination of what, if any, impacts occur on the street system.

The following comparative analyses are included in this report:

- Existing vs. Year 2015 No Build and Year 2030 No Build
- Year 2015 No Build, Auxiliary Lane, Direct Connector, Hybrid and Hybrid with Flyover scenarios
- Year 2030 No Build, Auxiliary Lane, Direct Connector, Hybrid and Hybrid with Flyover scenarios

5.2 Level of Service and Significance Thresholds

Level of Service (LOS) is the term used to denote the different operating conditions which occur on a given roadway facility under various traffic volume loads. It is a qualitative measure used to describe a quantitative analysis taking into account factors such as roadway geometries, signal phasing, speed, travel delay, freedom to maneuver, and safety. Level of Service provides an index to the operational qualities of a roadway facility. Level of Service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. Additional categories of LOS F have been developed to identify varying degrees of congestion on freeway facilities. The "measures of effectiveness" (MOEs) represented by the Level of Service designation are reported differently for signalized and unsignalized intersections, as well as for local roadway segments, freeway segments, freeway merge and freeway diverge locations.

5.3 Analysis Methodology

The facilities in the study area network have been categorized as either "Urban Street Facilities" or "Freeway Facilities". The Urban Street Facilities include signalized and unsignalized intersection locations, and local Circulation Element streets within the local jurisdiction, the City of San Diego. The Freeway Facilities include the freeway mainline, merge and diverge locations, ramps and weaving sections within the jurisdiction of the State of California (Caltrans).

For the analysis, "LOS E or better" operations have been adopted as a performance goal for the Freeway Facilities against which the project operational impacts have been assessed. "LOS D or better" operations have been adopted as a performance goal for the Urban Street Facilities.

5.3.1 *Urban Street Facilities*

Street Segments

Street segment analysis is based upon the comparison of daily traffic volumes (ADTs) to the *City of San Diego's Roadway Classification and Level of Service table*. This table provides segment capacities for different street classifications, based on traffic volumes and roadway characteristics.

Signalized Intersections

Signalized intersections were analyzed under AM and PM peak hour conditions. Average vehicle delay was determined utilizing the methodology found in Chapter 16 of the *2000 Highway Capacity Manual (HCM),* with the assistance of the *Synchro* (version 6.0) computer software. The delay values (represented in seconds) were qualified with a corresponding intersection Level of Service.

Signalized intersection calculation worksheets and a more detailed explanation of the methodology are attached in ***Appendix A***.

Unsignalized Intersections

Unsignalized intersections were analyzed under AM and PM peak hour conditions. Average vehicle delay and Levels of Service was determined based upon the procedures found in Chapter 17 of the *2000 Highway Capacity Manual (HCM),* with the assistance of the *Synchro* (version 6.0) computer software.

Unsignalized intersection calculation worksheets and a more detailed explanation of the methodology are attached in *Appendix A.*

Caltrans ILV Analysis

Caltrans requires that State-owned intersections be analyzed using Intersecting Lane Vehicles (ILV) methodology as described in Chapter 400, Topic 406 of the Department Highway Design Manual. The ILV methodology is based on the concept that capacity of intersecting lanes of traffic is 1,500 vehicles per hour. For the typical local street interchange there is usually a critical intersection of a ramp and the crossroads that establishes the capacity of the interchange. ***Appendix B*** contains the Caltrans ILV calculation sheets.

5.3.2 *Freeway Facilities*

Mainline Sections/ Local Bypass Sections

Freeway segments (mainlines and local bypass) were analyzed during the AM and PM peak hours based on the methodologies as outlined in the SANTEC/ITE Guidelines accepted by Caltrans District 11. Freeway segment LOS is based on the volume to capacity ratio on the freeway. The freeway capacities used in the analysis include 2,000 vehicles/hour for a mainline lane and 1,200 vehicles/hour for an auxiliary lane.

The LOS thresholds for Freeway Sections based on LOS are shown in ***Table 5–1***.

TABLE 5–1
FREEWAY SEGMENTS LOS

LOS	V/C
A	<0.41
B	0.62
C	0.8
D	0.92
E	1.00
F(0)	1.25
F(1)	1.35
F(2)	1.45
F(3)	>1.46

LOS = Level of Service
V/C = Volume/Capacity
Source: SANTEC/ITE Guidelines

Merge/Diverge Sections

Merge/diverge ramp operations were analyzed under AM and PM peak hour conditions for various timeframes. Operational characteristics were reported utilizing the methodology found in Chapter 25 of the *2000 Highway Capacity Manual (HCM),* with the assistance of the *Highway Capacity Software* (version 4.1).

Levels of service in merge and diverge influence areas are defined in terms of density for all cases of stable operations (LOS A through E). The capacity of a merge section is determined primarily by the capacity of the downstream freeway segment. The total flow arriving on the upstream freeway segment and the on-ramp cannot exceed the basic freeway segment capacity of the departing downstream freeway segment. *Exhibit 25–7 of the Highway Capacity Manual (HCM 2000)* lists capacity flow rates for the total downstream freeway segment and maximum desirable flow entering the ramp influence area. LOS F is expected when the volume on the total downstream freeway exceeds capacity and queues form upstream from the merge segment regardless of the flow entering the ramp influence area.

In a diverge section, the total flow that can depart is generally limited by the capacity of the freeway lanes approaching the diverge. Failure (LOS F) at diverge sections is expected if the capacity of the upstream freeway segment is exceeded by the total arriving demand flow or due to the capacity of the downstream freeway segment exceeded by the proceeding downstream freeway flow. *Exhibit 25–14 of the Highway Capacity Manual (HCM 2000)* lists the capacity values for diverge areas.

Appendix C and Appendix D contains the HCM calculation sheets for the merge/diverge junctions.

Ramp Capacity Analysis

Ramp operations have been analyzed for various locations for different timeframes to determine operational characteristics under AM and PM peak hour conditions. Chapter 25 of the *2000*

Highway Capacity Manual (HCM) discusses operations of ramp-freeway junctions and characteristics of ramp roadway themselves. *Exhibit 25–3* in the HCM discusses the approximate capacity of ramp roadways as a function of free flow speed of ramp (mph) and number of lanes on the ramp tapering out to the intersection. Ramp operations are described as either "Over" or "Under" capacity. This analysis is used in conjunction with the freeway mainline analysis to determine whether specific merge/diverge junctions are failing because of poor mainline operations, or excessive volumes on the ramps themselves. This analysis also is used to measure whether the number of lanes proposed for a ramp is sufficient for the projected volumes.

Weave Analysis

Freeway weaving analysis operations have been analyzed for various locations for different timeframes. There were two methods that were utilized to determine weaving segment operations – 1965 Highway Capacity Manual LOS D Method and Chapter 24 of the *2000 Highway Capacity Manual (HCM),* with the assistance of the *Highway Capacity Software* (version 4.1).

Pages 234-238 of the 1965 Highway Capacity Manual (HCM) provide a method for determining the adequacy of weaving sections near single lane ramps. It is often referred to as the LOS D method. The LOS D method can be used to project volumes along a weaving section. These volumes can be compared to the capacities along the same weaving section.

Appendix E contains the HCM calculation sheets for the weave segments by the HCM 2000 method and 1965 HCM LOS D method.

On-Ramp Meter Analysis

There are two methods currently accepted by the City of San Diego to calculate ramp delays and queues, a *fixed rate* approach and a uniform *15-minute maximum delay* approach. The fixed rate approach is based solely on the specific time intervals at which the ramp meter is programmed to release traffic. The uniform 15-minute approach is based on the assumption that any demand exceeding 15-minutes will seek an alternative route or will choose to use the ramp during a less busy time period. Effectively, this approach considers the ramp demand to spread out spatially and temporally if the calculated meter delay is greater than 15-minutes. Hence, the ramp meter rate has been calculated based on a 15-minute delay at the on-ramp. The ramp meter analyses for this study have been conducted using both the methods. The ramp meter rates for the horizon Year 2030 were derived by Caltrans for the I-5 North Coast Project.

Appendix F contains the ramp meter analysis calculation worksheets for the different ramp meter locations.

Traffic Operations for Year 2015 and 2030 Improvement Alternatives

Operational analyses for this project were conducted for the different Year 2015 and Year 2030 scenarios for the different variations under each scenario (No EB slip off-ramp and/or barrier, collector-distributor). The operational analyses for the variations have been completed for Auxiliary Lane and Direct Connector to get a suitable comparison. The different types of analyses have been done only for the facilities under its "area of influence".

For example: "No EB Slip off ramp" affects only the following intersections. Therefore multiple rows of analysis are shown at these intersections only.

- 19. Carmel Country Road/ Carmel Creek Road
- 25. I-5 NB ramps/ Carmel Valley Road
- 26. Old El Camino Real/ Carmel Valley Road
- 29. El Camino Real/ SR-56 EB On-ramp
- 30. Carmel Creek Road/ SR 56 WB ramps
- 31. Carmel Creek Road/ SR 56 EB ramps
- 32. Carmel Country Road/ Carmel Canyon Road
- 33. Carmel Country Road/ SR 56 WB off-ramp
- 34. Carmel Country Road/ SR 56 EB ramps

The remaining analyses like freeway mainline/bypass operations, merge, diverge, weaving and ILV have all been completed based on the same methodology.

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6.0 EXISTING OPERATIONS

This section presents the existing conditions analyses for the different urban street and freeway facilities.

6.1 Urban Street Facilities

The following is a discussion of the existing signalized and unsignalized intersection operations, and the Circulation Element street segment operations in the study area. This includes both State-controlled intersections (ramp termini) and intersections within the City of San Diego's jurisdiction.

6.1.1 *Street Segments*

Table 7–1 shows the existing street segment operations. The following roadway segments are currently calculated to operate at LOS E or LOS F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between San Andres Drive to El Camino Real, LOS F
- Carmel Valley Road between Camino Del Mar and Sorrento Valley Road, LOS F
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F
- El Camino Real between Via de la Valle and San Dieguito Road, LOS F

6.1.2 *Signalized Intersections (HCM Methodology)*

Table 7–2 shows the existing intersection operations. The following intersections are currently calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- El Camino Real West/ Via de la Valle, LOS E – AM peak hour
- I-5 Northbound ramps/ Del Mar Heights Road, LOS F – PM peak hour
- Portofino Drive/ Carmel Valley Road, LOS E – PM peak hour
- I-5 Northbound ramps/ Carmel Valley Road, LOS E – PM peak hour
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS E – PM peak hour

6.1.3 *Signalized Intersections (ILV Methodology)*

Table 7–3 shows the existing ILV intersection operations. The following intersection is currently calculated to operate "over capacity" in the PM peak hour.

- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road – PM peak hour

6.2 Freeway Facilities

The following is a discussion of the existing freeway mainline, merge/diverge, ramp capacity, and freeway weaving operations in the study area.

6.2.1 *Freeway Mainline Operations*

Table 7–4 shows the existing freeway mainline operations. The following freeway segments along SR-56 are currently calculated to operate at LOS E or worse in at least one of the peak hours (AM/PM).

SR-56 Mainline:

- Between El Camino Real and Carmel Creek Road, LOS F(0) – AM (WB)
- Between Carmel Creek Road and Carmel Country Road, LOS F(0) – AM (WB)
- Between Carmel Country Road and Carmel Valley Road, LOS F(0) – AM (WB)

Even though the freeway analyses shows LOS D or better operations in the PM peak hour, LLG conducted field observations and observed EB SR 56 to operate at LOS F between El Camino Real and Carmel Country in the PM peak hour.

6.2.2 *Freeway Bypass Operations*

Table 7–5 shows the existing freeway bypass operations. The bypass segments are currently calculated to operate at LOS C or better in the peak hours (AM/PM).

6.2.3 *Freeway Weaving Section Operations*

Table 7–6 shows the existing freeway weaving operations based on HCM 2000 weaving method. The following weaving sections are currently calculated to operate at LOS F in at least one of the peak hours (AM/PM).

- SR-56 EB between El Camino Real and Carmel Creek Road (on the frontage road), LOS E – PM peak hour.
- SR-56 WB between Carmel Creek Road and El Camino Real, LOS F – AM peak hour.

Table 7–7 shows the existing freeway weaving operations based on the 1965 HCM LOS D weaving method. This table also shows similar results that the weaving sections on SR-56 WB and EB between Carmel Creek Road and El Camino Real are calculated to operate worse than LOS D in the AM and PM peak hours respectively.

6.2.4 *Merge Sections*

Tables 7–8 and 7–9 shows the existing freeway merge operations. The merge segments along I-5 are currently calculated to operate at LOS D or better in the peak hours (AM/PM). The following merge segment along SR-56 is currently calculated to operate at LOS F in the AM peak hour.

- On ramp from Carmel Valley Road to WB SR-56, LOS F – AM peak hour

6.2.5 *Diverge Sections*

Tables 7–10 and 7–11 shows the existing freeway diverge operations. The diverge segments along I-5 are currently calculated to operate at LOS D or better in the peak hours (AM/PM).

The following diverge segments along SR-56 are currently calculated to operate at LOS E or worse in the peak hours (AM/PM).

- Off ramp from EB SR-56 to Carmel Creek Road, LOS E – PM peak hour
- Off ramp from WB SR-56 to Carmel Creek Road, LOS F – AM peak hour
- Off ramp from WB SR-56 to Carmel Country Road, LOS E – AM peak hour
- Off ramp from WB SR-56 to Carmel Valley Road, LOS E – AM peak hour

6.2.6 *On-ramp Capacity Analysis*

Table 7–12 shows the existing on-ramp capacity analyses along I-5 and SR-56. All the on-ramps in the project study area are currently calculated to operate under capacity in the AM and PM peak hours.

6.2.7 *Off-ramp Capacity Analysis*

Table 7–13 shows the existing off-ramp capacity analyses along I-5 and SR-56. All the off-ramps in the project study area are currently calculated to operate under capacity in the AM and PM peak hours.

6.2.8 *Ramp Meter Operations*

Tables 7–14 and 7–15 shows the existing on ramp-meter analysis based on Fixed Rate Method and maximum 15-minute delay method. The following ramps are currently calculated to experience a delay of more than 15 minutes in the AM/PM peak hours.

- Carmel Mountain Road to NB I-5 – PM peak hour
- Del Mar Heights Road to NB I-5 – PM peak hour
- WB Del Mar Heights Road (loop ramp) to SB I-5 – AM and PM peak hours
- EB Via de la Valle (loop ramp) to NB I-5 – PM peak hour

- WB Via de la Valle (loop ramp) to SB I-5 – AM & PM peak hours
- EB Via de la Valle (direct ramp) to SB I-5 – AM peak hour
- Carmel Valley Road to WB SR-56 – AM peak hour

7.0 YEAR 2015 OPERATIONS

This section presents a comparative analysis of the interim (Year 2015) traffic operations for the No-Build (Model Run A), Auxiliary Lane (Model Run B), Direct Connector (Run C), Hybrid (Model Run D) and Hybrid with Flyover (Model Run D1) Alternatives. There were also several variation alternatives (elimination of the EB slip off- ramp to Carmel Creek Road and/or installation of a WB collector-distributor alternative) of Auxiliary Lane and Direct Connector scenarios that were analyzed. Tables in this section will present to the reader the LOS's for urban street and freeway facilities in the interim condition.

7.1 Urban Street Facilities

The following is a discussion of the interim signalized and unsignalized intersection operations, and the Circulation Element street segment operations in the study area. This includes both State-controlled intersections (ramp termini) and intersections within the City of San Diego's jurisdiction.

7.1.1 *Street Segments*

No Build (Run A) Alternative — *Table 7–1* shows the interim street segment operations. In the No Build (Run A), the following roadway segments are calculated to operate at LOS E or LOS F, as traffic volumes at these locations are higher than the capacity provided.

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Carmel Valley Road between I-5 and El Camino Real, LOS E
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar, south of Carmel Valley Road, LOS F

Auxiliary Lane (Run B) Alternative — Similar street segment operations were observed in the Auxiliary Lane Alternative. The same roadway segments that were calculated to operate at LOS E or LOS F in the No Build scenario are calculated to operate at LOS E or F in the Auxiliary Lane alternative.

The segment of Carmel Valley Road between I-5 and El Camino Real improves to LOS D in comparison to the No Build Alternative because of an addition of westbound through lane on Carmel Valley Road between El Camino Real and I-5 NB ramps.

Direct Connector (Run C) Alternative — The direct connectors remove the freeway-to-freeway traffic from the local streets along Del Mar Heights Road and Carmel Valley Road and improves the level of service in comparison with the No Build (Run A) and Auxiliary lane (Run B) alternatives.

The level of service in Year 2015 along the following roadway segments improves in the Direct Connector Alternative:

- Del Mar Heights Road between I-5 NB ramps and High Bluff Drive (LOS D to LOS C)
- Del Mar Heights Road between El Camino Real to Carmel Country Road (LOS B to LOS A)
- Carmel Valley Road between I-5 and El Camino Real (LOS E to LOS C)
- Carmel Creek Road between Carmel Country Road and Del Mar Trails Road (LOS B to LOS A)
- Carmel Country Road between Del Mar Heights Road and Townsgate Drive (LOS C to LOS B)
- Carmel Country Road between Townsgate Drive and Carmel Creek Road (LOS C to LOS B)

In the Direct Connector Alternative, the following roadway segments are calculated to operate at LOS E or F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar, south of Carmel Valley Road, LOS F

The above street segments are calculated to operate at LOS E or F in the No Build, Auxiliary Lane and Direct Connector Alternatives. The direct connectors maintain the same level of service along these roadway segments and do not degrade the level of service when compared to the No Build scenario.

Improvement Alternatives — Certain roadway segments were analyzed for the improvement alternatives for Auxiliary Lane (Run B) and Direct Connector (Run C) scenarios. The different variation alternatives include:

- No EB Slip off-ramp to Carmel Creek Road – *B(2) and C(2)*
- No EB Slip off-ramp to Carmel Creek Road and collector-distributor alternative (C-D) on WB SR-56 between Carmel Creek Road and El Camino Real – *C(5)*

No EB Slip off-ramp — With the elimination of the EB slip off-ramp in the Auxiliary lane Alternative B(2), the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS F.

- Carmel Valley Road between I-5 and El Camino Real, LOS F

With the elimination of the EB slip off-ramp in the Direct Connectors Alternative C(2), Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS C. The Direct Connectors removes the freeway-to-freeway traffic on Carmel Valley Road and El Camino Real.

- Carmel Valley Road between I-5 and El Camino Real (LOS F in *Auxiliary Lane B2 alternative* to LOS C in *Direct Connector C2 alternative*)

No EB slip off-ramp and with WB Collector-Distributor (C-D) Alternative — Even with the additional traffic on Carmel Valley Road due to the elimination of slip off-ramp to Carmel Creek Road and collector-distributor on WB SR 56, the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS C in this alternative.

Hybrid (Run D) Alternative — The Hybrid Alternative includes the WB SR 56 to I-5 NB direct connector and Auxiliary Lane improvements from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector), traffic from SB I-5 to EB SR 56 would still be forced to use Carmel Valley Road. Hence the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS E. The following roadway segments are calculated to operate at LOS E or F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Carmel Valley Road between I-5 and El Camino Real, LOS E
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F

Hybrid with Flyover (Run D1) Alternative — The Hybrid with Flyover Alternative includes the WB SR 56 to I-5 NB Direct Connector and a flyover ramp on Carmel Valley Road from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector) and a flyover ramp, traffic from SB I-5 to EB SR 56 would still be forced to use Carmel Valley Road. The following roadway segments are calculated to operate at LOS E or F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Carmel Valley Road between I-5 and El Camino Real, LOS E
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F

7.1.2 *Signalized Intersections (HCM Methodology)*

No Build (Run A) Alternative — ***Table 7–2*** shows the interim intersection operations. In the No Build (Run A) scenario, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Del Mar Heights Road, LOS E – AM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F – PM peak hour
- I-5 Southbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E – PM peak hour
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS F – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS E – AM peak hour

The intersections that have a substantial amount of delay in No Build (Run A) are along Carmel Valley Road, El Camino Real, Del Mar Heights Road and Carmel Country Road.

Auxiliary Lane (Run B) Alternative — Levels of Service remains generally constant at majority of the study area intersections between the Year 2015 No Build and Year 2015 Auxiliary lane Alternatives. In the Auxiliary lane Alternative (Run B), the level of service improves along the Carmel Valley Road intersections between I-5 and El Camino Real based on the intersection improvements discussed in Section 4.1.2.

The following intersections show an improved level of service in the Auxiliary Lane Alternative in comparison to the No Build scenario during the AM/PM peak hours:

- I-5 Southbound ramps/ Carmel Valley Road (LOS E improves to LOS D in the AM peak hour and intersection delay improves in the PM peak hour)
- I-5 Northbound ramps/ Carmel Valley Road (delay improves in the AM peak hour and LOS E improves to LOS D in the PM peak hour)
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road (delay improves in the AM and PM peak hours)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS D/F improves to LOS B/D in the AM/PM peak hours)

Direct Connector (Run C) Alternative — The direct connector removes a significant amount of traffic from the local street intersections along Del Mar Heights Road, Carmel Country Road and Carmel Valley Road. The following intersections show an improved level of service in the Direct Connectors (Run C) scenario in comparison with the No Build (Run A) scenario:

- I-5 Southbound ramps/ Del Mar Heights Road (LOS D/D improves to LOS C/C in the AM/PM peak hours)

- High Bluff Drive/ Del Mar Heights Road (LOS D/D improves to LOS C/C in the AM/PM peak hours)
- El Camino Real/ Del Mar Heights Road (LOS D improves to LOS C in the AM peak hour)
- I-5 Southbound ramps/ Carmel Valley Road (LOS E/F improves to LOS C/C in the AM/PM peak hours)
- I-5 Northbound ramps/ Carmel Valley Road (LOS D/E improves to LOS C/C in the AM/PM peak hours)
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road (LOS D improves to LOS C in the AM peak hour)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS D/F improves to LOS B/C in the AM/PM peak hours)

In the Direct Connector Alternative (Run C), the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Del Mar Heights Road, LOS E – AM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F– PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS E – AM peak hour

The above intersections are calculated to operate at LOS E or F in the No Build, Auxiliary Lane and Direct Connector Alternatives. The direct connectors maintain the same level of service and do not degrade the level of service when compared to the No Build scenario.

Improvement Alternatives — Certain intersections were analyzed for the improvement alternatives for Auxiliary Lane (Run B) and Direct Connectors (Run C) scenarios. The different variations include:

- No EB Slip off-ramp to Carmel Creek Road – *B(2) and C(2)*
- No EB Slip off-ramp to Carmel Creek Road and collector-distributor alternative (C-D) on WB SR-56 between Carmel Creek Road and El Camino Real – *C(5)*

No EB Slip off-ramp — With the elimination of the EB slip off-ramp in the Auxiliary Lane Alternative B(2), the following intersections are calculated to operate at LOS E or F:

- I-5 Southbound ramps/ Carmel Valley Road, LOS F – PM peak hour
- I-5 Northbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS F – PM peak hour

With the elimination of the EB slip-off ramp, traffic destined to exit Carmel Creek Road would be forced to use the I-5 NB mainline, exit Carmel Valley Road and travel through the El Camino Real/ Carmel Valley intersection to access Carmel Creek Road off-ramp. Hence the levels of service degrade along the Carmel Valley Road intersections.

With the elimination of the EB slip off-ramp in the Direct Connectors Alternative C(2), the following intersections show an improved level of service in the Direct Connectors C(2) scenario in comparison with the Auxiliary lane B(2)scenario:

- I-5 Southbound ramps/ Carmel Valley Road (LOS D/F improves to LOS C/C in the AM/PM peak hours)
- I-5 Northbound ramps/ Carmel Valley Road (LOS F/F improves to LOS D/D in the AM/PM peak hours)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS F improves to LOS D in the PM peak hour)
- Carmel Country Road/ SR-56 WB off- ramp (LOS D improves to LOS C in the AM peak hour)
- Carmel Country Road/ SR-56 EB ramps (LOS D improves to LOS C in the PM peak hour)

No EB slip off-ramp with WB Collector-Distributor (C-D) Alternative — With the EB slip off-ramp to Carmel Creek Road eliminated and the collector-distributor alternative on WB SR-56 between Carmel Creek Road and El Camino Real, majority of the intersections are calculated to operate at a similar level of service as in the No EB slip off-ramp (Run C2) scenario.

Hybrid (Run D) Alternative — In the Hybrid Alternative, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Del Mar Heights Road, LOS E – AM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F – PM peak hour
- I-5 Southbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E – AM and PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS F – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS E – AM peak hour

The Hybrid Alternative includes the WB SR 56 to I-5 NB direct connector ("half connector") and Auxiliary Lane improvements from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector), traffic from I-5 to SR 56 would be forced to use Carmel Valley Road. Hence the intersections along Carmel Valley Road are still calculated to operate at LOS E or F.

The following intersections show an improved level of service in the Hybrid Alternative in comparison to the Auxiliary lane Alternative during the AM/PM peak hours:

- El Camino Real West/ Via de la Valle (LOS D improves to LOS C in the PM peak hour)
- High Bluff Drive/ Del Mar Heights Road (LOS D improves to LOS C in the AM and PM peak hours)
- El Camino Real/ SR 56 WB off-ramp/ Carmel Valley Road (LOS D improves to LOS C in the AM peak hour)
- Carmel Creek Road/ SR 56 EB ramps (LOS D improves to LOS C in the AM peak hour)

Hybrid with Flyover (Run D1) Alternative — In the Hybrid with Flyover Alternative, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Del Mar Heights Road, LOS E – AM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F – PM peak hour
- I-5 Southbound ramps/ Carmel Valley Road, LOS E – PM peak hour
- I-5 Northbound ramps/ Carmel Valley Road, LOS E – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS E – AM peak hour

The Hybrid with Flyover Alternative includes the WB SR 56 to I-5 NB direct connector ("half connector") and a flyover ramp from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector) and a flyover ramp, traffic from I-5 to SR 56 would be forced to use Carmel Valley Road. The benefit of the flyover is for the SB I-5 to EB SR 56 traffic to use the "flyover" and bypass the El Camino Real intersection.

The following intersections show an improved level of service in the Hybrid with Flyover Alternative in comparison to the Auxiliary lane Alternative during the AM/PM peak hours:

- I-5 Southbound ramps/ Carmel Valley Road (LOS F improves to LOS E in the PM peak hour)
- I-5 Northbound ramps/ Carmel Valley Road (LOS F/E improves to LOS D/E in the AM and PM peak hours)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS F improves to LOS D in the PM peak hour)

7.1.3 *Signalized Intersections (ILV Methodology)*

No Build (Run A) Alternative — *Table 7–3* shows the interim ILV intersection operations. In the No Build (Run A) scenario, the following intersections are calculated to operate "over capacity" in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Via de la Valle
- I-5 Northbound ramps/ Del Mar Heights Road
- I-5 Southbound ramps/ Carmel Valley Road
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road
- Carmel Country Road/ SR-56 WB off- ramp

The intersections that are operating at "over" capacity in the No Build scenario is expected with the substantial increase in traffic volumes and intersection delay at Del Mar Heights Road and Carmel Valley Road on I-5, and the Carmel Country Road interchanges on SR-56.

Auxiliary Lane (Run B) Alternative — ILV operations remain generally constant at majority of the study area intersections between the Year 2015 No Build and Year 2015 Auxiliary lane Alternatives.

Direct Connector (Run C) Alternative — In the Direct Connector Alternative (Run C), the following intersections are calculated to operate "over capacity" in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Via de la Valle
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road

The direct connectors improve the ILV operations at the Del Mar Heights Road and Carmel Valley interchanges on I-5, and Carmel Country Road interchange on SR 56.

Hybrid (Run D) Alternative — *Table 7–3* shows the interim ILV intersection operations. In the Hybrid Alternative, the following intersections are calculated to operate "over capacity" in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Via de la Valle
- I-5 Southbound ramps/ Carmel Valley Road
- I-5 Northbound ramps/ Carmel Valley Road
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road

The ILV operations for the Hybrid Alternative improve in comparison to the Auxiliary Lane and No Build Alternatives because of the WB SR 56 to NB I-5 connector.

Hybrid with Flyover (Run D1) Alternative — *Table 7–3* shows the interim ILV intersection operations. In the Hybrid with Flyover Alternative, the following intersections are calculated to operate "over capacity" in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Via de la Valle
- I-5 Northbound ramps/ Carmel Valley Road
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road

The ILV operations for the Hybrid with Flyover Alternative improve in comparison the Auxiliary Lane and No Build Alternatives because of the proposed improvements at the I-5 SB and NB ramps/ Carmel Valley Road intersections.

7.2 Freeway Facilities

The following is a discussion of the interim freeway mainline, merge/diverge, ramp capacity, and freeway weaving operations in the study area.

7.2.1 *Freeway Mainline Operations*

No Build (Run A) Alternative — ***Table 7–4*** shows the interim freeway mainline operations. The following freeway segments are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

SR-56 Mainline:

- Between El Camino Real and Carmel Creek Road, LOS F(0) – AM (WB)
- Between Carmel Creek Road and Carmel Country Road, LOS F(0) – AM (WB)
- Between Carmel Creek Road and Carmel Country Road, LOS F(0) – PM (EB)
- Between Carmel Country Road and Carmel Valley Road, LOS F(1) – AM (WB)
- Between Carmel Country Road and Carmel Valley Road, LOS F(0) – PM (EB)
- East of Carmel Valley Road, LOS F(0) – AM (WB)
- East of Carmel Valley Road, LOS F(0) – PM (EB)

In the interim scenario (Year 2015), SR 56 configuration is assumed to be the same as existing (4 mainlines and no HOV lanes). Hence the levels of service degrade along WB SR 56 in the AM peak hour and EB SR 56 in the PM peak hour in comparison to the existing conditions. With the addition of the third mainline lane (SR 56 widening project), the level of service improve significantly in the long-term as shown in the Year 2030 freeway mainline operations.

Auxiliary Lane (Run B) Alternative — Levels of Service remains generally constant at majority of the freeway segments along I-5 between the Year 2015 No Build and Year 2015 Auxiliary lane Alternatives. In the Auxiliary lane Alternative (Run B), the freeway operations improve (LOS D improves to LOS C in the AM peak hour) along the SB I-5 (between Del Mar Heights Road and Carmel Valley Road)

Direct Connector (Run C) Alternative — The following freeway segments show an improved level of service in the Direct Connectors (Run C) scenario in comparison with the No Build (Run A) scenario:

SR-56 Mainline:

- Between El Camino Real and Carmel Creek Road (LOS F(0) improves to LOS D – AM (WB))
- Between Carmel Creek Road and Carmel Country Road (LOS F(0) improves to LOS C – AM (WB))
- Between Carmel Creek Road and Carmel Country Road (LOS F(0) improves to LOS C – PM (EB))

However, the following freeway segments are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

SR-56 Mainline:

- Between Carmel Country Road and Carmel Valley Road, LOS F(2) – AM (WB)
- Between Carmel Country Road and Carmel Valley Road, LOS F(1) – PM (EB)
- East of Carmel Valley Road, LOS F(0) – AM (WB)
- East of Carmel Valley Road, LOS F(0) – PM (EB)

Even with the variation alternatives (like No EB slip off-ramp to Carmel Creek Road and/or WB C-D system), the Direct Connectors Alternative shows better freeway operations in comparison to the Auxiliary Lane Alternative.

Hybrid (Model Run D) Alternative — The following freeway segments are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

SR-56 Mainline:

- Between Carmel Creek Road and Carmel Country Road, LOS F(0) – PM (EB)
- Between Carmel Country Road and Carmel Valley Road, LOS F(2) – AM (WB)
- Between Carmel Country Road and Carmel Valley Road, LOS F(0) – PM (EB)
- East of Carmel Valley Road, LOS F(0) – AM (WB)
- East of Carmel Valley Road, LOS F(0) – PM (EB)

Hybrid with Flyover (Run D1) Alternative — Because of the flyover in the SB I-5 to EB SR 56 direction, the downstream freeway operations in the Hybrid with Flyover Alternative are similar to

the Direct Connector Alternative. The following freeway segments are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

SR-56 Mainline:

- Between Carmel Country Road and Carmel Valley Road, LOS F(2) – AM (WB)
- Between Carmel Country Road and Carmel Valley Road, LOS F(0) – PM (EB)
- East of Carmel Valley Road, LOS F(0) – AM (WB)
- East of Carmel Valley Road, LOS F(0) – PM (EB)

In the interim scenario (Year 2015), SR 56 configuration is assumed to be the same as existing (4 mainlines and no HOV lanes). Hence the levels of service along WB SR 56 in the AM peak hour and EB SR 56 in the PM peak hour are calculated to operate at LOS F or worse. With the addition of the third mainline lane (SR 56 widening project), the levels of service improve significantly in the long-term as shown in the Year 2030 freeway mainline operations.

7.2.2 *Freeway Bypass Operations*

No Build (Run A) Alternative — *Table 7–5* shows the interim freeway bypass operations for the Year 2015 conditions. The bypass segments are calculated to operate at LOS D or better in the AM/PM peak hours.

Auxiliary Lane (Run B) Alternative — Levels of Service remain generally constant at all the local bypass segments along I-5 between the Year 2015 No Build and Year 2015 Auxiliary Lane Alternative.

Direct Connector (Run C) Alternative — In the Direct Connector Alternative (Run C), the bypass segments are calculated to operate at LOS D or better in the AM/PM peak hours.

Hybrid (Run D) Alternative — The bypass segments along I-5 are calculated to operate at LOS D or better in the Hybrid Alternative.

Hybrid with Flyover (Run D1) Alternative — The bypass segments along I-5 are calculated to operate at LOS D or better in the Hybrid Alternative.

7.2.3 *Freeway Weaving Section Operations*

No Build (Run A) Alternative — *Table 7–6* shows the interim freeway weaving operations based on HCM 2000 weaving method. The following weaving sections are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

- SR-56 EB between El Camino Real and Carmel Creek Road (on the frontage road), LOS F – PM peak hour

- SR-56 WB between Carmel Creek Road and El Camino Real, LOS F – AM peak hour.

Auxiliary Lane (Run B) Alternative — Even with the addition of auxiliary lanes, the measures of effectiveness like speed, densities and levels of service remain generally constant at all the weaving sections between the Year 2015 No Build and Year 2015 Auxiliary lane Alternatives.

Direct Connector (Run C) Alternative — In the Direct Connector Alternative (Run C), the following weaving segments are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

- SR-56 EB between El Camino Real and Carmel Creek Road (on the frontage road), LOS F – PM peak hour.

The level of service for weaving section of SR-56 EB between Carmel Creek Road and Carmel Country Road improves from LOS E (in the No Build and Auxiliary lane scenarios) to LOS C (in the Direct Connectors scenario).

Year 2015 Improvement Alternatives — The weaving sections of SR-56 EB and WB between El Camino Real and Carmel Creek Road are calculated to operate at LOS E or worse. The speed and densities along these weaving sections degrade in the Year 2015 No Build (Run A) and Year 2015 Auxiliary Lane Alternatives from the Year 2015 Direct Connectors (Run C) scenario. Because of these failing weaving sections in the Year 2015 scenarios, the following improvement alternatives were developed:

- Elimination of the EB slip off-ramp to Carmel Creek Road (thereby eliminating the weaving section on SR-56 EB between El Camino Real and Carmel Creek Road) – *B(2) and C(2)*
- Elimination of the EB slip off-ramp to Carmel Creek Road and collector-distributor (C-D) alternative on WB SR-56 between Carmel Creek Road and El Camino Real – *C(5)*

By eliminating the EB slip off-ramp to Carmel Creek Road, the deficient weaving section is eliminated. However, these restrictions force traffic to use the Carmel Valley and El Camino Real interchanges, thereby degrading the LOS on the local street segments and intersections along Carmel Valley Road as shown in *Table 7–2* and *Table 7–3*.

The collector-distributor alternative was developed to eliminate the weaving maneuver of the vehicles entering the loop ramp at Carmel Creek Road onto WB SR-56 to go I-5 SB. This weaving maneuver would require 3-lane changes in a short distance and also includes a great speed differential. Hence this collector-distributor system would allow vehicles entering the loop ramp at Carmel Creek Road onto WB SR-56 to travel NB on I-5 and restrict them from traveling on SB I-5. Vehicles intending to go I-5 SB from Carmel Creek loop on-ramp would use the I-5/Carmel Valley interchange.

The collector-distributor alternative would include installation of a barrier separating the I-5 SB traffic from the I-5 NB traffic on WB SR-56. The barrier would start just upstream of the Carmel Creek loop ramp creating a collector-distributor roadway system between Carmel Creek Road and El Camino Real. Vehicles intending to go I-5 NB from WB SR-56 would use the collector-distributor system.

However, this collector-distributor alternative creates a weaving section of vehicles on WB SR-56 exiting at El Camino Real and vehicles entering Carmel Creek loop-ramp intending to go I-5 NB. This weaving section is calculated to operate at LOS D or better in the AM/PM peak hours.

Table 7–7 shows the long-term freeway weaving operations for the Year 2015 conditions based on the 1965 HCM LOS D weaving method. This table also shows similar results that the weaving sections on SR-56 EB and/or WB between Carmel Creek Road and El Camino Real are calculated to operate worse than LOS E in No Build (Run A), Auxiliary Lane (Run B), Direct Connectors (Run C) and Hybrid (Run D) scenarios in the AM/PM peak hours.

Hybrid (Run D) Alternative — *Table 7–6* and *Table 7–7* shows the interim freeway weaving operations based on HCM 2000 weaving method and LOS D weaving method. The weaving sections are calculated to operate at LOS C or better in the Hybrid Alternative with the exception of EB SR 56 between Carmel Creek Road and Country Road, which is calculated to operate at LOS F in the PM peak hour.

Hybrid with Flyover (Run D1) Alternative — *Table 7–6 and Table 7–7* shows the interim freeway weaving operations based on HCM 2000 weaving method and LOS D weaving method. The weaving sections are calculated to operate at LOS C or better in the Hybrid with Flyover Alternative.

7.2.4 *Merge Sections*

No Build (Run A) Alternative — ***Tables 7–8 and 7–9*** shows the interim freeway merge operations along I-5 and SR 56. In the No Build (Run A) scenario, the following merge segments are calculated to operate at LOS F in at least one of the peak hours (AM/PM).

I-5:

- On ramp from Carmel Valley Road to mainline SB I-5, LOS F – AM peak hour

SR-56:

- On ramp from Carmel Country Road to EB SR-56, LOS F – PM peak hour
- On ramp from Carmel Valley Road to WB SR-56, LOS F – AM peak hour
- On ramp from Carmel Valley Road to EB SR-56, LOS F – PM peak hour

Auxiliary Lane (Run B) Alternative — In the Auxiliary lane (Run B) scenario, the majority of the freeway merge segments show similar operations as in the No Build (Run A) scenario. The addition of auxiliary lanes on SB I-5 (between Del Mar Heights Road and Carmel Valley Road) and WB SR

56 (between Carmel Country Road and Carmel Creek Road) improves downstream freeway mainline operations.

Direct Connector (Run C) Alternative — In the Direct Connector Alternative (Run C), the following merge segments are calculated to operate at LOS F in at least one of the peak hours (AM/PM).

I-5:

- On ramp from Carmel Valley Road to mainline SB I-5, LOS F – AM peak hour

SR-56:

- On ramp from Carmel Country Road to EB SR-56, LOS F – PM peak hour
- On ramp from Carmel Valley Road to WB SR-56, LOS F – AM peak hour
- On ramp from Carmel Valley Road to EB SR-56, LOS F – PM peak hour

Hybrid (Run D) Alternative — In the Hybrid (Run D) scenario, the following merge segments are calculated to operate at LOS F in the AM/PM peak hours.

I-5:

- On ramp from Carmel Valley Road to mainline SB I-5, LOS F – AM peak hour

SR-56:

- On ramp from Carmel Country Road to EB SR-56, LOS F – PM peak hour
- On ramp from Carmel Valley Road to WB SR-56, LOS F – AM peak hour
- On ramp from Carmel Valley Road to EB SR-56, LOS F – PM peak hour

Hybrid with Flyover (Run D1) Alternative — The merge analyses for the Hybrid with Flyover alternative is similar to the Direct Connector alternative. In the Hybrid with Flyover alternative (Run D1) scenario, the following merge segments are calculated to operate at LOS F in the AM/PM peak hours.

I-5:

- On ramp from Carmel Valley Road to mainline SB I-5, LOS F – AM peak hour

SR-56:

- On ramp from Carmel Country Road to EB SR-56, LOS F – PM peak hour
- On ramp from Carmel Valley Road to WB SR-56, LOS F – AM peak hour
- On ramp from Carmel Valley Road to EB SR-56, LOS F – PM peak hour

In the interim scenario (Year 2015), SR 56 configuration is assumed to be the same as existing (4 mainlines and no HOV lanes). Hence the levels of service for the merge segments along SR 56 are calculated to operate at LOS F or worse. With the addition of the third mainline lane (SR 56 widening project), the levels of service for the downstream mainline facilities improve significantly in the long-term as shown in the Year 2030 freeway merge operations.

7.2.5 *Diverge Sections*

No Build (Run A) Alternative — ***Tables 7–10 and 7–11*** shows the interim freeway diverge operations. In the No Build (Run A) scenario, the following diverge segments are calculated to operate at LOS F in at least one of the peak hours (AM/PM).

I-5:

- Off ramp from mainline SB I-5 to local bypass SB I-5, LOS F – AM peak hour

SR-56:

- Off ramp from WB SR-56 to Carmel Creek Road – AM peak hour
- Off ramp from WB SR-56 to Carmel Country Road – AM peak hour
- Off ramp from WB SR-56 to Carmel Valley Road – AM peak hour

Auxiliary Lane (Run B) Alternative — In the Auxiliary Lane (Run B) scenario, the majority of the freeway diverge segments show similar operations as in the No Build (Run A) scenario. The addition of auxiliary lanes on SB I-5 (between Del Mar Heights Road and Carmel Valley Road) and WB SR 56 (between Carmel Country Road and Carmel Creek Road) improves downstream freeway and diverge operations.

The following diverge sections are calculated to operate at LOS F in the Auxiliary Lane scenario:

I-5:

- Off ramp from mainline SB I-5 to local bypass SB I-5, LOS F – AM peak hour

SR-56:

- Off ramp from WB SR-56 to Carmel Country Road – AM peak hour
- Off ramp from WB SR-56 to Carmel Valley Road – AM peak hour

Direct Connector (Run C) Alternative — The level of service improves in the Direct Connector Alternative in comparison to the No Build (Run A) and Auxiliary lane (Run B) alternatives.

The following diverge sections are calculated to operate at LOS F in the Direct Connector scenario:

SR-56:

- Off ramp from EB SR-56 to Carmel Valley Road – PM peak hour
- Off ramp from WB SR-56 to Carmel Country Road – AM peak hour

- Off ramp from WB SR-56 to Carmel Valley Road – AM peak hour

Hybrid (Run D) Alternative — *Tables 7–10 and 7–11* shows the interim freeway diverge operations. In the Hybrid Alternative, the following diverge segments are calculated to operate at LOS F in at least one of the peak hours (AM/PM).

I-5:

- Off ramp from mainline SB I-5 to local bypass SB I-5, LOS F – AM peak hour

SR-56:

- Off ramp from WB SR-56 to Carmel Country Road – AM peak hour
- Off ramp from WB SR-56 to Carmel Valley Road – AM peak hour

Hybrid with Flyover (Run D1) Alternative — The diverge analyses for the Hybrid with Flyover Alternative is similar to the Direct Connector Alternative. *Tables 7–10 and 7–11* shows the interim freeway diverge operations. The following diverge segments are calculated to operate at LOS F in at least one of the peak hours (AM/PM).

I-5:

- Off ramp from mainline SB I-5 to local bypass SB I-5, LOS F – AM peak hour

SR-56:

- Off ramp from WB SR-56 to Carmel Country Road – AM peak hour
- Off ramp from WB SR-56 to Carmel Valley Road – AM peak hour

In the interim scenario (Year 2015), SR 56 configuration is assumed to be the same as existing (4 mainlines and no HOV lanes). Hence the levels of service for the diverge segments along SR 56 are calculated to operate at LOS F or worse. With the addition of the third mainline lane (SR 56 widening project), the levels of service for the downstream mainline facilities improve significantly in the long-term as shown in the Year 2030 freeway diverge operations.

7.2.6 *On-ramp Capacity Analysis*

Table 7–12 shows the long-term on-ramp capacity analysis along I-5 and SR-56 for the Year 2015 conditions. All the on-ramps in the project study area are calculated to operate under capacity in the AM and PM peak hour in the No Build (Run A), Auxiliary Lane (Run B), Direct Connector (Run C) Hybrid (Run D) and Hybrid with Flyover (Run D1) scenarios.

7.2.7 *Off-ramp Capacity Analysis*

Table 7–13 shows the interim off-ramp capacity analysis along I-5 and SR-56 for the Year 2015 conditions. All the off-ramps in the project study area are calculated to operate under capacity in the AM and PM peak hour in the No Build (Run A), Auxiliary Lane (Run B), Direct Connector (Run C), Hybrid (Run D) and Hybrid with Flyover (Run D1) scenarios.

7.2.8 *Ramp Meter Operations*

No Build (Run A) Alternative — ***Table 7–14*** shows the interim on ramp-meter analysis for the Year 2015 conditions based on Fixed Rate Method. In the No Build (Run A), the following ramp is calculated to experience a delay of more than 15 minutes in the AM/PM peak hours.

- Carmel Valley Road on-ramp to NB I-5 – AM and PM peak hours

Auxiliary Lane (Run B) Alternative — In the Auxiliary lane (Run B) scenario, majority of the on-ramps show similar ramp meter operations as in the No Build (Run A) scenario.

Direct Connector (Run C) Alternative — ***Table 7–15*** shows the on ramp-meter analysis for the Year 2015 conditions based on 15-minute Maximum Delay Method. The uniform 15-minute approach is based on the assumption that any demand experiencing a delay exceeding 15-minutes will seek an alternative route or will choose to use the ramp during a less busy time period. Effectively, this approach considers the ramp demand to spread out spatially and temporally if the calculated meter delay is greater than 15-minutes. Hence, the ramp meter rate was calculated based on a 15-minute delay at the on-ramp. This table also shows similar results like the Fixed Rate method. In the No Build (Run A) and Auxiliary lane (Run B) scenarios, Carmel Valley Road on-ramp to NB I-5 is calculated to experience a delay of more than 15 minutes in the AM/PM peak hours. In the Direct Connector Alternative, the Carmel Valley Road on-ramp to NB I-5 is calculated to experience a delay of less than 15 minutes.

Hybrid (Run D) Alternative — The ramp meter operations for the Hybrid Alternative are similar to the Direct Connector in the WB SR 56 to NB I-5 direction and to the Auxiliary Lane Alternative in the SB I-5 to EB SR 56 direction. *Table 7–14 and 7–15* shows that majority of the ramps are calculated to experience a delay of less than 15 minutes.

Hybrid with Flyover (Run D1) Alternative — The ramp meter operations for the Hybrid with Flyover Alternative are similar to the Hybrid Alternative. *Table 7–14 and 7–15* show that the majority of the on-ramps are calculated to experience a delay of less than 15 minutes.

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TABLE 7–1
EXISTING AND YEAR 2015 STREET SEGMENT OPERATIONS

Segment	Existing					General Plan Classification	Capacity (LOS E)	No Build (Run A)			Auxiliary Lane Alternative (Run B)			Direct Connector Alternative (Run C)			Hybrid and Hybrid with Flyover Alternatives (Run D and D1)		
	Functional Classification	Capacity[a] (LOS E)	Volume	V/C[b]	LOS[c]			Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]
Via De La Valle																			
Jimmy Durante Blvd to I-5 SB Ramps	4-lane Major	40,000	42,510	1.063	**F**	4-lane Major	40,000	46,000	1.150	**F**	46,000	1.150	**F**	46,000	1.150	**F**	46,000	1.150	**F**
I-5 NB Ramps to San Andres Drive	4-lane Major	40,000	31,700	0.793	D	4-lane Major	40,000	36,970	0.924	**E**	36,970	0.924	**E**	36,090	0.902	**E**	36,490	0.912	**E**
San Andres Drive to El Camino Real	2-lane Collector	8,000	26,180	3.273	**F**	4-lane Major	40,000	28,280	0.707	C	28,280	0.707	C	27,400	0.685	C	27,800	0.695	C
Del Mar Heights Road																			
Camino Del Mar to Mango Drive	4-lane Major	40,000	22,800	0.570	C	4-lane Major	40,000	28,500	0.713	C	28,500	0.713	C	28,500	0.713	C	28,500	0.713	C
Mango Drive to Portofino Drive	4-lane Major	40,000	32,320	0.808	D	4-lane Major	40,000	36,000	0.900	**E**	36,000	0.900	**E**	36,000	0.900	**E**	36,000	0.900	**E**
I-5 NB Ramps to High Bluff Drive	6-lane Prime	60,000	42,930	0.716	C	6-lane Prime	60,000	54,910	0.915	D	54,910	0.915	D	47,000	0.783	C	50,620	0.844	D
High Bluff Drive to El Camino Real	6-lane Prime	60,000	33,200	0.553	B	6-lane Prime	60,000	43,640	0.727	C	43,640	0.727	C	37,200	0.620	C	40,150	0.669	C
El Camino Real to Carmel Country Road	6-lane Prime	60,000	19,100	0.318	A	6-lane Prime	60,000	31,440	0.524	B	31,440	0.524	B	25,000	0.417	A	27,950	0.466	B
Carmel Country Road to Carmel Canyon Road	6-lane Prime	60,000	18,600	0.310	A	6-lane Prime	60,000	24,670	0.411	A	24,670	0.411	A	23,200	0.387	A	23,870	0.398	A
Carmel Canyon Road to Carmel Valley Road	6-lane Prime	60,000	28,910	0.482	B	6-lane Prime	60,000	33,470	0.558	B	33,470	0.558	B	31,800	0.530	B	32,470	0.541	B
Townsgate Drive																			
El Camino Real to Carmel Country Road	2-lane Collector	8,000	5,800	0.725	D	2-lane Collector	8,000	6,000	0.750	D	6,000	0.750	D	6,000	0.750	D	6,000	0.750	D
Valley Center Drive																			
El Camino Real to Carmel Creek Road	4-lane Major	40,000	17,470	0.437	B	4-lane Major	40,000	18,500	0.463	B	18,500	0.463	B	18,500	0.463	B	18,920	0.473	B
Carmel Valley Road																			
Camino Del Mar to Sorrento Valley Road	2-lane Collector	8,000	11,100	1.388	**F**	4-lane Major	40,000	15,020	0.376	B	15,020	0.376	B	15,020	0.376	B	15,020	0.376	B
Sorrento Valley Road to I-5	4-lane Major	40,000	13,900	0.348	A	4-lane Major	40,000	16,200	0.405	B	16,200	0.405	B	16,200	0.405	B	16,200	0.405	B
I-5 to El Camino Real:	6-lane Prime	60,000	43,000	0.717	C	6-lane Prime	60,000	57,510	0.959	**E**	57,510[f]	0.885	D	37,000[f]	0.569	C	61,000[f]	0.938	**E**
B2: No EB slip off-ramp, no WB barrier[d]	-	-	-	-	-	7-lane Prime	65,000	-	-	-	65,390[e]	1.006	**F**	-	-	-	-	-	-
C2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	7-lane Prime	65,000	-	-	-	-	-	-	*44,880*[e]	*0.690*	*C*	-	-	-
C5: No EB slip off-ramp, with WB C-D system	-	-	-	-	-	7-lane Prime	65,000	-	-	-	-	-	-	*51,620*[g]	*0.794*	*C*	-	-	-
Carmel Mountain Road																			
Sorrento Valley Road to I-5 SB Ramps	4-lane Major	40,000	9,330	0.233	A	4-lane Major	40,000	14,600	0.365	A	14,600	0.365	A	14,600	0.365	A	14,600	0.365	A
I-5 NB Ramps to Vista Sorrento Pkwy	6-lane Prime	60,000	22,820	0.380	A	6-lane Prime	60,000	27,000	0.450	B	27,000	0.450	B	27,000	0.450	B	27,000	0.450	B
Vista Sorrento Pkwy to Carmel Mountain Road	6-lane Prime	60,000	20,600	0.343	A	6-lane Prime	60,000	24,100	0.402	A	24,100	0.402	A	24,100	0.402	A	24,100	0.402	A
Camino Del Mar																			
Del Mar Heights Road to Carmel Valley Road	3-lane Collector	15,000	22,600	1.507	**F**	3-lane Collector	15,000	26,000	1.733	**F**	26,000	1.733	**F**	26,000	1.733	**F**	26,000	1.733	**F**
South of Carmel Valley Road	2-lane Collector	10,000	20,720	2.072	**F**	2-lane Collector	10,000	21,500	2.150	**F**	21,500	2.150	**F**	21,500	2.150	**F**	21,500	2.150	**F**
Portofino Drive																			
Del Mar Heights Road to Carmel Valley Road	2-lane Collector	8,000	2,100	0.263	A	2-lane Collector	8,000	2,500	0.313	A	2,500	0.313	A	2,500	0.313	A	2,500	0.313	A
High Bluff Drive																			
Del Mar Heights Road to El Camino Real	4-lane Major	40,000	10,140	0.254	A	4-lane Major	40,000	14,270	0.357	A	14,270	0.357	A	12,800	0.320	A	13,470	0.337	A

TABLE 7–1 *continued*
EXISTING AND YEAR 2015 STREET SEGMENT OPERATIONS

Segment	Existing					General Plan Classification	Capacity (LOS E)	No Build (Run A)			Auxiliary Lane Alternative (Run B)			Direct Connector Alternative (Run C)			Hybrid and Hybrid with Flyover Alternatives (Run D and D1)		
	Functional Classification	Capacity[a] (LOS E)	Volume	V/C[b]	LOS[c]			Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]
El Camino Real																			
Via de la Valle to San Dieguito Road	2-lane Collector	10,000	23,200	2.320	F	4-lane Major	40,000	28,030	0.701	C	28,030	0.701	C	27,150	0.679	C	27,550	0.689	C
San Dieguito Road to Del Mar Heights Road	4-lane Major	40,000	24,400	0.610	C	4-lane Major	40,000	26,500	0.663	C	26,500	0.663	C	26,500	0.663	C	26,500	0.663	C
Del Mar Heights Road to Townsgate Drive	6-lane Major	50,000	16,600	0.332	A	6-lane Major	50,000	19,500	0.390	A	19,500	0.390	A	19,500	0.390	A	19,500	0.390	A
Townsgate Drive to High Bluff Drive	6-lane Major	50,000	24,100	0.482	B	6-lane Major	50,000	25,000	0.500	B	25,000	0.500	B	25,000	0.500	B	25,000	0.500	B
High Bluff Drive to Valley Center Drive	6-lane Major	50,000	24,300	0.486	B	6-lane Major	50,000	30,470	0.609	C	30,470	0.609	C	29,000	0.580	C	29,670	0.593	C
Valley Center Drive to Carmel Valley Road	6-lane Major	50,000	29,800	0.596	C	6-lane Major	50,000	36,470	0.729	C	36,470	0.729	C	35,000	0.700	C	36,090	0.722	C
B2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	6-lane Major	50,000	-	-	-	-	-	-	-	-	-	-	-	-
C2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	6-lane Major	50,000	-	-	-	-	-	-	*35,000*	*0.700*	*C*	-	-	-
C5: No EB slip off-ramp, with WB C-D system	-	-	-	-	-	6-lane Major	50,000	-	-	-	-	-	-	*35,420*	*0.708*	*C*			
Carmel Valley Road to Carmel Mountain Road	6-lane Major	50,000	25,900	0.518	B	6-lane Major	50,000	26,800	0.536	B	26,800	0.536	B	26,800	0.536	B	26,800	0.536	B
Carmel Creek Road																			
Carmel Country Road to Del Mar Trails Road	4-lane Major	40,000	14,370	0.359	A	4-lane Major	40,000	15,180	0.380	B	15,180	0.380	B	14,600	0.365	A	13,450	0.336	A
B2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	*14,600*	*0.365*	*A*	-	-	-	-	-	-
C2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*14,020*	*0.351*	*A*	-	-	-
C5: No EB slip off-ramp, with WB C-D system	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*13,180*	*0.330*	*A*			
Del Mar Trails Road to Valley Center Drive	4-lane Major	40,000	12,400	0.207	A	4-lane Major	40,000	13,380	0.335	A	13,380	0.335	A	12,800	0.320	A	10,790	0.270	A
B2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	*12,360*	*0.309*	*A*	-	-	-	-	-	-
C2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*11,780*	*0.295*	*A*	-	-	-
C5: No EB slip off-ramp, with WB C-D system	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*10,520*	*0.263*	*A*	-	-	-
Carmel Country Road																			
Del Mar Heights Road to Townsgate Drive	4-lane Major	40,000	14,170	0.354	A	4-lane Major	40,000	21,570	0.539	C	21,570	0.539	C	16,600	0.415	B	18,880	0.472	B
Townsgate Drive to Carmel Creek Road	4-lane Major	40,000	13,400	0.335	A	4-lane Major	40,000	21,470	0.537	C	21,470	0.537	C	16,500	0.413	B	18,780	0.470	B
Carmel Creek Road to Del Mar Trails Road	4-lane Major	40,000	9,000	0.225	A	4-lane Major	40,000	13,590	0.340	A	13,590	0.340	A	9,200	0.230	A	12,630	0.316	A
B2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	*14,170*	*0.354*	*A*	-	-	-	-	-	-
C2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*9,780*	*0.245*	*A*	-	-	-
C5: No EB slip off-ramp, with WB C-D system	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*10,620*	*0.266*	*A*	-	-	-
Del Mar Trails Road to SR-56 WB Ramps	4-lane Major	40,000	19,370	0.484	B	4-lane Major	40,000	26,990	0.675	C	26,990	0.675	C	22,600	0.565	C	26,890	0.672	C
B2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	*28,010*	*0.700*	*C*	-	-	-	-	-	-
C2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*23,620*	*0.591*	*C*	-	-	-
C5: No EB slip off-ramp, with WB C-D system	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*24,880*	*0.622*	*C*			

TABLE 7–1
EXISTING AND YEAR 2015 STREET SEGMENT OPERATIONS

Segment	Existing					General Plan Classification	Capacity (LOS E)	No Build (Run A)			Auxiliary Lane Alternative (Run B)			Direct Connector Alternative (Run C)			Hybrid and Hybrid with Flyover Alternatives (Run D and D1)		
	Functional Classification	Capacity[a] (LOS E)	Volume	V/C[b]	LOS[c]			Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]
Carmel Canyon Road																			
Del Mar Heights Road to Carmel Country Road	4-lane Major	40,000	3,800	0.095	A	4-lane Major	40,000	4,500	0.113	A	4,500	0.113	A	4,500	0.113	A	4,500	0.113	A
Carmel Country Road to Carmel Creek Road	2-lane Collector	8,000	3,760	0.470	C	2-lane Collector	8,000	4,100	0.513	C	4,100	0.513	C	4,100	0.513	C	4,520	0.565	C
B2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	2-lane Collector	8,000	-	-	-	4,680	0.585	C	-	-	-	-	-	-
C2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	2-lane Collector	8,000	-	-	-	-	-	-	*4,680*	*0.585*	*C*	-	-	-
C5: No EB slip off-ramp, with WB C-D system	-	-	-	-	-	2-lane Collector	8,000	-	-	-	-	-	-	*4,520*	*0.565*	*C*			
Carmel Valley Road																			
Del Mar Heights Road to SR-56 WB Ramps	4-lane Major	40,000	26,530	0.663	C	4-lane Major	40,000	29,770	0.744	C	29,770	0.744	C	29,180	0.730	C	29,850	0.746	C

Footnotes:

a. Capacities based on City of San Diego's Roadway Classification & LOS table.
b. Volume to Capacity ratio.
c. Level of Service.
d. This segment ADT refers to the condition where EB slip off-ramp to Carmel Creek Road is maintained and no barrier is installed on WB SR-56 between Carmel Country Road and Carmel Creek Road.
e. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
f. Carmel Valley Road is analyzed as a 7-lane Primary Arterial (three EB lanes and four WB lanes) in the Auxiliary Lane and Direct Connectors alternatives in Year 2015 (and its variations).
g. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56. This scenario also assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.

General Notes:

Bold typeface shows segments operating at LOS E or F.

TABLE 7–2
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
1) I–5 Southbound Ramps/ Via De La Valle *Traffic Signal*	*Existing*	15.1	B	14.4	B
	A: No Build	28.0	C	16.2	B
	B: Auxiliary Lane Alternative	28.0	C	16.2	B
	C: Direct Connector Alternative	26.9	C	16.1	B
	D: Hybrid Alternative	28.0	C	16.2	B
	D1: Hybrid with Flyover Alternative	28.0	C	16.2	B
2) I–5 Northbound Ramps/ Via De La Valle *Traffic Signal*	*Existing*	18.8	B	20.8	C
	A: No Build	23.1	C	31.2	C
	B: Auxiliary Lane Alternative	23.1	C	31.2	C
	C: Direct Connector Alternative	23.0	C	28.2	C
	D: Hybrid Alternative	23.1	C	28.6	C
	D1: Hybrid with Flyover Alternative	23.1	C	28.6	C
3) El Camino Real West/ Via De La Valle *Traffic Signal*	*Existing*	**71.0**	**E**	46.8	D
	A: No Build	35.0	C	35.9	D
	B: Auxiliary Lane Alternative	35.0	C	35.9	D
	C: Direct Connector Alternative	34.4	C	28.8	C
	D: Hybrid Alternative	34.9	C	29.0	C
	D1: Hybrid with Flyover Alternative	34.9	C	29.0	C
4) El Camino Real/ San Dieguito Road *Traffic Signal*	*Existing*	18.2	B	28.1	C
	A: No Build	18.0	B	20.1	C
	B: Auxiliary Lane Alternative	18.0	B	20.1	C
	C: Direct Connector Alternative	15.7	B	19.0	B
	D: Hybrid Alternative	15.9	B	19.4	B
	D1: Hybrid with Flyover Alternative	15.9	B	19.4	B
5) Camino Del Mar/ Del Mar Heights Road *Traffic Signal*	*Existing*	32.3	C	29.7	C
	A: No Build	35.7	D	40.4	D
	B: Auxiliary Lane Alternative	35.7	D	40.4	D
	C: Direct Connector Alternative	35.7	D	40.4	D
	D: Hybrid Alternative	35.7	D	40.4	D
	D1: Hybrid with Flyover Alternative	35.7	D	40.4	D
6) Mango Drive/ Del Mar Heights Road *Traffic Signal*	*Existing*	45.3	D	39.9	D
	A: No Build	48.6	D	43.1	D
	B: Auxiliary Lane Alternative	48.6	D	43.1	D
	C: Direct Connector Alternative	48.6	D	43.1	D
	D: Hybrid Alternative	48.6	D	43.1	D
	D1: Hybrid with Flyover Alternative	48.6	D	43.1	D
7) Portofino Drive/ Del Mar Heights Road *TWSC* [c]	*Existing*	10.9	B	9.9	A
	A: No Build	11.1	B	10.8	B
	B: Auxiliary Lane Alternative	11.1	B	10.8	B
	C: Direct Connector Alternative	11.1	B	10.8	B
	D: Hybrid Alternative	11.1	B	10.8	B
	D1: Hybrid with Flyover Alternative	11.1	B	10.8	B

TABLE 7–2 *continued*
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
8) I–5 Southbound Ramps/ Del Mar Heights Road *Traffic Signal*	*Existing*	24.7	C	20.5	C
	A: No Build	49.8	D	46.4	D
	B: Auxiliary Lane Alternative	49.8	D	46.4	D
	C: Direct Connector Alternative	25.7	C	20.8	C
	D: Hybrid Alternative	49.8	D	46.4	D
	D1: Hybrid with Flyover Alternative	49.8	D	46.4	D
9) I–5 Northbound Ramps/ Del Mar Heights Road *Traffic Signal*	*Existing*	52.9	D	**92.0**	**F**
	A: No Build	**71.4**	**E**	44.9	D
	B: Auxiliary Lane Alternative	**71.4**	**E**	44.9	D
	C: Direct Connector Alternative	**56.5**	**E**	42.4	D
	D: Hybrid Alternative	**57.6**	**E**	44.0	D
	D1: Hybrid with Flyover Alternative	**57.6**	**E**	44.0	D
10) High Bluff Drive/ Del Mar Heights Road *Traffic Signal*	*Existing*	27.4	C	31.7	C
	A: No Build	38.4	D	49.5	D
	B: Auxiliary Lane Alternative	38.4	D	49.5	D
	C: Direct Connector Alternative	32.1	C	33.1	C
	D: Hybrid Alternative	32.7	C	34.7	C
	D1: Hybrid with Flyover Alternative	32.7	C	34.7	C
11) El Camino Real/ Del Mar Heights Road *Traffic Signal*	*Existing*	29.9	C	36.1	D
	A: No Build	40.6	D	53.2	D
	B: Auxiliary Lane Alternative	40.6	D	53.2	D
	C: Direct Connector Alternative	34.6	C	38.4	D
	D: Hybrid Alternative	35.3	D	39.0	D
	D1: Hybrid with Flyover Alternative	35.3	D	39.0	D
12) Signature Pointe Driveway/ Del Mar Heights Road *Traffic Signal*	*Existing*	46.1	D	41.3	D
	A: No Build	47.6	D	54.5	D
	B: Auxiliary Lane Alternative	47.6	D	54.5	D
	C: Direct Connector Alternative	45.6	D	47.5	D
	D: Hybrid Alternative	46.6	D	52.1	D
	D1: Hybrid with Flyover Alternative	46.6	D	52.1	D
13) Carmel Country Road/ Hartfield Avenue/ Del Mar Heights Road *Traffic Signal*	*Existing*	35.7	D	36.0	D
	A: No Build	40.8	D	45.9	D
	B: Auxiliary Lane Alternative	40.8	D	45.9	D
	C: Direct Connector Alternative	35.7	D	37.1	D
	D: Hybrid Alternative	36.9	D	37.5	D
	D1: Hybrid with Flyover Alternative	36.9	D	37.5	D
14) Carmel Canyon Road/ Del Mar Heights Road *Traffic Signal*	*Existing*	22.7	C	20.8	C
	A: No Build	28.0	C	24.7	C
	B: Auxiliary Lane Alternative	28.0	C	24.7	C
	C: Direct Connector Alternative	27.4	C	24.1	C
	D: Hybrid Alternative	27.9	C	24.5	C
	D1: Hybrid with Flyover Alternative	27.9	C	24.5	C

TABLE 7–2 *continued*
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
15) Carmel Valley Road/ Del Mar Heights Road *Traffic Signal*	*Existing*	40.1	D	28.6	C
	A: No Build	54.2	D	31.1	C
	B: Auxiliary Lane Alternative	54.2	D	31.1	C
	C: Direct Connector Alternative	50.3	D	30.8	C
	D: Hybrid Alternative	50.4	D	30.9	C
	D1: Hybrid with Flyover Alternative	50.4	D	30.9	C
16) El Camino Real/ Townsgate Drive *Traffic Signal*	*Existing*	19.1	B	14.6	B
	A: No Build	21.5	C	15.7	B
	B: Auxiliary Lane Alternative	21.5	C	15.7	B
	C: Direct Connector Alternative	21.5	C	15.7	B
	D: Hybrid Alternative	21.5	C	15.7	B
	D1: Hybrid with Flyover Alternative	21.5	C	15.7	B
17) Carmel Country Road/ Townsgate Drive *Traffic Signal*	*Existing*	42.3	D	34.9	C
	A: No Build	43.6	D	39.1	D
	B: Auxiliary Lane Alternative	43.6	D	39.1	D
	C: Direct Connector Alternative	42.5	D	35.7	D
	D: Hybrid Alternative	42.6	D	36.1	D
	D1: Hybrid with Flyover Alternative	42.6	D	36.1	D
18) El Camino Real/ High Bluff Drive *Traffic Signal*	*Existing*	31.7	C	36.4	D
	A: No Build	34.2	C	42.3	D
	B: Auxiliary Lane Alternative	34.2	C	42.3	D
	C: Direct Connector Alternative	32.6	C	38.7	D
	D: Hybrid Alternative	32.9	C	41.8	D
	D1: Hybrid with Flyover Alternative	32.9	C	41.8	D
19) Carmel Country Road/ Carmel Creek Road *Traffic Signal*	*Existing*	38.9	D	44.7	D
	A: No Build	47.1	D	54.8	D
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	47.1	D	54.8	D
	B2: No EB slip off-ramp[e], no WB barrier	46.5	D	53.9	D
	C: Direct Connectors[e], With EB slip off-ramp, no WB barrier	46.1	D	50.2	D
	C2: No EB slip off-ramp, no WB barrier	45.9	D	49.1	D
	C5: No EB slip off-ramp, with WB C-D system[f]	46.3	D	49.9	D
	D: Hybrid Alternative	46.3	D	54.4	D
	D1: Hybrid with Flyover Alternative	46.3	D	54.4	D
20) Carmel Creek Road/ Del Mar Trails Road *AWSC[d]*	*Existing*	-	-	-	-
	A: No Build	-	-	-	-
	B: Auxiliary Lane Alternative	-	-	-	-
	C: Direct Connector Alternative	-	-	-	-
	D: Hybrid Alternative	-	-	-	-
	D1: Hybrid with Flyover Alternative	-	-	-	-

TABLE 7–2 *continued*
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
21) Camino Del Mar/ Carmel Valley Road *Traffic Signal*	*Existing*	27.1	C	13.7	B
	A: No Build	27.8	C	16.6	B
	B: Auxiliary Lane Alternative	27.8	C	16.6	B
	C: Direct Connector Alternative	27.8	C	16.6	B
	D: Hybrid Alternative	27.8	C	16.6	B
	D1: Hybrid with Flyover Alternative	27.8	C	16.6	B
22) Portofino Drive/ Carmel Valley Road *Traffic Signal*	*Existing*	28.0	C	**66.4**	**E**
	A: No Build	40.2	D	**117.6**	**F**
	B: Auxiliary Lane Alternative	40.2	D	**117.6**	**F**
	C: Direct Connector Alternative	40.2	D	**117.6**	**F**
	D: Hybrid Alternative	40.2	D	**117.6**	**F**
	D1: Hybrid with Flyover Alternative	40.2	D	**117.6**	**F**
23) Sorrento Valley Road/ Carmel Valley Road *Traffic Signal*	*Existing*	19.3	B	18.2	B
	A: No Build	19.8	B	24.4	C
	B: Auxiliary Lane Alternative	19.8	B	24.4	C
	C: Direct Connector Alternative	19.8	B	24.4	C
	D: Hybrid Alternative	19.8	B	24.4	C
	D1: Hybrid with Flyover Alternative	19.8	B	24.4	C
24) I–5 Southbound Ramps/ Carmel Valley Road *Traffic Signal*	*Existing*	26.8	C	28.2	C
	A: No Build	**56.3**	**E**	**94.5**	**F**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	49.1	D	**80.3**	**F**
	B2: No EB slip off-ramp, no WB barrier	49.1	D	**80.3**	**F**
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	23.2	C	25.1	C
	C2: No EB slip off-ramp, no WB barrier	23.2	C	25.1	C
	C5: No EB slip off-ramp, with WB C-D system	27.0	C	30.9	C
	D: Hybrid Alternative	**70.1**	**E**	**103.0**	**F**
	D1: Hybrid with Flyover Alternative	43.3	D	**65.3**	**E**
25) I–5 Northbound Ramps/ Carmel Valley Road *Traffic Signal*	*Existing*	33.5	C	**58.6**	**E**
	A: No Build	49.8	D	**61.7**	**E**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	45.4	D	39.0	D
	B2: No EB slip off-ramp, no WB barrier	**82.0**	**F**	**98.0**	**F**
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	30.3	C	26.8	C
	C2: No EB slip off-ramp, no WB barrier	36.8	D	41.8	D
	C5: No EB slip off-ramp, with WB C-D system	41.1	D	47.0	D
	D: Hybrid Alternative	**56.9**	**E**	**64.9**	**E**
	D1: Hybrid with Flyover Alternative	46.0	D	**57.5**	**E**

TABLE 7–2 *continued*
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
26) Old Camino Real/ Carmel Valley Road *Traffic Signal*	*Existing*	9.1	A	9.2	A
	A: No Build	14.2	B	11.2	B
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	11.6	B	10.1	B
	B2: No EB slip off-ramp, no WB barrier	13.4	B	13.7	B
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	11.0	B	9.7	A
	C2: No EB slip off-ramp, no WB barrier	11.8	B	12.1	B
	C5: No EB slip off-ramp, with WB C-D system	12.4	B	12.9	B
	D: Hybrid Alternative	14.5	B	17.2	B
	D1: Hybrid with Flyover Alternative	*DNE*	-	*DNE*	-
27) El Camino Real/ Valley Center Drive *Traffic Signal*	*Existing*	29.1	C	34.0	C
	A: No Build	30.3	C	36.1	D
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	30.3	C	36.1	D
	B2: No EB slip off-ramp, no WB barrier	30.3	C	36.1	D
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	29.8	C	35.4	D
	C2: No EB slip off-ramp, no WB barrier	29.8	C	35.4	D
	C5: No EB slip off-ramp, with WB C-D system	30.2	C	35.4	D
	D: Hybrid Alternative	30.2	C	35.4	D
	D1: Hybrid with Flyover Alternative	30.2	C	35.4	D
28) El Camino Real/SR-56 WB Off-ramp/Carmel Valley Road *Traffic Signal*	*Existing*	29.2	C	32.0	C
	A: No Build	51.1	D	32.4	C
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	35.8	D	30.7	C
	B2: No EB slip off-ramp, no WB barrier	35.8	D	30.7	C
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	31.5	C	20.7	C
	C2: No EB slip off-ramp, no WB barrier	31.5	C	20.7	C
	C5: No EB slip off-ramp, with WB C-D system	32.8	C	23.8	C
	D: Hybrid Alternative	33.2	C	24.2	C
	D1: Hybrid with Flyover Alternative	33.2	C	24.2	C
29) El Camino Real/ SR-56 Eastbound On-Ramp/Carmel Valley Road *Traffic Signal*	*Existing*	15.9	B	**59.2**	**E**
	A: No Build	41.1	D	**109.1**	**F**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	19.5	B	42.3	D
	B2: No EB slip off-ramp, no WB barrier	25.7	C	**108.6**	**F**
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	18.1	B	27.6	C
	C2: No EB slip off-ramp, no WB barrier	23.3	C	52.8	D
	C5: No EB slip off-ramp, with WB C-D system	23.3	C	52.8	D
	D: Hybrid Alternative	25.7	C	**108.6**	**F**
	D1: Hybrid with Flyover Alternative	24.0	C	54.7	D

TABLE 7–2 *continued*
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
30) Carmel Creek Road/SR-56 WB ramps/Valley Center Drive *Traffic Signal*	*Existing*	44.1	D	43.1	D
	A: No Build	52.2	D	45.7	D
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	47.8	D	42.8	D
	B2: No EB slip off-ramp, no WB barrier	49.6	D	48.0	D
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	47.5	D	40.3	D
	C2: No EB slip off-ramp, no WB barrier	49.1	D	40.7	D
	C5: No EB slip off-ramp, with WB C-D system	51.2	D	41.6	D
	D: Hybrid Alternative	50.1	D	44.5	D
	D1: Hybrid with Flyover Alternative	50.1	D	44.5	D
31) Carmel Creek Road/ SR-56 Eastbound Ramps *Traffic Signal*	*Existing*	37.8	D	42.3	D
	A: No Build	38.2	D	44.4	D
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	38.2	D	44.4	D
	B2: No EB slip off-ramp, no WB barrier	32.6	C	41.9	D
	C: Direct Connectors [e], With EB slip off-ramp, no WB barrier	37.9	D	42.5	D
	C2: No EB slip off-ramp, no WB barrier	32.4	C	40.2	D
	C5: No EB slip off-ramp, with WB C-D system	32.5	C	40.3	D
	D: Hybrid Alternative	32.6	C	41.1	D
	D1: Hybrid with Flyover Alternative	32.6	C	41.1	D
32) Carmel Country Road/ Carmel Canyon Road *Traffic Signal*	*Existing*	28.1	C	23.6	C
	A: No Build	32.4	C	38.7	D
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	32.4	C	38.7	D
	B2: No EB slip off-ramp, no WB barrier	32.7	C	45.6	D
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	31.3	C	39.8	D
	C2: No EB slip off-ramp, no WB barrier	31.5	C	42.7	D
	C5: No EB slip off-ramp, with WB C-D system	31.6	C	45.2	D
	D: Hybrid Alternative	31.6	C	47.6	D
	D1: Hybrid with Flyover Alternative	31.6	C	47.6	D
33) Carmel Country Road/ SR-56 Westbound Off-Ramp *Traffic Signal*	*Existing*	27.1	C	21.5	C
	A: No Build	28.0	C	27.6	C
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	28.0	C	27.6	C
	B2: No EB slip off-ramp, no WB barrier	35.9	D	28.9	C
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	27.7	C	21.9	C
	C2: No EB slip off-ramp, no WB barrier	31.7	C	22.7	C
	C5: No EB slip off-ramp, with WB C-D system	41.1	D	24.0	C
	D: Hybrid Alternative	42.6	D	24.8	C
	D1: Hybrid with Flyover Alternative	42.6	D	24.8	C

TABLE 7–2 *continued*
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
34) Carmel Country Road/ SR-56 Eastbound Ramps *Traffic Signal*	*Existing*	25.5	C	33.1	C
	A: No Build	31.3	C	34.8	C
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	31.3	C	34.8	C
	B2: No EB slip off-ramp, no WB barrier	33.9	C	41.5	D
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	26.8	C	33.5	C
	C2: No EB slip off-ramp, no WB barrier	32.4	C	33.9	C
	C5: No EB slip off-ramp, with WB C-D system	33.1	C	34.0	C
	D: Hybrid Alternative	35.6	D	35.6	D
	D1: Hybrid with Flyover Alternative	35.6	D	35.6	D
35) Carmel Valley Road/ SR-56 Westbound Ramps *Traffic Signal*	*Existing*	6.2	A	3.6	A
	A: No Build	11.0	B	20.0	B
	B: Auxiliary Lane Alternative	11.0	B	20.0	B
	C: Direct Connector Alternative	9.7	A	16.6	B
	D: Hybrid Alternative	9.8	A	16.8	B
	D1: Hybrid with Flyover Alternative	9.8	A	16.8	B
36) Carmel Valley Road/ SR-56 Eastbound Ramps *Traffic Signal*	*Existing*	22.4	C	22.9	C
	A: No Build	44.8	D	45.0	D
	B: Auxiliary Lane Alternative	44.8	D	45.0	D
	C: Direct Connector Alternative	43.5	D	44.1	D
	D: Hybrid Alternative	44.0	D	45.0	D
	D1: Hybrid with Flyover Alternative	44.0	D	45.0	D
37) Sorrento Valley Road/ Carmel Mountain Road *Traffic Signal*	*Existing*	24.0	C	14.0	B
	A: No Build	24.6	C	16.1	B
	B: Auxiliary Lane Alternative	24.6	C	16.1	B
	C: Direct Connector Alternative	24.6	C	16.1	B
	D: Hybrid Alternative	24.6	C	16.1	B
	D1: Hybrid with Flyover Alternative	24.6	C	16.1	B
38) I–5 Southbound Ramps/ Carmel Mountain Road *Traffic Signal*	*Existing*	36.1	D	29.7	C
	A: No Build	36.5	D	31.6	C
	B: Auxiliary Lane Alternative	36.5	D	31.6	C
	C: Direct Connector Alternative	36.5	D	31.6	C
	D: Hybrid Alternative	36.5	D	31.6	C
	D1: Hybrid with Flyover Alternative	36.5	D	31.6	C
39) I–5 Northbound Ramps/ Carmel Mountain Road *Traffic Signal*	*Existing*	43.7	D	30.8	C
	A: No Build	48.9	D	33.2	C
	B: Auxiliary Lane Alternative	48.9	D	33.2	C
	C: Direct Connector Alternative	48.9	D	33.2	C
	D: Hybrid Alternative	48.9	D	33.2	C
	D1: Hybrid with Flyover Alternative	48.9	D	33.2	C

TABLE 7–2
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
40) Vista Sorrento Parkway/ Torrey View Court/ Carmel Mountain Road *Traffic Signal*	*Existing*	22.3	C	34.5	C
	A: No Build	24.6	C	49.2	D
	B: Auxiliary Lane Alternative	24.6	C	49.2	D
	C: Direct Connector Alternative	24.6	C	49.2	D
	D: Hybrid Alternative	24.6	C	49.2	D
	D1: Hybrid with Flyover Alternative	24.6	C	49.2	D
41) El Camino Real/ Carmel Mountain Road *Traffic Signal*	*Existing*	29.7	C	34.1	C
	A: No Build	**56.9**	**E**	53.5	D
	B: Auxiliary Lane Alternative	**56.9**	**E**	53.5	D
	C: Direct Connector Alternative	**56.9**	**E**	53.5	D
	D: Hybrid Alternative	**56.9**	**E**	53.5	D
	D1: Hybrid with Flyover Alternative	**56.9**	**E**	53.5	D

Footnotes:

a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. TWSC – Two-Way Stop Controlled intersection. Minor street left turn delay is reported.
d. AWSC– All-way Stop controlled intersection.
e. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
f. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and collector-distributor system SR-56 WB between Carmel Creek Road and El Camino Real.

SIGNALIZED		UNSIGNALIZED	
DELAY/LOS THRESHOLDS		DELAY/LOS THRESHOLDS	
Delay	LOS	Delay	LOS
0.0 < 10.0	A	0.0 < 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
> 80.1	F	> 50.1	F

General Notes:
Bold typeface shows intersections operating at LOS E or F.

TABLE 7–3
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
CALTRANS ILV METHOD

Intersection	Model Run: Scenario	AM			PM		
		ILV[a]	Capacity[b]	HCM LOS[c]	ILV[a]	Capacity[b]	HCM LOS[c]
1) I–5 Southbound Ramps/ Via De La Valle	*Existing*	590	Under	B	688	Under	B
	A: No Build	1130	Under	C	1130	Near	B
	B: Auxiliary Lane Alternative	1130	Under	C	1130	Near	B
	C: Direct Connector Alternative	1110	Under	C	1115	Near	B
	D: Hybrid Alternative	1120	Under	C	1130	Near	B
	D1: Hybrid with Flyover Alternative	1120	Under	C	1130	Near	B
2) I–5 Northbound Ramps/ Via De La Valle	*Existing*	1054	Under	B	1114	Under	C
	A: No Build	**1505**	**Over**	C	**1500**	**Over**	C
	B: Auxiliary Lane Alternative	**1505**	**Over**	C	**1500**	**Over**	C
	C: Direct Connector Alternative	**1505**	**Over**	C	**1500**	**Over**	C
	D: Hybrid Alternative	**1505**	**Over**	C	**1500**	**Over**	C
	D1: Hybrid with Flyover Alternative	**1505**	**Over**	C	**1500**	**Over**	C
8) I–5 Southbound Ramps/ Del Mar Heights Road	*Existing*	976	Under	C	943	Under	C
	A: No Build	1205	Near	D	1367	Near	D
	B: Auxiliary Lane Alternative	1205	Near	D	1367	Near	D
	C: Direct Connector Alternative	1115	Under	C	1230	Near	C
	D: Hybrid Alternative	1205	Near	D	1367	Near	D
	D1: Hybrid with Flyover Alternative	1205	Near	D	1367	Near	D
9) I–5 Northbound Ramps/ Del Mar Heights Road	*Existing*	1281	Near	D	1412	Near	**F**
	A: No Build	**1811**	**Over**	**E**	**1550**	**Over**	D
	B: Auxiliary Lane Alternative	**1811**	**Over**	**E**	**1550**	**Over**	D
	C: Direct Connector Alternative	1490	Near	**E**	1350	Near	D
	D: Hybrid Alternative	1490	Near	**E**	1370	Near	D
	D1: Hybrid with Flyover Alternative	1490	Near	**E**	1370	Near	D
24) I–5 Southbound Ramps/ Carmel Valley Road	*Existing*	1101	Under	C	1260	Near	C
	A: No Build	1335	Near	**E**	**1548**	**Over**	**F**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1270	Near	D	1479	Near	**F**
	B2: No EB slip off-ramp[d], no WB barrier	1270	Near	D	1479	Near	**F**
	C: Direct Connectors[e], With EB slip off-ramp, no WB barrier	1035	Under	C	1125	Under	C
	C2: No EB slip off-ramp, no WB barrier	1035	Under	C	1125	Under	C
	C5: No EB slip off-ramp, with WB C-D system[e]	1185	Under	C	1278	Near	C
	D: Hybrid Alternative	1420	Near	**E**	**1632**	**Over**	**F**
	D1: Hybrid with Flyover Alternative	1289	Near	D	1464	Near	**E**

TABLE 7–3 *continued*
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
CALTRANS ILV METHOD

Intersection	Model Run: Scenario	AM			PM		
		ILV[a]	Capacity[b]	HCM LOS[c]	ILV[a]	Capacity[b]	HCM LOS[c]
25) I–5 Northbound Ramps/ Carmel Valley Road	*Existing*	931	Under	C	1044	Under	**E**
	A: No Build	1190	Under	D	1367	Near	**E**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1090	Under	D	1089	Under	D
	B2: No EB slip off-ramp, no WB barrier	1443	Near	**F**	**1502**	**Over**	**F**
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	1090	Under	C	735	Under	C
	C2: No EB slip off-ramp, no WB barrier	1443	Near	D	1148	Under	D
	C5: No EB slip off-ramp, with WB C-D system	**1593**	**Over**	D	1251	Near	D
	D: Hybrid Alternative	**1593**	**Over**	**E**	**1502**	**Over**	**E**
	D1: Hybrid with Flyover Alternative	**1593**	**Over**	D	1251	Near	**E**
28) El Camino Real/ SR-56 Westbound Off-Ramp/ Carmel Valley Road	*Existing*	1019	Under	C	911	Under	C
	A: No Build	1259	Near	D	1162	Under	C
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1466	Near	D	1217	Near	C
	B2: No EB slip off-ramp, no WB barrier	1466	Near	D	1217	Near	C
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	1098	Under	C	1090	Under	C
	C2: No EB slip off-ramp, no WB barrier	1098	Under	C	1090	Under	C
	C5: No EB slip off-ramp, with WB C-D system	1327	Near	C	1152	Under	C
	D: Hybrid Alternative	1338	Near	C	1169	Under	C
	D1: Hybrid with Flyover Alternative	1338	Near	C	1169	Under	C
29) El Camino Real/ SR-56 Eastbound On-Ramp/Carmel Valley Road	*Existing*	1041	Under	B	**1599**	**Over**	**E**
	A: No Build	1344	Near	D	**2553**	**Over**	**F**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	949	Under	B	**2083**	**Over**	D
	B2: No EB slip off-ramp, no WB barrier	1184	Under	C	**2358**	**Over**	**F**
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	894	Under	B	**1900**	**Over**	C
	C2: No EB slip off-ramp, no WB barrier	1028	Under	C	**2072**	**Over**	D
	C5: No EB slip off-ramp, with WB C-D system	1028	Under	C	**2072**	**Over**	D
	D: Hybrid Alternative	1184	Under	C	**2358**	**Over**	**F**
	D1: Hybrid with Flyover Alternative	1000	Under	C	**2085**	**Over**	D

TABLE 7–3 *continued*
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
CALTRANS ILV METHOD

Intersection	Model Run: Scenario	AM			PM		
		ILV[a]	Capacity[b]	HCM LOS[c]	ILV[a]	Capacity[b]	HCM LOS[c]
30) Carmel Creek Road/ SR-56 Westbound Ramps/ Valley Center Drive	*Existing*	1063	Under	D	780	Under	D
	A: No Build	1239	Near	D	1065	Under	D
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1145	Under	D	980	Under	D
	B2: No EB slip off-ramp, no WB barrier	1192	Under	D	1015	Under	D
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	1145	Near	D	980	Under	D
	C2: No EB slip off-ramp, no WB barrier	1192	Under	D	1015	Under	D
	C5: No EB slip off-ramp, with WB C-D system	1192	Under	D	1015	Under	D
	D: Hybrid Alternative	1192	Under	D	1015	Under	D
	D1: Hybrid with Flyover Alternative	1192	Under	D	1015	Under	D
31) Carmel Creek Road/ SR-56 Eastbound Ramps	*Existing*	716	Under	D	808	Under	D
	A: No Build	722	Under	D	915	Under	D
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	722	Under	D	915	Under	D
	B2: No EB slip off-ramp, no WB barrier	635	Under	C	785	Under	D
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	715	Under	D	905	Under	D
	C2: No EB slip off-ramp, no WB barrier	628	Under	C	775	Under	D
	C5: No EB slip off-ramp, with WB C-D system	638	Under	C	785	Under	D
	D: Hybrid Alternative	645	Under	C	795	Under	D
	D1: Hybrid with Flyover Alternative	645	Under	C	795	Under	D
33) Carmel Country Road/ SR-56 Westbound Off-Ramp	*Existing*	1046	Under	C	753	Under	C
	A: No Build	**1569**	**Over**	C	1021	Under	C
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	**1569**	**Over**	C	1021	Under	C
	B2: No EB slip off-ramp, no WB barrier	**1710**	**Over**	D	1076	Under	C
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	1210	Near	C	910	Under	C
	C2: No EB slip off-ramp, no WB barrier	1351	Near	C	965	Under	C
	C5: No EB slip off-ramp, with WB C-D system	1401	Near	D	995	Under	C
	D: Hybrid Alternative	1401	Near	D	995	Under	C
	D1: Hybrid with Flyover Alternative	1401	Near	D	995	Under	C

TABLE 7–3
EXISTING AND YEAR 2015 INTERSECTION OPERATIONS
CALTRANS ILV METHOD

Intersection	Model Run: Scenario	AM			PM		
		ILV[a]	Capacity[b]	HCM LOS[c]	ILV[a]	Capacity[b]	HCM LOS[c]
34) Carmel Country Road/ SR-56 Eastbound Ramps	*Existing*	852	Under	C	772	Under	C
	A: No Build	1141	Under	C	1006	Under	C
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1141	Under	C	1006	Under	C
	B2: No EB slip off-ramp, no WB barrier	1141	Under	C	1054	Under	D
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	1090	Under	C	930	Under	C
	C2: No EB slip off-ramp, no WB barrier	1090	Under	C	978	Under	C
	C5: No EB slip off-ramp, with WB C-D system	1090	Under	C	938	Under	C
	D: Hybrid Alternative	1141	Under	D	1064	Under	D
	D1: Hybrid with Flyover Alternative	1141	Under	D	1064	Under	D
35) Carmel Valley Road/ SR-56 Westbound Ramps	*Existing*	839	Under	A	335	Under	A
	A: No Build	934	Under	B	712	Under	B
	B: Auxiliary Lane Alternative	934	Under	B	712	Under	B
	C: Direct Connector Alternative	940	Under	A	715	Under	B
	D: Hybrid Alternative	940	Under	A	715	Under	B
	D1: Hybrid with Flyover Alternative	940	Under	A	715	Under	B
36) Carmel Valley Road/SR-56 Eastbound Ramps	*Existing*	264	Under	C	296	Under	C
	A: No Build	433	Under	D	586	Under	D
	B: Auxiliary Lane Alternative	433	Under	D	586	Under	D
	C: Direct Connector Alternative	426	Under	D	575	Under	D
	D: Hybrid Alternative	433	Under	D	586	Under	D
	D1: Hybrid with Flyover Alternative	433	Under	D	586	Under	D
38) I-5 Southbound Ramps/ Carmel Mountain Road	*Existing*	929	Under	D	741	Under	C
	A: No Build	985	Under	D	965	Under	C
	B: Auxiliary Lane Alternative	985	Under	D	965	Under	C
	C: Direct Connector Alternative	985	Under	D	965	Under	C
	D: Hybrid Alternative	985	Under	D	965	Under	C
	D1: Hybrid with Flyover Alternative	985	Under	D	965	Under	C
39) I-5 Northbound Ramps/ Carmel Mountain Road	*Existing*	826	Under	D	1044	Under	C
	A: No Build	995	Under	D	1335	Near	C
	B: Auxiliary Lane Alternative	995	Under	D	1335	Near	C
	C: Direct Connector Alternative	995	Under	D	1295	Near	C
	D: Hybrid Alternative	995	Under	D	1295	Near	C
	D1: Hybrid with Flyover Alternative	995	Under	D	1295	Near	C

Footnotes:

a. ILV = Intersecting Lane Vehicles.
b. CAPACITY is shown as *UNDER* capacity, *NEAR* capacity or *OVER* capacity;
   ***Under** Capacity = <1200 ILV/Hour*
   ***Near** Capacity = >1200 but < 1500 ILV/Hour*
   ***Over** Capacity = >1500 ILV/Hour*
c. HCM LOS from *Table 7–2* for comparison.
d. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
e. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

General Notes:

Bold typeface shows intersections operating at "Over" Capacity or HCM LOS E or F.

TABLE 7–4
EXISTING AND YEAR 2015 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
I–5 North of Via De La Valle	*Existing*	*NB*	4M + 1A	9,200	96,700	6,860	7,650	0.746	0.832	C	D
		SB	4M + 1A	9,200	99,900	7,100	7,720	0.772	0.839	C	D
	A: No Build	*NB*	5M + 1A	11,200	124,500	7,240	9,870	0.646	0.881	C	D
		SB	5M + 1A	11,200	129,900	9,260	7,940	0.827	0.709	D	C
	B: Auxiliary Lane Alternative	*NB*	5M + 1A	11,200	124,500	7,240	9,870	0.646	0.881	C	D
		SB	5M + 1A	11,200	129,900	9,260	7,940	0.827	0.709	D	C
	C: Direct Connector Alternative	*NB*	5M + 1A	11,200	128,600	7,550	10,080	0.674	0.900	C	D
		SB	5M + 1A	11,200	133,200	9,440	8,190	0.843	0.731	D	C
	D: Hybrid Alternative	*NB*	5M+ 1A	11,200	128,600	7,550	10,080	0.674	0.900	C	D
		SB	5M+ 1A	11,200	129,900	9,260	7,940	0.827	0.709	D	C
	D1: Hybrid with Flyover Alternative	*NB*	5M+ 1A	11,200	128,600	7,550	10,080	0.674	0.900	C	D
		SB	5M+ 1A	11,200	129,900	9,260	7,940	0.827	0.709	D	C
I–5 Between Via De La Valle and Del Mar Heights Road	*Existing*	*NB*	5M	10,000	103,300	7,370	8,050	0.737	0.805	C	D
		SB	5M	10,000	131,820	7,804	10,348	0.650	0.862	C	D
	A: No Build	*NB*	6M	12,000	131,820	7,804	10,348	0.650	0.862	C	D
		SB	6M	12,000	135,700	10,000	8,470	0.833	0.706	D	C
	B: Auxiliary Lane Alternative	*NB*	6M	12,000	131,820	7,804	10,348	0.650	0.862	C	D
		SB	6M	12,000	135,700	10,000	8,470	0.833	0.706	D	C
	C: Direct Connector Alternative	*NB*	6M	12,000	136,400	8,150	10,580	0.679	0.882	C	D
		SB	6M	12,000	139,400	10,200	8,750	0.850	0.729	D	C
	D: Hybrid Alternative	*NB*	6M	12,000	136,400	8,150	10,580	0.679	0.882	C	D
		SB	6M	12,000	135,700	10,000	8,470	0.833	0.706	D	C
	D1: Hybrid with Flyover Alternative	*NB*	6M	12,000	136,400	8,150	10,580	0.679	0.882	C	D
		SB	6M	12,000	135,700	10,000	8,470	0.833	0.706	D	C
I–5 Between Del Mar Heights Road and Carmel Valley Road	*Existing*	*NB*	6M	12,000	105,900	7,530	7,950	0.628	0.663	C	C
		SB	6M	12,000	105,600	8,630	8,600	0.719	0.717	C	C
	A: No Build	*NB*	6M + 1A	13,200	131,030	7,843	10,208	0.594	0.773	B	C
		SB	6M	12,000	131,980	10,210	8,287	0.851	0.691	D	C
	B: Auxiliary Lane Alternative	*NB*	6M + 1A	13,200	131,030	7,843	10,208	0.594	0.773	B	C
		SB	6M + 1A	12,000	131,980	10,210	8,287	0.773	0.628	C	C
	C: Direct Connector Alternative	*NB*	4M	8,000	73,900	4,940	6,500	0.618	0.813	B	D
		SB	4M	8,000	94,700	6,920	6,200	0.865	0.775	D	C
	D: Hybrid Alternative	*NB*	4M	8,000	73,900	4,940	6,500	0.618	0.813	B	D
		SB	6M + 1A	13,200	131,980	10,210	8,287	0.773	0.628	C	C
	D1: Hybrid with Flyover Alternative	*NB*	4M	8,000	73,900	4,940	6,500	0.618	0.813	B	D
		SB	6M + 1A	13,200	131,980	10,210	8,287	0.773	0.628	C	C

TABLE 7–4 *continued*
EXISTING AND YEAR 2015 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
I–5 Between Carmel Valley Road and Carmel Mountain Road	*Existing*	*NB*	5M	10,000	83,000	6,170	5,670	0.617	0.567	B	B
		SB	4M	8,000	72,400	6,470	6,390	0.809	0.799	D	C
	A: No Build	*NB*	5M	10,000	82,400	5,660	7,300	0.566	0.730	B	C
		SB	4M	8,000	84,400	6,660	5,520	0.833	0.690	D	C
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*NB*	5M	10,000	82,400	5,660	7,300	0.566	0.730	B	C
		SB	4M	8,000	84,400	6,660	5,520	0.833	0.690	D	C
	B2: No EB slip off-ramp, no WB barrier[h]	*NB*	5M	10,000	90,280	6,365	8,125	0.637	0.813	C	D
		SB	4M	8,000	84,400	6,660	5,520	0.833	0.690	D	C
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	*NB*	5M	10,000	82,400	5,660	7,300	0.566	0.730	B	C
		SB	4M	8,000	84,400	6,660	5,520	0.833	0.690	D	C
	C2: No EB slip off-ramp, no WB barrier	*NB*	5M	10,000	90,280	6,365	8,125	0.637	0.813	C	D
		SB	4M	8,000	84,400	6,660	5,520	0.833	0.690	D	C
	C5: No EB slip off-ramp, with WB C-D system[i]	*NB*	5M	10,000	90,280	6,365	2,815	0.637	0.282	C	A
		SB	4M	8,000	91,140	6,960	5,825	0.870	0.728	D	C
	D: Hybrid Alternative	*NB*	5M	10,000	90,280	6,365	8,125	0.637	0.813	C	D
		SB	4M	8,000	91,140	6,960	5,825	0.870	0.728	D	C
	D1: Hybrid with Flyover Alternative	*NB*	5M	10,000	90,280	6,365	8,125	0.637	0.813	C	D
		SB	4M	8,000	91,140	6,960	5,825	0.870	0.728	D	C

TABLE 7–4 *continued*
EXISTING AND YEAR 2015 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
I–5 South of Carmel Mountain Road	*Existing*	*NB*	6M	12,000	83,000	6,170	5,670	0.514	0.473	B	B
		SB	4M	8,000	72,400	6,470	6,390	0.809	0.799	D	C
	A: No Build	*NB*	6M	12,000	82,400	5,660	7,300	0.472	0.608	B	B
		SB	5M	10,000	84,400	6,660	5,520	0.666	0.552	C	B
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*NB*	6M	12,000	82,400	5,660	7,300	0.472	0.608	B	B
		SB	5M	10,000	84,400	6,660	5,520	0.666	0.552	C	B
	B2: No EB slip off-ramp, no WB barrier	*NB*	6M	12,000	90,280	6,365	8,125	0.530	0.677	B	C
		SB	5M	10,000	84,400	6,660	5,520	0.666	0.552	C	B
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	*NB*	6M	12,000	82,400	5,660	7,300	0.472	0.608	B	B
		SB	5M	10,000	84,400	6,660	5,520	0.666	0.552	C	B
	C2: No EB slip off-ramp, no WB barrier	*NB*	6M	12,000	90,280	6,365	8,125	0.530	0.677	B	C
		SB	5M	10,000	84,400	6,660	5,520	0.666	0.552	C	B
	C5: No EB slip off-ramp, with WB C-D system	*NB*	6M	12,000	90,280	6,365	2,815	0.530	0.235	B	A
		SB	5M	10,000	91,140	6,960	5,825	0.696	0.583	C	B
	D: Hybrid Alternative	*NB*	6M	12,000	90,280	6,365	8,125	0.530	0.677	B	C
		SB	5M	10,000	91,140	6,960	5,825	0.696	0.583	C	B
	D1: Hybrid with Flyover Alternative	*NB*	6M	12,000	90,280	6,365	8,125	0.530	0.677	B	C
		SB	5M	10,000	91,140	6,960	5,825	0.696	0.583	C	B

TABLE 7–4 *continued*
EXISTING AND YEAR 2015 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
SR–56 Between El Camino Real and Carmel Creek Road	*Existing*	*EB*	2M	4,000	20,900	1,010	2,680	0.253	0.670	A	C
		WB	2M + 1 A	5,200	45,000	5,294	2,472	1.018	0.475	**F(0)**	B
	A: No Build	*EB*	2M	4,000	27,500	1,060	2,640	0.265	0.660	A	C
		WB	2M + 1 A	5,200	60,930	6,142	2,835	1.181	0.545	**F(0)**	B
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*EB*	2M	4,000	27,500	1,060	2,640	0.265	0.660	A	C
		WB	3M + 1A	7,200	60,930	6,142	2,835	0.853	0.394	D	A
	B2: No EB slip off-ramp, no WB barrier	*EB*	2M	4,000	30,120	1,295	2,915	0.324	0.729	A	C
		WB	3M + 1 A	7,200	60,930	6,142	2,835	0.853	0.394	D	A
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	*EB*	4M	8,000	44,200	1,910	3,900	0.239	0.488	A	B
		WB	4M	8,000	69,000	6,750	3,230	0.844	0.404	D	A
	C2: No EB slip off-ramp, no WB barrier	*EB*	4M	8,000	46,820	2,145	4,175	0.268	0.522	A	B
		WB	4M	8,000	69,000	6,750	3,230	0.844	0.404	D	A
	C5: No EB slip off-ramp, with WB C-D system	*EB*	4M	8,000	46,820	2,145	4,175	0.268	0.522	A	B
		WB	2M	4,000	32,260	3,550	1,495	0.888	0.374	D	A
		WB(2)[j]	2M + 1A	9,200	36,320	3,180	1,715	0.612	0.330	B	A
	D: Hybrid Alternative	*EB*	2M	4,000	30,120	1,295	2,915	0.324	0.729	A	C
		WB	2M	4,000	32,260	3,550	1,495	0.888	0.374	D	A
		WB(2)[j]	2M + 1A	5,200	36,320	3,180	1,715	0.612	0.330	B	A
	D1: Hybrid with Flyover Alternative	*EB*	2M	4,000	30,120	1,295	2,915	0.324	0.729	A	C
		EB	2M	4,000	10,900	550	817	0.138	0.204	A	A
		WB	2M	4,000	32,260	3,550	1,495	0.888	0.374	D	A
		WB(2)[j]	2M + 1A	5,200	36,320	3,180	1,715	0.612	0.330	B	A

TABLE 7–4
EXISTING AND YEAR 2015 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
SR–56 Between Carmel Creek Road and Carmel Country Road	*Existing*	*EB*	2M + 1 A	5,200	40,100	2,100	4,570	0.404	0.879	A	D
		WB	2M + 1 A	5,200	39,500	5,234	2,030	1.007	0.390	**F(0)**	A
	A: No Build	*EB*	2M + 1A	5,200	56,620	2,496	5,677	0.480	1.092	B	**F(0)**
		WB	2M + 1A	5,200	54,740	6,066	2,300	1.167	0.442	**F(0)**	B
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*EB*	2M + 1A	5,200	56,620	2,496	5,677	0.480	1.092	B	**F(0)**
		WB	3M + 1A	7,200	54,740	6,066	2,300	0.843	0.319	D	A
	B2: No EB slip off-ramp, no WB barrier	*EB*	2M + 1A	5,200	59,240	2,731	5,952	0.525	1.145	B	**F(0)**
		WB	3M + 1A	7,200	56,340	6,207	2,465	0.862	0.342	D	A
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	*EB*	4M + 1A	9,200	63,000	2,830	6,160	0.308	0.670	A	C
		WB	4M + 1A	9,200	62,500	6,650	2,680	0.723	0.291	C	A
	C2: No EB slip off-ramp, no WB barrier	*EB*	4M + 1A	9,200	65,620	3,065	6,435	0.333	0.699	A	C
		WB	4M + 1A	9,200	64,100	6,791	2,845	0.738	0.309	C	A
	C5: No EB slip off-ramp, with WB C-D system	*EB*	4M + 1A	9,200	66,040	3,085	6,455	0.335	0.702	A	C
		WB	4M + 1A	9,200	65,780	6,871	2,925	0.747	0.318	C	A
	D: Hybrid Alternative	*EB*	2M + 1A	5,200	59,660	2,751	5,972	0.529	1.148	B	**F(0)**
		WB	4M + 1A	9,200	65,780	6,871	2,925	0.747	0.318	C	A
	D1: Hybrid with Flyover Alternative	*EB*	4M + 1A	9,200	59,660	2,751	5,972	0.299	0.649	A	C
		WB	4M + 1A	9,200	65,780	6,871	2,925	0.747	0.318	C	A

TABLE 7–4
EXISTING AND YEAR 2015 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
SR–56 Between Carmel Country Road and Carmel Valley Road	*Existing*	*EB*	2M	4,000	34,600	2,017	3,673	0.504	0.918	B	D
		WB	2M	4,000	33,100	4,369	1,593	1.092	0.398	**F(0)**	A
	A: No Build	*EB*	2M	4,000	52,830	2,547	4,789	0.637	1.197	C	**F(0)**
		WB	2M	4,000	49,620	5,075	1,901	1.269	0.475	**F(1)**	B
	B: Auxiliary Lane Alternative	*EB*	2M	4,000	52,830	2,547	4,789	0.637	1.197	C	**F(0)**
		WB	2M	4,000	49,620	5,075	1,901	1.269	0.475	**F(1)**	B
	C: Direct Connector Alternative	*EB*	2M	4,000	57,200	2,780	5,120	0.695	1.280	C	**F(1)**
		WB	2M	4,000	55,000	5,480	2,170	1.370	0.543	**F(2)**	B
	D: Hybrid Alternative	*EB*	2M	4,000	52,830	2,547	4,789	0.637	1.197	C	**F(0)**
		WB	2M	4,000	55,000	5,480	2,170	1.370	0.543	**F(2)**	B
	D1: Hybrid with Flyover Alternative	*EB*	2M	4,000	52,830	2,547	4,789	0.637	1.197	C	**F(0)**
		WB	2M	4,000	55,000	5,480	2,170	1.370	0.543	**F(2)**	B
SR–56 East of Carmel Valley Road	*Existing*	*EB*	2M	4,000	28,120	1,606	3,178	0.402	0.795	A	C
		WB	2M	4,000	26,520	3,626	1,316	0.907	0.329	D	A
	A: No Build	*EB*	2M	4,000	49,100	2,380	4,330	0.595	1.083	B	**F(0)**
		WB	2M	4,000	46,000	4,520	1,940	1.130	0.485	**F(0)**	B
	B: Auxiliary Lane Alternative	*EB*	2M	4,000	49,100	2,380	4,,330	0.595	1.083	B	**F(0)**
		WB	2M	4,000	46,000	4,520	1,940	1.130	0.485	**F(0)**	B
	C: Direct Connector Alternative	*EB*	2M	4,000	52,400	2,560	4,580	0.640	1.145	C	**F(0)**
		WB	2M	4,000	50,100	4,830	2,150	1.208	0.538	**F(0)**	B
	D: Hybrid Alternative	*EB*	2M	4,000	49,100	2,380	4,330	0.595	1.083	B	**F(0)**
		WB	2M	4,000	50,100	4,830	2,150	1.208	0.538	**F(0)**	B
	D1: Hybrid with Flyover Alternative	*EB*	2M	4,000	49,100	2,380	4,330	0.595	1.083	B	**F(0)**
		WB	2M	4,000	50,100	4,830	2,150	1.208	0.538	**F(0)**	B

Footnotes:

a. Dir = Direction of travel.
b. Lanes: 2M +1A = 2 mainline + 1 auxiliary, etc.
c. Capacity and methodology is based on SANTEC/ITE Guidelines adopted by Caltrans District 11, where mainline/auxiliary lanes have capacities of 2,000/1,200 vph respectively.
d. ADT = Average Daily Traffic volumes.
e. Peak hour volumes are based on Caltrans traffic model, and are expressed in vehicles per hour (vph).
f. V/C = Volume/Capacity ratio.
g. LOS = Level of Service.
h. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
i. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
j. The WB (2) freeway mainline refers to collector-distributor system on SR 56 WB between Carmel Creek Road and El Camino Real.

LOS	V/C
A	<0.41
B	0.62
C	0.8
D	0.92
E	1
F(0)	1.25
F(1)	1.35
F(2)	1.45
F(3)	>1.46

TABLE 7–5
EXISTING AND YEAR 2015 I-5 LOCAL BYPASS OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
I–5 Between Del Mar Heights Road and Carmel Valley Road	*Existing*	*NB*	2M	4,000	20,500	1,230	2,400	0.308	0.600	A	B
		SB	2M	4,000	30,200	2,200	2,200	0.550	0.550	B	B
	A: No Build	*NB*	2M	4,000	40,500	1,700	2,700	0.425	0.675	B	C
		SB	2M	4,000	37,000	3,220	2,200	0.805	0.550	D	B
	B: Auxiliary Lane Alternative	*NB*	2M	4,000	40,500	1,700	2,700	0.425	0.675	B	C
		SB	2M	4,000	37,000	3,220	2,200	0.805	0.550	D	B
	C: Direct Connector Alternative	*NB*	4M	8,000	66,000	3,570	4,140	0.446	0.518	B	B
		SB	3M	6,000	44,600	3,670	2,640	0.612	0.440	B	B
	D: Hybrid Alternative	*NB*	4M	8,000	66,000	3,570	4,140	0.446	0.518	B	B
		SB	2M	4,000	37,000	3,220	2,200	0.805	0.550	D	B
	D1: Hybrid with Flyover Alternative	*NB*	4M	8,000	66,000	3,570	4,140	0.446	0.518	B	B
		SB	2M	4,000	37,000	3,220	2,200	0.805	0.550	D	B
I–5 Between Carmel Valley Road and Carmel Mountain Road	*Existing*	*NB*	4M	8,000	50,700	3,000	6,000	0.375	0.750	A	C
		SB	4M	8,000	59,000	5,900	3,800	0.738	0.475	C	B
	A: No Build	*NB*	4M	8,000	78,500	3,700	6,440	0.463	0.805	B	D
		SB	4M	8,000	76,000	7,070	4,000	0.884	0.500	D	B
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*NB*	4M	8,000	78,500	3,700	6,440	0.463	0.805	B	D
		SB	4M	8,000	76,000	7,070	4,000	0.884	0.500	D	B
	B2: No EB slip off-ramp[h], no WB barrier	*NB*	4M	8,000	70,620	2,995	5,615	0.374	0.702	A	C
		SB	4M	8,000	76,000	7,070	4,000	0.884	0.500	D	B
	C: Direct Connectors, *With EB slip off-ramp, no WB barrier*	*NB*	4M	8,000	78,500	3,700	6,440	0.463	0.805	B	D
		SB	4M	8,000	76,000	7,070	4,000	0.884	0.500	D	B
	C2: No EB slip off-ramp, no WB barrier[i]	*NB*	4M	8,000	70,620	2,995	5,615	0.374	0.702	A	C
		SB	4M	8,000	76,000	7,070	4,000	0.884	0.500	D	B
	C5: No EB slip off-ramp, with WB C-D system[i]	*NB*	4M	8,000	70,620	2,995	5,615	0.374	0.702	A	C
		SB	4M	8,000	69,260	6,770	3,695	0.846	0.462	D	B
	D: Hybrid Alternative	*NB*	4M	8,000	70,620	2,995	5,615	0.374	0.702	A	C
		SB	4M	8,000	69,260	6,770	3,695	0.846	0.462	D	B
	D1: Hybrid with Flyover Alternative	*NB*	4M	8,000	70,620	2,995	5,615	0.374	0.702	A	C
		SB	4M	8,000	69,260	6,770	3,695	0.846	0.462	D	B

TABLE 7–5
EXISTING AND YEAR 2015 I-5 LOCAL BYPASS OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
I–5 South of Carmel Mountain	*Existing*	*NB*	4M	8,000	52,400	3,150	6,300	0.394	0.788	A	C
		SB	4M	8,000	60,000	5,900	4,100	0.738	0.513	C	B
	A: No Build	*NB*	4M	8,000	80,200	3,800	6,570	0.475	0.821	B	D
		SB	4M	8,000	77,700	7,200	4,200	0.900	0.525	D	B
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*NB*	4M	8,000	80,200	3,800	6,570	0.475	0.821	B	D
		SB	4M	8,000	77,700	7,200	4,200	0.900	0.525	D	B
	B2: No EB slip off-ramp, no WB barrier	*NB*	4M	8,000	72,320	3,095	5,745	0.387	0.718	A	C
		SB	4M	8,000	77,700	7,200	4,200	0.900	0.525	D	B
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	*NB*	4M	8,000	80,200	3,800	6,570	0.475	0.821	B	D
		SB	4M	8,000	77,700	7,200	4,200	0.900	0.525	D	B
	C2: No EB slip off-ramp, no WB barrier	*NB*	4M	8,000	72,320	3,095	5,745	0.387	0.718	A	C
		SB	4M	8,000	77,700	7,200	4,200	0.900	0.525	D	B
	C5: No EB slip off-ramp, with WB C-D system	*NB*	4M	8,000	72,320	3,095	5,745	0.387	0.718	A	C
		SB	4M	8,000	70,960	6,900	3,895	0.863	0.487	D	B
	D: Hybrid Alternative	*NB*	4M	8,000	72,320	3,095	5,745	0.387	0.718	A	C
		SB	4M	8,000	70,960	6,900	3,895	0.863	0.487	D	B
	D1: Hybrid with Flyover Alternative	*NB*	4M	8,000	72,320	3,095	5,745	0.387	0.718	A	C
		SB	4M	8,000	70,960	6,900	3,895	0.863	0.487	D	B

Footnotes:

a. Dir = Direction of travel.
b. Lanes: 2M +1A = 2 mainline + 1 auxiliary, etc.
c. Capacity and methodology is based on SANTEC/ITE Guidelines adopted by Caltrans District 11, where mainline/auxiliary lanes have capacities of 2,000/1,200 vph, respectively.
d. ADT = Average Daily Traffic volumes.
e. Peak hour volumes are based on Caltrans traffic model, and are expressed in vehicles per hour (vph).
f. V/C = Volume/Capacity ratio.
g. LOS = Level of Service.
h. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
i. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

LOS	V/C
A	<0.41
B	0.62
C	0.8
D	0.92
E	1
F(0)	1.25
F(1)	1.35
F(2)	1.45
F(3)	>1.46

TABLE 7–6
EXISTING AND YEAR 2015 SR-56 WEAVING OPERATIONS (HCM 2000 METHOD)

Weaving Sections	Model Run: Scenario	Weaving Segment					
		Speed[a]		Density[b]		LOS[c]	
		AM	PM	AM	PM	AM	PM
56W1) EB SR-56 between El Camino Real and Carmel Creek Road (on frontage road) ▪ *3-lane frontage road in Existing* ▪ *3-lane frontage road in Year 2015*	*Existing*	26.17	24.20	23.78	36.73	C	E
	A: No Build	24.69	22.26	31.73	60.08	D	**F**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	24.69	22.26	31.73	60.08	D	**F**
	B2: No EB slip off-ramp[d], no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	26.17	23.32	22.90	45.48	C	**F**
	C2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C5: No EB slip off-ramp, with WB C-D system[e]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	D: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	D1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
56W2) WB SR-56 between Carmel Creek Road and El Camino Real ▪ *4 Mainline+1 aux.lane* ▪ *2-lane off-ramp at diverge*	*Existing*	43.59	45.11	44.43	20.04	**F**	C
	A: No Build	39.33	44.96	57.12	23.07	**F**	D
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	39.33	44.96	57.12	23.07	**F**	D
	B2: No EB slip off-ramp, no WB barrier	39.33	44.96	57.12	23.07	**F**	D
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	49.06	53.58	37.75	16.54	E	B
	C2: No EB slip off-ramp, no WB barrier	49.06	53.58	37.75	16.54	E	B
	C5: No EB slip off-ramp, with WB C-D system	43.36	52.90	26.82	8.94	C	A
	D: Hybrid Alternative	43.36	52.90	26.82	8.94	C	A
	D1: Hybrid with Flyover Alternative	43.36	52.90	26.82	8.94	C	A

TABLE 7–6
EXISTING AND YEAR 2015 SR-56 WEAVING OPERATIONS (HCM 2000 METHOD)

Weaving Sections	Model Run: Scenario	Weaving Segment					
		Speed[a]		Density[b]		LOS[c]	
		AM	PM	AM	PM	AM	PM
56W3) EB SR-56 between Carmel Creek Road and Carmel Country Road. ▪ *4 Mainline+1 aux. lane* ▪ *2-lane off-ramp at diverge*	*Existing*	60.51	53.23	12.69	31.40	B	D
	A: No Build	59.52	51.59	15.33	40.25	B	E
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	59.52	51.59	15.33	40.25	B	E
	B2: No EB slip off-ramp, no WB barrier	57.02	49.11	17.51	45.08	B	**F**
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	63.41	56.98	11.59	2373	B	C
	C2: No EB slip off-ramp, no WB barrier	61.35	55.52	10.93	25.44	B	C
	C5: No EB slip off-ramp, with WB C-D system	60.99	55.28	11.10	25.63	B	C
	D: Hybrid Alternative	56.60	49.53	16.77	44.11	B	**F**
	D1: Hybrid with Flyover Alternative	60.50	54.85	9.98	23.90	A	C

Footnotes:

a. Speed is measured in miles per hour (mph)
b. Density is measured in passenger cars per mile per lane (pc/mile/lane)
c. LOS = Level of Service
d. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated. Hence there are no weaving movements.
e. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

General Notes:
DNE – Does not exist.
The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.

TABLE 7–7
EXISTING AND YEAR 2015 SR-56 WEAVING OPERATIONS (LOS D METHOD)

Weaving Sections	Model Run: Scenario	Weaving Segment			
		Weaving volume (veh/h)		Better/ Worse than LOS D? [a]	
		AM	PM	AM	PM
56W1) EB SR-56 between El Camino Real and Carmel Creek Road (on frontage road) ▪ *3-lane frontage road in Existing* ▪ *3-lane frontage road in Year 2030*	*Existing*	1399	**1982**	Better	**Worse**
	A: No Build	**1722**	**2958**	**Worse**	**Worse**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	**1722**	**2958**	**Worse**	**Worse**
	B2: No EB slip off-ramp [b], no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	C: Direct Connectors, *With EB slip off-ramp, no WB barrier*	1320	**2352**	Better	**Worse**
	C2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	C5: No EB slip off-ramp, with WB C-D system [c]	*DNE*	*DNE*	*DNE*	*DNE*
	D: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*
	D1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*
56W2) WB SR-56 between Carmel Creek Road and El Camino Real ▪ *4 Mainline+1 aux.lane* ▪ *2-lane off-ramp at diverge*	*Existing*	**1724**	1253	**Worse**	Better
	A: No Build	**2342**	1499	**Worse**	Better
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	**2342**	1499	**Worse**	Better
	B2: No EB slip off-ramp, no WB barrier	**2342**	1499	**Worse**	Better
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	**1664**	1077	**Worse**	Better
	C2: No EB slip off-ramp, no WB barrier	**1664**	1077	**Worse**	Better
	C5: No EB slip off-ramp, with WB C-D system	**1797**	1213	**Worse**	Better
	D: Hybrid Alternative	**1797**	1213	**Worse**	Better
	D1: Hybrid with Flyover Alternative	**1797**	1213	**Worse**	Better

TABLE 7–7
EXISTING AND YEAR 2015 SR-56 WEAVING OPERATIONS (LOS D METHOD)

Weaving Sections	Model Run: Scenario	Weaving Segment			
		Weaving volume (veh/h)		Better/ Worse than LOS D? [a]	
		AM	PM	AM	PM
56W3) EB SR-56 between Carmel Creek Road and Carmel Country Road. ▪ *4 Mainline+1 aux.lane* ▪ *2-lane off-ramp at diverge*	*Existing*	266	614	Better	Better
	A: No Build	315	731	Better	Better
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	315	731	Better	Better
	B2: No EB slip off-ramp, no WB barrier	402	833	Better	Better
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	310	723	Better	Better
	C2: No EB slip off-ramp, no WB barrier	397	825	Better	Better
	C5: No EB slip off-ramp, with WB C-D system	412	840	Better	Better
	D: Hybrid Alternative	417	848	Better	Better
	D1: Hybrid with Flyover Alternative	417	848	Better	Better

Footnotes:

a. Methodology based on LOS D Weaving method described in the 1965 HCM. Any weaving volume more than 1650 veh/h at 0.91 PHF is considered worse than LOS D.

b. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated. Hence there are no weaving movements.

c. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

General Notes:

DNE – Does not exist.

The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.

TABLE 7–8
EXISTING AND YEAR 2015 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M1) On-Ramp from WB Via de la Valle to NB I-5 [e] ▪ *6 Mainlines* ▪ *1 lane On-Ramp at merge*	*Existing*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	A: No Build	5265	6746	11,750	N	N	2148	2655	4600	N	N	B	C
	B: Auxiliary Lane Alternative	5265	6746	11,750	N	N	2148	2655	4600	N	N	B	C
	C: Direct Connectors Alternative	5267	7601	11,750	N	N	2147	2948	4600	N	N	B	C
	D: Hybrid Alternative	5267	7601	11,750	N	N	2147	2948	4600	N	N	B	C
	D1: Hybrid with Flyover Alternative	5267	7601	11,750	N	N	2147	2948	4600	N	N	B	C
5M2) On-Ramp from EB Via de la Valle to SB I-5 [e] ▪ *6 Mainlines* ▪ *1 lane On-Ramp at merge*	*Existing*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	A: No Build	7054	6080	11,750	N	N	2717	2435	4600	N	N	C	C
	B: Auxiliary Lane Alternative	7054	6080	11,750	N	N	2717	2435	4600	N	N	C	C
	C: Direct Connectors Alternative	7128	6269	11,750	N	N	2738	2491	4600	N	N	C	C
	D: Hybrid Alternative	7054	6080	11,750	N	N	2717	2435	4600	N	N	C	C
	D1: Hybrid with Flyover Alternative	7054	6080	11,750	N	N	2717	2435	4600	N	N	C	C
5M3) Bypass NB I-5 with Mainline NB I-5 ▪ *4 Mainlines* ▪ *3-lane Bypass (adds its own lanes)*	*Existing*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	A: No Build	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	B: Auxiliary Lane Alternative	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	C: Direct Connectors Alternative	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	D: Hybrid Alternative	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	D1: Hybrid with Flyover Alternative	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
5M4) EB Del Mar Heights Road with Bypass SB I-5 ▪ *3 Bypass lanes* ▪ *1-lane On-ramp at merge*	*Existing* [f]	6077	6059	11,750	N	N	2429	2423	4600	N	N	C	C
	A: No Build	7076	5853	11,750	N	N	2754	2355	4600	N	N	C	B
	B: Auxiliary Lane Alternative	6121	5290	11,750	N	N	1399	1277	4600	N	N	B	B
	C: Direct Connectors Alternative	4078	2932	7050	N	N	2692	1997	4600	N	N	C	B
	D: Hybrid Alternative	6121	5290	11,750	N	N	1399	1277	4600	N	N	B	B
	D1: Hybrid with Flyover Alternative	6121	5290	11,750	N	N	1399	1277	4600	N	N	B	B

TABLE 7–8 *continued*
EXISTING AND YEAR 2015 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M5) WB SR-56 connector to I-5 NB with Local Bypass NB I-5 ▪ *3 Mainlines* ▪ *1-lane Bypass (adds a lane)*	*Existing* [g]	5657	5673	11,750	N	N	2318	2302	4600	N	N	B	B
	A: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	B2: No EB slip off-ramp [h]*, no WB barrier*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	3957	4598	9400	N	N	3260	3482	4600	N	N	C	C
	C2: No EB slip off-ramp, no WB barrier	3957	4598	9400	N	N	3260	3482	4600	N	N	C	C
	C5: No EB slip off-ramp, with WB C-D system [i]	3957	4598	9400	N	N	3260	3482	4600	N	N	C	C
	D: Hybrid Alternative	3957	4598	9400	N	N	3260	3482	4600	N	N	C	C
	D1: Hybrid with Flyover Alternative	3957	4598	9400	N	N	3260	3482	4600	N	N	C	C

TABLE 7–8 *continued*
EXISTING AND YEAR 2015 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M6) On-Ramp from Carmel Valley Road to SB I-5 ▪ *4 Mainlines* ▪ *1-lane On-Ramp at merge*	*Existing*	7192	7104	9400	N	N	4560	4524	4600	N	N	D	D
	A: No Build	7402	6134	9400	N	N	**4636**	3922	4600	**Y**	N	**F**	C
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	7402	6134	9400	N	N	**4636**	3922	4600	**Y**	N	**F**	C
	B2: No EB slip off-ramp, no WB barrier	7402	6134	9400	N	N	**4636**	3922	4600	**Y**	N	**F**	C
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	7402	6134	9400	N	N	**4636**	3922	4600	**Y**	N	**F**	C
	C2: No EB slip off-ramp, no WB barrier	7402	6134	9400	N	N	**4636**	3922	4600	**Y**	N	**F**	C
	C5: No EB slip off-ramp, with WB C-D system	7733	6470	9400	N	N	**4704**	4044	4600	**Y**	N	**F**	C
	D: Hybrid Alternative	7733	6470	9400	N	N	**4704**	4044	4600	**Y**	N	**F**	C
	D1: Hybrid with Flyover Alternative	7733	6470	9400	N	N	**4704**	4044	4600	**Y**	N	**F**	C
5M7) On-Ramp from Carmel Mountain Road to Bypass NB I-5 ▪ *4 Bypass lanes* ▪ *1 lane On-Ramp at merge*	*Existing*	3334	6671	9400	N	N	1497	2622	4600	N	N	B	C
	A: No Build	4111	7159	9400	N	N	1795	2755	4600	N	N	B	C
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	4111	7159	9400	N	N	1795	2755	4600	N	N	B	C
	B2: No EB slip off-ramp, no WB barrier	3326	6241	9400	N	N	1542	2483	4600	N	N	B	C
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	4111	7159	9400	N	N	1795	2755	4600	N	N	B	C
	C2: No EB slip off-ramp, no WB barrier	3326	6241	9400	N	N	1542	2483	4600	N	N	B	C
	C5: No EB slip off-ramp, with WB C-D system	3326	6241	9400	N	N	1542	2483	4600	N	N	B	C
	D: Hybrid Alternative	3326	6241	9400	N	N	1542	2483	4600	N	N	B	C
	D1: Hybrid with Flyover Alternative	3326	6241	9400	N	N	1542	2483	4600	N	N	B	C

TABLE 7–8
EXISTING AND YEAR 2015 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M8) On-Ramp from Carmel Mountain Road to Bypass SB I-5 ▪ *4 Bypass lanes* ▪ *1 lane On-Ramp at merge*	*Existing*	6559	4556	9400	N	N	2579	1954	4600	N	N	C	B
	A: No Build	8115	4666	9400	N	N	3012	2025	4600	N	N	C	B
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	8115	4666	9400	N	N	3012	2025	4600	N	N	C	B
	B2: No EB slip off-ramp, no WB barrier	8115	4666	9400	N	N	3012	2025	4600	N	N	C	B
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	8004	4666	9400	N	N	2982	2025	4600	N	N	C	B
	C2: No EB slip off-ramp, no WB barrier	8004	4666	9400	N	N	2982	2025	4600	N	N	C	B
	C5: No EB slip off-ramp, with WB C-D system	7670	4326	9400	N	N	2889	1926	4600	N	N	C	B
	D: Hybrid Alternative	7670	4326	9400	N	N	2889	1926	4600	N	N	C	B
	D1: Hybrid with Flyover Alternative	7670	4326	9400	N	N	2889	1926	4600	N	N	C	B

TABLE 7–8
EXISTING AND YEAR 2015 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M9) On-Ramp from Del Mar Heights Road to NB I-5[e] ▪ *7 Mainlines* ▪ *1 lane On-Ramp at merge*	*Existing*	6290	6790	11,750	N	N	2513	2659	4600	N	N	C	C
	A: No Build	6073	7521	11,750	N	N	3818	4523	4600	N	N	C	D
	B: Auxiliary Lane Alternative	6073	7521	11,750	N	N	3818	4523	4600	N	N	C	D
	C: Direct Connectors Alternative	5481	6820	11,750	N	N	3533	4216	4600	N	N	C	D
	D: Hybrid Alternative	5481	6820	11,750	N	N	3533	4216	4600	N	N	C	D
	D1: Hybrid with Flyover Alternative	5481	6820	11,750	N	N	3533	4216	4600	N	N	C	D

Footnotes:

a. Volumes factored up to account for peak hour factor (PHF) and truck percentages and are expressed in vehicles per hour (vph) for downstream mainline section. Because of this factoring, these volumes do NOT match figures.
b. Capacity based on methodology found in Chapter 25 of the *2000 Highway Capacity Manual (HCM)*. For ramps, capacity is referred as "Ramp Junction Capacity at the Merge Influence Area".
c. Merge influence area includes mainline volumes for rightmost lanes 1 and 2 and on ramp volumes.
d. Ramp Junction operations dependent on freeway mainline operations and ramp capacity.
e. According to Chapter 25 of HCM, merge areas with 6 mainlines or more cannot be evaluated. So the volume per lane was calculated and analysis was conducted with 5 mainlines.
f. The merge section 5M4 in the existing scenarios deals with the EB Del Mar Heights Road on-ramp to mainline SB I-5.
g. The merge section 5M5 in the existing scenario deals with the merging of Carmel Valley on-ramp to NB I-5.
h. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
i. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

General Notes:
DNE – Does not exist for specified scenario.
NM – No merge analysis required for the specified scenario.
The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.

TABLE 7–9
EXISTING AND YEAR 2015 RAMP MERGE OPERATIONS (SR-56)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS[d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56M1) I-5 connectors to EB SR-56 ▪ *2-lane from Bypass NB I-5* ▪ *2-lane Bypass from SB I-5 at merge*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	A: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	B2: No EB slip off-ramp [e], no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	C2: No EB slip off-ramp, no WB barrier	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	C5: No EB slip off-ramp, with WB C-D system [f]	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	D: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	D1: Hybrid with Flyover Alternative	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
56M2) Carmel Country Road to WB SR-56 ▪ *3 Mainlines* ▪ *1-lane at merge (adds a lane)*	*Existing*	5813	2253	7050	N	N	5813	2253	7050 [g]	N	N	D	B
	A: No Build	6735	2552	7050	N	N	6735	2552	7050 [g]	N	N	E	B
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	6735	2552	9400	N	N	4793	1891	7050	N	N	C	B
	B2: No EB slip off-ramp, no WB barrier	6891	2733	9400	N	N	4949	2072	7050	N	N	C	B
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	7573	2975	11,750	N	N	5613	1868	7050	N	N	C	B
	C2: No EB slip off-ramp, no WB barrier	7541	3156	11,750	N	N	5352	2335	7050	N	N	C	B
	C5: No EB slip off-ramp, with WB C-D system	7629	3245	11,750	N	N	5440	2424	7050	N	N	C	B
	D: Hybrid Alternative	7629	3245	11,750	N	N	5440	2424	7050	N	N	C	B
	D1: Hybrid with Flyover Alternative	7629	3245	11,750	N	N	5440	2424	7050	N	N	C	B

TABLE 7–9
EXISTING AND YEAR 2015 RAMP MERGE OPERATIONS (SR-56)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS[d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56M3) On-Ramp from Carmel Country Road to EB SR-56 ▪ *3 Mainlines* ▪ *1-lane On-Ramp at merge*	*Existing*	2241	4085	4700	N	N	2241	4085	4600	N	N	B	D
	A: No Build	2828	**5325**	4700	N	**Y**	2828	**5325**	4600	N	**Y**	C	**F**
	B: Auxiliary Lane Alternative	2828	**5325**	4700	N	**Y**	2828	**5325**	4600	N	**Y**	C	**F**
	C: Direct Connectors Alternative	3089	**5695**	4700	N	**Y**	2059	3537	4600	N	N	B	**F**
	D: Hybrid Alternative	2828	**5325**	4700	N	**Y**	2828	**5325**	4600	N	**Y**	C	**F**
	D1: Hybrid with Flyover Alternative	2828	**5325**	4700	N	**Y**	1949	3385	4600	N	N	C	**F**
56M4) On-Ramp from Carmel Valley Road to WB SR-56 ▪ *2 Mainlines* ▪ *1-lane On-Ramp at merge*	*Existing*	**4854**	1770	4700	**Y**	N	**4854**	1770	4600	**Y**	N	**F**	B
	A: No Build	**5640**	2111	4700	**Y**	N	**5640**	2111	4600	**Y**	N	**F**	B
	B: Auxiliary Lane Alternative	**5640**	2111	4700	**Y**	N	**5640**	2111	4600	**Y**	N	**F**	B
	C: Direct Connectors Alternative	**6090**	2410	4700	**Y**	N	**6090**	2410	4600	**Y**	N	**F**	C
	D: Hybrid Alternative	**6090**	2410	4700	**Y**	N	**6090**	2410	4600	**Y**	N	**F**	C
	D1: Hybrid with Flyover Alternative	**6090**	2410	4700	**Y**	N	**6090**	2410	4600	**Y**	N	**F**	C
56M5) On-Ramp from Carmel Valley Road to EB SR-56 ▪ *2 Mainlines* ▪ *1-lane On-Ramp at merge*	*Existing*	1787	3537	4700	N	N	1787	3537	4600	N	N	B	D
	A: No Build	2646	**4816**	4700	**Y**	N	2646	**4816**	4600	N	**Y**	C	**F**
	B: Auxiliary Lane Alternative	2646	**4816**	4700	**Y**	N	2646	**4816**	4600	N	**Y**	C	**F**
	C: Direct Connectors Alternative	2847	**5095**	4700	N	**Y**	2847	**5095**	4600	N	**Y**	C	**F**
	D: Hybrid Alternative	2646	**4816**	4700	**Y**	N	2646	**4816**	4600	N	**Y**	C	**F**
	D1: Hybrid with Flyover Alternative	2646	**4816**	4700	**Y**	N	2646	**4816**	4600	N	**Y**	C	**F**

Footnotes:

a. Volumes factored up to account for peak hour factor (PHF) and truck percentages and are expressed in vehicles per hour (vph) for downstream mainline section. Because of this factoring, these volumes do NOT match figures.
b. Capacity based on methodology found in Chapter 25 of the *2000 Highway Capacity Manual (HCM)*. For ramps, capacity is referred as "Ramp Junction Capacity at the Merge Influence Area".
c. Merge influence area includes mainline volumes for rightmost lanes 1 and 2 and on ramp volumes.
d. Ramp Junction operations dependent on freeway mainline operations and ramp capacity.
e. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
f. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
g. The Highway Capacity Manual (HCM) does not provide merge analysis for situations involving lane additions. Hence for this merge segment, the merge influence area is assumed to consist of 3-lanes (two outer freeway lanes and one lane from the ramp). Hence the capacity used is 7050 pc/h. Level of service D is assumed to be at 90% of capacity.

General Notes:
DNE – Does not exist for specified scenario.
NM – No merge analysis required for the specified scenario.
The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.

TABLE 7–10
EXISTING AND YEAR 2015 RAMP DIVERGE OPERATIONS (I-5)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5D1) Off-Ramp to Via de la Valle from Mainline SB I-5[d] ▪ *6 Mainlines* ▪ *2-lane Off-Ramp at diverge*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	A: No Build	6151	4823	9400	N	N	1096	1069	3800	N	N	B	B
	B: Auxiliary Lane Alternative	6151	4823	9400	N	N	1096	1069	3800	N	N	B	B
	C: Direct Connectors Alternative	6319	5042	9400	N	N	1073	1036	3800	N	N	B	B
	D: Hybrid Alternative	6151	4823	9400	N	N	1096	1069	3800	N	N	B	B
	D1: Hybrid with Flyover Alternative	6151	4823	9400	N	N	1096	1069	3800	N	N	B	B
5D2) Off-Ramp to Via de la Valle from NB I-5 [d] ▪ *6 Mainlines* ▪ *2-lane Off-Ramp at diverge*	*Existing*	4283	4433	9400	N	N	1484	1543	3800	N	N	B	B
	A: No Build	4556	5860	9400	N	N	1552	1819	3800	N	N	B	B
	B: Auxiliary Lane Alternative	4556	5860	9400	N	N	1552	1819	3800	N	N	B	B
	C: Direct Connectors Alternative	4825	6035	9400	N	N	1552	1819	3800	N	N	B	B
	D: Hybrid Alternative	4825	6035	9400	N	N	1552	1819	3800	N	N	B	B
	D1: Hybrid with Flyover Alternative	4825	6035	9400	N	N	1552	1819	3800	N	N	B	B
5D3) Off-Ramp to Del Mar Heights Road from Mainline SB I-5[d] ▪ *8 Mainlines* ▪ *2-lane Off-Ramp at diverge*	*Existing*	6542	6412	9400	N	N	1141	1157	2000	N	N	B	B
	A: No Build	6183	4684	9400	N	N	1643	1601	3800	N	N	B	B
	B: Auxiliary Lane Alternative	6183	4684	9400	N	N	1643	1601	3800	N	N	B	B
	C: Direct Connectors Alternative	4550	3873	9400	N	N	1438	1301	3800	N	N	B	B
	D: Hybrid Alternative	6183	4684	9400	N	N	1643	1601	3800	N	N	B	B
	D1: Hybrid with Flyover Alternative	6183	4684	9400	N	N	1643	1601	3800	N	N	B	B
5D4) Off-Ramp to Del Mar Heights Road from Bypass NB I-5 ▪ *4 Bypass lanes* ▪ *2-lane Off-Ramp at diverge*	*Existing*	4614	4633	9400	N	N	1323	1267	3800	N	N	A	A
	A: No Build	4189	6076	9400	N	N	1631	1499	3800	N	N	B	B
	B: Auxiliary Lane Alternative	4189	5865	9400	N	N	1631	1499	3800	N	N	B	B
	C: Direct Connectors Alternative	2343	3109	7050	N	N	1631	1499	3800	N	N	A	B
	D: Hybrid Alternative	2343	3109	7050	N	N	1631	1499	3800	N	N	B	B
	D1: Hybrid with Flyover Alternative	2343	3109	7050	N	N	1631	1499	3800	N	N	B	B

TABLE 7–10 *continued*
EXISTING AND YEAR 2015 RAMP DIVERGE OPERATIONS (I-5)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5D5) Freeway Connector to EB SR-56 from Mainline I-5 SB ▪ *5 Mainlines* ▪ *2-lane Connector at diverge*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	A: No Build [e]	4723	3933	9400	N	N	3549	2425	4400	N	N	F[f]	A
	B: Auxiliary Lane Alternative [e]	3343	3205	9400	N	N	3549	2425	4400	N	N	F[f]	A
	C: Direct Connectors Alternative	5225	4477	9400	N	N	937	1389	3800	N	N	B	B
	D: Hybrid Alternative [e]	3343	3205	9400	N	N	3549	2425	4400	N	N	F[f]	A
	D1: Hybrid with Flyover Alternative [e]	3343	3205	9400	N	N	3549	2425	4400	N	N	F[f]	A
5D6) Off-Ramp to Carmel Valley Road from Bypass SB I-5 ▪ *4 Bypass lanes* ▪ *1-lane Off-Ramp at diverge*	*Existing*	5521	5492	9400	N	N	882	893	2000	N	N	B	B
	A: No Build	6562	4885	9400	N	N	1014	1264	2000	N	N	C	B
	B: Auxiliary Lane Alternative	5478	4337	9400	N	N	1014	1264	2000	N	N	C	B
	C: Direct Connectors Alternative	3589	2453	4700	N	N	496	485	2000	N	N	B	A
	D: Hybrid Alternative	5478	4337	9400	N	N	1014	1264	2000	N	N	C	B
	D1: Hybrid with Flyover Alternative	5478	4337	9400	N	N	1014	1264	2000	N	N	C	B
5D7) Off-Ramp to Carmel Valley Road from Mainline NB I-5 ▪ *5 Mainlines* ▪ *2-lane Off-Ramp at diverge*	*Existing*	5010	4483	9400	N	N	827	882	3800	N	N	B	B
	A: No Build	4198	5199	9400	N	N	1157	1301	3800	N	N	B	B
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	4198	5199	9400	N	N	1157	1301	3800	N	N	B	B
	B2: No EB slip off-ramp [g], no WB barrier	3734	5025	9400	N	N	1934	2210	3800	N	N	B	C
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	4198	5199	9400	N	N	1157	1301	3800	N	N	B	B
	C2: No EB slip off-ramp, no WB barrier	3734	5025	9400	N	N	1934	2210	3800	N	N	B	C
	C5: No EB slip off-ramp, with WB C-D system [h]	3734	5025	9400	N	N	1934	2210	3800	N	N	B	C
	D: Hybrid Alternative	3734	5025	9400	N	N	1934	2210	3800	N	N	B	C
	D1: Hybrid with Flyover Alternative	3734	5025	9400	N	N	1934	2210	3800	N	N	B	C

TABLE 7–10 *continued*
EXISTING AND YEAR 2015 RAMP DIVERGE OPERATIONS (I-5)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5D8) Off-Ramp to Carmel Mountain Road from Bypass SB I-5 ▪ *4 Bypass lanes* ▪ *1-lane Off-Ramp at diverge*	*Existing*	5740	3789	9400	N	N	827	441	2000	N	N	D	C
	A: No Build	6965	3736	9400	N	N	904	716	2000	N	N	E	C
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	6965	3736	9400	N	N	904	716	2000	N	N	E	C
	B2: No EB slip off-ramp, no WB barrier	6965	3736	9400	N	N	904	716	2000	N	N	E	C
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	6965	3736	9400	N	N	904	716	2000	N	N	E	C
	C2: No EB slip off-ramp, no WB barrier	6965	3736	9400	N	N	904	716	2000	N	N	E	C
	C5: No EB slip off-ramp, with WB C-D system	6631	3397	9400	N	N	904	716	2000	N	N	E	C
	D: Hybrid Alternative	6631	3397	9400	N	N	904	716	2000	N	N	E	C
	D1: Hybrid with Flyover Alternative	6631	3397	9400	N	N	904	716	2000	N	N	E	C

TABLE 7–10
EXISTING AND YEAR 2015 RAMP DIVERGE OPERATIONS (I-5)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5D9) Off-Ramp to Carmel Mountain Road from Bypass NB I-5 ▪ *4 Bypass lanes* ▪ *1-lane Off-Ramp at diverge*	*Existing*	2790	6020	9400	N	N	716	992	2000	N	N	B	D
	A: No Build	3425	6266	9400	N	N	805	1047	2000	N	N	C	E
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	3425	6266	9400	N	N	805	1047	2000	N	N	C	E
	B2: No EB slip off-ramp, no WB barrier	2640	5347	9400	N	N	805	1047	2000	N	N	B	D
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	3425	6266	9400	N	N	805	1047	2000	N	N	C	E
	C2: No EB slip off-ramp, no WB barrier	2640	5347	9400	N	N	805	1047	2000	N	N	B	D
	C5: No EB slip off-ramp, with WB C-D system	2640	5347	9400	N	N	805	1047	2000	N	N	B	D
	D: Hybrid Alternative	2640	5347	9400	N	N	805	1047	2000	N	N	B	D
	D1: Hybrid with Flyover Alternative	2640	5347	9400	N	N	805	1047	2000	N	N	B	D

Footnotes:

a. Volumes factored up to account for peak hour factor (PHF) and truck percentages, and are expressed in vehicles per hour (vph) in the downstream mainline section. Because of this factoring, these volumes do NOT match figures.
b. Capacity based on methodology found in Chapter 25 of the *2000 Highway Capacity Manual (HCM)* (Exhibit 25–14). For ramps, capacity is a function of free flow speed of ramp (mph) and number of lanes on the ramp.
c. Ramp Junction operations dependent on freeway mainline operations and ramp capacity in the influence area.
d. According to Chapter 25 of HCM, diverge areas with 6 mainlines or more cannot be evaluated. So volume per lane was calculated and analysis was conducted with 5 mainlines.
e. The diverge section 5D5 for the Year 2015 No Build (Run E) , Auxiliary Lane and Hybrid Alternatives deals with the diverge section of I-5 SB bypass exiting from I-5 SB mainline.
f. The diverge junction shows acceptable operations at the downstream mainline facility and off ramp but shows LOS F at the ramp influence area (V_{12}).
g. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
h. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

General Notes:

DNE = Does not exist for specified scenario. The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.

TABLE 7–11
EXISTING AND YEAR 2015 RAMP DIVERGE OPERATIONS (SR-56)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56D1) Off-Ramp to Carmel Creek Road from EB SR-56 ▪ *2 Mainline* ▪ *1-lane Off-Ramp at diverge*	*Existing*	1132	2993	4700	N	N	838	1014	2000	N	N	C	E
	A: No Build	1190	2951	4700	N	N	1036	1212	2000	N	N	C	E
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1190	2951	4700	N	N	1036	1212	2000	N	N	C	E
	B2: No EB slip off-ramp [d], no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	1190	2951	4700	N	N	1036	1212	2000	N	N	C	E
	C2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C5: No EB slip off-ramp, with WB C-D system [e]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	D: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	D1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
56D2) Off-Ramp to I-5 NB connector from WB SR-56 ▪ *4 Mainlines* ▪ *2-lane Off-Ramp at diverge*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	A: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	B2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	4302	2014	4700	N	N	1653	1047	3800	N	N	C	B
	C2: No EB slip off-ramp, no WB barrier	4302	2014	4700	N	N	1653	1047	3800	N	N	C	B
	C5: No EB slip off-ramp, with WB C-D system	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	D: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	D1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*

TABLE 7–11 *continued*
EXISTING AND YEAR 2015 RAMP DIVERGE OPERATIONS (SR-56)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56D3) Off-Ramp to Carmel Creek Road from WB SR-56 ▪ *3 Mainline* ▪ *2-lane Off-Ramp at diverge*	*Existing*	**5186**	1933	4700	**Y**	N	640	326	2000	N	N	**F**	A
	A: No Build	**6009**	2169	4700	**Y**	N	743	391	2000	N	N	**F**	A
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	6009	2169	7050	N	N	743	391	3800	N	N	D	A
	B2: No EB slip off-ramp, no WB barrier	6011	2171	7050	N	N	898	573	3800	N	N	D	A
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	5206	2608	9400	N	N	716	375	3800	N	N	B	A
	C2: No EB slip off-ramp, no WB barrier	5176	2610	9400	N	N	872	557	3800	N	N	B	A
	C5: No EB slip off-ramp, with WB C-D system	5247	2699	9400	N	N	872	557	3800	N	N	B	A
	D: Hybrid Alternative	5247	2699	9400	N	N	872	557	3800	N	N	B	A
	D1: Hybrid with Flyover Alternative	5247	2699	9400	N	N	872	557	3800	N	N	B	A
56D4) Off-Ramp to Carmel Valley Road from EB SR-56 ▪ *2 Mainlines* ▪ *1-lane Off-Ramp at diverge*	*Existing*	1732	3497	4700	N	N	513	591	3800	N	N	A	A
	A: No Build	2306	4437	4700	N	N	529	893	3800	N	N	A	E
	B: Auxiliary Lane Alternative	2306	4437	4700	N	N	529	893	3800	N	N	A	E
	C: Direct Connectors Alternative	2543	**4773**	4700	**Y**	N	551	926	2000	N	N	B	**F**
	D: Hybrid Alternative	2306	4437	4700	N	N	529	893	3800	N	N	A	E
	D1: Hybrid with Flyover Alternative	2306	4437	4700	N	N	529	893	3800	N	N	A	E
56D5) Off-Ramp to Carmel Country Road from WB SR-56 ▪ *2 Mainlines* ▪ *1-lane Off-Ramp at diverge*	*Existing*	4575	1558	4700	N	N	288	215	3800	N	N	E [f]	A
	A: No Build	**5110**	1740	4700	**Y**	N	539	376	2000	N	N	**F**	A
	B: Auxiliary Lane Alternative	**5110**	1740	4700	**Y**	N	539	376	2000	N	N	**F**	A
	C: Direct Connectors Alternative	**5757**	2162	7050	**Y**	N	342	253	2000	N	N	**F**	C
	D: Hybrid Alternative	**5757**	2162	7050	**Y**	N	342	253	2000	N	N	**F**	C
	D1: Hybrid with Flyover Alternative	**5757**	2162	7050	**Y**	N	342	253	2000	N	N	**F**	C
56D6) Off-Ramp to Carmel Valley Road from WB SR-56 ▪ *2 Mainlines* ▪ *1-lane Off-Ramp at diverge*	*Existing*	3956	1419	4700	N	N	80	46	2000	N	N	E	B
	A: No Build	**4746**	1589	4700	**Y**	N	285	570	2000	N	N	**F** [h]	C
	B: Auxiliary Lane Alternative	**4746**	1589	4700	**Y**	N	285	570	2000	N	N	**F** [h]	C
	C: Direct Connectors Alternative	**5156**	1864	4700	**Y**	N	220	529	2000	N	N	**F**	C

TABLE 7–11
EXISTING AND YEAR 2015 RAMP DIVERGE OPERATIONS (SR-56)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
	D: Hybrid Alternative	**5156**	1864	4700	**Y**	N	220	529	2000	N	N	**F**	C
	D1: Hybrid with Flyover Alternative	**5156**	1864	4700	**Y**	N	220	529	2000	N	N	**F**	C
56D7) Off-Ramp to El Camino Real Road from WB SR-56 ▪ *4 Mainline* ▪ *2-lane Off-Ramp at diverge*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	A: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	B2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C5: No EB slip off-ramp, with WB C-D system	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	D: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	D1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*

Footnotes:

a. Volumes factored up to account for peak hour factor (PHF) and truck percentages, and are expressed in vehicles per hour (vph) in the downstream mainline section. Because of this factoring, these volumes do NOT match figures.
b. Capacity based on methodology found in Chapter 25 of the *2000 Highway Capacity Manual (HCM)* (Exhibit 25–14). For ramps, capacity is a function of free flow speed of ramp (mph) and number of lanes on the ramp.
c. Ramp Junction operations dependent on freeway mainline operations and ramp capacity in the influence area.
d. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated. Hence there is no diverge section.
e. This alternative is analyzed as a Collector-Distributor alternative between Carmel Creek Road and El Camino Real on WB SR-56.
f. This diverge junction has 2 mainlines downstream, which equals to capacity of 4700 pc/h. The volume (4575) to capacity ratio (4700) is 0.97 and hence LOS E is reported.

General Notes:

DNE = Does not exist for specified scenario.
The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.

TABLE 7–12
EXISTING AND YEAR 2015 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
ON1) On-ramp from Carmel Mountain Road to Bypass NB I-5 ▪ *2 lane on-ramp*	*Existing*	500	600	3800	35	U	U
	A: No Build	630	820	3800	35	U	U
	B: Auxiliary Lane Alternative	630	820	3800	35	U	U
	C: Direct Connectors Alternative	630	820	3800	35	U	U
	D: Hybrid Alternative	630	820	3800	35	U	U
	D1: Hybrid with Flyover Alternative	630	820	3800	35	U	U
ON2) On-ramp from Carmel Valley Road to Bypass NB I-5 ▪ *1 lane on-ramp*	*Existing*	880	680	2000	35	U	U
	A: No Build	1203	1008	2000	35	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1203	1008	3800 [c]	35	U	U
	B2: No EB slip off-ramp [d], no WB barrier	1203	1008	3800 [c]	35	U	U
	C: Direct Connectors, *With EB slip off-ramp, no WB barrier*	370	490	2000	35	U	U
	C2: No EB slip off-ramp, no WB barrier	370	490	2000	35	U	U
	C5: No EB slip off-ramp, with WB C-D system [e]	370	490	2000	35	U	U
	D: Hybrid Alternative	370	490	2000	35	U	U
	D1: Hybrid with Flyover Alternative	370	490	2000	35	U	U
ON3) On-ramp from Del Mar Heights Road to NB I-5 ▪ *2-lane on-ramp*	*Existing*	1040	1250	3800	35	U	U
	A: No Build	1441	1500	3800	35	U	U
	B: Auxiliary Lane Alternative	1441	1500	3800	35	U	U
	C: Direct Connectors Alternative	1120	1300	3800	35	U	U
	D: Hybrid Alternative	1120	1300	3800	35	U	U
	D1: Hybrid with Flyover Alternative	1120	1300	3800	35	U	U
ON4) Loop on-ramp from EB Via de la Valle to NB I-5 ▪ *1 lane on-ramp*	*Existing*	320	600	1900	25	U	U
	A: No Build	390	650	1900	25	U	U
	B: Auxiliary Lane Alternative	390	650	1900	25	U	U
	C: Direct Connectors Alternative	390	650	1900	25	U	U
	D: Hybrid Alternative	390	650	1900	25	U	U
	D1: Hybrid with Flyover Alternative	390	650	1900	25	U	U
ON5) On-ramp from WB Via de la Valle to NB I-5 ▪ *1-lane on-ramp*	*Existing*	470	400	2000	35	U	U
	A: No Build	406	522	2000	35	U	U
	B: Auxiliary Lane Alternative	406	522	2000	35	U	U
	C: Direct Connectors Alternative	460	530	2000	35	U	U
	D: Hybrid Alternative	460	530	2000	35	U	U
	D1: Hybrid with Flyover Alternative	460	530	2000	35	U	U

TABLE 7–12 *continued*
EXISTING AND YEAR 2015 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
ON6) Loop on-ramp from WB Via de la Valle to SB I-5 ▪ *1-lane on-ramp*	*Existing*	670	520	1900	25	U	U
	A: No Build	740	690	1900	25	U	U
	B: Auxiliary Lane Alternative	740	690	1900	25	U	U
	C: Direct Connectors Alternative	740	690	1900	25	U	U
	D: Hybrid Alternative	740	690	1900	25	U	U
	D1: Hybrid with Flyover Alternative	740	690	1900	25	U	U
ON7) On-ramp from EB Via de la Valle to SB I-5 ▪ *2 lane on-ramp*	*Existing*	910	760	3800	35	U	U
	A: No Build	960	810	3800	35	U	U
	B: Auxiliary Lane Alternative	960	810	3800	35	U	U
	C: Direct Connectors Alternative	960	810	3800	35	U	U
	D: Hybrid Alternative	960	810	3800	35	U	U
	D1: Hybrid with Flyover Alternative	960	810	3800	35	U	U
ON8) Loop on-ramp from WB Del Mar Heights Road to Bypass SB I-5 ▪ *2 lane on-ramp*	*Existing*	900	600	3500	25	U	U
	A: No Build	1050	700	3500	25	U	U
	B: Auxiliary Lane Alternative	1050	700	3500	25	U	U
	C: Direct Connectors Alternative	1050	700	3500	25	U	U
	D: Hybrid Alternative	1050	700	3500	25	U	U
	D1: Hybrid with Flyover Alternative	1050	700	3500	25	U	U
ON9) On-ramp from EB Del Mar Heights Road to Bypass SB I-5 ▪ *2-lane on ramp*	*Existing*	550	550	3800	35	U	U
	A: No Build	600	570	3800	35	U	U
	B: Auxiliary Lane Alternative	600	570	3800	35	U	U
	C: Direct Connectors Alternative	600	570	3800	35	U	U
	D: Hybrid Alternative	600	570	3800	35	U	U
	D1: Hybrid with Flyover Alternative	600	570	3800	35	U	U
FF1) SB I-5 Freeway connector to EB SR-56 ▪ *2-lane freeway connector*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	A: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	B: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C: Direct Connectors Alternative	850	1260	4100	45	U	U
	D: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	D1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
FF2) WB SR-56 Freeway connector to Bypass NB I-5 ▪ *2-lane freeway connector*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	A: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	B: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	1500	950	4100	45	U	U
	C2: No EB slip off-ramp, no WB barrier	1500	950	4100	45	U	U
	C5: No EB slip off-ramp, with WB C-D system	1500	950	4100	45	U	U
	D: Hybrid Alternative	1500	950	4100	45	U	U
	D1: Hybrid with Flyover Alternative	1500	950	4100	45	U	U

TABLE 7–12 *continued*

EXISTING AND YEAR 2015 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
FF3) Bypass NB I-5 Freeway connector to EB SR-56 ▪ *2-lane freeway connector*	*Existing*	1770	3600	4100	45	U	U
	A: No Build	2000	3740	4100	45	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	2000	3740	4100	45	U	U
	B2: No EB slip off-ramp, no WB barrier	1295	2915	4100	45	U	U
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	2000	3740	4100	45	U	U
	C2: No EB slip off-ramp, no WB barrier	1295	2915	4100	45	U	U
	C5: No EB slip off-ramp, with WB C-D system	1295	2915	4100	45	U	U
	D: Hybrid Alternative	1295	2915	4100	45	U	U
	D1: Hybrid with Flyover Alternative	1295	2915	4100	45	U	U
FF4) WB SR-56 Freeway connector to SB I-5 ▪ *2-lane freeway connector*	*Existing*	3700	1600	4100	45	U	U
	A: No Build	3850	1800	4100	45	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	3850	1800	4100	45	U	U
	B2: No EB slip off-ramp, no WB barrier	3850	1800	4100	45	U	U
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	3850	1800	4100	45	U	U
	C2: No EB slip off-ramp, no WB barrier	3850	1800	4100	45	U	U
	C5: No EB slip off-ramp, with WB C-D system	3550	1495	4100	45	U	U
	D: Hybrid Alternative	3550	1495	4100	45	U	U
	D1: Hybrid with Flyover Alternative	3550	1495	4100	45	U	U

TABLE 7–12 *continued*

EXISTING AND YEAR 2015 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
ON10) On-ramp from Carmel Valley Road to SB I-5 ▪ *2-lane on-ramp*	*Existing*	840	800	3800	35	U	U
	A: No Build	950	940	3800	35	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	950	940	3800	35	U	U
	B2: No EB slip off-ramp, no WB barrier	950	940	3800	35	U	U
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	950	940	3800	35	U	U
	C2: No EB slip off-ramp, no WB barrier	950	940	3800	35	U	U
	C5: No EB slip off-ramp, with WB C-D system	1250	1245	3800	35	U	U
	D: Hybrid Alternative	1250	1245	3800	35	U	U
	D1: Hybrid with Flyover Alternative	1250	1245	3800	35	U	U
ON11) On-ramp from Carmel Mountain Road to Bypass SB I-5 ▪ *2 lane on-ramp*	*Existing*	750	700	3800	35	U	U
	A: No Build	950	850	3800	35	U	U
	B: Auxiliary Lane Alternative	950	850	3800	35	U	U
	C: Direct Connectors Alternative	950	850	3800	35	U	U
	D: Hybrid Alternative	950	850	3800	35	U	U
	D1: Hybrid with Flyover Alternative	950	850	3800	35	U	U
ON12) On-ramp from El Camino Real to EB SR-56 ▪ *2-lane on-ramp*	*Existing*	942	1511	3800	35	U	U
	A: No Build	1203	2557	3800	35	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1203	2557	3800	35	U	U
	B2: No EB slip off-ramp, no WB barrier	1908	3382	3800 [f]	35	U	U [c]
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	700	1800	3800	35	U	U
	C2: No EB slip off-ramp, no WB barrier	1405	2625	3800 [f]	35	U	U [c]
	C5: No EB slip off-ramp, with WB C-D system	1405	2625	3800 [f]	35	U	U
	D: Hybrid Alternative	1908	3382	3800 [f]	35	U	U [c]
	D1: Hybrid with Flyover Alternative	1358	2565	3800 [f]	35	U	U [c]

TABLE 7–12
EXISTING AND YEAR 2015 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
ON13) On-ramp from Carmel Creek Road to EB SR-56 ▪ *2-lane on-ramp*	*Existing*	237	477	3800	35	U	U
	A: No Build	293	580	3800	35	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	293	580	3800	35	U	U
	B2: No EB slip off-ramp, no WB barrier	293	580	3800	35	U	U
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	280	560	3800	35	U	U
	C2: No EB slip off-ramp, no WB barrier	280	560	3800	35	U	U
	C5: No EB slip off-ramp, with WB C-D system	300	580	3800	35	U	U
	D: Hybrid Alternative	313	600	3800	35	U	U
	D1: Hybrid with Flyover Alternative	313	600	3800	35	U	U
ON14) On-ramp from Carmel Country Road to EB SR-56 ▪ *2-lane on-ramp*	*Existing*	393	273	3800	35	U	U
	A: No Build	601	492	3800	35	U	U
	B: Auxiliary Lane Alternative	601	492	3800	35	U	U
	C: Direct Connectors Alternative	500	340	3800	35	U	U
	D: Hybrid Alternative	601	492	3800	35	U	U
	D1: Hybrid with Flyover Alternative	601	492	3800	35	U	U
ON15) On-ramp from Carmel Valley Road to EB SR-56 ▪ *2-lane on-ramp*	*Existing*	54	41	3800	35	U	U
	A: No Build	313	351	3800	35	U	U
	B: Auxiliary Lane Alternative	313	351	3800	35	U	U
	C: Direct Connectors Alternative	280	300	3800	35	U	U
	D: Hybrid Alternative	313	351	3800	35	U	U
	D1: Hybrid with Flyover Alternative	313	351	3800	35	U	U
ON16) On-ramp from Carmel Valley Road to WB SR-56 ▪ *2-lane on-ramp*	*Existing*	816	319	3800	35	U	U
	A: No Build	814	478	3800	35	U	U
	B: Auxiliary Lane Alternative	814	478	3800	35	U	U
	C: Direct Connectors Alternative	850	500	3800	35	U	U
	D: Hybrid Alternative	850	500	3800	35	U	U
	D1: Hybrid with Flyover Alternative	850	500	3800	35	U	U

TABLE 7–12
EXISTING AND YEAR 2015 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
ON17) Loop on-ramp from Carmel Country Road to WB SR-56 ▪ *2-lane on-ramp*	*Existing*	1126	632	3500	25	U	U
	A: No Build	1480	740	3500	25	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1480	740	3500	25	U	U
	B2: No EB slip off-ramp, no WB barrier	1621	905	3500	25	U	U
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	1480	700	3500	25	U	U
	C2: No EB slip off-ramp, no WB barrier	1621	905	3500	25	U	U
	C5: No EB slip off-ramp, with WB C-D system	1701	985	3500	25	U	U
	D: Hybrid Alternative	1701	985	3500	25	U	U
	D1: Hybrid with Flyover Alternative	1701	985	3500	25	U	U
ON18) Loop on-ramp from Carmel Creek Road to WB SR-56 ▪ *2-lane on-ramp*	*Existing*	641	738	3500	25	U	U
	A: No Build	750	890	3500	25	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	750	890	3500	25	U	U
	B2: No EB slip off-ramp, no WB barrier	750	890	3500	25	U	U
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	750	890	3500	25	U	U
	C2: No EB slip off-ramp, no WB barrier	750	890	3500	25	U	U
	C5: No EB slip off-ramp, with WB C-D system	650	790	3500	25	U	U
	D: Hybrid Alternative	650	790	3500	25	U	U
	D1: Hybrid with Flyover Alternative	650	790	3500	25	U	U

Footnotes:

a. Capacity based on methodology found in Chapter 25 *(Exhibit 25- 3)* of the *2000 Highway Capacity Manual (HCM)*. Capacity is a function of free flow speed on the ramp (mph) and number of lanes on the ramp.
b. Estimated free-flow speed based on ramp geometry.
c. Carmel Valley Road on-ramp to Bypass NB I-5 in Year 2015 Auxiliary Lane Alternative (Run B) is 2 SOV + 1 HOV on-ramp. HCM 2000 does not specify capacity for a 3-lane on-ramp. Hence the capacity for a 2-lane on-ramp is used as a worst case.
d. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
e. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
f. HCM 2000 does not specify capacity for a 3-lane on-ramp. Hence the capacity for a 2-lane on-ramp is used as a worst case. Since the ramp consists of 3 lanes, the volume is considered to be less than capacity.

General Notes:
The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.

TABLE 7–13
EXISTING AND YEAR 2015 OFF-RAMP CAPACITY ANALYSIS

Ramp Diverge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
OF1) Off-ramp from Bypass NB I-5 to Carmel Mountain Road ▪ *1 lane off-ramp*	*Existing*	650	900	2000	35	U	U
	A: No Build	730	950	2000	35	U	U
	B: Auxiliary Lane Alternative	730	950	2000	35	U	U
	C: Direct Connectors Alternative	730	950	2000	35	U	U
	D: Hybrid Alternative	730	950	2000	35	U	U
	D1: Hybrid with Flyover Alternative	730	950	2000	35	U	U
OF2) Off-ramp from Mainline NB I-5 to Carmel Valley Road ▪ *2 lane off-ramp*	*Existing*	750	800	3800	35	U	U
	A: No Build	1050	1180	3800	35	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1050	1180	3800	35	U	U
	B2: No EB slip off-ramp [c], no WB barrier	1755	2005	3800	35	U	U
	C: Direct Connectors, *With EB slip off-ramp, no WB barrier*	1050	1180	3800	35	U	U
	C2: No EB slip off-ramp, no WB barrier	1755	2005	3800	35	U	U
	C5: No EB slip off-ramp, with WB C-D system [d]	1755	2005	3800	35	U	U
	D: Hybrid Alternative	1755	2005	3800	35	U	U
	D1: Hybrid with Flyover Alternative	1755	2005	3800	35	U	U
OF3) Off-ramp from Bypass NB I-5 to Del Mar Heights Road ▪ *2 lane off-ramp*	*Existing*	1200	1150	3800	35	U	U
	A: No Build	1480	1360	3800	35	U	U
	B: Auxiliary Lane Alternative	1480	1360	3800	35	U	U
	C: Direct Connectors Alternative	1480	1360	3800	35	U	U
	D: Hybrid Alternative	1480	1360	3800	35	U	U
	D1: Hybrid with Flyover Alternative	1480	1360	3800	35	U	U
OF4) Off-ramp from Mainline NB I-5 to Via de la Valle ▪ *2 lane off-ramp*	*Existing*	1300	1400	3800	35	U	U
	A: No Build	1360	1650	3800	35	U	U
	B: Auxiliary Lane Alternative	1360	1650	3800	35	U	U
	C: Direct Connectors Alternative	1360	1650	3800	35	U	U
	D: Hybrid Alternative	1360	1650	3800	35	U	U
	D1: Hybrid with Flyover Alternative	1440	1453	3800	35	U	U
OF5) Off-ramp from Mainline SB I-5 to Via de la Valle ▪ *2 lane off-ramp*	*Existing*	500	500	3800	35	U	U
	A: No Build	960	970	3800	35	U	U
	B: Auxiliary Lane Alternative	960	970	3800	35	U	U
	C: Direct Connectors Alternative	940	940	3800	35	U	U
	D: Hybrid Alternative	960	970	3800	35	U	U
	D1: Hybrid with Flyover Alternative	1440	1453	3800	35	U	U

TABLE 7–13 *continued*
EXISTING AND YEAR 2015 OFF-RAMP CAPACITY ANALYSIS

Ramp Diverge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
OF6) Off-ramp from Mainline SB I-5 to Del Mar Heights Road ▪ *2 lane off-ramp*	*Existing*	1000	1050	3800	35	U	U
	A: No Build	1440	1453	3800	35	U	U
	B: Auxiliary Lane Alternative	1440	1453	3800	35	U	U
	C: Direct Connectors Alternative	1260	1180	3800	35	U	U
	D: Hybrid Alternative	1440	1453	3800	35	U	U
	D1: Hybrid with Flyover Alternative	1440	1453	3800	35	U	U
OF7) Off-ramp from Bypass SB I-5 to Carmel Valley Road ▪ *1 lane off-ramp*	*Existing*	800	810	2000	35	U	U
	A: No Build	920	1147	2000	35	U	U
	B: Auxiliary Lane Alternative	920	1147	3800	35	U	U
	C: Direct Connectors Alternative	450	440	2000	35	U	U
	D: Hybrid Alternative	920	1147	3800	35	U	U
	D1: Hybrid with Flyover Alternative	920	1147	3800	35	U	U
OF8) Off-ramp from Bypass SB I-5 to Carmel Mountain Road ▪ *1 lane off-ramp*	*Existing*	750	400	2000	35	U	U
	A: No Build	820	650	2000	35	U	U
	B: Auxiliary Lane Alternative	820	650	2000	35	U	U
	C: Direct Connectors Alternative	820	650	2000	35	U	U
	D: Hybrid Alternative	820	650	2000	35	U	U
	D1: Hybrid with Flyover Alternative	820	650	2000	35	U	U
OF9) Off-ramp from EB SR-56 (frontage road) to Carmel Creek Road ▪ *2 lane off-ramp*	*Existing*	849	1018	3800	35	U	U
	A: No Build	1000	1200	3800	35	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1000	1200	3800	35	U	U
	B2: No EB slip off-ramp, no WB barrier	765	925	2000	35	U	U
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	1000	1200	3800	35	U	U
	C2: No EB slip off-ramp, no WB barrier	765	925	2000	35	U	U
	C5: No EB slip off-ramp, with WB C-D system	765	925	2000	35	U	U
	D: Hybrid Alternative	765	925	2000	35	U	U
	D1: Hybrid with Flyover Alternative	765	925	2000	35	U	U

TABLE 7–13 *continued*
EXISTING AND YEAR 2015 OFF-RAMP CAPACITY ANALYSIS

Ramp Diverge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
OF10) Off-ramp from EB SR-56 to Carmel Country Road ▪ *2 lane off-ramp*	*Existing*	476	1170	2000	35	U	U
	A: No Build	550	1380	2000	35	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	550	1380	2000 [e]	35	U	U
	B2: No EB slip off-ramp, no WB barrier	785	1655	2000 [e]	35	U	U
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	550	1380	3800	35	U	U
	C2: No EB slip off-ramp, no WB barrier	785	1655	3800	35	U	U
	C5: No EB slip off-ramp, with WB C-D system	805	1675	3800	35	U	U
	D: Hybrid Alternative	805	1675	2000 [e]	35	U	U
	D1: Hybrid with Flyover Alternative	805	1675	2000 [e]	35	U	U
OF11) Off-ramp from EB SR-56 to Carmel Valley Road ▪ *1 lane off-ramp*	*Existing*	465	536	3800	35	U	U
	A: No Build	480	810	2000	35	U	U
	B: Auxiliary Lane Alternative	480	810	2000	35	U	U
	C: Direct Connectors Alternative	500	840	2000	35	U	U
	D: Hybrid Alternative	480	810	2000	35	U	U
	D1: Hybrid with Flyover Alternative	480	810	2000	35	U	U
OF12) Off-ramp from WB SR-56 to Carmel Valley Road ▪ *1 lane off-ramp*	*Existing*	73	42	2000	35	U	U
	A: No Build	259	517	2000	35	U	U
	B: Auxiliary Lane Alternative	259	517	2000	35	U	U
	C: Direct Connectors Alternative	200	480	2000	35	U	U
	D: Hybrid Alternative	200	480	2000	35	U	U
	D1: Hybrid with Flyover Alternative	200	480	2000	35	U	U
OF13) Off-ramp from WB SR-56 to Carmel Country Road ▪ *1 lane off-ramp*	*Existing*	261	195	2000	35	U	U
	A: No Build	489	341	2000	35	U	U
	B: Auxiliary Lane Alternative	489	341	2000	35	U	U
	C: Direct Connectors Alternative	310	230	2000	35	U	U
	D: Hybrid Alternative	310	230	2000	35	U	U
	D1: Hybrid with Flyover Alternative	310	230	2000	35	U	U

TABLE 7–13
EXISTING AND YEAR 2015 OFF-RAMP CAPACITY ANALYSIS

Ramp Diverge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
OF14) Off-ramp from WB SR-56 to Carmel Creek Road ▪ *2 lane off-ramp*	*Existing*	581	296	2000	35	U	U
	A: No Build	674	355	2000	35	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	674	355	3800	35	U	U
	B2: No EB slip off-ramp, no WB barrier	815	520	3800	35	U	U
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	650	340	3800	35	U	U
	C2: No EB slip off-ramp, no WB barrier	791	505	3800	35	U	U
	C5: No EB slip off-ramp, with WB C-D system	791	505	3800	35	U	U
	D: Hybrid Alternative	791	505	3800	35	U	U
	D1: Hybrid with Flyover Alternative	791	505	3800	35	U	U
OF15) Off-ramp from WB SR-56 to El Camino Real ▪ *2-lane off-ramp*	*Existing*	1596	872	3800	35	U	U
	A: No Build	2292	1035	3800	35	U	U
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	2292	1035	3800	35	U	U
	B2: No EB slip off-ramp, no WB barrier	2292	1035	3800	35	U	U
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	1400	480	3800	35	U	U
	C2: No EB slip off-ramp, no WB barrier	1400	480	3800	35	U	U
	C5: No EB slip off-ramp, with WB C-D system	1680	765	3800	35	U	U
	D: Hybrid Alternative	1680	765	3800	35	U	U
	D1: Hybrid with Flyover Alternative	1680	765	3800	35	U	U

Footnotes:

a. Capacity based on methodology found in Chapter 25 *(Exhibit 25- 3)* of the *2000 Highway Capacity Manual (HCM)*. Capacity is a function of free flow speed (mph) on the ramp and number of lanes on ramp.
b. Estimated free-flow speed based on ramp geometry.
c. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
d. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
e. Carmel Country Road is a one-lane off-ramp in Auxiliary Lane and Hybrid Alternatives.

General Notes:
The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.

TABLE 7–14
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Mountain Road to I-5 NB Bypass (2 S0V + 1 HOV)	*Existing*	NM	540	NM	398	-	142	-	**21**
	A: No Build	567	738	670	910	-	-	-	-
	B: Auxiliary Lane Alternative	567	738	670	910	-	-	-	-
	C: Direct Connectors Alternative	567	738	670	910	-	-	-	-
	D: Hybrid Alternative	567	738	670	910	-	-	-	-
	D1: Hybrid with Flyover Alternative	567	738	670	910	-	-	-	-
Carmel Mountain Road to I-5 SB Bypass (2 S0V + 1 HOV)	*Existing*	NM	NM	NM	NM	-	-	-	-
	A: No Build	855	765	1045	830	-	-	-	-
	B: Auxiliary Lane Alternative	855	765	1045	830	-	-	-	-
	C: Direct Connectors Alternative	855	765	1045	830	-	-	-	-
	D: Hybrid Alternative	855	765	1045	830	-	-	-	-
	D1: Hybrid with Flyover Alternative	855	765	1045	830	-	-	-	-
Carmel Valley Road to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	612	NM	677	-	0	-	0
	A: No Build	1083	907	340	470	743	437	**131**	**56**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1083	907	680	940	403	-	**36**	-
	B2: No EB slip off-ramp [e], no WB barrier	1083	907	680	940	403	-	**36**	-
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	333	441	340	470	11	-	-	-
	C2: No EB slip off-ramp, no WB barrier	333	441	340	470	11	-	-	-
	C5: No EB slip off-ramp, with WB C-D system [f]	333	441	340	470	11	-	-	-
	D: Hybrid Alternative	333	441	340	470	11	-	-	-
	D1: Hybrid with Flyover Alternative	333	441	340	470	11	-	-	-

TABLE 7–14 *continued*
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Valley Road to I-5 SB (2 S0V)	*Existing*	840	NM	710	NM	130	-	11	-
	A: No Build	950	940	1300	1000	-	-	-	-
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	B2: No EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C2: No EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C5: No EB slip off-ramp, with WB C-D system	1250	1245	1300	1000	-	245	-	15
	D: Hybrid Alternative	1250	1245	1300	1000	-	245	-	15
	D1: Hybrid with Flyover Alternative	1250	1245	1300	1000	-	245	-	15
Del Mar Heights Road to I-5 NB (2 S0V + 1 HOV)	*Existing*	NM	1125	NM	593	-	532	-	**54**
	A: No Build	1297	1350	1225	1290	72	60	4	3
	B: Auxiliary Lane Alternative	1297	1350	1225	1290	72	60	4	3
	C: Direct Connectors Alternative	1008	1170	1225	1290	-	-	-	-
	D: Hybrid Alternative	1008	1170	1225	1290	-	-	-	-
	D1: Hybrid with Flyover Alternative	1008	1170	1225	1290	-	-	-	-
WB Del Mar Heights Road (loop ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	810	540	368	368	442	172	**72**	**28**
	A: No Build	945	630	740	550	45	35	3	6
	B: Auxiliary Lane Alternative	945	630	740	550	45	35	3	6
	C: Direct Connectors Alternative [g]	945	630	740	550	45	35	3	6
	D: Hybrid Alternative	945	630	740	550	45	35	3	6
	D1: Hybrid with Flyover Alternative	945	630	740	550	45	35	3	6
EB Del Mar Heights Road (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	495	495	492	492	3	3	0	0
	A: No Build	540	513	1175	750	-	-	-	-
	B: Auxiliary Lane Alternative	540	513	1175	750	-	-	-	-
	C: Direct Connectors Alternative [g]	540	513	1175	750	-	-	-	-
	D: Hybrid Alternative	540	513	1175	750	-	-	-	-
	D1: Hybrid with Flyover Alternative	540	513	1175	750	-	-	-	-
WB Via de la Valle (direct ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	360	NM	343	-	17	-	3
	A: No Build	365	470	460	480	-	-	-	-
	B: Auxiliary Lane Alternative	365	470	460	480	-	-	-	-
	C: Direct Connectors Alternative	333	450	460	480	-	-	-	-
	D: Hybrid Alternative	333	450	460	480	-	-	-	-
	D1: Hybrid with Flyover Alternative	333	450	460	480	-	-	-	-

TABLE 7–14
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
EB Via de la Valle (loop ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	540	NM	318	-	222	-	**42**
	A: No Build	351	585	430	670	-	-	-	-
	B: Auxiliary Lane Alternative	351	585	430	670	-	-	-	-
	C: Direct Connectors Alternative	351	585	430	670	-	-	-	-
	D: Hybrid Alternative	351	585	430	670	-	-	-	-
	D1: Hybrid with Flyover Alternative	351	585	430	670	-	-	-	-
WB Via de la Valle (loop ramp) to I-5 SB (1 S0V + 1 HOV)	*Existing*	603	468	343	343	260	125	**45**	**22**
	A: No Build	666	621	750	700	-	-	-	-
	B: Auxiliary Lane Alternative	666	621	750	700	-	-	-	-
	C: Direct Connectors Alternative	666	621	750	700	-	-	-	-
	D: Hybrid Alternative	666	621	750	700	-	-	-	-
	D1: Hybrid with Flyover Alternative	666	621	750	700	-	-	-	-
EB Via de la Valle (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	819	684	593	593	226	91	**23**	9
	A: No Build	864	729	930	770	-	-	-	-
	B: Auxiliary Lane Alternative	864	729	930	770	-	-	-	-
	C: Direct Connectors Alternative	864	729	930	770	-	-	-	-
	D: Hybrid Alternative	864	729	930	770	-	-	-	-
	D1: Hybrid with Flyover Alternative	864	729	930	770	-	-	-	-
Carmel Valley Road to SR-56 WB (2 S0V + 1 HOV)	*Existing*	734	NM	343	NM	391	-	**68**	-
	A: No Build	733	430	686	686	47	-	4	-
	B: Auxiliary Lane Alternative	733	430	686	686	47	-	4	-
	C: Direct Connectors Alternative	765	450	686	686	79	-	7	-
	D: Hybrid Alternative	765	450	686	686	79	-	7	-
	D1: Hybrid with Flyover Alternative	765	450	686	686	79	-	7	-
WB SR 56 to NB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	A: No Build	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	B: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	C: Direct Connectors Alternative [h]	750	475	660	420	90	55	8	8
	C2: No EB slip off-ramp, no WB barrier	750	475	660	420	90	55	8	8
	C5: No EB slip off-ramp, with WB C-D system	750	475	660	420	90	55	8	8
	D: Hybrid Alternative	750	475	660	420	90	55	8	8
	D1: Hybrid with Flyover Alternative	750	475	660	420	90	55	8	8

TABLE 7–14
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
WB SR 56 to SB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	A: No Build [1]	1925	900	1750	900	175	-	6	-
	B: Auxiliary Lane Alternative	1925	900	1750	900	175	-	6	-
	B2: No EB slip off-ramp, no WB barrier	1925	900	1750	900	175	-	6	-
	C: Direct Connectors Alternative	1925	900	1750	900	175	-	6	-
	C2: No EB slip off-ramp, no WB barrier	1925	900	1750	900	175	-	6	-
	C5: No EB slip off-ramp, with WB C-D system	1775	748	1750	900	25	-	1	-
	D: Hybrid Alternative	1775	748	1750	900	25	-	1	-
	D1: Hybrid with Flyover Alternative	1775	748	1750	900	25	-	1	-

Footnotes:

a. Peak hour ramp volumes obtained from *2015 Traffic Volumes Report*. SOV peak hour volumes calculated to be 90% of the total on ramp volume (10% accounted for HOV).
b. Peak hour ramp meter rate derived by Caltrans Ramp Metering Branch for the I-5 North Coast Project.
c. Excess demand = SOV Peak hour volume - ramp meter rate.
d. Delay (min) = (Excess demand / Meter rate) * 60.
e. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
f. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
g. Del Mar Heights Road on-ramp to I-5 SB merges with the local bypass in the Year 2015 Direct Connector (Run C) scenario.
h. The ramp meter rate for the WB SR 56 to NB I-5 freeway connector calculated based on a maximum delay of 8 minutes.
i. The ramp meter rate for the WB SR 56 to SB I-5 freeway connector obtained from I-5 North Coast Year 2030 Freeway Operations Report.

General Notes:

Bold typeface indicates delays greater than 15 minutes.
Ramp Meter Methodology based on SANTEC/ ITE Guidelines.
The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.
NM – Not metered.
DNE – Does not exist.

TABLE 7–15
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Mountain Road to I-5 NB Bypass (2 S0V + 1 HOV)	*Existing*	NM	540	NM	398	-	142	-	**21**
	A: No Build	567	738	670	910	-	-	-	-
	B: Auxiliary Lane Alternative	567	738	670	910	-	-	-	-
	C: Direct Connectors Alternative	567	738	670	910	-	-	-	-
	D: Hybrid Alternative	567	738	670	910	-	-	-	-
	D1: Hybrid with Flyover Alternative	567	738	670	910	-	-	-	-
Carmel Mountain Road to I-5 SB Bypass (2 S0V + 1 HOV)	*Existing*	NM	NM	NM	NM	-	-	-	-
	A: No Build	855	765	1045	830	-	-	-	-
	B: Auxiliary Lane Alternative	855	765	1045	830	-	-	-	-
	C: Direct Connectors Alternative	855	765	1045	830	-	-	-	-
	D: Hybrid Alternative	855	765	1045	830	-	-	-	-
	D1: Hybrid with Flyover Alternative	855	765	1045	830	-	-	-	-
Carmel Valley Road to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	612	NM	677	-	0	-	0
	A: No Build	1083	907	*870* [e]	*730*	743	437	**15**	**15**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1083	907	*870*	940	403	-	**15**	-
	B2: No EB slip off-ramp [f]*, no WB barrier*	1083	907	*870*	940	403	-	**15**	-
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	333	441	340	470	11	-	-	-
	C2: No EB slip off-ramp, no WB barrier	333	441	340	470	11	-	-	-
	C5: No EB slip off-ramp, with WB C-D system [g]	333	441	340	470	11	-	-	-
	D: Hybrid Alternative	333	441	340	470	11	-	-	-
	D1: Hybrid with Flyover Alternative	333	441	340	470	11	-	-	-
Carmel Valley Road to I-5 SB (2 SOV)	*Existing*	840	NM	710	NM	130	-	11	-
	A: No Build	950	940	1300	1000	-	-	-	-
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	B2: No EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C2: No EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C5: No EB slip off-ramp, with WB C-D system	1250	1245	1300	1000	-	245	-	15
	D: Hybrid Alternative	1250	1245	1300	1000	-	245	-	15
	D1: Hybrid with Flyover Alternative	1250	1245	1300	1000	-	245	-	15

TABLE 7–15
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Del Mar Heights Road to I-5 NB (2 S0V + 1 HOV)	*Existing*	NM	1125	NM	593	-	532	-	**54**
	A: No Build	1297	1350	1225	1290	72	60	4	3
	B: Auxiliary Lane Alternative	1297	1350	1225	1290	72	60	4	3
	C: Direct Connectors Alternative	1008	1170	1225	1290	-	-	-	-
	D: Hybrid Alternative	1008	1170	1225	1290	-	-	-	-
	D1: Hybrid with Flyover Alternative	1008	1170	1225	1290	-	-	-	-
WB Del Mar Heights Road (loop ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	810	540	368	368	442	172	**72**	**28**
	A: No Build	945	630	740	550	45	35	3	6
	B: Auxiliary Lane Alternative	945	630	740	550	45	35	3	6
	C: Direct Connectors Alternative	945	630	740	550	45	35	3	6
	D: Hybrid Alternative	945	630	740	550	45	35	3	6
	D1: Hybrid with Flyover Alternative	945	630	740	550	45	35	3	6
EB Del Mar Heights Road (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	495	495	492	492	3	3	0	0
	A: No Build	540	513	1175	750	-	-	-	-
	B: Auxiliary Lane Alternative	540	513	1175	750	-	-	-	-
	C: Direct Connectors Alternative	540	513	1175	750	-	-	-	-
	D: Hybrid Alternative	540	513	1175	750	-	-	-	-
	D1: Hybrid with Flyover Alternative	540	513	1175	750	-	-	-	-
WB Via de la Valle (direct ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	-	360	-	343	-	17	-	3
	A: No Build	365	470	460	480	-	-	-	-
	B: Auxiliary Lane Alternative	365	470	460	480	-	-	-	-
	C: Direct Connectors Alternative	333	450	460	480	-	-	-	-
	D: Hybrid Alternative	333	450	460	480	-	-	-	-
	D1: Hybrid with Flyover Alternative	333	450	460	480	-	-	-	-
EB Via de la Valle (loop ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	540	NM	318	-	222	-	**42**
	A: No Build	351	585	430	670	-	-	-	-
	B: Auxiliary Lane Alternative	351	585	430	670	-	-	-	-
	C: Direct Connectors Alternative	351	585	430	670	-	-	-	-
	D: Hybrid Alternative	351	585	430	670	-	-	-	-
	D1: Hybrid with Flyover Alternative	351	585	430	670	-	-	-	-

TABLE 7–15
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
WB Via de la Valle (loop ramp) to I-5 SB (1 S0V + 1 HOV)	*Existing*	603	468	343	343	260	125	**45**	**22**
	A: No Build	666	621	750	700	-	-	-	-
	B: Auxiliary Lane Alternative	666	621	750	700	-	-	-	-
	C: Direct Connectors Alternative	666	621	750	700	-	-	-	-
	D: Hybrid Alternative	666	621	750	700	-	-	-	-
	D1: Hybrid with Flyover Alternative	666	621	750	700	-	-	-	-
EB Via de la Valle (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	819	684	593	593	226	91	**23**	9
	A: No Build	864	729	930	770	-	-	-	-
	B: Auxiliary Lane Alternative	864	729	930	770	-	-	-	-
	C: Direct Connectors Alternative	864	729	930	770	-	-	-	-
	D: Hybrid Alternative	864	729	930	770	-	-	-	-
	D1: Hybrid with Flyover Alternative	864	729	930	770	-	-	-	-
Carmel Valley Road to SR-56 WB (2 S0V + 1 HOV)	*Existing*	734	NM	343	NM	391	-	**68**	-
	A: No Build	733	430	686	686	47	-	4	-
	B: Auxiliary Lane Alternative	733	430	686	686	47	-	4	-
	C: Direct Connectors Alternative	765	450	686	686	106	-	9	-
	D: Hybrid Alternative	765	450	686	686	106	-	9	-
	D1: Hybrid with Flyover Alternative	765	450	686	686	106	-	9	-
WB SR 56 to NB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	A: No Build	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	B: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	C: Direct Connectors Alternative [h]	750	475	660	420	90	55	8	8
	C2: No EB slip off-ramp, no WB barrier	750	475	660	420	90	55	8	8
	C5: No EB slip off-ramp, with WB C-D system	750	475	660	420	90	55	8	8
	D: Hybrid Alternative	750	475	660	420	90	55	8	8
	D1: Hybrid with Flyover Alternative	750	475	660	420	90	55	8	8

TABLE 7–15
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
WB SR 56 to SB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	A: No Build [i]	1925	900	1750	900	175	-	6	-
	B: Auxiliary Lane Alternative	1925	900	1750	900	175	-	6	-
	B2: No EB slip off-ramp, no WB barrier	1925	900	1750	900	175	-	6	-
	C: Direct Connectors Alternative	1925	900	1750	900	175	-	6	-
	C2: No EB slip off-ramp, no WB barrier	1925	900	1750	900	175	-	6	-
	C5: No EB slip off-ramp, with WB C-D system	1775	748	1750	900	25	-	1	-
	D: Hybrid Alternative	1775	748	1750	900	25	-	1	-
	D1: Hybrid with Flyover Alternative	1775	748	1750	900	25	-	1	-

Footnotes:

a. Peak hour ramp volumes obtained from 2015 Traffic Volumes Report. SOV peak hour volumes calculated to be 90% of the total on ramp volume (10% accounted for HOV).
b. Peak hour ramp meter rate derived by Caltrans Ramp Metering Branch for the I-5 North Coast Project.
c. Excess demand = SOV Peak hour volume - ramp meter rate.
d. Delay (min) = (Excess demand / Meter rate) * 60. Delay more than 15 minutes is equal to 15 minutes as any demand exceeding 15-minutes will seek an alternative route or will choose to use the ramp during a less busy time period. In the existing scenario, ramp meter experiencing delays more than 15 minutes have been bolded. Ramp meter rates for 15-minute maximum delay have been derived for the future scenarios only.
e. The flow rates have been derived based on a maximum delay of 15 minutes at the ramp.
f. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
g. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
h. The ramp meter rate for the WB SR 56 to NB I-5 freeway connector calculated based on a maximum delay of 8 minutes.
i. The ramp meter rate for the WB SR 56 to SB I-5 freeway connector obtained from I-5 North Coast Year 2030 Freeway Operations Report.

General Notes:
Bold typeface indicates 15 minute delays.
Blank cells (dashes) means ramp volumes are less than ramp metering rate.
The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.
NM – Not metered.
DNE – Does not exist.

8.0 YEAR 2030 OPERATIONS

This section presents a comparative analysis of the long-term operations of the No-Build (Model Run E), Auxiliary Lane (Model Run F), Direct Connector (Run G), Hybrid (Model Run H) and Hybrid with Flyover (Model Run H1) Alternatives. There were also several variation alternatives (elimination of the EB slip off-ramp to Carmel Creek Road and/or installation of a WB barrier/collector-distributor alternative) of Auxiliary Lane and Direct Connectors that were analyzed. Tables in this section will present to the reader the LOS's for urban street and freeway facilities in the long-term condition.

8.1 Urban Street Facilities

The following is a discussion of the long-term signalized and unsignalized intersection operations, and the Circulation Element street segment operations in the study area. This includes both State-controlled intersections (ramp termini) and intersections within the City of San Diego's jurisdiction.

8.1.1 *Street Segments*

No Build (Run E) Alternative — *Table 8–1* shows the long-term street segment operations. In the No Build (Run E), the following roadway segments are calculated to operate at LOS E or LOS F, as traffic volumes at these locations are higher than the capacity provided.

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS F
- Del Mar Heights Road between Camino Del Mar and Mango Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Del Mar Heights Road between I-5 NB ramps and High Bluff Drive, LOS F
- Carmel Valley Road between I-5 and El Camino Real, LOS F
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F

Auxiliary Lane (Run F) Alternative — Similar street segment operations were observed in the Auxiliary Lane Alternative like the No Build (Run E) scenario. The same roadway segments that were calculated to operate at LOS E or LOS F in the No Build scenario are calculated to operate at LOS E or F in the Auxiliary Lane alternative.

The segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS E even with an 8-lane Carmel Valley Road configuration.

Direct Connector (Run G) Alternative — The direct connectors remove the freeway-to-freeway traffic from the local streets along Del Mar Heights Road and Carmel Valley Road and improves the level of service in comparison with the No Build (Run E) and Auxiliary lane (Run F) alternatives.

The level of service in Year 2030 along the following roadway segments improves with the construction of direct connectors:

- Via de la Valle – San Andres Drive to El Camino Real (LOS D to LOS C)
- Del Mar Heights Road between I-5 NB ramps and High Bluff Drive (LOS F to LOS D)
- Del Mar Heights Road between High Bluff Drive and El Camino Real (LOS D to LOS C)
- Del Mar Heights Road between Carmel Country Road and Carmel Canyon Road (LOS C to LOS B)
- Carmel Valley Road between I-5 and El Camino Real (LOS F to LOS C)
- Carmel Creek Road between Carmel Country Road and Del Mar Trails Road (LOS B to LOS A)
- Carmel Country Road between Townsgate Drive and Carmel Creek Road (LOS C to LOS B)
- Carmel Country Road between Del Mar Trails Road and SR-56 WB ramps (LOS D to LOS C)

In the Direct Connector Alternative, the following roadway segments are calculated to operate at LOS E or F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS F
- Del Mar Heights Road between Camino Del Mar and Mango Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F

The above street segments are calculated to operate at LOS E or F in the No Build (Run E), Auxiliary Lane (Run F) and Direct Connector Alternatives. The direct connectors maintain the same level of service along these roadway segments and do not degrade the level of service when compared to the No Build scenario.

Improvement Alternatives — Certain roadway segments were analyzed for the improvement alternatives for Auxiliary Lane (Run F) and Direct Connectors (Run G) scenarios. The different variation alternatives include:

- No EB Slip off-ramp to Carmel Creek Road – *F(2) and G(2)*
- Installation of a WB barrier between Carmel Creek Road and El Camino Real – *F(3) and G(3)*
- No EB Slip off-ramp to Carmel Creek Road and installation of a WB barrier between Carmel Creek Road and El Camino Real – *F(4) and G(4)*
- No EB Slip off-ramp to Carmel Creek Road and collector-distributor alternative (C-D) on WB SR-56 between Carmel Creek Road and El Camino Real – *G(5)*

No EB Slip off-ramp — With the elimination of the EB slip off-ramp in the Auxiliary Lane Alternative F(2), the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS F.

With the elimination of the EB slip off-ramp in the Direct Connectors Alternative G(2), Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS C. The direct connectors remove the freeway-to-freeway traffic on Carmel Valley Road and El Camino Real.

With WB Barrier — With the installation of a WB barrier between Carmel Creek Road and El Camino Real in the Auxiliary Lane Alternative F(3), the following segments are calculated to operate at LOS E or worse:

- Carmel Valley Road between I-5 and El Camino Real, LOS F
- El Camino Real between Valley Center Drive and Carmel Valley Road, LOS E

With the installation of a barrier between Carmel Creek Road and El Camino Real in the Direct Connector Alternative G(3), the above segments are calculated to operate at LOS C. The direct connectors remove the freeway-to-freeway traffic on Carmel Valley Road and El Camino Real.

No EB slip off-ramp and with WB Barrier — With the elimination of the EB slip off-ramp to Carmel Creek Road and the installation of a barrier between Carmel Creek Road and El Camino Real in the Auxiliary lane Alternative F(4), the following segments are calculated to operate at LOS E or worse:

- Carmel Valley Road between I-5 and El Camino Real, LOS F
- El Camino Real between Valley Center Drive and Carmel Valley Road, LOS E

With the elimination of the EB slip off-ramp to Carmel Creek Road and the installation of a barrier between Carmel Creek Road and El Camino Real in the Direct Connectors alternative G(4), the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS E. The segment of El Camino Real between Valley Center Drive and Carmel Valley Road is calculated to operate at LOS D. The direct connectors remove the freeway-to-freeway traffic on Carmel Valley Road and El Camino Real.

No EB slip off-ramp and with WB Collector-Distributor (C-D) Alternative — In the Direct Connector Alternative G(5), the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS E. This is better than level of service F calculated for the Auxiliary Lane Alternatives and its variations.

Year 2030 Hybrid (Run H) Alternative — The Hybrid Alternative includes the WB SR 56 to I-5 NB direct connector and Auxiliary Lane improvements from SB I-5 to EB SR 56. The WB SR 56 to NB I-5 direct connector reduces traffic volumes at Via de Valle, Del Mar Heights Road and Carmel Valley Road in comparison to the No Build (Run E) scenario. Even with the WB SR 56 to NB I-5 direct connector, the following roadway segments are calculated to operate at LOS E or F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS F
- Del Mar Heights Road between Camino Del Mar and Mango Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Del Mar Heights Road between I-5 NB ramps and High Bluff Drive, LOS E
- Carmel Valley Road between I-5 and El Camino Real, LOS F
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F

Hybrid with Flyover (Run H1) Alternative — The Hybrid with Flyover Alternative includes the WB SR 56 to I-5 NB direct connector and a flyover ramp on Carmel Valley Road from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector) and a flyover ramp, traffic from SB I-5 to EB SR 56 would still be forced to use Carmel Valley Road. The following roadway segments are calculated to operate at LOS E or F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS E
- Del Mar Heights Road between Camino Del Mar and Mango Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Del Mar Heights Road between I-5 NB ramps and High Bluff Drive, LOS E
- Carmel Valley Road between I-5 and El Camino Real, LOS E
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F

8.1.2 *Signalized Intersections (HCM Methodology)*

Year 2030 No Build (Run E) Alternative — ***Table 8–2*** shows the long-term intersection operations. In the No Build (Run E) scenario, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- Camino Del Mar/ Del Mar Heights Road, LOS F – PM peak hour
- Mango Drive/ Del Mar Heights Road, LOS E – AM peak hour
- I-5 Southbound ramps/ Del Mar Heights Road, LOS E – AM and PM peak hours
- I-5 Northbound ramps/ Del Mar Heights Road, LOS F/E – AM/PM peak hours
- High Bluff Drive/ Del Mar Heights Road, LOS E – PM peak hour
- El Camino Real/ Del Mar Heights Road, LOS E – AM and PM peak hours
- Signature Pointe Driveway/ Del Mar Heights Road, LOS E – PM peak hour
- Carmel Country Road/ Hartfield Avenue/ Del Mar Heights Road, LOS E – AM and PM peak hours
- Carmel Valley Road/ Del Mar Heights Road, LOS F – AM peak hour
- Carmel Country Road/ Townsgate Drive, LOS E – AM peak hour
- Carmel Country Road/ Carmel Creek Road, LOS E – AM and PM peak hours
- Portofino Drive/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E – AM and PM peak hours
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road, LOS E – AM peak hour
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive, LOS E – AM peak hour
- I-5 Northbound ramps/ Carmel Mountain Road, LOS E – AM peak hour
- Vista Sorrento Parkway/ Torrey View Court/ Carmel Mountain Road, LOS E – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS F – AM and PM peak hours

The intersections that have a substantial amount of delay in No Build (Run E) are along Carmel Valley Road, El Camino Real, Del Mar Heights Road and Carmel Country Road.

Year 2030 Auxiliary Lane (Run F) Alternative — Levels of Service remains generally constant at majority of the study area intersections between the Year 2030 No Build and Year 2030 Auxiliary lane Alternatives. In the Auxiliary lane Alternative (Run F), the level of service improves along the Carmel Valley Road intersections between I-5 and El Camino Real based on the intersection improvements discussed in Section 4.2.2.

The following intersections show an improved level of service in the Auxiliary Lane Alternative during the AM/PM peak hours in comparison to the No Build Alternative:

- I-5 Southbound ramps/ Carmel Valley Road (LOS F improves to LOS E in the AM peak hour)
- I-5 Northbound ramps/ Carmel Valley Road (LOS E/E improves to LOS D/D)
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road (LOS E/D improves to LOS D/C)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS E improves to LOS C in the AM peak hour)
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive (LOS E improves to LOS D in the AM peak hour)

Year 2030 Direct Connector (Run G) Alternative — The direct connectors remove the freeway-to-freeway traffic from the local street intersections along Del Mar Heights Road and Carmel Valley Road and improves the level of service in comparison to the No Build (Run E) and Auxiliary lane (Run F) Alternatives. The following intersections show an improved level of service in the Direct Connectors (Run G) scenario in comparison with the No Build (Run E) scenario:

- I-5 Southbound ramps/ Del Mar Heights Road (LOS E/E improves to LOS C/C)
- I-5 Northbound ramps/ Del Mar Heights Road (LOS F improves to LOS E in the AM peak hour)
- High Bluff Drive/ Del Mar Heights Road (LOS D/E improves to LOS C/C)
- El Camino Real/ Del Mar Heights Road (LOS E/E improves to LOS D/D)
- Signature Pointe Driveway/ Del Mar Heights Road (LOS E improves to LOS D in the PM peak hour)
- Carmel Country Road/ Hartfield Avenue/ Del Mar Heights Road (LOS E/E improves to LOS D/D).
- Carmel Country Road/ Townsgate Drive (LOS E improves to LOS D in the AM peak hour)
- El Camino Real/ High Bluff Drive (LOS D improves to LOS C in the AM peak hour)
- Carmel Country Road/ Carmel Creek Road (LOS E/E improves to LOS D/D)

- I-5 Southbound ramps/ Carmel Valley Road (LOS F/F improves to LOS C/C)
- I-5 Northbound ramps/ Carmel Valley Road (LOS E/E improves to LOS C/C)
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road (LOS E/D improves to LOS D/C)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS E/F improves to LOS C/D)
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive (LOS E improves to LOS D in the AM peak hour)
- Carmel Country Road/ SR-56 EB ramps (LOS D improves to LOS C in the PM peak hour)

In the Direct Connector Alternative, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- Camino Del Mar/ Del Mar Heights Road, LOS F – PM peak hour
- Mango Drive/ Del Mar Heights Road, LOS E – AM peak hour
- I-5 Northbound ramps/ Del Mar Heights Road, LOS E – AM and PM peak hours
- Carmel Valley Road/ Del Mar Heights Road, LOS E – AM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F– AM and PM peak hours
- I-5 Northbound ramps/ Carmel Mountain Road, LOS E – AM peak hour
- Vista Sorrento Parkway/ Torrey View Court/ Carmel Mountain Road, LOS E – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS F – AM and PM peak hours

The above intersections are calculated to operate at LOS E or F in the No Build (Run E), Auxiliary Lane and Direct Connector Alternatives. The direct connectors maintain the same level of service at the above intersections and do not degrade the level of service when compared to the No Build scenario.

Improvement Alternatives — Certain intersections were analyzed for the improvement alternatives for Auxiliary Lane (Run F) and Direct Connectors (Run G) scenarios. The different variations include:

- No EB Slip off-ramp to Carmel Creek Road – *F(2) and G(2)*
- Installation of a WB barrier between Carmel Creek Road and El Camino Real – *F(3) and G(3)*
- No EB Slip off-ramp to Carmel Creek Road and installation of a WB barrier between Carmel Creek Road and El Camino Real – *F(4) and G(4)*

- No EB Slip off-ramp to Carmel Creek Road and collector-distributor alternative (C-D) on WB SR-56 between Carmel Creek Road and El Camino Real – *G(5)*

No EB Slip off-ramp — With the elimination of the EB slip off-ramp in the Auxiliary Lane Alternative F(2), the following intersections are calculated to operate at LOS E or F:

- Carmel Country Road/ Carmel Creek Road, LOS E – AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive, LOS E – AM and PM peak hours
- Carmel Country Road/ Carmel Canyon Road, LOS E – PM peak hour
- Carmel Country Road/ SR-56 EB ramps, LOS E – PM peak hour

The direct connectors remove the freeway-to-freeway traffic from the local street intersections along Del Mar Heights Road and Carmel Valley Road. With the elimination of the EB slip off-ramp in the Direct Connectors Alternative G(2), the following intersections show an improved level of service in the Direct Connectors G(2) scenario in comparison with the Auxiliary lane F(2) scenario:

- Carmel Country Road/ Carmel Creek Road (LOS E/E improves to LOS D/D)
- I-5 Southbound ramps/ Carmel Valley Road (LOS E/F improves to LOS C/C)
- I-5 Northbound ramps/ Carmel Valley Road (LOS E/F improves to LOS D/D)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS E/F improves to LOS D/E)
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive (LOS E improves to LOS D in the AM and PM peak hours)
- Carmel Country Road/ Carmel Canyon Road (LOS E improves to LOS D in the PM peak hour)
- Carmel Country Road/ SR-56 EB ramps (LOS E improves to LOS D in the PM peak hour)

With WB Barrier — With the installation of a barrier between Carmel Creek Road and El Camino Real in the Auxiliary Lane Alternative F(3), the following intersections are calculated to operate at LOS E or worse:

- Carmel Country Road/ Carmel Creek Road, LOS E –AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E – AM peak hour
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS F –PM peak hour

With the installation of a WB barrier in the Direct Connectors Alternative G(3) scenario, the following intersections show an improved level of service in comparison with the Auxiliary lane F(3) scenario:

- Carmel Country Road/ Carmel Creek Road (LOS E/E improves to LOS D/D)
- I-5 Southbound ramps/ Carmel Valley Road (LOS F/F improves to LOS C/C)
- I-5 Northbound ramps/ Carmel Valley Road (LOS E improves to LOS D in the AM peak hour)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS F improves to LOS D in the PM peak hour)

No EB slip off-ramp and with WB Barrier — With the elimination of the EB slip off-ramp to Carmel Creek Road and the installation of a barrier between Carmel Creek Road and El Camino Real in the Auxiliary lane Alternative F(4), the following intersections are calculated to operate at LOS E or worse:

- Carmel Country Road/ Carmel Creek Road, LOS E – AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive, LOS E – AM peak hour
- Carmel Country Road/ Carmel Canyon Road, LOS E – PM peak hour
- Carmel Country Road/ SR-56 WB off- ramp, LOS F – AM peak hour
- Carmel Country Road/ SR-56 EB ramps, LOS E – PM peak hour

With the EB slip off-ramp to Carmel Creek Road eliminated and with the installation of a WB barrier in the Direct Connectors alternative G(4) scenario, the following intersections show an improved level of service in comparison with the Auxiliary lane F(4) scenario:

- Carmel Country Road/ Carmel Creek Road (LOS E/E improves to LOS D/D)
- I-5 Southbound ramps/ Carmel Valley Road (LOS F/F improves to LOS C/C)
- I-5 Northbound ramps/ Carmel Valley Road (LOS F/F improves to LOS D/E)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS E/F improves to LOS D/E)
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive (LOS E improves to LOS D in the AM peak hour)
- Carmel Country Road/ Carmel Canyon Road (LOS E improves to LOS D in the PM peak hour)
- Carmel Country Road/ SR-56 WB off- ramp (LOS F improves to LOS E in the AM peak hour)
- Carmel Country Road/ SR-56 EB ramps (LOS E improves to LOS D in the PM peak hour).

No EB slip off-ramp and with WB Collector-Distributor (C-D) Alternative — With the EB slip off-ramp to Carmel Creek Road eliminated and the collector-distributor alternative on WB SR-56 between Carmel Creek Road and El Camino Real, the following intersections show delay improvements in comparison with the Direct Connectors (No EB slip + WB barrier) G(4) scenario:

- Carmel Country Road/ Carmel Creek Road (delay improves in the AM and PM peak hours)
- I-5 Northbound ramps/ Carmel Valley Road (LOS E improves to LOS D in the AM peak hour)
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road (delay improves in the AM and PM peak hours)
- Carmel Country Road/ SR-56 WB off- ramp (delay improves in the AM and PM peak hours)
- Carmel Country Road/ SR-56 EB ramps (delay improves in the AM and PM peak hours)

Hybrid (Run H) Alternative — In the Hybrid Alternative, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- Camino Del Mar/ Del Mar Heights Road, LOS F – PM peak hour
- Mango Drive/ Del Mar Heights Road, LOS E – AM peak hour

- I-5 Southbound ramps/ Del Mar Heights Road, LOS E – AM and PM peak hours
- I-5 Northbound ramps/ Del Mar Heights Road, LOS F/E – AM/PM peak hours
- High Bluff Drive/ Del Mar Heights Road, LOS E – PM peak hour
- El Camino Real/ Del Mar Heights Road, LOS E – PM peak hour
- Signature Pointe Driveway/ Del Mar Heights Road, LOS E – PM peak
- Carmel Valley Road/ Del Mar Heights Road, LOS E – AM peak hour
- Carmel Country Road/ Carmel Creek Road, LOS E – PM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive, LOS E – AM and PM peak hours
- Carmel Country Road/ Carmel Canyon Road, LOS E – PM peak hour
- Carmel Country Road/ SR 56 WB off-ramp, LOS E– AM peak hour
- Carmel Country Road/ SR 56 EB ramps, LOS E– PM peak hour
- I-5 Northbound ramps/ Carmel Mountain Road, LOS E – AM peak hour
- Vista Sorrento Parkway/ Torrey View Court/ Carmel Mountain Road, LOS E – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS F – AM and PM peak hours

The Hybrid Alternative includes the WB SR 56 to I-5 NB direct connector and Auxiliary Lane improvements from SB I-5 to EB SR 56. The WB SR 56 to NB I-5 direct connector reduces traffic volumes at Via de Valle, Del Mar Heights Road and Carmel Valley Road in comparison to the No Build (Run E) scenario, but the intersections along Carmel Valley Road and Del Mar Heights Road are still calculated at LOS E or F.

The following intersections show an improved level of service in the Hybrid Alternative in comparison to the Auxiliary lane Alternative F(2) during the AM/PM peak hours:

- El Camino Real/ Del Mar Heights Road (LOS E improves to LOS D in the AM peak hour)
- Carmel Country Road/ Hartfield Avenue/ Del Mar Heights Road (LOS E improves to LOS D in the AM and PM peak hours)

- Carmel Country Road/ Townsgate Drive (LOS E improves to LOS D in the AM peak hour)
- El Camino Real/ High Bluff Drive (LOS D improves to LOS C in the AM peak hour)
- Carmel Country Road/ Carmel Creek Road (LOS E improves to LOS D in the AM peak hour)

Hybrid with Flyover (Run H1) Alternative — In the Hybrid with Flyover Alternative, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- Camino Del Mar/ Del Mar Heights Road, LOS F – PM peak hour
- Mango Drive/ Del Mar Heights Road, LOS E – AM peak hour
- I-5 Southbound ramps/ Del Mar Heights Road, LOS E – AM and PM peak hours
- I-5 Northbound ramps/ Del Mar Heights Road, LOS F/E – AM/PM peak hours
- High Bluff Drive/ Del Mar Heights Road, LOS E – PM peak hour
- El Camino Real/ Del Mar Heights Road, LOS E – PM peak hour
- Signature Pointe Driveway/ Del Mar Heights Road, LOS E – PM peak
- Carmel Valley Road/ Del Mar Heights Road, LOS E – AM peak hour
- Carmel Country Road/ Carmel Creek Road, LOS E – PM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS F/F – AM/PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS F – PM peak hour
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive, LOS E – AM and PM peak hours
- Carmel Country Road/ Carmel Canyon Road, LOS E – PM peak hour
- Carmel Country Road/ SR 56 WB off-ramp, LOS E– AM peak hour
- Carmel Country Road/ SR 56 EB ramps, LOS E– PM peak hour
- I-5 Northbound ramps/ Carmel Mountain Road, LOS E – AM peak hour
- Vista Sorrento Parkway/ Torrey View Court/ Carmel Mountain Road, LOS E – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS F – AM and PM peak hours

The Hybrid with Flyover Alternative includes the WB SR 56 to I-5 NB direct connector ("half connector") and a flyover ramp from SB I-5 to EB SR 56. Even with the "half connector" (WB SR

56 to NB I-5 freeway connector) and a flyover ramp, traffic from I-5 to SR 56 would be forced to use Carmel Valley Road. The benefit of the flyover is for the SB I-5 to EB SR 56 traffic to use the "flyover" and bypass the El Camino Real intersection.

The following intersections show an improved level of service in the Hybrid with Flyover Alternative during the AM/PM peak hours in comparison to the Hybrid Alternative:

- I-5 Southbound ramps/ Carmel Valley Road (LOS F improves to LOS E in the AM peak hour)
- I-5 Northbound ramps/ Carmel Valley Road (LOS F improves to LOS E in the AM peak hour)

8.1.3 *Signalized Intersections (ILV Methodology)*

Year 2030 No Build (Run E) Alternative — *Table 8–3* shows the long-term ILV intersection operations. In the No Build (Run E) scenario, the following eight intersections are calculated to operate "over capacity" in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Via de la Valle
- I-5 Northbound ramps/ Del Mar Heights Road
- I-5 Southbound ramps/ Carmel Valley Road
- I-5 Northbound ramps/ Carmel Valley Road
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive
- Carmel Country Road/ SR-56 WB off- ramp
- I-5 Northbound ramps/ Carmel Mountain Road

The intersections that are operating at "over" capacity in the No Build scenario is expected with the substantial increase in volume and delay at Del Mar Heights Road on I-5, Carmel Valley Road on I-5, Carmel Creek Road and Country Road interchanges on SR-56.

Year 2030 Auxiliary Lane (Run F) Alternative — ILV operations remain generally constant at majority of the study area intersections between the Year 2030 No Build and Year 2030 Auxiliary lane Alternatives.

Year 2030 Direct Connector (Run G) Alternative — In the Direct Connector Alternative (Run G), the following five intersections are calculated to operate "over capacity" in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Via de la Valle
- I-5 Northbound ramps/ Del Mar Heights Road
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive

- I-5 Northbound ramps/ Carmel Mountain Road

The direct connectors improve the ILV operations at the I-5/Carmel Valley interchange and El Camino Real/SR-56 WB off-ramp intersection.

Year 2030 Hybrid (Run H) Alternative — *Table 8–3* shows the long-term ILV intersection operations. In the Hybrid Alternative, the following eight intersections are calculated to operate "over capacity" in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Via de la Valle
- I-5 Northbound ramps/ Del Mar Heights Road
- I-5 Southbound ramps/ Carmel Valley Road
- I-5 Northbound ramps/ Carmel Valley Road
- El Camino Real/ SR 56 WB off-ramp/ Carmel Valley Road
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive
- Carmel Country Road/ SR-56 WB off- ramp
- I-5 Northbound ramps/ Carmel Mountain Road

Year 2030 Hybrid with Flyover (Run H1) Alternative — *Table 8–3* shows the long-term ILV intersection operations. In the Hybrid with Flyover Alternative, the following intersections are calculated to operate "over capacity" in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Via de la Valle
- I-5 Northbound ramps/ Del Mar Heights Road
- I-5 Southbound ramps/ Carmel Valley Road
- I-5 Northbound ramps/ Carmel Valley Road
- El Camino Real/ SR 56 WB off-ramp/ Carmel Valley Road
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive
- Carmel Country Road/ SR-56 WB off- ramp
- I-5 Northbound ramps/ Carmel Mountain Road

8.2 Freeway Facilities

The following is a discussion of the long-term freeway mainline, merge/diverge, ramp capacity, and freeway weaving operations in the study area.

8.2.1 *Freeway Mainline Operations*

Year 2030 No Build (Run E) Alternative — ***Table 8–4*** shows the long-term freeway mainline operations. The following freeway segments are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

I-5 Mainline:

- Between Carmel Valley Road and Carmel Mountain Road, LOS F(0) – AM (SB)

SR-56 Mainline:

- Between El Camino Real and Carmel Creek Road, LOS F(1) – AM (WB)
- Between Carmel Creek Road and Carmel Country Road, LOS F(0) – AM (WB)

Year 2030 Auxiliary Lane (Run F) Alternative — Levels of Service remains generally constant at majority of the freeway segments along I-5 between the Year 2030 No Build and Year 2030 Auxiliary lane Alternatives. In the Auxiliary lane Alternative (Run F), the freeway operations improve (LOS E improves to LOS D in the AM peak hour) along the SB I-5 (between Del Mar Heights Road and Carmel Valley Road)

In the Auxiliary Lane Alternative, the level of service improves from LOS F(1) to LOS E along WB SR 56 from El Camino Real to Carmel Creek Road in comparison to the No Build scenario. The level of service also improves from LOS F to LOS D along WB SR 56 between Carmel Country Road to Carmel Creek Road.

Year 2030 Direct Connector (Run G) Alternative — In the Direct Connector Alternative (Run G), the following freeway segments are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

I-5 Mainline:

- North of Via de Valle, LOS F(0) – PM (NB)

The levels of service along the freeway segments of I-5 from Via de la Valle to Carmel Valley Road degrade in comparison with the No Build (Run E) scenario. Based on a comparison of model volumes between Year 2030 Direct Connectors (Run G) versus Year 2030 No Build (Run E), the Run G volumes show an increase of approximately 8700 ADT. These are new trips that are attracted due to the presence of the direct connectors and these trips would use different routes like I-15 or SR

78 with a "no connectors" (No Build) situation. This volume is included in the Year 2030 SR-56 Direct Connectors (Run G) analyses and represents a more conservative case. With this additional volume included in the Direct Connector (Run G) analyses, the freeway is calculated to operate at LOS E or better.

The freeway segments on SR 56 are calculated to operate at LOS E or better. With the variation alternatives (like No EB slip off-ramp to Carmel Creek Road and/or with/without WB barrier), the Direct Connectors Alternative show better freeway operations in comparison to the Auxiliary Lane Alternative.

Year 2030 Hybrid (Model Run H) Alternative — The following freeway segments are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

I-5 Mainline:

- North of Via de Valle, LOS F(0) – PM (NB)
- Between Carmel Valley Road and Carmel Mountain Road, LOS F(0) – AM (SB)

SR-56 Mainline:

- Between Carmel Creek Road and Carmel Country Road, LOS F(0) – PM (EB)

Year 2030 Hybrid with Flyover (Model Run H1) Alternative — The following freeway segments are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

I-5 Mainline:

- North of Via de Valle, LOS F(0) – PM (NB)
- Between Carmel Valley Road and Carmel Mountain Road, LOS F(0) – AM (SB)

8.2.2 *Freeway Bypass Operations*

Year 2030 No Build (Run E) Alternative — ***Table 8–5*** shows the long-term freeway bypass operations for the Year 2030 conditions. The bypass segments are calculated to operate at LOS E or better in the AM/PM peak hours.

Year 2030 Auxiliary Lane (Run F) Alternative — Levels of Service remain generally constant at all the local bypass segments along I-5 and SR-56 between the Year 2030 No Build and Year 2030 Auxiliary lane alternative.

Year 2030 Direct Connector (Run G) Alternative — In the Direct Connector Alternative (Run G), the bypass segments are calculated to operate at LOS E or better in the AM/PM peak hours.

Year 2030 Hybrid (Run H) Alternative — The bypass segments along I-5 are calculated to operate at LOS D or better in the Hybrid Alternative.

Year 2030 Hybrid with Flyover (Run H1) Alternative — The bypass segments along I-5 are calculated to operate at LOS D or better in the Hybrid with Flyover Alternative.

8.2.3 *Freeway Weaving Section Operations*

Year 2030 No Build (Run E) Alternative — ***Table 8–6*** shows the long-term freeway weaving operations based on HCM 2000 weaving method. The following weaving sections are calculated to operate at LOS F in at least one of the peak hours (AM/PM).

- SR-56 EB between El Camino Real and Carmel Creek Road (on the frontage road), LOS F – AM and PM peak hours.
- SR-56 WB between Carmel Creek Road and El Camino Real, LOS F – AM peak hour.

Year 2030 Auxiliary Lane (Run F) Alternative — Even with the addition of auxiliary lanes, the measures of effectiveness like speed, densities and levels of service remain generally constant at all the weaving sections between the Year 2030 No Build and Year 2030 Auxiliary lane Alternatives.

Year 2030 Direct Connector (Run G) Alternative — In the Direct Connector Alternative (Run G), the following weaving segments are still calculated to operate at LOS F in at least one of the peak hours (AM/PM).

- SR-56 EB between El Camino Real and Carmel Creek Road (on the frontage road), LOS F – PM peak hour.
- SR-56 WB between Carmel Creek Road and El Camino Real, LOS F – AM peak hour.

The level of service for weaving section of SR-56 EB between Carmel Creek Road and Carmel Country Road improves from LOS F (in the No Build and Auxiliary lane scenarios) to LOS D (in the Direct Connectors scenario). This shows the benefit of direct connectors in improving freeway weaving operations downstream on SR-56.

Year 2030 Improvement Alternatives — The weaving sections of SR-56 EB and WB between El Camino Real and Carmel Creek Road are calculated to operate at LOS E or worse. The speed and densities along these weaving sections degrades in the Year 2030 No Build (Run E) and Year 2030 Auxiliary Lane Alternative from the Year 2030 Direct Connectors (Run G) scenario. Because of these failing weaving sections in the Year 2030 scenarios, the following improvement alternatives have been developed:

- Elimination of the EB slip off-ramp to Carmel Creek Road (thereby eliminating the weaving problem on SR-56 EB between El Camino Real and Carmel Creek Road) – *F(2) and G(2)*
- Installation of a WB barrier between Carmel Creek Road and El Camino Real (thereby eliminating the weaving problem on SR-56 WB between Carmel Creek Road and El Camino Real) – *F(3) and G(3)*

- Elimination of the EB slip off-ramp to Carmel Creek Road and installation of a WB barrier between Carmel Creek Road and El Camino Real – *F(4) and G(4)*
- Elimination of the EB slip off-ramp to Carmel Creek Road and collector-distributor
  (C-D) alternative on WB SR-56 between Carmel Creek Road and El Camino Real – *G(5)*

By eliminating the EB slip off-ramp to Carmel Creek Road and installation of a barrier on WB SR-56 between Carmel Creek Road and El Camino Real, the deficient weaving sections are eliminated. However, these restrictions force traffic to use the Carmel Valley and El Camino Real interchanges, thereby degrading the LOS on the local street segments and intersections along Carmel Valley Road as shown in *Table 8–2* and *Table 8–3*.

The collector-distributor alternative was developed to eliminate the weaving maneuver of the vehicles entering the loop ramp at Carmel Creek Road onto WB SR-56 to go I-5 SB. This weaving maneuver would require 3-lane changes in a very short distance and also includes a great speed differential. Hence this collector-distributor system would allow vehicles entering the loop ramp at Carmel Creek Road onto WB SR-56 to travel NB on I-5 and restrict them from traveling on SB I-5. Vehicles intending to go I-5 SB from Carmel Creek loop on-ramp would use the I-5/Carmel Valley interchange.

The collector-distributor alternative would include installation of a barrier separating the I-5 SB traffic from the I-5 NB traffic on WB SR-56. The barrier would start just upstream of the Carmel Creek loop ramp creating a collector-distributor roadway system between Carmel Creek Road and El Camino Real. Vehicles intending to go I-5 NB from WB SR-56 would use the collector-distributor system.

However, this collector-distributor alternative creates a weaving section of vehicles on WB SR-56 exiting at El Camino Real and vehicles entering Carmel Creek loop-ramp intending to go I-5 NB. This weaving section is calculated to operate at LOS D or better in the AM/PM peak hours.

Table 8–7 shows the long-term freeway weaving operations for the Year 2030 conditions based on the 1965 HCM LOS D weaving method. This table also shows similar results that the weaving sections on SR-56 EB and/or WB between Carmel Creek Road and El Camino Real are calculated to operate worse than LOS D in No Build (Run E), Auxiliary Lane (Run F), Direct Connectors (Run G) Hybrid (Run H) and Hybrid with flyover (H1) scenarios in the AM/PM peak hours.

Year 2030 Hybrid (Run H) Alternative — *Tables 8–6 and 8–7* show the long-term freeway weaving operations based on HCM 2000 and LOS D weaving method. The weaving sections are calculated to operate at LOS D or better with the exception of WB SR 56 between Carmel Creek Road and El Camino Real.

Year 2030 Hybrid with Flyover (Run H1) Alternative — *Tables 8–6 and 8–7* show the long-term freeway weaving operations based on HCM 2000 and LOS D weaving method. The weaving sections are calculated to operate at LOS D or better with exception of WB SR 56 between Carmel Creek Road and El Camino Real.

8.2.4 *Merge Sections*

Year 2030 No Build (Run E) Alternative — ***Tables 8–8 and 8–9*** shows the long-term freeway merge operations along I-5 and SR 56. In the No Build (Run E) scenario, the following merge segments are calculated to operate at LOS F in at least one of the peak hours (AM/PM).

I-5:

- On ramp from Carmel Valley Road to mainline SB I-5, LOS F – AM peak hour
- On ramp from Del Mar Heights Road to NB I-5, LOS F – PM peak hour

Year 2030 Auxiliary Lane (Run F) Alternative — In the Auxiliary Lane (Run F) scenario, majority of the freeway merge segments show similar operations as in the No Build (Run E) scenario. The addition of auxiliary lane on SB I-5 (between Del Mar Heights Road and Carmel Valley Road) improves downstream freeway mainline operations.

Year 2030 Direct Connector (Run G) Alternative — In the Direct Connector Alternative (Run G), the following merge segment is calculated to operate at LOS F in at least one of the peak hours (AM/PM).

I-5:

- On ramp from Carmel Valley Road to mainline SB I-5, LOS F – AM peak hour

Year 2030 Hybrid (Run H) Alternative — In the Hybrid (Run H) scenario, the following merge segment is calculated to operate at LOS F in the AM/PM peak hours.

I-5:

- On ramp from Carmel Valley Road to mainline SB I-5, LOS F – AM and PM peak hours

Year 2030 Hybrid with Flyover (Run H1) Alternative — In the Hybrid with Flyover (Run H1) scenario, the following merge segment is calculated to operate at LOS F in the AM/PM peak hours.

I-5:

- On ramp from Carmel Valley Road to mainline SB I-5, LOS F – AM and PM peak hours

8.2.5 *Diverge Sections*

Year 2030 No Build (Run E) Alternative — ***Tables 8–10 and 8–11*** shows the long-term freeway diverge operations. In the No Build (Run E) scenario, the following diverge segments are calculated to operate at LOS F in at least one of the peak hours (AM/PM).

I-5:

- Off ramp from mainline SB I-5 to local bypass SB I-5, LOS F – AM peak hour
- Off ramp from SB I-5 to Carmel Valley Road, LOS F – AM peak hour

SR-56:

- Off ramp from WB SR-56 to Carmel Creek Road – AM peak hour

Year 2030 Auxiliary Lane (Run F) Alternative — In the Auxiliary lane (Run F) scenario, a majority of the freeway diverge segments show similar operations as in the No Build (Run E) scenario. The addition of auxiliary lane on SB I-5 (between Del Mar Heights Road and Carmel Valley Road) improves downstream freeway and diverge operations.

The freeway diverge operations along WB SR 56 improve in comparison to the No Build scenario because of the proposed auxiliary lane on WB SR 56 between Carmel Country Road and Carmel Creek Road. The following diverge section is calculated to operate at LOS F in the No slip F(2) and No slip with barrier F(4) scenarios:

SR-56:

- Off ramp from EB SR-56 to Carmel Country Road – PM peak hour

Year 2030 Direct Connector (Run G) Alternative — In the Direct Connector Alternative (Run G), no freeway diverge segments are calculated to operate at LOS F. The direct connectors remove the freeway-to-freeway traffic on Carmel Valley Road and El Camino Real and improves freeway diverge operations.

Year 2030 Hybrid (Run H) Alternative — *Tables 8–10 and 8–11* shows the long-term freeway diverge operations. In the Hybrid Alternative, the following diverge segment is calculated to operate at LOS F in at least one of the peak hours (AM/PM).

I-5:

- Off ramp from mainline SB I-5 to local bypass SB I-5, LOS F – AM peak hour

SR-56:

- Off ramp from EB SR-56 to Carmel Country Road – PM peak hour

Year 2030 Hybrid with Flyover (Run H1) Alternative — The following diverge segment along I-5 is calculated to operate at LOS F:

I-5:

- Off ramp from mainline SB I-5 to local bypass SB I-5, LOS F – AM peak hour

The diverge operations for the Hybrid with Flyover alternative on SR 56 is similar to the Direct Connector Alternative. No freeway diverge segments are calculated to operate at LOS F.

8.2.6 *On-ramp Capacity Analysis*

Table 8–12 shows the long-term on-ramp capacity analysis along I-5 and SR-56 for the Year 2030 conditions. All the on-ramps in the project study area are calculated to operate under capacity in the AM and PM peak hour in the No Build (Run E), Auxiliary Lane (Run F), Direct Connectors (Run G), Hybrid (Run H) and Hybrid with Flyover (Run H1) scenarios.

8.2.7 *Off-ramp Capacity Analysis*

Table 9–13 shows the long-term off-ramp capacity analysis along I-5 and SR-56 for the Year 2030 conditions. All the off-ramps in the project study area are calculated to operate under capacity in the AM and PM peak hour in the No Build (Run E), Auxiliary Lane (Run F), Direct Connectors (Run G), Hybrid (Run H) and Hybrid with Flyover (Run H1) scenarios.

The off-ramp from EB SR-56 to Carmel Country Road is calculated to be "over capacity" in the Auxiliary Lane F(2) – No EB slip off-ramp, F(4) – No EB slip off-ramp and WB SR-56 barrier and Hybrid (Run F) scenarios.

8.2.8 *Ramp Meter Operations*

Year 2030 No Build (Run E) Alternative — ***Table 8–14*** shows the long-term on ramp-meter analysis for the Year 2030 conditions based on Fixed Rate Method. In the No Build (Run E), the following two ramps are calculated to experience a delay of more than 15 minutes in the AM/PM peak hours.

- Carmel Valley Road on-ramp to NB I-5 – AM and PM peak hours
- WB Del Mar Heights Road loop ramp to SB I-5 – AM and PM peak hours

Year 2030 Auxiliary Lane (Run F) Alternative — In the Auxiliary lane (Run F) scenario, a majority of the on-ramps show similar ramp meter operations as in the No Build (Run E) scenario.

Year 2030 Direct Connector (Run G) Alternative — ***Table 8–15*** shows the on ramp-meter analysis for the Year 2030 conditions based on 15-minute Maximum Delay Method. The uniform 15-minute approach is based on the assumption that any demand experiencing a delay exceeding 15-minutes will seek an alternative route or will choose to use the ramp during a less busy time period. Effectively, this approach considers the ramp demand to spread out spatially and temporally if the calculated meter delay is greater than 15-minutes. Hence, the ramp meter rate was calculated based on a 15-minute delay at the on-ramp. This table also shows similar results like the Fixed Rate method. In the No Build (Run E) and Auxiliary lane (Run F) scenarios, Carmel Valley Road on-ramp to NB I-5 and WB Del Mar Heights Road loop ramp to SB I-5 are calculated to experience a

delay of more than 15 minutes in the AM/PM peak hours. In the Direct Connector Alternative (Run G), the Carmel Valley Road on-ramp to NB I-5 is calculated to experience a delay of less than 15 minutes. The Direct Connector Alternative maintains the same delay on the WB Del Mar Heights Road loop ramp to SB I-5.

Year 2030 Hybrid and Hybrid with Flyover (Run D1) Alternative — In the Hybrid and Hybrid with Flyover Alternatives, majority of the on-ramps show similar ramp meter operations as in the Auxiliary Lane Alternative (Run F) scenario.

8.2.9 *Freeway Meter Operations*

Table 8–16 shows the freeway meter operations on WB SR-56. The freeway meter would be placed just upstream of the Carmel Creek loop off-ramp. The freeway meter rate was calculated based on the weaving operations between Carmel Creek Road and El Camino Real. The target LOS's for the weaving sections were LOS D and LOS E and separate freeway meter rates were deduced for LOS D and LOS E.

Based on the analysis, to achieve LOS D on the weaving section between Carmel Creek Road and El Camino Real, a freeway meter on WB SR-56 would incur a queue length of approximately 23,370 feet. If LOS E were the target LOS, then the queue length on SR-56 would be approximately 17,250 feet.

TABLE 8–1
EXISTING AND YEAR 2030 STREET SEGMENT OPERATIONS

Segment	Existing					General Plan Classification	Capacity (LOS E)	No Build (Run E)			Auxiliary Lane Alternative (Run F)			Direct Connectors Alternative (Run G)			Hybrid and Hybrid with Flyover Alternative (Run H and Run H1)		
	Functional Classification	Capacity[a] (LOS E)	Volume	V/C[b]	LOS[c]			Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]
Via De La Valle																			
Jimmy Durante Blvd to I-5 SB Ramps	4-lane Major	40,000	42,510	1.063	**F**	4-lane Major	40,000	51,820	1.296	**F**	51,820	1.296	**F**	51,820	1.296	**F**	51,820	1.296	**F**
I-5 NB Ramps to San Andres Drive	4-lane Major	40,000	31,700	0.793	D	4-lane Major	40,000	42,740	1.069	**F**	42,740	1.069	**F**	41,730	1.043	**F**	42,190	1.055	**F**
San Andres Drive to El Camino Real	2-lane Collector	8,000	26,180	3.273	**F**	4-lane Major	40,000	30,750	0.769	D	30,750	0.769	D	29,740	0.744	C	30,200	0.755	D
Del Mar Heights Road																			
Camino Del Mar to Mango Drive	4-lane Major	40,000	22,800	0.570	C	4-lane Major	40,000	35,280	0.882	**E**	35,280	0.882	**E**	35,280	0.882	**E**	35,280	0.882	**E**
Mango Drive to Portofino Drive	4-lane Major	40,000	32,320	0.808	D	4-lane Major	40,000	39,580	0.990	**E**	39,580	0.990	**E**	39,580	0.990	**E**	39,580	0.990	**E**
I-5 NB Ramps to High Bluff Drive	6-lane Prime	60,000	42,930	0.716	C	6-lane Prime	60,000	60,850	1.014	**F**	60,850	1.014	**F**	51,800	0.863	D	55,940	0.932	**E**
High Bluff Drive to El Camino Real	6-lane Prime	60,000	33,200	0.553	B	6-lane Prime	60,000	50,140	0.836	D	50,140	0.836	D	42,770	0.713	C	46,140	0.769	C
El Camino Real to Carmel Country Road	6-lane Prime	60,000	19,100	0.318	A	6-lane Prime	60,000	48,270	0.805	C	48,270	0.805	C	40,900	0.682	C	44,270	0.738	C
Carmel Country Road to Carmel Canyon Road	6-lane Prime	60,000	18,600	0.310	A	6-lane Prime	60,000	36,080	0.601	C	36,080	0.601	C	34,400	0.573	B	35,170	0.586	C
Carmel Canyon Road to Carmel Valley Road	6-lane Prime	60,000	28,910	0.482	B	6-lane Prime	60,000	36,350	0.606	C	36,350	0.606	C	34,670	0.578	B	35,440	0.591	C
Townsgate Drive																			
El Camino Real to Carmel Country Road	2-lane Collector	8,000	5,800	0.725	D	2-lane Collector	8,000	6,200	0.775	D	6,200	0.775	D	6,200	0.775	D	6,200	0.775	D
Valley Center Drive																			
El Camino Real to Carmel Creek Road	4-lane Major	40,000	17,470	0.437	B	4-lane Major	40,000	20,000	0.500	B	20,000	0.500	B	20,000	0.500	B	20,740	0.519	B
Carmel Valley Road																			
Camino Del Mar to Sorrento Valley Road	2-lane Collector	8,000	11,100	1.388	**F**	4-lane Major	40,000	17,400	0.435	B	17,400	0.435	B	17,400	0.435	B	17,400	0.435	B
Sorrento Valley Road to I-5	4-lane Major	40,000	13,900	0.348	A	4-lane Major	40,000	17,800	0.445	B	17,800	0.445	B	17,800	0.445	B	17,800	0.445	B
I-5 to El Camino Real:	6-lane Prime	60,000	43,000	0.717	C	6-lane Prime	60,000	66,480	1.108	**F**	66,480[g]	0.950	**E**	43,020[d]	0.615	C	75,250[d]	1.075	**F**
F2: No EB slip off-ramp, no WB barrier[e]	-	-	-	-	-	8-lane Prime	70,000	-	-	-	76,980[h]	1.100	**F**	-	-	-	-	-	-
F3: With EB slip off-ramp, with WB barrier[f]	-	-	-	-	-	8-lane Prime	70,000	-	-	-	75,000[h]	1.071	**F**	-	-	-	-	-	-
F4: No EB slip off-ramp, with WB barrier[g]	-	-	-	-	-	8-lane Prime	70,000	-	-	-	85,500[h]	1.221	**F**	-	-	-	-	-	-
G2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	8-lane Prime	70,000	-	-	-	-	-	-	*53,520*[h]	*0.765*	*C*	-	-	-
G3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	8-lane Prime	70,000	-	-	-	-	-	-	*54,860*[h]	*0.784*	*C*	-	-	-
G4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	8-lane Prime	70,000	-	-	-	-	-	-	*65,360*[h]	*0.934*	***E***	-	-	-
G5: No EB slip off-ramp, with WB C-D system[i]	-	-	-	-	-	8-lane Prime	70,000	-	-	-	-	-	-	*64,530*[h]	*0.922*	***E***	-	-	-
Carmel Mountain Road																			
Sorrento Valley Road to I-5 SB Ramps	4-lane Major	40,000	9,330	0.233	A	4-lane Major	40,000	20,030	0.501	B	20,030	0.501	B	20,030	0.501	B	20,030	0.501	B
I-5 NB Ramps to Vista Sorrento Pkwy	6-lane Prime	60,000	22,820	0.380	A	6-lane Prime	60,000	32,930	0.549	B	32,930	0.549	B	32,930	0.549	B	32,930	0.549	B
Vista Sorrento Pkwy to Carmel Mountain Road	6-lane Prime	60,000	20,600	0.343	A	6-lane Prime	60,000	34,660	0.578	B	34,660	0.578	B	34,660	0.578	B	34,660	0.578	B
Camino Del Mar																			
Del Mar Heights Road to Carmel Valley Road	3-lane Collector	15,000	22,600	1.507	**F**	3-lane Collector	15,000	30,000	2.000	**F**	30,000	2.000	**F**	30,000	2.000	**F**	30,000	2.000	**F**
South of Carmel Valley Road	2-lane Collector	10,000	20,720	2.072	**F**	2-lane Collector	10,000	23,000	2.300	**F**	23,000	2.300	**F**	23,000	2.300	**F**	23,000	2.300	**F**
Portofino Drive																			
Del Mar Heights Road to Carmel Valley Road	2-lane Collector	8,000	2,100	0.263	A	2-lane Collector	8,000	3,270	0.409	B	3,270	0.409	B	3,270	0.409	B	3,270	0.409	B
High Bluff Drive																			
Del Mar Heights Road to El Camino Real	4-lane Major	40,000	10,140	0.254	A	4-lane Major	40,000	18,170	0.454	B	18,170	0.454	B	16,490	0.412	B	17,260	0.432	B

TABLE 8–1 *continued*

EXISTING AND YEAR 2030 STREET SEGMENT OPERATIONS

Segment	Existing					General Plan Classification	Capacity (LOS E)	No Build (Run E)			Auxiliary Lane Alternative (Run F)			Direct Connectors Alternative (Run G)			Hybrid and Hybrid with Flyover Alternative (Run H and Run H1)		
	Functional Classification	Capacity[a] (LOS E)	Volume	V/C[b]	LOS[c]			Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]
El Camino Real																			
Via de la Valle to San Dieguito Road	2-lane Collector	10,000	23,200	2.320	F	4-lane Major	40,000	31,320	0.783	D	31,320	0.783	D	31,320	0.783	D	31,780	0.795	D
San Dièguito Road to Del Mar Heights Road	4-lane Major	40,000	24,400	0.610	C	4-lane Major	40,000	29,000	0.725	C	29,000	0.725	C	29,000	0.725	C	29,000	0.725	C
Del Mar Heights Road to Townsgate Drive	6-lane Major	50,000	16,600	0.332	A	6-lane Major	50,000	23,120	0.462	B	23,120	0.462	B	23,000	0.460	B	23,120	0.462	B
Townsgate Drive to High Bluff Drive	6-lane Major	50,000	24,100	0.482	B	6-lane Major	50,000	26,120	0.522	B	26,120	0.522	B	26,000	0.520	B	26,120	0.522	B
High Bluff Drive to Valley Center Drive	6-lane Major	50,000	24,300	0.486	B	6-lane Major	50,000	37,300	0.746	C	37,300	0.746	C	35,620	0.712	C	36,390	0.728	C
Valley Center Drive to Carmel Valley Road	6-lane Major	50,000	29,800	0.596	C	6-lane Major	50,000	44,700	0.894	D	44,700	0.894	D	43,020[d]	0.860	D	44,530	0.891	D
F2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	6-lane Major	50,000	-	-	-	44,700	0.894	D	-	-	-	-	-	-
F3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	6-lane Major	50,000	-	-	-	45,230	0.905	E	-	-	-	-	-	-
F4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	6-lane Major	50,000	-	-	-	45,230	0.905	E	-	-	-	-	-	-
G2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	6-lane Major	50,000	-	-	-	-	-	-	*43,020*	*0.860*	*D*	-	-	-
G3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	6-lane Major	50,000	-	-	-	-	-	-	*43,760*	*0.875*	*D*	-	-	-
G4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	6-lane Major	50,000	-	-	-	-	-	-	*43,760*	*0.875*	*D*	-	-	-
Carmel Valley Road to Carmel Mountain Road	6-lane Major	50,000	25,900	0.518	B	6-lane Major	50,000	28,000	0.560	B	28,000	0.560	B	28,000	0.560	B	28,000	0.560	B
Carmel Creek Road																			
Carmel Country Road to Del Mar Trails Road	4-lane Major	40,000	14,370	0.359	A	4-lane Major	40,000	15,660	0.392	B	15,660	0.392	B	15,000[d]	0.375	A	12,840	0.321	A
F2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	14,260	0.357	A	-	-	-	-	-	-
F3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	14,600	0.365	A	-	-	-	-	-	-
F4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	13,200	0.330	A	-	-	-	-	-	-
G2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*13,600*	*0.340*	*A*	-	-	-
G3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*13,520*	*0.338*	*A*	-	-	-
G4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*12,120*	*0.303*	*A*	-	-	-
G5: No EB slip off-ramp, with WB C-D system[i]	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*12,540*	*0.314*	*A*			
Del Mar Trails Road to Valley Center Drive	4-lane Major	40,000	12,400	0.207	A	4-lane Major	40,000	13,740	0.344	A	13,740	0.344	A	13,080[d]	0.327	A	10,390	0.260	A
F2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	12,340	0.309	A	-	-	-	-	-	-
F3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	12,150	0.304	A	-	-	-	-	-	-
F4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	10,750	0.269	A	-	-	-	-	-	-
G2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*11,680*	*0.292*	*A*	-	-	-
G3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*10,860*	*0.272*	*A*	-	-	-
G4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*9,460*	*0.237*	*A*	-	-	-
G5: No EB slip off-ramp, with WB C-D system[i]	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*10,090*	*0.252*	*A*	-	-	-
Carmel Country Road																			
Del Mar Heights Road to Townsgate Drive	4-lane Major	40,000	14,170	0.354	A	4-lane Major	40,000	27,970	0.699	C	27,970	0.699	C	22,280	0.557	C	24,880	0.622	C
Townsgate Drive to Carmel Creek Road	4-lane Major	40,000	13,400	0.335	A	4-lane Major	40,000	24,490	0.612	C	24,490	0.612	C	18,800	0.470	B	21,400	0.535	C
Carmel Creek Road to Del Mar Trails Road	4-lane Major	40,000	9,000	0.225	A	4-lane Major	40,000	14,530	0.363	A	14,530	0.363	A	9,500[d]	0.238	A	13,570	0.339	A
F2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	15,230	0.381	B	-	-	-	-	-	-
F3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	15,600	0.390	B	-	-	-	-	-	-
F4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	16,300	0.408	B	-	-	-	-	-	-

TABLE 8–1
EXISTING AND YEAR 2030 STREET SEGMENT OPERATIONS

Segment	Existing					General Plan Classification	Capacity (LOS E)	No Build (Run E)			Auxiliary Lane Alternative (Run F)			Direct Connectors Alternative (Run G)			Hybrid and Hybrid with Flyover Alternative (Run H and Run H1)		
	Functional Classification	Capacity[a] (LOS E)	Volume	V/C[b]	LOS[c]			Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]	Volume	V/C[b]	LOS[c]
G2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*10,200*	*0.255*	*A*	-	-	-
G3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*10,980*	*0.275*	*A*	-	-	-
G4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*11,680*	*0.292*	*A*	-	-	-
G5: No EB slip off-ramp, with WB C-D system[i]	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*11,270*	*0.282*	*A*	-	-	-
Del Mar Trails Road to SR-56 WB Ramps	4-lane Major	40,000	19,370	0.484	B	4-lane Major	40,000	31,030	0.776	D	31,030	0.776	D	26,000[d]	0.650	C	31,300	0.783	D
F2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	32,430	0.811	D	-	-	-	-	-	-
F3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	32,630	0.816	D	-	-	-	-	-	-
F4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	34,030	0.851	D	-	-	-	-	-	-
G2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*27,400*	*0.685*	*C*	-	-	-
G3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*28,220*	*0.706*	*C*	-	-	-
G4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*29,620*	*0.741*	*C*	-	-	-
G5: No EB slip off-ramp, with WB C-D system[i]	-	-	-	-	-	4-lane Major	40,000	-	-	-	-	-	-	*29,000*	*0.725*	*C*			
Carmel Canyon Road																			
Del Mar Heights Road to Carmel Country Road	4-lane Major	40,000	3,800	0.095	A	4-lane Major	40,000	7,500	0.188	A	7,500	0.188	A	7,500	0.188	A	7,500	0.188	A
Carmel Country Road to Carmel Creek Road	2-lane Collector	8,000	3,760	0.470	C	2-lane Collector	8,000	4,500	0.563	C	4,500	0.563	C	4,500[d]	0.563	C	5,730	0.716	D
F2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	2-lane Collector	8,000	-	-	-	5,200	0.650	D	-	-	-	-	-	-
F3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	2-lane Collector	8,000	-	-	-	5,030	0.629	D	-	-	-	-	-	-
F4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	2-lane Collector	8,000	-	-	-	5,730	0.716	D	-	-	-	-	-	-
G2: No EB slip off-ramp, no WB barrier	-	-	-	-	-	2-lane Collector	8,000	-	-	-	-	-	-	*5,200*	*0.650*	*D*	-	-	-
G3: With EB slip off-ramp, with WB barrier	-	-	-	-	-	2-lane Collector	8,000	-	-	-	-	-	-	*5,240*	*0.655*	*D*	-	-	-
G4: No EB slip off-ramp, with WB barrier	-	-	-	-	-	2-lane Collector	8,000	-	-	-	-	-	-	*5,940*	*0.743*	*D*	-	-	-
G5: No EB slip off-ramp, with WB C-D system[i]	-	-	-	-	-	2-lane Collector	8,000	-	-	-	-	-	-	*5,730*	*0.716*	*D*			
Carmel Valley Road																			
Del Mar Heights Road to SR-56 WB Ramps	4-lane Major	40,000	26,530	0.663	C	4-lane Major	40,000	32,390	0.810	D	32,390	0.810	D	31,720	0.793	D	32,030	0.801	D

Footnotes:

a. Capacities based on City of San Diego's Roadway Classification & LOS table.
b. Volume to Capacity ratio.
c. Level of Service.
d. This segment ADT refers to the condition where EB slip off-ramp to Carmel Creek Road is maintained and no barrier is installed on WB SR-56 between Carmel Country Road and Carmel Creek Road.
e. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
f. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
g. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
h. Carmel Valley Road is analyzed as an 8-lane Primary Arterial (four EB lanes and four WB lanes) in the Auxiliary lane and Direct Connectors alternatives in Year 2030 (and its variations).
i. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

General Notes:
Bold typeface shows segments operating at LOS E or F.

TABLE 8–2
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
1) I–5 Southbound Ramps/ Via De La Valle *Traffic Signal*	*Existing*	15.1	B	14.4	B
	E: No Build	29.3	C	25.6	C
	F: Auxiliary Lane Alternative	29.3	C	25.6	C
	G: Direct Connectors Alternative	29.2	C	22.5	C
	H: Hybrid Alternative	29.3	C	25.6	C
	H1: Hybrid with Flyover Alternative	29.3	C	25.6	C
2) I–5 Northbound Ramps/ Via De La Valle *Traffic Signal*	*Existing*	18.8	B	20.8	C
	E: No Build	27.4	C	42.1	D
	F: Auxiliary Lane Alternative	27.4	C	42.1	D
	G: Direct Connectors Alternative	27.2	C	40.6	D
	H: Hybrid Alternative	27.3	C	41.9	D
	H1: Hybrid with Flyover Alternative	27.3	C	41.9	D
3) El Camino Real West/ Via De La Valle *Traffic Signal*	*Existing*	**71.0**	**E**	46.8	D
	E: No Build	47.7	D	49.1	D
	F: Auxiliary Lane Alternative	47.7	D	49.1	D
	G: Direct Connectors Alternative	44.6	D	46.4	D
	H: Hybrid Alternative	46.2	D	47.6	D
	H1: Hybrid with Flyover Alternative	46.2	D	47.6	D
4) El Camino Real/ San Dieguito Road *Traffic Signal*	*Existing*	18.2	B	28.1	C
	E: No Build	19.6	B	27.7	C
	F: Auxiliary Lane Alternative	19.6	B	27.7	C
	G: Direct Connectors Alternative	17.6	B	24.2	C
	H: Hybrid Alternative	19.4	B	26.0	C
	H1: Hybrid with Flyover Alternative	19.4	B	26.0	C
5) Camino Del Mar/ Del Mar Heights Road *Traffic Signal*	*Existing*	32.3	C	29.7	C
	E: No Build	38.9	D	**241.6**	**F**
	F: Auxiliary Lane Alternative	38.9	D	**241.6**	**F**
	G: Direct Connectors Alternative	38.9	D	**241.6**	**F**
	H: Hybrid Alternative	38.9	D	**241.6**	**F**
	H1: Hybrid with Flyover Alternative	38.9	D	**241.6**	**F**
6) Mango Drive/ Del Mar Heights Road *Traffic Signal*	*Existing*	45.3	D	39.9	D
	E: No Build	**57.2**	**E**	48.3	D
	F: Auxiliary Lane Alternative	**57.2**	**E**	48.3	D
	G: Direct Connectors Alternative	**57.2**	**E**	48.3	D
	H: Hybrid Alternative	**57.2**	**E**	48.3	D
	H1: Hybrid with Flyover Alternative	**57.2**	**E**	48.3	D
7) Portofino Drive/ Del Mar Heights Road *TWSC*[c]	*Existing*	10.9	B	9.9	A
	E: No Build	14.4	B	11.2	B
	F: Auxiliary Lane Alternative	14.4	B	11.2	B
	G: Direct Connectors Alternative	14.4	B	11.2	B
	H: Hybrid Alternative	14.4	B	11.2	B
	H1: Hybrid with Flyover Alternative	14.4	B	11.2	B

TABLE 8–2 *continued*
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
8) I–5 Southbound Ramps/ Del Mar Heights Road *Traffic Signal*	*Existing*	24.7	C	20.5	C
	E: No Build	**56.6**	**E**	**58.2**	**E**
	F: Auxiliary Lane Alternative	**56.6**	**E**	**58.2**	**E**
	G: Direct Connectors Alternative	29.6	C	21.8	C
	H: Hybrid Alternative	**56.6**	**E**	**58.2**	**E**
	H1: Hybrid with Flyover Alternative	**56.6**	**E**	**58.2**	**E**
9) I–5 Northbound Ramps/ Del Mar Heights Road *Traffic Signal*	*Existing*	52.9	D	**92.0**	**F**
	E: No Build	**106.5**	**F**	**66.4**	**E**
	F: Auxiliary Lane Alternative	**106.5**	**F**	**66.4**	**E**
	G: Direct Connectors Alternative	**77.9**	**E**	**60.4**	**E**
	H: Hybrid Alternative	**81.3**	**F**	**62.1**	**E**
	H1: Hybrid with Flyover Alternative	**81.3**	**F**	**62.1**	**E**
10) High Bluff Drive/ Del Mar Heights Road *Traffic Signal*	*Existing*	27.4	C	31.7	C
	E: No Build	52.7	D	**64.3**	**E**
	F: Auxiliary Lane Alternative	52.7	D	**64.3**	**E**
	G: Direct Connectors Alternative	32.4	C	33.8	C
	H: Hybrid Alternative	37.2	D	**57.7**	**E**
	H1: Hybrid with Flyover Alternative	37.2	D	**57.7**	**E**
11) El Camino Real/ Del Mar Heights Road *Traffic Signal*	*Existing*	29.9	C	36.1	D
	E: No Build	**58.9**	**E**	**61.7**	**E**
	F: Auxiliary Lane Alternative	**58.9**	**E**	**61.7**	**E**
	G: Direct Connectors Alternative	39.4	D	42.8	D
	H: Hybrid Alternative	48.2	D	**57.7**	**E**
	H1: Hybrid with Flyover Alternative	48.2	D	**57.7**	**E**
12) Signature Pointe Driveway/ Del Mar Heights Road *Traffic Signal*	*Existing*	46.1	D	41.3	D
	E: No Build	48.9	D	**62.5**	**E**
	F: Auxiliary Lane Alternative	48.9	D	**62.5**	**E**
	G: Direct Connectors Alternative	47.0	D	52.9	D
	H: Hybrid Alternative	47.3	D	**59.6**	**E**
	H1: Hybrid with Flyover Alternative	47.3	D	**59.6**	**E**
13) Carmel Country Road/ Hartfield Avenue/ Del Mar Heights Road *Traffic Signal*	*Existing*	35.7	D	36.0	D
	E: No Build	**56.6**	**E**	**58.8**	**E**
	F: Auxiliary Lane Alternative	**56.6**	**E**	**58.8**	**E**
	G: Direct Connectors Alternative	39.9	D	40.6	D
	H: Hybrid Alternative	40.2	D	48.8	D
	H1: Hybrid with Flyover Alternative	40.2	D	48.8	D
14) Carmel Canyon Road/ Del Mar Heights Road *Traffic Signal*	*Existing*	22.7	C	20.8	C
	E: No Build	31.2	C	27.0	C
	F: Auxiliary Lane Alternative	31.2	C	27.0	C
	G: Direct Connectors Alternative	29.8	C	24.9	C
	H: Hybrid Alternative	31.0	C	26.6	C
	H1: Hybrid with Flyover Alternative	31.0	C	26.6	C

TABLE 8–2 *continued*
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
15) Carmel Valley Road/ Del Mar Heights Road *Traffic Signal*	*Existing*	40.1	D	28.6	C
	E: No Build	**83.3**	**F**	35.1	D
	F: Auxiliary Lane Alternative	**83.3**	**F**	35.1	D
	G: Direct Connectors Alternative	**78.9**	**E**	35.0	D
	H: Hybrid Alternative	**79.1**	**E**	35.0	D
	H1: Hybrid with Flyover Alternative	**79.1**	**E**	35.0	D
16) El Camino Real/ Townsgate Drive *Traffic Signal*	*Existing*	19.1	B	14.6	B
	E: No Build	26.8	C	19.9	B
	F: Auxiliary Lane Alternative	26.8	C	19.9	B
	G: Direct Connectors Alternative	26.8	C	19.9	B
	H: Hybrid Alternative	26.8	C	19.9	B
	H1: Hybrid with Flyover Alternative	26.8	C	19.9	B
17) Carmel Country Road/ Townsgate Drive *Traffic Signal*	*Existing*	42.3	D	34.9	C
	E: No Build	**64.2**	**E**	49.2	D
	F: Auxiliary Lane Alternative	**64.2**	**E**	49.2	D
	G: Direct Connectors Alternative	53.5	D	41.5	D
	H: Hybrid Alternative	54.4	D	47.9	D
	H1: Hybrid with Flyover Alternative	54.4	D	47.9	D
18) El Camino Real/ High Bluff Drive *Traffic Signal*	*Existing*	31.7	C	36.4	D
	E: No Build	35.6	D	49.9	D
	F: Auxiliary Lane Alternative	35.6	D	49.9	D
	G: Direct Connectors Alternative	33.0	C	44.8	D
	H: Hybrid Alternative	35.0	C	49.3	D
	H1: Hybrid with Flyover Alternative	35.0	C	49.3	D
19) Carmel Country Road/ Carmel Creek Road *Traffic Signal*	*Existing*	38.9	D	44.7	D
	E: No Build	**55.6**	**E**	**66.0**	**E**
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	**55.6**	**E**	**66.0**	**E**
	F2: No EB slip off-ramp, no WB barrier [e]	**55.2**	**E**	**65.9**	**E**
	F3: With EB slip off-ramp, with WB barrier [f]	**55.3**	**E**	**66.0**	**E**
	F4: No EB slip off-ramp, with WB barrier [g]	**55.7**	**E**	**66.6**	**E**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	53.7	D	52.6	D
	G2: No EB slip off-ramp, no WB barrier	51.5	D	52.4	D
	G3: With EB slip off-ramp, with WB barrier	52.2	D	53.0	D
	G4: No EB slip off-ramp, with WB barrier	52.7	D	53.4	D
	G5: No EB slip off-ramp, with WB C-D system [h]	51.9	D	52.8	D
	H: Hybrid Alternative	54.8	D	**62.4**	**E**
	H1: Hybrid with Flyover Alternative	54.8	D	**62.4**	**E**

TABLE 8–2 *continued*
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
20) Carmel Creek Road/ Del Mar Trails Road *AWSC* [d]	*Existing*	-	-	-	-
	E: No Build	-	-	-	-
	F: Auxiliary Lane Alternative	-	-	-	-
	G: Direct Connectors Alternative	-	-	-	-
	H: Hybrid Alternative	-	-	-	-
	H1: Hybrid with Flyover Alternative	-	-	-	-
21) Camino Del Mar/ Carmel Valley Road *Traffic Signal*	*Existing*	27.1	C	13.7	B
	E: No Build	30.1	C	30.9	C
	F: Auxiliary Lane Alternative	30.1	C	30.9	C
	G: Direct Connectors Alternative	30.1	C	30.9	C
	H: Hybrid Alternative	30.1	C	30.9	C
	H1: Hybrid with Flyover Alternative	30.1	C	30.9	C
22) Portofino Drive/ Carmel Valley Road *Traffic Signal*	*Existing*	28.0	C	**66.4**	**E**
	E: No Build	**132.9**	**F**	**186.5**	**F**
	F: Auxiliary Lane Alternative	**132.9**	**F**	**186.5**	**F**
	G: Direct Connectors Alternative	**132.9**	**F**	**186.5**	**F**
	H: Hybrid Alternative	**132.9**	**F**	**186.5**	**F**
	H1: Hybrid with Flyover Alternative	**132.9**	**F**	**186.5**	**F**
23) Sorrento Valley Road/ Carmel Valley Road *Traffic Signal*	*Existing*	19.3	B	18.2	B
	E: No Build	22.1	C	26.1	C
	F: Auxiliary Lane Alternative	22.1	C	26.1	C
	G: Direct Connectors Alternative	22.1	C	25.8	C
	H: Hybrid Alternative	22.1	C	26.1	C
	H1: Hybrid with Flyover Alternative	22.1	C	26.1	C
24) I–5 Southbound Ramps/ Carmel Valley Road *Traffic Signal*	*Existing*	26.8	C	28.2	C
	E: No Build	**101.9**	**F**	**116.6**	**F**
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	**67.5**	**E**	**105.5**	**F**
	F2: No EB slip off-ramp, no WB barrier	**67.5**	**E**	**105.5**	**F**
	F3: With EB slip off-ramp, with WB barrier	**105.0**	**F**	**125.2**	**F**
	F4: No EB slip off-ramp, with WB barrier	**105.0**	**F**	**125.2**	**F**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	24.1	C	27.0	C
	G2: No EB slip off-ramp, no WB barrier	24.1	C	27.0	C
	G3: With EB slip off-ramp, with WB barrier	27.9	C	32.0	C
	G4: No EB slip off-ramp, with WB barrier	27.9	C	32.0	C
	G5: No EB slip off-ramp, with WB C-D system	27.9	C	32.0	C
	H: Hybrid Alternative	**105.0**	**F**	**125.2**	**F**
	H1: Hybrid with Flyover Alternative	**105.0**	**F**	**125.2**	**F**

TABLE 8–2
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
25) I–5 Northbound Ramps/ Carmel Valley Road *Traffic Signal*	*Existing*	33.5	C	**58.6**	**E**
	E: No Build	**59.7**	**E**	**69.5**	**E**
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	36.7	D	39.5	D
	F2: No EB slip off-ramp, no WB barrier	**68.2**	**E**	**141.1**	**F**
	F3: With EB slip off-ramp, with WB barrier	**55.4**	**E**	45.7	D
	F4: No EB slip off-ramp, with WB barrier	**82.3**	**F**	**147.2**	**F**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	27.2	C	30.0	C
	G2: No EB slip off-ramp, no WB barrier	46.9	D	47.3	D
	G3: With EB slip off-ramp, with WB barrier	44.7	D	37.4	D
	G4: No EB slip off-ramp, with WB barrier	51.7	D	**73.6**	**E**
	G5: No EB slip off-ramp, with WB C-D system	53.0	D	**67.1**	**E**
	H: Hybrid Alternative	**74.7**	**E**	**144.6**	**F**
	H1: Hybrid with Flyover Alternative	**74.9**	**E**	**143.4**	**F**
26) Old Camino Real/ Carmel Valley Road *Traffic Signal*	*Existing*	9.1	A	9.2	A
	E: No Build	18.8	B	13.6	B
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	13.1	B	12.0	B
	F2: No EB slip off-ramp, no WB barrier	17.4	B	13.2	B
	F3: With EB slip off-ramp, with WB barrier	14.0	B	12.7	B
	F4: No EB slip off-ramp, with WB barrier	18.7	B	13.6	B
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	10.9	B	9.7	A
	G2: No EB slip off-ramp, no WB barrier	11.1	B	16.0	B
	G3: With EB slip off-ramp, with WB barrier	13.6	B	15.0	B
	G4: No EB slip off-ramp, with WB barrier	14.3	B	17.1	B
	G5: No EB slip off-ramp, with WB C-D system	14.1	B	15.1	B
	H: Hybrid Alternative	16.0	B	16.6	B
	H1: Hybrid with Flyover Alternative	*DNE*	-	*DNE*	-

TABLE 8–2 *continued*
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
27) El Camino Real/ Valley Center Drive *Traffic Signal*	*Existing*	29.1	C	34.0	C
	E: No Build	38.2	D	39.5	D
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	38.2	D	39.5	D
	F2: No EB slip off-ramp, no WB barrier	38.2	D	39.5	D
	F3: With EB slip off-ramp, with WB barrier	42.8	D	40.1	D
	F4: No EB slip off-ramp, with WB barrier	42.8	D	40.1	D
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	35.8	D	38.7	D
	G2: No EB slip off-ramp, no WB Barrier	35.8	D	38.7	D
	G3: With EB slip off-ramp, with WB barrier	43.5	D	39.3	D
	G4: No EB slip off-ramp, with WB barrier	43.5	D	39.3	D
	G5: No EB slip off-ramp, with WB C-D system	43.5	D	39.3	D
	H: Hybrid Alternative	45.1	D	39.4	D
	H1: Hybrid with Flyover Alternative	45.1	D	39.4	D
28) El Camino Real/SR-56 WB Off-ramp/Carmel Valley Road *Traffic Signal*	*Existing*	29.2	C	32.0	C
	E: No Build	**66.8**	**E**	37.8	D
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	41.9	D	31.1	C
	F2: No EB slip off-ramp, no WB barrier	41.9	D	31.1	C
	F3: With EB slip off-ramp, with WB barrier	49.2	D	34.8	C
	F4: No EB slip off-ramp, with WB barrier	49.2	D	34.8	C
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	37.3	D	23.6	C
	G2: No EB slip off-ramp, no WB barrier	37.3	D	23.6	C
	G3: With EB slip off-ramp, with WB barrier	39.8	D	32.2	C
	G4: No EB slip off-ramp, with WB barrier	39.8	D	32.2	C
	G5: No EB slip off-ramp, with WB C-D system	37.7	D	28.3	C
	H: Hybrid Alternative	38.6	D	30.9	C
	H1: Hybrid with Flyover Alternative	38.6	D	30.9	C
29) El Camino Real/ SR-56 Eastbound On-Ramp/Carmel Valley Road *Traffic Signal*	*Existing*	15.9	B	**59.2**	**E**
	E: No Build	**61.3**	**E**	**157.7**	**F**
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	26.8	C	**98.8**	**F**
	F2: No EB slip off-ramp, no WB barrier	**63.2**	**E**	**168.7**	**F**
	F3: With EB slip off-ramp, with WB barrier	26.8	C	**98.8**	**F**
	F4: No EB slip off-ramp, with WB barrier	**63.2**	**E**	**168.7**	**F**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	23.1	C	38.2	D
	G2: No EB slip off-ramp, no WB barrier	38.7	D	**79.8**	**E**
	G3: With EB slip off-ramp, with WB barrier	23.1	C	38.2	D
	G4: No EB slip off-ramp, with WB barrier	38.7	D	**79.8**	**E**
	G5: No EB slip off-ramp, with WB C-D system	38.7	D	**79.8**	**E**
	H: Hybrid Alternative	**63.2**	**E**	**168.7**	**F**
	H1: Hybrid with Flyover Alternative	35.6	D	**86.4**	**F**

TABLE 8–2 *continued*
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
30) Carmel Creek Road/SR-56 WB ramps/Valley Center Drive *Traffic Signal*	*Existing*	44.1	D	43.1	D
	E: No Build	**67.2**	**E**	50.1	D
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	53.2	D	44.3	D
	F2: No EB slip off-ramp, no WB barrier	**58.3**	**E**	**56.0**	**E**
	F3: With EB slip off-ramp, with WB barrier	53.0	D	43.4	D
	F4: No EB slip off-ramp, with WB barrier	**56.8**	**E**	45.4	D
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	52.8	D	44.3	D
	G2: No EB slip off-ramp, no WB barrier	53.9	D	47.7	D
	G3: With EB slip off-ramp, with WB barrier	52.9	D	42.7	D
	G4: No EB slip off-ramp, with WB barrier	54.8	D	44.2	D
	G5: No EB slip off-ramp, with WB C-D system	**57.6**	**E**	**55.9**	**E**
	H: Hybrid Alternative	**56.7**	**E**	**55.1**	**E**
	H1: Hybrid with Flyover Alternative	**56.7**	**E**	**55.1**	**E**
31) Carmel Creek Road/ SR-56 Eastbound Ramps *Traffic Signal*	*Existing*	37.8	D	42.3	D
	E: No Build	40.6	D	50.4	D
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	40.6	D	50.4	D
	F2: No EB slip off-ramp, no WB barrier	37.6	D	52.2	D
	F3: With EB slip off-ramp, with WB barrier	41.3	D	49.8	D
	F4: No EB slip off-ramp, with WB barrier	37.6	D	52.2	D
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	40.9	D	49.3	D
	G2: No EB slip off-ramp, no WB barrier	33.3	C	40.7	D
	G3: With EB slip off-ramp, with WB barrier	41.2	D	49.2	D
	G4: No EB slip off-ramp, with WB barrier	33.4	C	41.3	D
	G5: No EB slip off-ramp, with WB C-D system	36.7	D	47.5	D
	H: Hybrid Alternative	37.0	D	48.3	D
	H1: Hybrid with Flyover Alternative	37.0	D	48.3	D
32) Carmel Country Road/ Carmel Canyon Road *Traffic Signal*	*Existing*	28.1	C	23.6	C
	E: No Build	33.1	C	47.3	D
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	33.1	C	47.3	D
	F2: No EB slip off-ramp, no WB barrier	34.3	C	**55.7**	**E**
	F3: With EB slip off-ramp, with WB barrier	33.8	C	53.2	D
	F4: No EB slip off-ramp, with WB barrier	39.1	D	**61.2**	**E**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	31.6	C	43.6	D
	G2: No EB slip off-ramp, no WB barrier	33.5	C	49.6	D
	G3: With EB slip off-ramp, with WB barrier	33.2	C	45.1	D
	G4: No EB slip off-ramp, with WB barrier	35.2	D	50.6	D
	G5: No EB slip off-ramp, with WB C-D system	33.8	C	45.7	D
	H: Hybrid Alternative	34.5	C	**56.9**	**E**
	H1: Hybrid with Flyover Alternative	34.5	C	**56.9**	**E**

TABLE 8–2 *continued*
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
33) Carmel Country Road/ SR-56 Westbound Off-Ramp *Traffic Signal*	*Existing*	27.1	C	21.5	C
	E: No Build	31.3	C	28.1	C
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	31.3	C	28.1	C
	F2: No EB slip off-ramp, no WB barrier	54.0	D	29.2	C
	F3: With EB slip off-ramp, with WB barrier	47.0	D	28.6	C
	F4: No EB slip off-ramp, with WB barrier	**82.5**	**F**	34.3	C
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	30.4	C	22.2	C
	G2: No EB slip off-ramp, no WB barrier	52.0	D	26.0	C
	G3: With EB slip off-ramp, with WB barrier	42.8	D	25.5	C
	G4: No EB slip off-ramp, with WB barrier	**73.6**	**E**	26.3	C
	G5: No EB slip off-ramp, with WB C-D system	**61.8**	**E**	25.8	C
	H: Hybrid Alternative	**67.6**	**E**	30.7	C
	H1: Hybrid with Flyover Alternative	**67.6**	**E**	30.7	C
34) Carmel Country Road/ SR-56 Eastbound Ramps *Traffic Signal*	*Existing*	25.5	C	33.1	C
	E: No Build	34.2	C	42.6	D
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	34.2	C	42.6	D
	F2: No EB slip off-ramp, no WB barrier	42.8	D	**69.9**	**E**
	F3: With EB slip off-ramp, with WB barrier	34.4	C	43.9	D
	F4: No EB slip off-ramp, with WB barrier	47.6	D	**73.9**	**E**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	29.0	C	33.8	C
	G2: No EB slip off-ramp, no WB barrier	41.8	D	36.2	D
	G3: With EB slip off-ramp, with WB barrier	30.0	C	34.4	C
	G4: No EB slip off-ramp, with WB barrier	46.9	D	37.7	D
	G5: No EB slip off-ramp, with WB C-D system	44.5	D	36.5	D
	H: Hybrid Alternative	43.1	D	**73.0**	**E**
	H1: Hybrid with Flyover Alternative	43.1	D	**73.0**	**E**
35) Carmel Valley Road/ SR-56 Westbound Ramps *Traffic Signal*	*Existing*	6.2	A	3.6	A
	E: No Build	11.7	B	19.6	B
	F: Auxiliary Lane Alternative	11.7	B	19.6	B
	G: Direct Connectors Alternative	10.3	B	18.9	B
	H: Hybrid Alternative	10.3	B	19.0	B
	H1: Hybrid with Flyover Alternative	10.3	B	19.0	B
36) Carmel Valley Road/ SR-56 Eastbound Ramps *Traffic Signal*	*Existing*	22.4	C	22.9	C
	E: No Build	45.6	D	46.9	D
	F: Auxiliary Lane Alternative	45.6	D	46.9	D
	G: Direct Connectors Alternative	45.0	D	45.5	D
	H: Hybrid Alternative	46.0	D	46.8	D
	H1: Hybrid with Flyover Alternative	46.0	D	46.8	D

TABLE 8–2
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
HCM METHOD

Intersection	Model Run: Scenario	AM		PM	
		Delay[a]	LOS[b]	Delay[a]	LOS[b]
37) Sorrento Valley Road/ Carmel Mountain Road *Traffic Signal*	*Existing*	24.0	C	14.0	B
	E: No Build	25.0	C	21.8	C
	F: Auxiliary Lane Alternative	25.0	C	21.8	C
	G: Direct Connectors Alternative	25.0	C	21.8	C
	H: Hybrid Alternative	25.0	C	21.8	C
	H1: Hybrid with Flyover Alternative	25.0	C	21.8	C
38) I–5 Southbound Ramps/ Carmel Mountain Road *Traffic Signal*	*Existing*	36.1	D	29.7	C
	E: No Build	37.0	D	32.4	C
	F: Auxiliary Lane Alternative	37.0	D	32.4	C
	G: Direct Connectors Alternative	37.0	D	32.4	C
	H: Hybrid Alternative	37.0	D	32.4	C
	H1: Hybrid with Flyover Alternative	37.0	D	32.4	C
39) I–5 Northbound Ramps/ Carmel Mountain Road *Traffic Signal*	*Existing*	43.7	D	30.8	C
	E: No Build	**60.0**	**E**	37.5	D
	F: Auxiliary Lane Alternative	**60.0**	**E**	37.5	D
	G: Direct Connectors Alternative	**60.0**	**E**	37.5	D
	H: Hybrid Alternative	**60.0**	**E**	37.5	D
	H1: Hybrid with Flyover Alternative	**60.0**	**E**	37.5	D
40) Vista Sorrento Parkway/ Torrey View Court/ Carmel Mountain Road *Traffic Signal*	*Existing*	22.3	C	34.5	C
	E: No Build	28.7	C	**72.3**	**E**
	F: Auxiliary Lane Alternative	28.7	C	**72.3**	**E**
	G: Direct Connectors Alternative	28.7	C	**72.3**	**E**
	H: Hybrid Alternative	28.7	C	**72.3**	**E**
	H1: Hybrid with Flyover Alternative	28.7	C	**72.3**	**E**
41) El Camino Real/ Carmel Mountain Road *Traffic Signal*	*Existing*	29.7	C	34.1	C
	E: No Build	**176.4**	**F**	**112.9**	**F**
	F: Auxiliary Lane Alternative	**176.4**	**F**	**112.9**	**F**
	G: Direct Connectors Alternative	**176.4**	**F**	**112.9**	**F**
	H: Hybrid Alternative	**176.4**	**F**	**112.9**	**F**
	H1: Hybrid with Flyover Alternative	**176.4**	**F**	**112.9**	**F**

Footnotes:

a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. TWSC – Two-Way Stop Controlled intersection. Minor street left turn delay is reported.
d. AWSC– All-way Stop controlled intersection.
e. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
f. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
g. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
h. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

SIGNALIZED		UNSIGNALIZED	
DELAY/LOS THRESHOLDS		DELAY/LOS THRESHOLDS	
Delay	LOS	Delay	LOS
0.0 < 10.0	A	0.0 < 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
> 80.1	F	> 50.1	F

General Notes:
Bold typeface shows intersections operating at LOS E or F.

TABLE 8–3
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
CALTRANS ILV METHOD

Intersection	Model Run: Scenario	AM			PM		
		ILV[a]	Capacity[b]	HCM LOS[c]	ILV[a]	Capacity[b]	HCM LOS[c]
1) I–5 Southbound Ramps/ Via De La Valle	*Existing*	590	Under	B	688	Under	B
	E: No Build	1212	Near	C	1308	Near	C
	F: Auxiliary Lane Alternative	1212	Near	C	1308	Near	C
	G: Direct Connectors Alternative	1200	Under	C	1290	Near	C
	H: Hybrid Alternative	1212	Near	C	1308	Near	C
	H1: Hybrid with Flyover Alternative	1212	Near	C	1308	Near	C
2) I–5 Northbound Ramps/ Via De La Valle	*Existing*	1054	Under	B	1114	Under	C
	E: No Build	**1585**	**Over**	C	**1665**	**Over**	D
	F: Auxiliary Lane Alternative	**1585**	**Over**	C	**1665**	**Over**	D
	G: Direct Connectors Alternative	**1585**	**Over**	C	**1665**	**Over**	D
	H: Hybrid Alternative	**1585**	**Over**	C	**1665**	**Over**	D
	H1: Hybrid with Flyover Alternative	**1585**	**Over**	C	**1665**	**Over**	D
8) I–5 Southbound Ramps/ Del Mar Heights Road	*Existing*	976	Under	C	943	Under	C
	E: No Build	1389	Near	**E**	1454	Near	**E**
	F: Auxiliary Lane Alternative	1389	Near	**E**	1454	Near	**E**
	G: Direct Connectors Alternative	1275	Near	C	1295	Near	C
	H: Hybrid Alternative	1389	Near	**E**	1454	Near	**E**
	H1: Hybrid with Flyover Alternative	1389	Near	**E**	1454	Near	**E**
9) I–5 Northbound Ramps/ Del Mar Heights Road	*Existing*	1281	Near	D	1412	Near	**F**
	E: No Build	**2021**	**Over**	**F**	**1742**	**Over**	**E**
	F: Auxiliary Lane Alternative	**2021**	**Over**	**F**	**1742**	**Over**	**E**
	G: Direct Connectors Alternative	**1650**	**Over**	**E**	**1565**	**Over**	**E**
	H: Hybrid Alternative	**1650**	**Over**	**F**	**1565**	**Over**	**E**
	H1: Hybrid with Flyover Alternative	**1650**	**Over**	**F**	**1565**	**Over**	**E**
24) I–5 Southbound Ramps/ Carmel Valley Road	*Existing*	1101	Under	C	1260	Near	C
	E: No Build	**1594**	**Over**	**F**	**1844**	**Over**	**F**
	F: Auxiliary Lane, *With EB slip off-ramp, no WB barrier*	**1519**	**Over**	**E**	**1754**	**Over**	**F**
	F2: No EB slip off-ramp, no WB barrier [d]	**1519**	**Over**	**E**	**1754**	**Over**	**F**
	F3: With EB slip off-ramp, with WB barrier [e]	**1708**	**Over**	**F**	**1954**	**Over**	**F**
	F4: No EB slip off-ramp, with WB barrier [f]	**1708**	**Over**	**F**	**1954**	**Over**	**F**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1225	Near	C	1345	Near	C
	G2: No EB slip off-ramp, no WB barrier	1225	Near	C	1345	Near	C
	G3: With EB slip off-ramp, with WB barrier	1414	Near	C	**1545**	**Over**	C
	G4: No EB slip off-ramp, with WB barrier	1414	Near	C	**1545**	**Over**	C
	G5: No EB slip off-ramp, with WB C-D system [g]	1414	Near	C	**1545**	**Over**	C
	H: Hybrid Alternative	**1708**	**Over**	**F**	**1954**	**Over**	**F**
	H1: Hybrid with Flyover Alternative	**1547**	**Over**	**F**	**1760**	**Over**	**F**

TABLE 8–3 *continued*
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
CALTRANS ILV METHOD

Intersection	Model Run: Scenario	AM			PM		
		ILV[a]	Capacity[b]	HCM LOS [c]	ILV[a]	Capacity[b]	HCM LOS [c]
25) I–5 Northbound Ramps/ Carmel Valley Road	*Existing*	931	Under	C	1044	Under	**E**
	E: No Build	1379	Near	**E**	**1604**	**Over**	**E**
	F: Auxiliary Lane, *With EB slip off-ramp, no WB barrier*	1178	Under	D	1484	Near	D
	F2: No EB slip off-ramp, no WB barrier	**1543**	**Over**	**E**	**1839**	**Over**	**F**
	F3: With EB slip off-ramp, with WB barrier	1367	Near	**E**	1484	Near	D
	F4: No EB slip off-ramp, with WB barrier	**1679**	**Over**	**F**	**1839**	**Over**	**F**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1178	Under	C	1075	Under	C
	G2: No EB slip off-ramp, no WB barrier	1492	Near	D	1430	Near	D
	G3: With EB slip off-ramp, with WB barrier	1367	Near	D	1110	Under	D
	G4: No EB slip off-ramp, with WB barrier	**1681**	**Over**	**E**	1465	Near	**E**
	G5: No EB slip off-ramp, with WB C-D system	**1681**	**Over**	D	1465	Near	**E**
	H: Hybrid Alternative	**1681**	**Over**	**E**	**1839**	**Over**	**F**
	H1: Hybrid with Flyover Alternative	**1862**	**Over**	**E**	**1528**	**Over**	**F**
28) El Camino Real/ SR-56 Westbound Off-Ramp/ Carmel Valley Road	*Existing*	1019	Under	C	911	Under	C
	E: No Build	1428	Near	**E**	1308	Near	D
	F: Auxiliary Lane, *With EB slip off-ramp, no WB barrier*	**1742**	**Over**	D	1366	Near	C
	F2: No EB slip off-ramp, no WB barrier	**1742**	**Over**	D	1366	Near	C
	F3: With EB slip off-ramp, with WB barrier	**1843**	**Over**	D	**1502**	**Over**	C
	F4: No EB slip off-ramp, with WB barrier	**1843**	**Over**	D	**1502**	**Over**	C
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1464	Near	D	1243	Near	C
	G2: No EB slip off-ramp, no WB barrier	1464	Near	D	1243	Near	C
	G3: With EB slip off-ramp, with WB barrier	**1693**	**Over**	D	1453	Near	C
	G4: No EB slip off-ramp, with WB barrier	**1693**	**Over**	D	1453	Near	C
	G5: No EB slip off-ramp, with WB C-D system	**1595**	**Over**	C	1331	Near	C
	H: Hybrid Alternative	**1595**	**Over**	D	1331	Near	C
	H1: Hybrid with Flyover Alternative	**1595**	**Over**	D	1331	Near	C
29) El Camino Real/ SR-56 Eastbound On-Ramp/Carmel Valley Road	*Existing*	1041	Under	B	**1599**	**Over**	**E**
	E: No Build	**1623**	**Over**	**E**	**3164**	**Over**	**F**
	F: Auxiliary Lane, *With EB slip off-ramp, no WB barrier*	1442	Near	C	**2922**	**Over**	**F**
	F2: No EB slip off-ramp, no WB barrier	**1755**	**Over**	**E**	**3276**	**Over**	**F**
	F3: With EB slip off-ramp, with WB barrier	1442	Near	C	**2922**	**Over**	**F**
	F4: No EB slip off-ramp, with WB barrier	**1755**	**Over**	**E**	**3276**	**Over**	**F**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1241	Near	C	**2590**	**Over**	D
	G2: No EB slip off-ramp, no WB barrier	**1554**	**Over**	D	**3024**	**Over**	**E**
	G3: With EB slip off-ramp, with WB barrier	1241	Near	C	**2590**	**Over**	D
	G4: No EB slip off-ramp, with WB barrier	**1554**	**Over**	D	**3024**	**Over**	**E**
	G5: No EB slip off-ramp, with WB C-D system	**1554**	**Over**	D	**3024**	**Over**	**E**
	H: Hybrid Alternative	**1755**	**Over**	**E**	**3276**	**Over**	**F**
	H1: Hybrid with Flyover Alternative	1262	Near	D	**2702**	**Over**	**F**

TABLE 8–3 *continued*
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
CALTRANS ILV METHOD

Intersection	Model Run: Scenario	AM			PM		
		ILV[a]	Capacity[b]	HCM LOS [c]	ILV[a]	Capacity[b]	HCM LOS [c]
30) Carmel Creek Road/ SR-56 Westbound Ramps/ Valley Center Drive	*Existing*	1063	Under	D	780	Under	D
	E: No Build	**1553**	**Over**	**E**	1365	Near	D
	F: Auxiliary Lane, *With EB slip off-ramp, no WB barrier*	1430	Near	D	1261	Near	D
	F2: No EB slip off-ramp, no WB barrier	1326	Near	**E**	1105	Under	**E**
	F3: With EB slip off-ramp, with WB barrier	1430	Near	D	1261	Near	D
	F4: No EB slip off-ramp, with WB barrier	1326	Near	**E**	1105	Under	D
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1430	Near	D	1211	Near	D
	G2: No EB slip off-ramp, no WB barrier	1393	Near	D	1138	Under	D
	G3: With EB slip off-ramp, with WB barrier	1433	Near	D	1211	Near	D
	G4: No EB slip off-ramp, with WB barrier	1333	Near	D	1105	Under	D
	G5: No EB slip off-ramp, with WB C-D system	1333	Near	**E**	1074	Under	**E**
	H: Hybrid Alternative	1333	Near	**E**	1074	Under	**E**
	H1: Hybrid with Flyover Alternative	1333	Near	**E**	1074	Under	**E**
31) Carmel Creek Road/ SR-56 Eastbound Ramps	*Existing*	716	Under	D	808	Under	D
	E: No Build	881	Under	D	1170	Under	D
	F: Auxiliary Lane, *With EB slip off-ramp, no WB barrier*	881	Under	D	1170	Under	D
	F2: No EB slip off-ramp, no WB barrier	764	Under	C	1006	Under	D
	F3: With EB slip off-ramp, with WB barrier	892	Under	D	1183	Under	D
	F4: No EB slip off-ramp, with WB barrier	775	Under	C	1019	Under	D
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	872	Under	D	1158	Under	D
	G2: No EB slip off-ramp, no WB barrier	755	Under	C	994	Under	D
	G3: With EB slip off-ramp, with WB barrier	896	Under	D	1186	Under	D
	G4: No EB slip off-ramp, with WB barrier	779	Under	C	1022	Under	D
	G5: No EB slip off-ramp, with WB C-D system	767	Under	D	1006	Under	D
	H: Hybrid Alternative	776	Under	D	1019	Under	D
	H1: Hybrid with Flyover Alternative	776	Under	D	1019	Under	D
33) Carmel Country Road/ SR-56 Westbound Off-Ramp	*Existing*	1046	Under	C	753	Under	C
	E: No Build	**1786**	**Over**	C	1177	Under	C
	F: Auxiliary Lane, *With EB slip off-ramp, no WB barrier*	**1786**	**Over**	C	1177	Under	C
	F2: No EB slip off-ramp, no WB barrier	**1874**	**Over**	D	1325	Near	C
	F3: With EB slip off-ramp, with WB barrier	**1845**	**Over**	D	1215	Near	C
	F4: No EB slip off-ramp, with WB barrier	**1943**	**Over**	**F**	1388	Near	C
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1350	Near	C	1040	Under	C
	G2: No EB slip off-ramp, no WB barrier	**1538**	**Over**	D	1111	Under	C
	G3: With EB slip off-ramp, with WB barrier	1470	Near	D	923	Under	C
	G4: No EB slip off-ramp, with WB barrier	**1661**	**Over**	**E**	1194	Under	C
	G5: No EB slip off-ramp, with WB C-D system	**1597**	**Over**	**E**	1149	Under	C
	H: Hybrid Alternative	**1597**	**Over**	**E**	1149	Under	C
	H1: Hybrid with Flyover Alternative	**1597**	**Over**	**E**	1149	Under	C

TABLE 8–3
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
CALTRANS ILV METHOD

Intersection	Model Run: Scenario	AM			PM		
		ILV[a]	Capacity[b]	HCM LOS [c]	ILV[a]	Capacity[b]	HCM LOS [c]
34) Carmel Country Road/ SR-56 Eastbound Ramps	*Existing*	852	Under	C	772	Under	C
	E: No Build	1308	Near	C	1208	Near	D
	F: Auxiliary Lane, *With EB slip off-ramp, no WB barrier*	1308	Near	C	1208	Near	D
	F2: No EB slip off-ramp, no WB barrier	1348	Near	D	1275	Near	**E**
	F3: With EB slip off-ramp, with WB barrier	1348	Near	C	1208	Near	D
	F4: No EB slip off-ramp, with WB barrier	1348	Near	D	1287	Near	**E**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1290	Near	C	1120	Under	C
	G2: No EB slip off-ramp, no WB barrier	1290	Near	D	1187	Under	D
	G3: With EB slip off-ramp, with WB barrier	1290	Near	C	1120	Under	C
	G4: No EB slip off-ramp, with WB barrier	1290	Near	D	1215	Near	D
	G5: No EB slip off-ramp, with WB C-D system	1290	Near	D	1175	Under	D
	H: Hybrid Alternative	1353	Near	D	1288	Under	**E**
	H1: Hybrid with Flyover Alternative	1353	Near	D	1288	Under	**E**
35) Carmel Valley Road/ SR-56 Westbound Ramps	*Existing*	839	Under	A	335	Under	A
	E: No Build	976	Under	B	831	Under	B
	F: Auxiliary Lane Alternative	976	Under	B	831	Under	B
	G: Direct Connectors Alternative	983	Under	B	835	Under	B
	H: Hybrid Alternative	983	Under	B	835	Under	B
	H1: Hybrid with Flyover Alternative	983	Under	B	835	Under	B
36) Carmel Valley Road/SR-56 Eastbound Ramps	*Existing*	264	Under	C	296	Under	C
	E: No Build	487	Under	D	720	Under	D
	F: Auxiliary Lane Alternative	487	Under	D	720	Under	D
	G: Direct Connectors Alternative	478	Under	D	708	Under	D
	H: Hybrid Alternative	499	Under	D	737	Under	D
	H1: Hybrid with Flyover Alternative	499	Under	D	737	Under	D
38) I-5 Southbound Ramps/ Carmel Mountain Road	*Existing*	929	Under	D	741	Under	C
	E: No Build	1180	Under	D	1040	Under	C
	F: Auxiliary Lane Alternative	1180	Under	D	1040	Under	C
	G: Direct Connectors Alternative	1180	Under	D	1040	Under	C
	H: Hybrid Alternative	1180	Under	D	1040	Under	C
	H1: Hybrid with Flyover Alternative	1180	Under	D	1040	Under	C

TABLE 8–3
EXISTING AND YEAR 2030 INTERSECTION OPERATIONS
CALTRANS ILV METHOD

Intersection	Model Run: Scenario	AM			PM		
		ILV[a]	Capacity[b]	HCM LOS [c]	ILV[a]	Capacity[b]	HCM LOS [c]
39) I-5 Northbound Ramps/ Carmel Mountain Road	*Existing*	826	Under	D	1044	Under	C
	E: No Build	1145	Under	**E**	**1520**	**Over**	D
	F: Auxiliary Lane Alternative	1145	Under	**E**	**1520**	**Over**	D
	G: Direct Connectors Alternative	1145	Under	**E**	**1520**	**Over**	D
	H: Hybrid Alternative	1145	Under	**E**	**1520**	**Over**	D
	H1: Hybrid with Flyover Alternative	1145	Under	**E**	**1520**	**Over**	D

Footnotes:

a. ILV = Intersecting Lane Vehicles.

b. CAPACITY is shown as *UNDER* capacity, *NEAR* capacity or *OVER* capacity;
***Under** Capacity = <1200 ILV/Hour*
***Near** Capacity = >1200 but < 1500 ILV/Hour*
***Over** Capacity = >1500 ILV/Hour*

c. HCM LOS from *Table 7–2* for comparison.

d. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.

e. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off ramp to Carmel Creek Road is maintained in this scenario.

f. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.

g. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

General Notes:
Bold typeface shows intersections operating at Over Capacity or HCM LOS E or F.

TABLE 8–4
EXISTING AND YEAR 2030 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
I–5 North of Via De La Valle	*Existing*	*NB*	4M + 1A	9,200	96,700	6,860	7,650	0.746	0.832	C	D
		SB	4M + 1A	9,200	99,900	7,100	7,720	0.772	0.839	C	D
	E: No Build	*NB*	5M + 1A	11,200	143,800	8,640	11,100	0.771	0.991	C	E
		SB	5M + 1A	11,200	151,700	10,740	9,270	0.959	0.828	E	D
	F: Auxiliary Lane Alternative	*NB*	5M + 1A	11,200	143,800	8,640	11,100	0.771	0.991	C	E
		SB	5M + 1A	11,200	151,700	10,740	9,270	0.959	0.828	E	D
	G: Direct Connectors Alternative	*NB*	5M + 1A	11,200	148,600	9,000	11,340	0.804	1.013	D	**F(0)**
		SB	5M + 1A	11,200	155,600	10,950	9,570	0.978	0.854	E	D
	H: Hybrid Alternative	*NB*	5M+ 1A	11,200	148,600	9,000	11,340	0.804	1.013	D	**F(0)**
		SB	5M+ 1A	11,200	151,700	10,740	9,270	0.959	0.828	E	D
	H1: Hybrid with Flyover Alternative	*NB*	5M+ 1A	11,200	148,600	9,000	11,340	0.804	1.013	D	**F(0)**
		SB	5M+ 1A	11,200	151,700	10,740	9,270	0.959	0.828	E	D
I–5 Between Via De La Valle and Del Mar Heights Road	*Existing*	*NB*	5M	10,000	103,300	7,370	8,050	0.737	0.805	C	D
		SB	5M	10,000	105,400	8,180	8,500	0.818	0.850	D	D
	E: No Build	*NB*	6M	12,000	150,750	9,179	11,613	0.665	0.825	C	D
		SB	6M	12,000	156,240	11,395	9,705	0.950	0.809	E	D
	F: Auxiliary Lane Alternative	*NB*	6M	12,000	150,750	9,179	11,613	0.665	0.825	C	D
		SB	6M	12,000	156,240	11,395	9,705	0.950	0.809	E	D
	G: Direct Connectors Alternative	*NB*	6M	12,000	156,100	9,580	11,880	0.798	0.990	C	E
		SB	6M	12,000	160,600	11,630	10,040	0.969	0.837	E	D
	H: Hybrid Alternative	*NB*	6M	12,000	156,100	9,580	11,880	0.798	0.990	C	E
		SB	6M	12,000	156,240	11,395	9,705	0.950	0.809	E	D
	H1: Hybrid with Flyover Alternative	*NB*	6M	12,000	156,100	9,580	11,880	0.798	0.990	C	E
		SB	6M	12,000	156,240	11,395	9,705	0.950	0.809	E	D
I–5 Between Del Mar Heights Road and Carmel Valley Road	*Existing*	*NB*	6M	12,000	105,900	7,530	7,950	0.628	0.663	C	C
		SB	6M	12,000	105,600	8,630	8,600	0.719	0.717	C	C
	E: No Build	*NB*	6M + 1A	13,200	147,340	9,108	11,576	0.690	0.877	C	D
		SB	6M	12,000	155,100	11,838	9,508	0.987	0.792	E	C
	F: Auxiliary Lane Alternative	*NB*	6M + 1A	13,200	147,340	9,108	11,576	0.690	0.877	C	D
		SB	6M + 1A	13,200	155,100	11,838	9,508	0.897	0.720	D	C
	G: Direct Connectors Alternative	*NB*	4M	8,000	82,100	5,610	7,440	0.701	0.930	C	E
		SB	4M	8,000	112,600	7,980	7,320	0.998	0.915	E	D
	H: Hybrid Alternative	*NB*	4M	8,000	82,100	5,610	7,440	0.701	0.930	C	E
		SB	6M+ 1A	13,200	155,100	11,838	9,508	0.897	0.720	D	C
	H1: Hybrid with Flyover Alternative	*NB*	4M	8,000	82,100	5,610	7,440	0.701	0.930	C	E
		SB	6M+ 1A	13,200	155,100	11,838	9,508	0.897	0.720	D	C

TABLE 8–4 *continued*
EXISTING AND YEAR 2030 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
I–5 Between Carmel Valley Road and Carmel Mountain Road	*Existing*	*NB*	5M	10,000	83,000	6,170	5,670	0.617	0.567	B	B
		SB	4M	8,000	72,400	6,470	6,390	0.809	0.799	D	C
	E: No Build	*NB*	5M	10,000	92,800	6,400	8,330	0.640	0.833	C	D
		SB	4M	8,000	107,340	8,010	6,499	1.001	0.812	**F(0)**	D
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*NB*	5M	10,000	92,800	6,400	8,330	0.640	0.833	C	D
		SB	4M	8,000	107,340	8,010	6,499	1.001	0.812	**F(0)**	D
	F2: No EB slip off-ramp, no WB barrier[h]	*NB*	5M	10,000	103,300	7,340	9,393	0.734	0.939	C	E
		SB	4M	8,000	107,340	8,010	6,499	1.001	0.812	**F(0)**	D
	F3: With EB slip off-ramp, with WB barrier[i]	*NB*	5M	10,000	92,800	6,400	8,330	0.640	0.833	C	D
		SB	4M	8,000	115,860	8,387	6,898	1.048	0.862	**F(0)**	D
	F4: No EB slip off-ramp, with WB barrier[j]	*NB*	5M	10,000	103,300	7,340	9,393	0.734	0.939	C	E
		SB	4M	8,000	115,860	8,387	6,898	1.048	0.862	**F(0)**	D
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	*NB*	5M	10,000	92,800	6,400	8,330	0.640	0.833	C	D
		SB	4M	8,000	102,880	7,610	6,499	0.951	0.812	E	D
	G2: No EB slip off-ramp, no WB barrier	*NB*	5M	10,000	103,300	7,340	9,393	0.734	0.939	C	E
		SB	4M	8,000	102,880	7,610	6,499	0.951	0.812	E	D
	G3: With EB slip off-ramp, with WB barrier	*NB*	5M	10,000	92,800	6,400	8,330	0.640	0.833	C	D
		SB	4M	8,000	111,400	7,987	6,898	0.998	0.862	E	D
	G4: No EB slip off-ramp, with WB barrier	*NB*	5M	10,000	103,300	7,340	9,393	0.734	0.939	C	E
		SB	4M	8,000	111,400	7,987	6,898	0.998	0.862	E	D
	G5: No EB slip off-ramp, with WB C-D system[k]	*NB*	5M	10,000	103,300	7,340	9,393	0.734	0.939	C	E
		SB	4M	8,000	111,400	7,987	6,898	0.998	0.862	E	D
	H: Hybrid Alternative	*NB*	5M	10,000	103,300	7,340	9,393	0.734	0.939	C	E
		SB	4M	8,000	115,860	8,387	6,898	1.048	0.862	**F(0)**	D
	H1: Hybrid with Flyover Alternative	*NB*	5M	10,000	103,300	7,340	9,393	0.734	0.939	C	E
		SB	4M	8,000	115,860	8,387	6,898	1.048	0.862	**F(0)**	D

TABLE 8–4 *continued*
EXISTING AND YEAR 2030 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
I–5 South of Carmel Mountain Road	*Existing*	*NB*	6M	12,000	83,000	6,170	5,670	0.514	0.473	B	B
		SB	4M	8,000	72,400	6,470	6,390	0.809	0.799	D	C
	E: No Build	*NB*	6M	12,000	92,800	6,400	8,330	0.533	0.694	B	C
		SB	5M	10,000	107,340	8,010	6,499	0.801	0.650	D	C
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*NB*	6M	12,000	92,800	6,400	8,330	0.533	0.694	B	C
		SB	5M	10,000	107,340	8,010	6,499	0.801	0.650	D	C
	F2: No EB slip off-ramp, no WB barrier	*NB*	6M	12,000	103,300	7,340	9,393	0.612	0.783	B	C
		SB	5M	10,000	107,340	8,010	6,499	0.801	0.650	D	C
	F3: With EB slip off-ramp, with WB barrier	*NB*	6M	12,000	92,800	6,400	8,330	0.533	0.694	B	C
		SB	5M	10,000	115,860	8,387	6,897	0.839	0.690	D	C
	F4: No EB slip off-ramp, with WB barrier	*NB*	6M	12,000	103,300	7,340	9,393	0.612	0.783	B	C
		SB	5M	10,000	115,860	8,387	6,897	0.839	0.690	D	C
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	*NB*	6M	12,000	92,800	6,400	8,330	0.533	0.694	B	C
		SB	5M	10,000	102,880	7,610	6,499	0.761	0.650	C	C
	G2: No EB slip off-ramp, no WB barrier	*NB*	6M	12,000	103,300	7,340	9,393	0.612	0.783	B	C
		SB	5M	10,000	102,880	7,610	6,499	0.761	0.650	C	C
	G3: With EB slip off-ramp, with WB barrier	*NB*	6M	12,000	92,800	6,400	8,330	0.533	0.694	B	C
		SB	5M	10,000	111,400	7,987	6,898	0.799	0.690	C	C
	G4: No EB slip off-ramp, with WB barrier	*NB*	6M	12,000	103,300	7,340	9,393	0.612	0.783	B	C
		SB	5M	10,000	111,400	7,987	6,898	0.799	0.690	C	C
	G5: No EB slip off-ramp, with WB C-D system	*NB*	6M	12,000	103,300	7,340	9,393	0.612	0.783	B	C
		SB	5M	10,000	111,400	7,987	6,898	0.799	0.690	C	C
	H: Hybrid Alternative	*NB*	6M	12,000	103,300	7,340	9,393	0.612	0.783	B	C
		SB	5M	10,000	115,860	8,387	6,898	0.839	0.690	D	C
	H1: Hybrid with Flyover Alternative	*NB*	6M	12,000	103,300	7,340	9,393	0.612	0.783	B	C
		SB	5M	10,000	115,860	8,387	6,898	0.839	0.690	D	C

TABLE 8–4 *continued*
EXISTING AND YEAR 2030 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
SR–56 Between El Camino Real and Carmel Creek Road	*Existing*	*EB*	2M	4,000	20,900	1,010	2,680	0.253	0.670	A	C
		WB	2M + 1 A	5,200	45,000	5,294	2,472	1.018	0.475	**F(0)**	B
	E: No Build	*EB*	2M	4,000	30,000	1267	2523	0.317	0.631	A	C
		WB	2M + 1 A	5,200	70,850	6785	3282	1.305	0.631	**F(1)**	C
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*EB*	2M	4,000	30,000	1267	2523	0.317	0.631	A	C
		WB	3M + 1 A	7,200	70,850	6785	3282	0.942	0.456	E	B
	F2: No EB slip off-ramp, no WB barrier	*EB*	2M	4,000	33,500	1580	2877	0.395	0.719	A	C
		WB	3M + 1 A	7,200	70,850	6785	3282	0.942	0.456	E	B
	F3: With EB slip off-ramp, with WB barrier	*EB*	2M	4,000	30,000	1267	2523	0.317	0.631	A	C
		WB	3M	6,000	58,180	5918	2275	0.986	0.379	E	A
	F4: No EB slip off-ramp, with WB barrier	*EB*	2M	4,000	33,500	1580	2877	0.395	0.719	A	C
		WB	3M	6,000	58,180	5918	2275	0.986	0.379	E	A
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	*EB*	4M	8,000	49,220	2317	3994	0.290	0.499	A	B
		WB	4M	8,000	80,200	7488	3750	0.936	0.469	E	B
	G2: No EB slip off-ramp, no WB barrier	*EB*	4M	8,000	52,720	2630	4348	0.329	0.544	A	B
		WB	4M	8,000	80,200	7488	3750	0.936	0.469	E	B
	G3: With EB slip off-ramp, with WB barrier	*EB*	4M	8,000	49,220	2317	3994	0.290	0.499	A	B
		WB	4M	8,000	68,360	6719	2864	0.840	0.358	D	A
	G4: No EB slip off-ramp, with WB barrier	*EB*	4M	8,000	52,720	2630	4348	0.329	0.544	A	B
		WB	4M	8,000	68,360	6719	2864	0.840	0.358	D	A
	G5: No EB slip off-ramp, with WB C-D system	*EB*	4M	8,000	52,720	2630	4348	0.329	0.544	A	B
		WB	2M	4,000	36,480	3621	1601	0.905	0.400	D	A
		WB(2)[1]	2M + 1A	5,200	42,980	3819	2093	0.734	0.402	C	A
	H: Hybrid Alternative	*EB*	2M	4,000	33,500	1580	2877	0.395	0.719	A	C
		WB	2M	4,000	36,480	3621	1601	0.905	0.400	D	A
		WB(2)[1]	2M + 1A	5,200	42,980	3819	2093	0.734	0.402	C	A
	H1: Hybrid with Flyover Alternative	*EB*	2M	4,000	33,500	1580	2877	0.395	0.719	A	C
		EB	2M	4,000	12,640	692	967	0.173	0.242	A	A
		WB	2M	4,000	36,480	3621	1601	0.905	0.400	D	A
		WB(2)[1]	2M + 1A	5,200	42,980	3819	2093	0.734	0.402	C	A

TABLE 8–4 *continued*
EXISTING AND YEAR 2030 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
SR–56 Between Carmel Creek Road and Carmel Country Road	*Existing*	*EB*	2M + 1 A	5,200	40,100	2,100	4,570	0.404	0.879	A	D
		WB	2M + 1 A	5,200	39,500	5,234	2,030	1.007	0.390	**F(0)**	A
	E: No Build	*EB*	3M	6,000	59,970	2889	5736	0.482	0.956	B	E
		WB	3M	6,000	55,110	6072	2284	1.012	0.380	**F(0)**	A
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*EB*	3M	6,000	59,970	2889	5736	0.482	0.956	B	E
		WB	3M + 1A	7,200	55,110	6072	2284	0.843	0.317	D	A
	F2: No EB slip off-ramp, no WB barrier	*EB*	3M	6,000	63,470	3202	6090	0.534	1.015	B	**F(0)**
		WB	3M + 1A	7,200	57,210	6260	2497	0.869	0.347	D	A
	F3: With EB slip off-ramp, with WB barrier	*EB*	3M	6,000	60,500	2912	5761	0.485	0.960	B	E
		WB	3M + 1A	7,200	57,240	6166	2384	0.856	0.331	D	A
	F4: No EB slip off-ramp, with WB barrier	*EB*	3M	6,000	64,000	3225	6115	0.538	1.019	B	**F(0)**
		WB	3M + 1A	7,200	59,340	6354	2597	0.883	0.361	D	A
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	*EB*	4M + 1A	9,200	75,000	3592	7006	0.390	0.762	A	C
		WB	3M + 1A	7,200	62,900	6648	2684	0.923	0.373	E	A
	G2: No EB slip off-ramp, no WB barrier	*EB*	4M + 1A	9,200	78,500	3905	7360	0.424	0.800	B	D
		WB	3M + 1A	7,200	65,000	6836	2897	0.949	0.402	E	A
	G3: With EB slip off-ramp, with WB barrier	*EB*	4M + 1A	9,200	75,740	3640	7062	0.396	0.768	A	C
		WB	3M + 1A	7,200	65,860	6840	2905	0.950	0.403	E	A
	G4: No EB slip off-ramp, with WB barrier	*EB*	4M + 1A	9,200	79,240	3953	7416	0.430	0.806	B	D
		WB	3M + 1A	7,200	67,960	7028	3118	0.976	0.433	E	B
	G5: No EB slip off-ramp, with WB C-D system	*EB*	4M + 1A	9,200	79,030	3929	7385	0.427	0.803	B	D
		WB	3M + 1A	7,200	67,130	6930	2996	0.963	0.416	E	B
	H: Hybrid Alternative	*EB*	4M + 1A	9,200	64,000	3226	6115	0.351	0.665	A	C
		WB	3M+ 1A	7,200	67,130	6930	2996	0.963	0.416	E	B
	H1: Hybrid with Flyover Alternative	*EB*	4M + 1A	9,200	64,000	3226	6115	0.351	0.665	A	C
		WB	3M+ 1A	7,200	67,130	6930	2996	0.963	0.416	E	B

TABLE 8–4 *continued*
EXISTING AND YEAR 2030 FREEWAY MAINLINE OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
SR–56 Between Carmel Country Road and Carmel Valley Road	*Existing*	*EB*	2M	4,000	34,600	2,017	3,673	0.504	0.918	B	D
		WB	2M	4,000	33,100	4,369	1,593	1.092	0.398	**F(0)**	A
	E: No Build	*EB*	3M	6,000	54,570	2895	4567	0.483	0.761	B	C
		WB	3M	6,000	48,240	4978	1771	0.830	0.295	D	A
	F: Auxiliary Lane Alternative	*EB*	3M	6,000	54,570	2895	4567	0.483	0.761	B	C
		WB	3M	6,000	48,240	4978	1771	0.830	0.295	D	A
	G: Direct Connectors Alternative	*EB*	3M	6,000	58,300	3122	4861	0.520	0.810	B	D
		WB	3M	6,000	53,300	5348	2034	0.891	0.339	D	A
	H: Hybrid Alternative	*EB*	3M	6,000	54,570	2895	4567	0.483	0.761	B	C
		WB	3M	6,000	53,300	5348	2034	0.891	0.339	D	A
	H1: Hybrid with Flyover Alternative	*EB*	3M	6,000	54,570	2895	4567	0.483	0.761	B	C
		WB	3M	6,000	53,300	5348	2034	0.891	0.339	D	A
SR–56 East of Carmel Valley Road	*Existing*	*EB*	2M	4,000	28,120	1,606	3,178	0.402	0.795	A	C
		WB	2M	4,000	26,520	3,626	1,316	0.907	0.329	D	A
	E: No Build	*EB*	3M	6,000	49,280	2737	3966	0.456	0.661	B	C
		WB	3M	6,000	43,500	4448	1824	0.741	0.304	C	A
	F: Auxiliary Lane Alternative	*EB*	3M	6,000	49,280	2737	3966	0.456	0.661	B	C
		WB	3M	6,000	43,500	4448	1824	0.741	0.304	C	A
	G: Direct Connectors Alternative	*EB*	3M	6,000	51,780	2897	4166	0.483	0.694	B	C
		WB	3M	6,000	47,100	4708	2014	0.785	0.336	C	A
	H: Hybrid Alternative	*EB*	3M	6,000	49,280	2737	3966	0.456	0.661	B	C
		WB	3M	6,000	47,100	4708	2014	0.785	0.336	C	A
	H1: Hybrid with Flyover Alternative	*EB*	3M	6,000	49,280	2737	3966	0.456	0.661	B	C
		WB	3M	6,000	47,100	4708	2014	0.785	0.336	C	A

Footnotes:

a. Dir = Direction of travel.
b. Lanes: 2M +1A = 2 mainline + 1 auxiliary, etc.
c. Capacity and methodology is based on SANTEC/ITE Guidelines adopted by Caltrans District 11, where mainline/auxiliary lanes have capacities of 2,000/1,200 vph respectively.
d. ADT = Average Daily Traffic volumes.
e. Peak hour volumes are based on Caltrans traffic model, and are expressed in vehicles per hour (vph).
f. V/C = Volume/Capacity ratio.
g. LOS = Level of Service.
h. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
i. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
j. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
k. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
l. The WB (2) freeway mainline refers to collector-distributor system on SR 56 WB between Carmel Creek Road and El Camino Real.

LOS	V/C
A	<0.41
B	0.62
C	0.8
D	0.92
E	1
F(0)	1.25
F(1)	1.35
F(2)	1.45
F(3)	>1.46

TABLE 8–5
EXISTING AND YEAR 2030 I-5 LOCAL BYPASS OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
I–5 Between Del Mar Heights Road and Carmel Valley Road	*Existing*	*NB*	2M	4,000	20,500	1,230	2,400	0.308	0.600	A	B
		SB	2M	4,000	30,200	2,200	2,200	0.550	0.550	B	B
	E: No Build	*NB*	2M	4,000	46,000	2,150	2,980	0.538	0.745	B	C
		SB	2M	4,000	37,760	3,390	2,311	0.848	0.578	D	B
	F: Auxiliary Lane Alternative	*NB*	2M	4,000	46,000	2,150	2,980	0.538	0.745	B	C
		SB	2M	4,000	37,760	3,390	2,311	0.848	0.578	D	B
	G: Direct Connectors Alternative	*NB*	4M	8,000	75,500	4,270	4,650	0.534	0.581	B	B
		SB	3M	6,000	51,000	4,320	2,840	0.720	0.473	C	B
	H & H1: Hybrid and Hybrid with Flyover Alternative	*NB*	4M	8,000	75,500	4,270	4,650	0.534	0.581	B	B
		SB	2M	4,000	37,760	3,390	2,311	0.848	0.578	D	B
I–5 Between Carmel Valley Road and Carmel Mountain Road	*Existing*	*NB*	4M	8,000	50,700	3,000	6,000	0.375	0.750	A	C
		SB	4M	8,000	59,000	5,900	3,800	0.738	0.475	C	B
	E: No Build	*NB*	4M	8,000	90,000	4,670	6,920	0.584	0.865	B	D
		SB	4M	8,000	82,760	7,388	4,311	0.924	0.539	E	B
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*NB*	4M	8,000	90,000	4,670	6,920	0.584	0.865	B	D
		SB	4M	8,000	82,760	7,388	4,311	0.924	0.539	E	B
	F2: No EB slip off-ramp, no WB barrier	*NB*	4M	8,000	79,500	3,730	5,857	0.466	0.732	B	C
		SB	4M	8,000	82,760	7,388	4,311	0.924	0.539	E	B
	F3: With EB slip off-ramp, with WB barrier	*NB*	4M	8,000	90,000	4,670	6,920	0.584	0.865	B	D
		SB	4M	8,000	74,240	7,011	3,912	0.876	0.489	D	B
	F4: No EB slip off-ramp, with WB barrier	*NB*	4M	8,000	79,500	3,730	5,857	0.466	0.732	B	C
		SB	4M	8,000	74,240	7,011	3,912	0.876	0.489	D	B
	G: Direct Connectors, *With EB slip off-ramp, no WB barrier*	*NB*	4M	8,000	90,000	4,670	6,920	0.584	0.865	B	D
		SB	4M	8,000	87,220	7,788	4,311	0.974	0.539	E	B
	G2: No EB slip off-ramp, no WB barrier[h]	*NB*	4M	8,000	79,500	3,730	5,857	0.466	0.732	B	C
		SB	4M	8,000	87,220	7,788	4,311	0.974	0.539	E	B
	G3: With EB slip off-ramp, with WB barrier[i]	*NB*	4M	8,000	90,000	4,670	6,920	0.584	0.865	B	D
		SB	4M	8,000	78,700	7,411	3,912	0.926	0.489	E	B
	G4: No EB slip off-ramp, with WB barrier[j]	*NB*	4M	8,000	79,500	3,730	5,857	0.466	0.732	B	C
		SB	4M	8,000	78,700	7,411	3,912	0.926	0.489	E	B
	G5: No EB slip off-ramp, with WB C-D system[k]	*NB*	4M	8,000	79,500	3,730	5,857	0.466	0.732	B	C
		SB	4M	8,000	78,700	7,411	3,912	0.926	0.489	E	B
	H & H1: Hybrid and Hybrid with Flyover Alternative	*NB*	4M	8,000	79,500	3,730	5,857	0.466	0.732	B	C
		SB	4M	8,000	74,240	7,011	3,912	0.876	0.489	D	B

TABLE 8–5
EXISTING AND YEAR 2030 I-5 LOCAL BYPASS OPERATIONS

Segment	Model Run: Scenario	Dir[a]	Lanes[b]	Capacity[c]	ADT[d]	Peak Hour Volume[e]		V/C[f]		LOS[g]	
						AM	PM	AM	PM	AM	PM
I–5 South of Carmel Mountain	*Existing*	*NB*	4M	8,000	52,400	3,150	6,300	0.394	0.788	A	C
		SB	4M	8,000	60,000	5,900	4,100	0.738	0.513	C	B
	E: No Build	*NB*	4M	8,000	92,000	4,800	7,080	0.600	0.885	B	D
		SB	4M	8,000	84,760	7,548	4,431	0.944	0.554	E	B
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*NB*	4M	8,000	92,000	4,800	7,080	0.600	0.885	B	D
		SB	4M	8,000	84,760	7,548	4,431	0.944	0.554	E	B
	F2: No EB slip off-ramp, no WB barrier	*NB*	4M	8,000	81,500	3,860	6,017	0.483	0.752	B	C
		SB	4M	8,000	84,760	7,548	4,431	0.944	0.554	E	B
	F3: With EB slip off-ramp, with WB barrier	*NB*	4M	8,000	92,000	4,800	7,080	0.600	0.885	B	D
		SB	4M	8,000	76,240	7,171	4,032	0.896	0.504	D	B
	F4: No EB slip off-ramp, with WB barrier	*NB*	4M	8,000	81,500	3,860	6,017	0.483	0.752	B	C
		SB	4M	8,000	76,240	7,171	4,032	0.896	0.504	D	B
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	*NB*	4M	8,000	92,000	4,800	7,080	0.600	0.885	B	D
		SB	4M	8,000	89,220	7,948	4,431	0.994	0.554	E	B
	G2: No EB slip off-ramp, no WB barrier	*NB*	4M	8,000	81,500	3,860	6,017	0.483	0.752	B	C
		SB	4M	8,000	89,220	7,948	4,431	0.994	0.554	E	B
	G3: With EB slip off-ramp, with WB barrier	*NB*	4M	8,000	92,000	4,800	7,080	0.600	0.885	B	D
		SB	4M	8,000	80,700	7,571	4,032	0.946	0.504	E	B
	G4: No EB slip off-ramp, with WB barrier	*NB*	4M	8,000	81,500	3,860	6,017	0.483	0.752	B	C
		SB	4M	8,000	80,700	7,571	4,032	0.946	0.504	E	B
	G5: No EB slip off-ramp, with WB C-D system	*NB*	4M	8,000	81,500	3,860	6,017	0.483	0.752	B	C
		SB	4M	8,000	80,700	7,571	4,032	0.946	0.504	E	B
	H & H1: Hybrid and Hybrid with Flyover Alternative	*NB*	4M	8,000	81,500	3,860	6,017	0.483	0.752	B	C
		SB	4M	8,000	76,240	7,171	4,032	0.896	0.504	D	B

Footnotes:

a. Dir = Direction of travel.
b. Lanes: 2M +1A = 2 mainline + 1 auxiliary, etc.
c. Capacity and methodology is based on SANTEC/ITE Guidelines adopted by Caltrans District 11, where mainline/auxiliary lanes have capacities of 2,000/1,200 vph, respectively.
d. ADT = Average Daily Traffic volumes.
e. Peak hour volumes are based on Caltrans traffic model, and are expressed in vehicles per hour (vph).
f. V/C = Volume/Capacity ratio.
g. LOS = Level of Service.
h. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
i. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
j. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real.
k. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

LOS	V/C
A	<0.41
B	0.62
C	0.8
D	0.92
E	1
F(0)	1.25
F(1)	1.35
F(2)	1.45
F(3)	>1.46

TABLE 8–6
EXISTING AND YEAR 2030 SR-56 WEAVING OPERATIONS (HCM 2000 METHOD)

Weaving Sections	Model Run: Scenario	Weaving Segment					
		Speed[a]		Density[b]		LOS[c]	
		AM	PM	AM	PM	AM	PM
56W1) EB SR-56 between El Camino Real and Carmel Creek Road (on frontage road) ▪ *3-lane frontage road in Existing* ▪ *3-lane frontage road in Year 2030*	*Existing*	26.17	24.20	23.78	36.73	C	E
	E: No Build	23.19	21.27	44.52	80.88	F	F
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	23.19	21.27	44.52	80.88	F	F
	F2: No EB slip off-ramp[d], no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F3: With EB slip off-ramp, with WB barrier[e]	23.19	21.27	44.52	80.88	F	F
	F4: No EB slip off-ramp, with WB barrier[f]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	24.37	22.10	32.89	63.30	D	F
	G2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G3: With EB slip off-ramp, with WB barrier	24.37	22.10	32.89	63.30	D	F
	G4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G5: No EB slip off-ramp, with WB C-D system[g]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
56W2) WB SR-56 between Carmel Creek Road and El Camino Real ▪ *4 Mainline+1 aux.lane* ▪ *2-lane off-ramp at diverge*	*Existing*	43.59	45.11	44.43	20.04	F	C
	E: No Build	36.32	42.00	68.33	28.57	F	D
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	39.60	45.28	47.01	19.88	F	B
	F2: No EB slip off-ramp, no WB barrier	39.60	45.28	47.01	19.88	F	B
	F3: With EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	45.73	50.92	44.92	20.20	F	C
	G2: No EB slip off-ramp, no WB barrier	45.73	50.92	44.92	20.20	F	C
	G3: With EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G5: No EB slip off-ramp, with WB C-D system	41.27	50.91	32.43	13.11	D	B
	H: Hybrid Alternative	41.27	50.91	32.43	13.11	D	B
	H1: Hybrid with Flyover Alternative	41.27	50.91	32.43	13.11	D	B

TABLE 8–6
EXISTING AND YEAR 2030 SR-56 WEAVING OPERATIONS (HCM 2000 METHOD)

Weaving Sections	Model Run: Scenario	Weaving Segment					
		Speed[a]		Density[b]		LOS[c]	
		AM	PM	AM	PM	AM	PM
56W3) EB SR-56 between Carmel Creek Road and Carmel Country Road. ▪ *4 Mainline+1 aux. lane* ▪ *2-lane off-ramp at diverge*	*Existing*	60.51	53.23	12.69	31.40	B	D
	E: No Build[h]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F: Auxiliary Lane[h], With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F3: With EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	61.66	54.34	12.79	28.30	B	D
	G2: No EB slip off-ramp, no WB Barrier	59.51	52.65	14.33	30.68	B	D.
	G3: With EB slip off-ramp, with WB barrier	60.92	53.74	13.11	28.85	B	D
	G4: No EB slip off-ramp, with WB barrier	58.81	52.08	14.75	31.25	B	D
	G5: No EB slip off-ramp, with WB C-D system	59.14	52.37	14.58	30.96	B	D
	H: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H1: Hybrid with Flyover Alternative	58.21	51.25	12.16	26.19	B	C

Footnotes:

a. Speed is measured in miles per hour (mph)
b. Density is measured in passenger cars per mile per lane (pc/mile/lane)
c. LOS = Level of Service
d. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated. Hence there are no weaving movements.
e. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
f. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
g. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
h. 56W3 in the No Build and Auxiliary lane scenarios are treated as isolated merge and diverge sections.

General Notes:
DNE – Does not exist.
The lanes shown in the table refer to the Year 2030 Direct Connectors (Run G) scenario.

TABLE 8–7
EXISTING AND YEAR 2030 SR-56 WEAVING OPERATIONS (LOS D METHOD)

Weaving Sections	Model Run: Scenario	Weaving Segment			
		Weaving volume (veh/h)		Better/ Worse than LOS D? [a]	
		AM	PM	AM	PM
56W1) EB SR-56 between El Camino Real and Carmel Creek Road (on frontage road) ▪ *3-lane frontage road in Existing* ▪ *3-lane frontage road in Year 2030*	*Existing*	1399	**1982**	Better	**Worse**
	E: No Build	**2223**	**3789**	**Worse**	**Worse**
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	**2223**	**3789**	**Worse**	**Worse**
	F2: No EB slip off-ramp [b], no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	F3: With EB slip off-ramp, with WB barrier [c]	**2223**	**3789**	**Worse**	**Worse**
	F4: No EB slip off-ramp, with WB barrier [d]	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors , *With EB slip off-ramp, no WB barrier*	**1719**	**3086**	**Worse**	**Worse**
	G2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	G3: With EB slip off-ramp, with WB barrier	**1719**	**3086**	**Worse**	**Worse**
	G4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	G5: No EB slip off-ramp, with WB C-D system [e]	*DNE*	*DNE*	*DNE*	*DNE*
	H: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*
	H1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*
56W2) WB SR-56 between Carmel Creek Road and El Camino Real ▪ *4 Mainline+1 aux.lane* ▪ *2-lane off-ramp at diverge*	*Existing*	**1724**	1253	**Worse**	Better
	E: No Build	**2887**	**1860**	**Worse**	**Worse**
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	**2887**	**1860**	**Worse**	**Worse**
	F2: No EB slip off-ramp, no WB barrier	**2887**	**1860**	**Worse**	**Worse**
	F3: With EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	F4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	**2106**	1342	**Worse**	Better
	G2: No EB slip off-ramp, no WB barrier	**2106**	1342	**Worse**	Better
	G3: With EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	G4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	G5: No EB slip off-ramp, with WB C-D system	**2243**	1218	**Worse**	Better
	H: Hybrid Alternative	**2243**	1218	**Worse**	Better
	H1: Hybrid with Flyover Alternative	**2243**	1218	**Worse**	Better

TABLE 8–7
EXISTING AND YEAR 2030 SR-56 WEAVING OPERATIONS (LOS D METHOD)

Weaving Sections	Model Run: Scenario	Weaving Segment			
		Weaving volume (veh/h)		Better/ Worse than LOS D? [a]	
		AM	PM	AM	PM
56W3) EB SR-56 between Carmel Creek Road and Carmel Country Road. ▪ *4 Mainline+1 aux.lane* ▪ *2-lane off-ramp at diverge*	*Existing*	266	614	Better	Better
	E: No Build [f]	*DNE*	*DNE*	*DNE*	*DNE*
	F: Auxiliary Lane [f], With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	F2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	F3: With EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	F4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	398	921	Better	Better
	G2: No EB slip off-ramp, no WB barrier	513	1052	Better	Better
	G3: With EB slip off-ramp, with WB barrier	434	963	Better	Better
	G4: No EB slip off-ramp, with WB barrier	549	1094	Better	Better
	G5: No EB slip off-ramp, with WB C-D system	531	1071	Better	Better
	H: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*
	H1: Hybrid with Flyover Alternative	538	1080	Better	Better

Footnotes:

a. Methodology based on LOS D Weaving method described in the 1965 HCM. Any weaving volume more than 1650 veh/h at 0.91 PHF is considered worse than LOS D.
b. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated. Hence there are no weaving movements.
c. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
d. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
e. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
f. 56W3 in the No Build and Auxiliary lane scenarios are treated as isolated merge and diverge sections.

General Notes:

DNE – Does not exist.
The lanes shown in the table refer to the Year 2030 Direct Connectors (Run G) scenario.

TABLE 8–8
EXISTING AND YEAR 2030 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M1) On-Ramp from WB Via de la Valle to NB I-5 [e] ▪ *6 Mainlines* ▪ *1 lane On-Ramp at merge*	*Existing*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	E: No Build	7111	7892	11,750	N	N	2782	3032	4600	N	N	C	C
	F: Auxiliary Lane Alternative	7111	7892	11,750	N	N	2782	3032	4600	N	N	C	C
	G: Direct Connectors Alternative	6174	8113	11,750	N	N	2465	3113	4600	N	N	C	C
	H: Hybrid Alternative	6174	8113	11,750	N	N	2465	3113	4600	N	N	C	C
	H1: Hybrid with Flyover Alternative	6174	8113	11,750	N	N	2465	3113	4600	N	N	C	C
5M2) On-Ramp from EB Via de la Valle to SB I-5 [e] ▪ *6 Mainlines* ▪ *1 lane On-Ramp at merge*	*Existing*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	E: No Build	8241	6798	11,750	N	N	3042	2648	4600	N	N	C	C
	F: Auxiliary Lane Alternative	8241	6798	11,750	N	N	3042	2648	4600	N	N	C	C
	G: Direct Connectors Alternative	8458	6952	11,750	N	N	3101	2694	4600	N	N	C	C
	H: Hybrid Alternative	8241	6798	11,750	N	N	3042	2648	4600	N	N	C	C
	H1: Hybrid with Flyover Alternative	8241	6798	11,750	N	N	3042	2648	4600	N	N	C	C
5M3) Bypass NB I-5 with Mainline NB I-5 ▪ *4 Mainlines* ▪ *3-lane Bypass (adds its own lanes)*	*Existing*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	E: No Build	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	F: Auxiliary Lane Alternative	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	G: Direct Connectors Alternative	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	H: Hybrid Alternative	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	H1: Hybrid with Flyover Alternative	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
5M4) EB Del Mar Heights Road with Bypass SB I-5 ▪ *3 Bypass lanes* ▪ *1-lane On-ramp at merge*	*Existing* [f]	6077	6059	11,750	N	N	2429	2423	4600	N	N	C	C
	E: No Build	8618	6570	11,750	N	N	3196	2589	4600	N	N	C	C
	F: Auxiliary Lane Alternative	7153	5831	11,750	N	N	4557	3830	4600	N	N	D	C
	G: Direct Connectors Alternative	4800	3154	7050	N	N	3206	2143	4600	N	N	C	B
	H: Hybrid Alternative	7153	5831	11,750	N	N	4557	3830	4600	N	N	D	C
	H1: Hybrid with Flyover Alternative	7153	5831	11,750	N	N	4557	3830	4600	N	N	D	C

TABLE 8–8
EXISTING AND YEAR 2030 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M5) WB SR-56 connector to I-5 NB with Local Bypass NB I-5 ▪ *3 Mainlines* ▪ *1-lane Bypass (adds a lane)*	*Existing* [g]	5657	5673	11,750	N	N	2318	2302	4600	N	N	B	B
	E: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F2: No EB slip off-ramp, no WB barrier [h]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F3: With EB slip off-ramp, with WB barrier [i]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F4: No EB slip off-ramp, with WB barrier [j]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	4734	5163	9400	N	N	3914	4032	4600	N	N	C	C
	G2: No EB slip off-ramp, no WB barrier	4734	5163	9400	N	N	3914	4032	4600	N	N	C	C
	G3: With EB slip off-ramp, with WB barrier	4738	5169	9400	N	N	3791	3881	4600	N	N	C	C
	G4: No EB slip off-ramp, with WB barrier	4738	5169	9400	N	N	3791	3881	4600	N	N	C	C
	G5: No EB slip off-ramp, with WB C-D system [k]	4734	5163	9400	N	N	3914	4032	4600	N	N	C	C
	H: Hybrid Alternative	4734	5163	9400	N	N	3914	4032	4600	N	N	C	C
	H1: Hybrid with Flyover Alternative	4734	5163	9400	N	N	3914	4032	4600	N	N	C	C

TABLE 8–8 *continued*

EXISTING AND YEAR 2030 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M6) On-Ramp from Carmel Valley Road to SB I-5 ▪ *4 Mainlines* ▪ *1-lane On-Ramp at merge*	*Existing*	7192	7104	9400	N	N	4560	4524	4600	N	N	D	D
	E: No Build	8903	7222	9400	N	N	**5408**	4499	4600	**Y**	N	**F**	D
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	8903	7222	9400	N	N	**5408**	4499	4600	**Y**	N	**F**	D
	F2: No EB slip off-ramp, no WB barrier	8903	7222	9400	N	N	**5408**	4499	4600	**Y**	N	**F**	D
	F3: With EB slip off-ramp, with WB barrier	9319	7662	9400	N	N	**5423**	**4605**	4600	**Y**	**Y**	**F**	**F**
	F4: No EB slip off-ramp, with WB barrier	9319	7662	9400	N	N	**5423**	**4605**	4600	**Y**	**Y**	**F**	**F**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	8458	7222	9400	N	N	**5165**	4499	4600	**Y**	N	**F**	D
	G2: No EB slip off-ramp, no WB barrier	8458	7222	9400	N	N	**5165**	4499	4600	**Y**	N	**F**	D
	G3: With EB slip off-ramp, with WB barrier	8874	7662	9400	N	N	**5203**	**4605**	4600	**Y**	**Y**	**F**	**F**
	G4: No EB slip off-ramp, with WB barrier	8874	7662	9400	N	N	**5203**	**4605**	4600	**Y**	**Y**	**F**	**F**
	G5: No EB slip off-ramp, with WB C-D system	8874	7662	9400	N	N	**5203**	**4605**	4600	**Y**	**Y**	**F**	**F**
	H: Hybrid Alternative	9319	7662	9400	N	N	**5423**	**4605**	4600	**Y**	**Y**	**F**	**F**
	H1: Hybrid with Flyover Alternative	9319	7662	9400	N	N	**5423**	**4605**	4600	**Y**	**Y**	**F**	**F**

TABLE 8–8 *continued*

EXISTING AND YEAR 2030 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M7) On-Ramp from Carmel Mountain Road to Bypass NB I-5 ▪ *4 Bypass lanes* ▪ *1 lane On-Ramp at merge*	*Existing*	3334	6671	9400	N	N	1497	2622	4600	N	N	B	C
	E: No Build	5191	7692	9400	N	N	2156	2894	4600	N	N	B	C
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	5191	7692	9400	N	N	2156	2894	4600	N	N	B	C
	F2: No EB slip off-ramp, no WB barrier	4144	6509	9400	N	N	1831	2566	4600	N	N	B	C
	F3: With EB slip off-ramp, with WB barrier	5191	7692	9400	N	N	1315	1626	4600	N	N	B	B
	F4: No EB slip off-ramp, with WB barrier	4144	6509	9400	N	N	1831	2566	4600	N	N	B	C
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	5191	7692	9400	N	N	2156	2894	4600	N	N	B	C
	G2: No EB slip off-ramp, no WB barrier	4144	6509	9400	N	N	1831	2566	4600	N	N	B	C
	G3: With EB slip off-ramp, with WB barrier	5191	7692	9400	N	N	2156	2894	4600	N	N	B	C
	G4: No EB slip off-ramp, with WB barrier	4144	6509	9400	N	N	1831	2566	4600	N	N	B	C
	G5: No EB slip off-ramp, with WB C-D system	4144	6509	9400	N	N	1831	2566	4600	N	N	B	C
	H: Hybrid Alternative	4144	6509	9400	N	N	1831	2566	4600	N	N	B	C
	H1: Hybrid with Flyover Alternative	4144	6509	9400	N	N	1831	2566	4600	N	N	B	C

TABLE 8–8
EXISTING AND YEAR 2030 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M8) On-Ramp from Carmel Mountain Road to Bypass SB I-5 ▪ *4 Bypass lanes* ▪ *1 lane On-Ramp at merge*	*Existing*	6559	4556	9400	N	N	2579	1954	4600	N	N	C	B
	E: No Build	8389	4922	9400	N	N	3056	2107	4600	N	N	C	B
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	8389	4922	9400	N	N	3056	2107	4600	N	N	C	B
	F2: No EB slip off-ramp, no WB barrier	8389	4922	9400	N	N	3056	2107	4600	N	N	C	B
	F3: With EB slip off-ramp, with WB barrier	7969	4478	9400	N	N	2949	1979	4600	N	N	C	B
	F4: No EB slip off-ramp, with WB barrier	7969	4478	9400	N	N	2949	1979	4600	N	N	C	B
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	8834	4922	9400	N	N	3170	2107	4600	N	N	C	B
	G2: No EB slip off-ramp, no WB barrier	8834	4922	9400	N	N	3170	2107	4600	N	N	C	B
	G3: With EB slip off-ramp, with WB barrier	8414	4478	9400	N	N	3063	1979	4600	N	N	C	B
	G4: No EB slip off-ramp, with WB barrier	8414	4478	9400	N	N	3063	1979	4600	N	N	C	B
	G5: No EB slip off-ramp, with WB C-D system	8414	4478	9400	N	N	3063	1979	4600	N	N	C	B
	H: Hybrid Alternative	7969	4478	9400	N	N	2949	1979	4600	N	N	C	B
	H1: Hybrid with Flyover Alternative	7969	4478	9400	N	N	2949	1979	4600	N	N	C	B

TABLE 8–8
EXISTING AND YEAR 2030 RAMP MERGE OPERATIONS (I-5)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS [d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5M9) On-Ramp from Del Mar Heights Road to NB I-5[e] ▪ *7 Mainlines* ▪ *1 lane On-Ramp at merge*	*Existing*	6290	6790	11,750	N	N	2513	2659	4600	N	N	C	C
	E: No Build	6925	8553	11,750	N	N	4208	4977	4600	N	**Y**	D	**F**
	F: Auxiliary Lane Alternative	6925	8553	11,750	N	N	4208	4977	4600	N	**Y**	D	**F**
	G: Direct Connectors Alternative	6235	7493	11,750	N	N	3913	4537	4600	N	N	C	D
	H: Hybrid Alternative	6235	7493	11,750	N	N	3913	4537	4600	N	N	C	D
	H1: Hybrid with Flyover Alternative	6235	7493	11,750	N	N	3913	4537	4600	N	N	C	D

Footnotes:

a. Volumes factored up to account for peak hour factor (PHF) and truck percentages and are expressed in vehicles per hour (vph) for downstream mainline section. Because of this factoring, these volumes do NOT match figures.
b. Capacity based on methodology found in Chapter 25 of the *2000 Highway Capacity Manual (HCM)*. For ramps, capacity is referred as "Ramp Junction Capacity at the Merge Influence Area".
c. Merge influence area includes mainline volumes for rightmost lanes 1 and 2 and on ramp volumes.
d. Ramp Junction operations dependent on freeway mainline operations and ramp capacity.
e. According to Chapter 25 of HCM, merge areas with 6 mainlines or more cannot be evaluated. So the volume per lane was calculated and analysis was conducted with 5 mainlines.
f. The merge section 5M4 in the existing scenarios deals with the EB Del Mar Heights Road on-ramp to mainline SB I-5.
g. The merge section 5M5 in the existing scenario deals with the merging of Carmel Valley on-ramp to NB I-5.
h. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
i. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
j. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
k. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

General Notes:

DNE – Does not exist for specified scenario.
NM – No merge analysis required for the specified scenario.
The lanes shown in the table refer to the Year 2030 Direct Connectors (Run G) scenario.

TABLE 8–9
EXISTING AND YEAR 2030 RAMP MERGE OPERATIONS (SR-56)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS[d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56M1) I-5 connectors to EB SR-56 ▪ *2-lane from Bypass NB I-5* ▪ *2-lane Bypass from SB I-5 at merge*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	E: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F2: No EB slip off-ramp, no WB barrier [e]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F3: With EB slip off-ramp, with WB barrier [f]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F4: No EB slip off-ramp, with WB barrier [g]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors , With EB slip off-ramp, no WB barrier	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	G2: No EB slip off-ramp, no WB barrier	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	G3: With EB slip off-ramp, with WB barrier	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	G4: No EB slip off-ramp, with WB barrier	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	G5: No EB slip off-ramp, with WB C-D system [h]	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*
	H: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H1: Hybrid with Flyover Alternative	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*	*NM*

TABLE 8–9
EXISTING AND YEAR 2030 RAMP MERGE OPERATIONS (SR-56)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS[d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56M2) Carmel Country Road to WB SR-56 ▪ *3 Mainlines* ▪ *1-lane at merge (adds a lane)*	*Existing*	5813	2253	7050	N	N	5813	2253	7050 [1]	N	N	D	B
	E: No Build	6740	2532	9400	N	N	4888	1967	7050	N	N	D	B
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	6740	2532	9400	N	N	4888	1967	7050	N	N	D	B
	F2: No EB slip off-ramp, no WB barrier	6947	2767	9400	N	N	5095	2202	7050	N	N	D	B
	F3: With EB slip off-ramp, with WB barrier	6843	2642	9400	N	N	4991	2077	7050	N	N	D	B
	F4: No EB slip off-ramp, with WB barrier	7051	2877	9400	N	N	5199	2312	7050	N	N	D	B
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	7381	2977	9400	N	N	5286	2243	7050	N	N	D	B
	G2: No EB slip off-ramp, no WB barrier	7588	3212	9400	N	N	5493	2478	7050	N	N	D	B
	G3: With EB slip off-ramp, with WB barrier	7592	3221	9400	N	N	5497	2487	7050	N	N	D	B
	G4: No EB slip off-ramp, with WB barrier	7800	3455	9400	N	N	5705	2721	7050	N	N	D	B
	G5: No EB slip off-ramp, with WB C-D system	7692	3321	9400	N	N	5597	2587	7050	N	N	D	B
	H: Hybrid Alternative	7692	3321	9400	N	N	5597	2587	7050	N	N	D	B
	H1: Hybrid with Flyover Alternative	7692	3321	9400	N	N	5597	2587	7050	N	N	D	B
56M3) On-Ramp from Carmel Country Road to EB SR-56 ▪ *4 Mainlines* ▪ *1-lane On-Ramp at merge*	*Existing*	2241	4085	4700	N	N	2241	4085	4600	N	N	B	D
	E: No Build	3214	5077	7050	N	N	2230	3279	4600	N	N	B	C
	F: Auxiliary Lane Alternative	3214	5077	7050	N	N	2230	3279	4600	N	N	B	C
	G: Direct Connectors Alternative	3468	5406	7050	N	N	1454	1988	4600	N	N	B	B
	H: Hybrid Alternative	3214	5077	7050	N	N	2230	3279	4600	N	N	B	C
	H1: Hybrid with Flyover Alternative	3214	5077	7050	N	N	1439	1912	4600	N	N	B	B

TABLE 8–9
EXISTING AND YEAR 2030 RAMP MERGE OPERATIONS (SR-56)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS[d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56M4) On-Ramp from Carmel Valley Road to WB SR-56 ▪ *3 Mainlines* ▪ *1-lane On-Ramp at merge*	*Existing*	**4854**	1770	4700	**Y**	N	**4854**	1770	4600	**Y**	N	**F**	B
	E: No Build	5532	1965	7050	N	N	3663	1433	4600	N	N	D	B
	F: Auxiliary Lane Alternative	5532	1965	7050	N	N	3663	1433	4600	N	N	D	B
	G: Direct Connectors Alternative	5943	2257	7050	N	N	3925	1618	4600	N	N	D	B
	H: Hybrid Alternative	5943	2257	7050	N	N	3925	1618	4600	N	N	D	B
	H1: Hybrid with Flyover Alternative	5943	2257	7050	N	N	3925	1618	4600	N	N	D	B
56M5) On-Ramp from Carmel Valley Road to EB SR-56 ▪ *3 Mainlines* ▪ *1-lane On-Ramp at merge*	*Existing*	1787	3537	4700	N	N	1787	3537	4600	N	N	B	D
	E: No Build	3042	4410	7050	N	N	1972	2806	4600	N	N	B	C
	F: Auxiliary Lane Alternative	3042	4410	7050	N	N	1972	2806	4600	N	N	B	C
	G: Direct Connectors Alternative	3221	4633	7050	N	N	2059	2912	4600	N	N	B	C
	H: Hybrid Alternative	3042	4410	7050	N	N	1972	2806	4600	N	N	B	C
	H1: Hybrid with Flyover Alternative	3042	4410	7050	N	N	1972	2806	4600	N	N	B	C

TABLE 8–9
EXISTING AND YEAR 2030 RAMP MERGE OPERATIONS (SR-56)

Ramp Merge Location	Model Run: Scenario	Downstream Mainline Facility					Merge Influence Area					Ramp Junction LOS[d]	
		Volume [a]		Capacity [b]	LOS F?		Volume [c]		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56M6) Carmel Creek Road to EB SR-56 ▪ *3 Mainlines* [k] ▪ *1-lane On-Ramp at merge*	*Existing* [j]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	E: No Build	3212	6376	7050	N	N	2705	4119	4600	N	N	B	D
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	3212	6376	7050	N	N	2705	4119	4600	N	N	B	D
	F2: No EB slip off-ramp, no WB barrier	3560	6770	7050	N	N	2282	4353	4600	N	N	B	E
	F3: With EB slip off-ramp, with WB barrier	3237	6404	7050	N	N	2100	4147	4600	N	N	B	D
	F4: No EB slip off-ramp, with WB barrier	3585	6798	7050	N	N	2307	4381	4600	N	N	B	E
	G: Direct Connectors [j]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H: Hybrid Alternative	3560	6770	7050	N	N	2282	4353	4600	N	N	B	E
	H1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*

Footnotes:

a. Volumes factored up to account for peak hour factor (PHF) and truck percentages and are expressed in vehicles per hour (vph) for downstream mainline section. Because of this factoring, these volumes do NOT match figures.
b. Capacity based on methodology found in Chapter 25 of the *2000 Highway Capacity Manual (HCM)*. For ramps, capacity is referred as "Ramp Junction Capacity at the Merge Influence Area".
c. Merge influence area includes mainline volumes for rightmost lanes 1 and 2 and on ramp volumes.
d. Ramp Junction operations dependent on freeway mainline operations and ramp capacity.
e. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
f. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
g. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movements.
h. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
i. The Highway Capacity Manual (HCM) does not provide merge analysis for situations involving lane additions. Hence for this merge segment, the merge influence area is assumed to consist of 3-lanes (two outer freeway lanes and one lane from the ramp). Hence the capacity used is 7050 pc/h. Level of service D is assumed to be at 90% of capacity.
j. The merge section 56M2 adds an auxiliary lane on WB SR 56 between Carmel Creek Road and Carmel Country Road in these scenarios. Hence this section is treated as a weaving section in these scenarios.
k. The lanes for this merge section refer to the No Build and Auxiliary lane scenarios.

General Notes:

DNE – Does not exist for specified scenario.
NM – No merge analysis required for the specified scenario.
The lanes shown in the table refer to the Year 2030 Direct Connectors (Run G) scenario.

TABLE 8–10
EXISTING AND YEAR 2030 RAMP DIVERGE OPERATIONS (I-5)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5D1) Off-Ramp to Via de la Valle from Mainline SB I-5[d] ▪ *6 Mainlines* ▪ *2-lane Off-Ramp at diverge*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	E: No Build	7122	5628	9400	N	N	1284	1251	3800	N	N	B	B
	F: Auxiliary Lane Alternative	7122	5628	9400	N	N	1284	1251	3800	N	N	B	B
	G: Direct Connectors Alternative	7315	5890	9400	N	N	1255	1212	3800	N	N	B	B
	H: Hybrid Alternative	7122	5628	9400	N	N	1284	1251	3800	N	N	B	B
	H1: Hybrid with Flyover Alternative	7122	5628	9400	N	N	1284	1251	3800	N	N	B	B
5D2) Off-Ramp to Via de la Valle from NB I-5[d] ▪ *6 Mainlines* ▪ *2-lane Off-Ramp at diverge*	*Existing*	4283	4433	9400	N	N	1484	1543	3800	N	N	B	B
	E: No Build	5506	6645	9400	N	N	1678	1973	3800	N	N	B	B
	F: Auxiliary Lane Alternative	5506	6645	9400	N	N	1678	1973	3800	N	N	B	B
	G: Direct Connectors Alternative	5818	6843	9400	N	N	1678	1973	3800	N	N	B	B
	H: Hybrid Alternative	5818	6843	9400	N	N	1678	1973	3800	N	N	B	B
	H1: Hybrid with Flyover Alternative	5818	6843	9400	N	N	1678	1973	3800	N	N	B	B
5D3) Off-Ramp to Del Mar Heights Road from Mainline SB I-5[d] ▪ *8 Mainlines* ▪ *2-lane Off-Ramp at diverge*	*Existing*	6542	6412	9400	N	N	1141	1157	2000	N	N	B	B
	E: No Build	7094	5442	9400	N	N	1823	1760	3800	N	N	B	B
	F: Auxiliary Lane Alternative	7094	5442	9400	N	N	1823	1760	3800	N	N	B	B
	G: Direct Connectors Alternative	5263	4526	9400	N	N	1564	1411	3800	N	N	B	B
	H: Hybrid Alternative	7094	5442	9400	N	N	1823	1760	3800	N	N	B	B
	H1: Hybrid with Flyover Alternative	7094	5442	9400	N	N	1823	1760	3800	N	N	B	B
5D4) Off-Ramp to Del Mar Heights Road from Bypass NB I-5 ▪ *4 Bypass lanes* ▪ *2-lane Off-Ramp at diverge*	*Existing*	4614	4633	9400	N	N	1323	1267	3800	N	N	A	A
	E: No Build [d]	4029	5601	9400	N	N	1763	1763	3800	N	N	B	B
	F: Auxiliary Lane Alternative	4029	5601	9400	N	N	1763	1763	3800	N	N	B	B
	G: Direct Connectors Alternative	2990	3413	7050	N	N	1763	1763	3800	N	N	B	B
	H: Hybrid Alternative	2990	3413	7050	N	N	1763	1763	3800	N	N	B	B
	H1: Hybrid with Flyover Alternative	2990	3413	7050	N	N	1763	1763	3800	N	N	B	B

TABLE 8–10
EXISTING AND YEAR 2030 RAMP DIVERGE OPERATIONS (I-5)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5D5) Freeway Connector to EB SR-56 from Mainline I-5 SB ▪ *5 Mainlines* ▪ *2-lane Connector at diverge*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	E: No Build [e]	5810	4719	9400	N	N	3736	2547	4400	N	N	F[f]	A
	F: Auxiliary Lane Alternative [e]	4219	3509	9400	N	N	3736	2547	4400	N	N	F[f]	A
	G: Direct Connectors Alternative [e]	5949	4897	9400	N	N	1157	1621	3800	N	N	B	B
		4015	4237	9400	N	N	2513	1686	3800	N	N	C	B
	H: Hybrid Alternative [e]	4219	3509	9400	N	N	3736	2547	4400	N	N	F[f]	A
	H1: Hybrid with Flyover Alternative [e]	4219	3509	9400	N	N	3736	2547	4400	N	N	F[f]	A
5D6) Off-Ramp to Carmel Valley Road from Bypass SB I-5 ▪ *4 Bypass lanes* ▪ *1-lane Off-Ramp at diverge*	*Existing*	5521	5492	9400	N	N	882	893	2000	N	N	B	B
	E: No Build	7552	5570	9400	N	N	1232	1486	2000	N	N	F[g]	C
	F: Auxiliary Lane Alternative	6297	4562	9400	N	N	1232	1486	2000	N	N	C	C
	G: Direct Connectors Alternative	4224	2578	4700	N	N	584	583	2000	N	N	B	B
	H: Hybrid Alternative	6297	4562	9400	N	N	1232	1486	2000	N	N	C	C
	H1: Hybrid with Flyover Alternative	6297	4562	9400	N	N	1232	1486	2000	N	N	C	C
5D7) Off-Ramp to Carmel Valley Road from Mainline NB I-5 ▪ *5 Mainlines* ▪ *2-lane Off-Ramp at diverge*	*Existing*	5010	4483	9400	N	N	827	882	3800	N	N	B	B
	E: No Build	4432	5985	9400	N	N	1267	1433	3800	N	N	B	B
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	4432	5985	9400	N	N	1267	1433	3800	N	N	B	B
	F2: No EB slip off-ramp, no WB barrier [h]	4232	5760	9400	N	N	2304	2604	3800	N	N	C	C
	F3: With EB slip off-ramp, with WB barrier [i]	4432	5985	9400	N	N	1267	1433	3800	N	N	B	B
	F4: No EB slip off-ramp, with WB barrier [j]	4232	5760	9400	N	N	2304	2604	3800	N	N	C	C
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	4432	5985	9400	N	N	1267	1433	3800	N	N	B	B
	G2: No EB slip off-ramp, no WB barrier	4232	5760	9400	N	N	2304	2604	3800	N	N	C	C
	G3: With EB slip off-ramp, with WB barrier	4432	5985	9400	N	N	1267	1433	3800	N	N	B	B
	G4: No EB slip off-ramp, with WB barrier	4232	5760	9400	N	N	2304	2604	3800	N	N	C	C

TABLE 8–10
EXISTING AND YEAR 2030 RAMP DIVERGE OPERATIONS (I-5)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
	G5: No EB slip off-ramp, with WB C-D system [k]	4232	5760	9400	N	N	2304	2604	3800	N	N	C	C
	H: Hybrid Alternative	4232	5760	9400	N	N	2304	2604	3800	N	N	C	C
	H1: Hybrid with Flyover Alternative	4232	5760	9400	N	N	2304	2604	3800	N	N	C	C
5D8) Off-Ramp to Carmel Mountain Road from Bypass SB I-5 ▪ *4 Bypass lanes* ▪ *1-lane Off-Ramp at diverge*	*Existing*	5740	3789	9400	N	N	827	441	2000	N	N	D	C
	E: No Build	7165	3960	9400	N	N	1058	838	2000	N	N	E	C
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	7165	3960	9400	N	N	1058	838	2000	N	N	E	C
	F2: No EB slip off-ramp, no WB barrier	7165	3960	9400	N	N	1058	838	2000	N	N	E	C
	F3: With EB slip off-ramp, with WB barrier	6746	3516	9400	N	N	1058	838	2000	N	N	E	C
	F4: No EB slip off-ramp, with WB barrier	6746	3516	9400	N	N	1058	838	2000	N	N	E	C
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	7610	3516	9400	N	N	1058	838	2000	N	N	E	C
	G2: No EB slip off-ramp, no WB barrier	7610	3516	9400	N	N	1058	838	2000	N	N	E	C
	G3: With EB slip off-ramp, with WB barrier	7191	3516	9400	N	N	1058	838	2000	N	N	E	C
	G4: No EB slip off-ramp, with WB barrier	7191	3516	9400	N	N	1058	838	2000	N	N	E	C
	G5: No EB slip off-ramp, with WB C-D system	7191	3516	9400	N	N	1058	838	2000	N	N	E	C
	H: Hybrid Alternative	6746	3516	9400	N	N	1058	838	2000	N	N	E	C
	H1: Hybrid with Flyover Alternative	6746	3516	9400	N	N	1058	838	2000	N	N	E	C

TABLE 8–10
EXISTING AND YEAR 2030 RAMP DIVERGE OPERATIONS (I-5)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
5D9) Off-Ramp to Carmel Mountain Road from Bypass NB I-5 ▪ *4 Bypass lanes* ▪ *1-lane Off-Ramp at diverge*	*Existing*	2790	6020	9400	N	N	716	992	2000	N	N	B	D
	E: No Build	4406	6646	9400	N	N	937	1234	2000	N	N	C	E
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	4406	6646	9400	N	N	937	1234	2000	N	N	C	E
	F2: No EB slip off-ramp, no WB barrier	3359	5463	9400	N	N	937	1234	2000	N	N	C	D
	F3: With EB slip off-ramp, with WB barrier	4406	6646	9400	N	N	937	1234	2000	N	N	C	E
	F4: No EB slip off-ramp, with WB barrier	3359	5463	9400	N	N	937	1234	2000	N	N	C	D
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	4406	6646	9400	N	N	937	1234	2000	N	N	C	E
	G2: No EB slip off-ramp, no WB barrier	3359	5463	9400	N	N	937	1234	2000	N	N	C	D
	G3: With EB slip off-ramp, with WB barrier	4406	6646	9400	N	N	937	1234	2000	N	N	C	E
	G4 & G5: No EB slip off-ramp, with WB barrier/ C-D system	3359	5463	9400	N	N	937	1234	2000	N	N	C	D
	H & H1: Hybrid and flyover alts	3359	5463	9400	N	N	937	1234	2000	N	N	C	D

Footnotes:

a. Volumes factored up to account for peak hour factor (PHF) and truck percentages, and are expressed in vehicles per hour (vph) in the downstream mainline section. Because of this factoring, these volumes do NOT match figures.
b. Capacity based on methodology found in Chapter 25 of the *2000 Highway Capacity Manual (HCM)* (Exhibit 25–14). For ramps, capacity is a function of free flow speed of ramp (mph) and number of lanes on the ramp.
c. Ramp Junction operations dependent on freeway mainline operations and ramp capacity in the influence area.
d. According to Chapter 25 of HCM, diverge areas with 6 mainlines or more cannot be evaluated. So volume per lane was calculated and analysis was conducted with 5 mainlines.
e. The diverge section 5D5 for the No Build, Auxiliary Lane and Hybrid Alternatives deals with the I-5 SB bypass exiting the I-5 SB mainline. The second row of the Direct Connector Alternative deals with the diverge section of EB SR 56 exiting the mainline I-5 SB.
f. The diverge junction shows acceptable operations at the downstream mainline facility and off ramp but shows LOS F at the ramp influence area (V_{12}).
g. The diverge junction shows failing operations at the ramp influence area (V_{12}) and upstream mainline facility.
h. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
i. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
j. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real.
k. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.

General Notes:

DNE = Does not exist for specified scenario. The lanes shown in the table refer to the Year 2030 Direct Connectors (Run G) scenario.

TABLE 8–11
EXISTING AND YEAR 2030 RAMP DIVERGE OPERATIONS (SR-56)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56D1) Off-Ramp to Carmel Creek Road from EB SR-56 ▪ *2 Mainline* ▪ *1-lane Off-Ramp at diverge*	*Existing*	1132	2993	4700	N	N	838	1014	2000	N	N	C	E
	E: No Build	1424	2823	4700	N	N	1381	1562	2000	N	N	C	E
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1424	2823	4700	N	N	1381	1562	2000	N	N	C	E
	F2: No EB slip off-ramp, no WB barrier [d]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F3: With EB slip off-ramp, with WB barrier [e]	1424	2823	4700	N	N	1381	1562	2000	N	N	C	E
	F4: No EB slip off-ramp, with WB barrier [f]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1424	2823	4700	N	N	1381	1562	2000	N	N	C	E
	G2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G3: With EB slip off-ramp, with WB barrier	1424	2823	4700	N	N	1381	1562	2000	N	N	C	E
	G4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G5: No EB slip off-ramp, with WB C-D system [g]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*

TABLE 8–11
EXISTING AND YEAR 2030 RAMP DIVERGE OPERATIONS (SR-56)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56D2) Off-Ramp to I-5 NB connector from WB SR-56 ▪ *4 Mainlines* ▪ *2-lane Off-Ramp at diverge*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	E: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F3: With EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	4469	2239	4700	N	N	1907	1267	3800	N	N	C	B
	G2: No EB slip off-ramp, no WB barrier	4469	2239	4700	N	N	1907	1267	3800	N	N	C	B
	G3: With EB slip off-ramp, with WB barrier	4045	1789	4700	N	N	1475	731	3800	N	N	A	A
	G4: No EB slip off-ramp, with WB barrier	4045	1789	4700	N	N	1475	731	3800	N	N	A	A
	G5: No EB slip off-ramp, with WB C-D system	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*

TABLE 8–11 *continued*
EXISTING AND YEAR 2030 RAMP DIVERGE OPERATIONS (SR-56)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56D3) Off-Ramp to Carmel Creek Road from WB SR-56 ▪ *3 Mainline* ▪ *1-lane Off-Ramp at diverge*	*Existing*	**5186**	1933	4700	**Y**	N	640	326	2000	N	N	**F**	A
	E: No Build	**6492**	2426	4700	**Y**	N	990	506	2000	N	N	**F**	A
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	6492	2426	7050	N	N	990	506	3800	N	N	C	A
	F2: No EB slip off-ramp, no WB barrier	6494	2428	7050	N	N	1197	741	3800	N	N	C	A
	F3: With EB slip off-ramp, with WB barrier	6597	2537	7050	N	N	990	506	3800	N	N	C	A
	F4: No EB slip off-ramp, with WB barrier	6599	2539	7050	N	N	1197	741	3800	N	N	C	A
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	6440	2501	9400	N	N	960	486	3800	N	N	C	A
	G2: No EB slip off-ramp, no WB barrier	6442	2503	9400	N	N	1167	721	3800	N	N	C	A
	G3: With EB slip off-ramp, with WB barrier	6653	2747	9400	N	N	960	486	3800	N	N	C	A
	G4: No EB slip off-ramp, with WB barrier[g]	6655	2749	9400	N	N	1167	721	3800	N	N	C	A
	G5: No EB slip off-ramp, with WB C-D system	6546	2614	9400	N	N	1167	721	3800	N	N	C	A
	H: Hybrid Alternative	6546	2614	9400	N	N	1167	721	3800	N	N	C	A
	H1: Hybrid with Flyover Alternative	6546	2614	9400	N	N	1167	721	3800	N	N	C	A
56D4) Off-Ramp to Carmel Valley Road from EB SR-56 ▪ *3 Mainlines* ▪ *1-lane Off-Ramp at diverge*	*Existing*	1732	3497	4700	N	N	513	591	3800	N	N	A	A
	E: No Build	2643	3964	4700	N	N	579	1119	3800	N	N	A	A
	F: Auxiliary Lane Alternative	2643	3964	4700	N	N	579	1119	3800	N	N	B	C
	G: Direct Connectors Alternative	2869	4254	7050	N	N	606	1157	2000	N	N	B	C
	H: Hybrid Alternative	2643	3964	4700	N	N	579	1119	3800	N	N	B	C
	H1: Hybrid with Flyover Alternative	2643	3964	4700	N	N	579	1119	3800	N	N	B	C

TABLE 8–11
EXISTING AND YEAR 2030 RAMP DIVERGE OPERATIONS (SR-56)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
56D5) Off-Ramp to Carmel Country Road from WB SR-56 ▪ *3 Mainlines* ▪ *1-lane Off-Ramp at diverge*	*Existing*	4575	1558	4700	N	N	288	215	3800	N	N	E[h]	A
	E: No Build	4873	1489	7050	N	N	668	482	3800	N	N	C	A
	F: Auxiliary Lane Alternative	4873	1489	7050	N	N	668	482	3800	N	N	C	A
	G: Direct Connectors Alternative	5512	1933	7050	N	N	441	331	2000	N	N	D	B
	H: Hybrid Alternative	5512	1933	7050	N	N	441	331	2000	N	N	D	B
	H1: Hybrid with Flyover Alternative	5512	1933	7050	N	N	441	331	2000	N	N	D	B
56D6) Off-Ramp to Carmel Valley Road from WB SR-56 ▪ *3 Mainlines* ▪ *1-lane Off-Ramp at diverge*	*Existing*	3956	1419	4700	N	N	80	46	2000	N	N	E	B
	E: No Build	4610	1318	7050	N	N	341	712	2000	N	N	D	B
	F: Auxiliary Lane Alternative	4610	1318	7050	N	N	341	712	2000	N	N	D	B
	G: Direct Connectors Alternative	4975	1581	7050	N	N	265	661	2000	N	N	D	B
	H: Hybrid Alternative	4975	1581	7050	N	N	265	661	2000	N	N	D	B
	H1: Hybrid with Flyover Alternative	4975	1581	7050	N	N	265	661	2000	N	N	D	B
56D7) Off-Ramp to El Camino Real Road from WB SR-56 ▪ *4 Mainline* ▪ *2-lane Off-Ramp at diverge*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	E: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F3: With EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F4: No EB slip off-ramp, with WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G2: No EB slip off-ramp, no WB barrier	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G3: With EB slip off-ramp, with WB barrier	5539	2527	9400	N	N	1940	661	3800	N	N	A	A
	G4: No EB slip off-ramp, with WB barrier	5539	2527	9400	N	N	1940	661	3800	N	N	A	A
	G5: No EB slip off-ramp, with WB C-D system	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*

TABLE 8–11
EXISTING AND YEAR 2030 RAMP DIVERGE OPERATIONS (SR-56)

Ramp Diverge Location	Model Run: Scenario	Downstream Mainline Facility					Off-Ramp					Ramp Junction LOS[c]	
		Volume [a]		Capacity [b]	LOS F?		Volume		Capacity	LOS F?			
		AM	PM		AM	PM	AM	PM		AM	PM	AM	PM
	H: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
56D8) Off-Ramp to Carmel Country Road from EB SR-56 ▪ *3 Mainline*[i] ▪ *1-lane Off-Ramp at diverge*	*Existing*[j]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	E: No Build	2443	4450	7050	N	N	783	1934	3800	N	N	B	C
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	2443	4450	7050	N	N	783	1934	3800	N	N	B	C
	F2: No EB slip off-ramp, no WB barrier	2436	4454	7050	N	N	1128	2324	3800	N	**Y**	B	**F**
	F3: With EB slip off-ramp, with WB barrier	2433	4450	7050	N	N	808	1962	3800	N	N	B	C
	F4: No EB slip off-ramp, with WB barrier	2437	4454	7050	N	N	1153	2352	3800	N	**Y**	B	**F**
	G: Direct Connectors[j]	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H: Hybrid Alternative	2436	4454	7050	N	N	1128	2324	3800	N	**Y**	B	**F**
	H1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*

Footnotes:

a. Volumes factored up to account for peak hour factor (PHF) and truck percentages, and are expressed in vehicles per hour (vph) in the downstream mainline section. Because of this factoring, these volumes do NOT match figures.
b. Capacity based on methodology found in Chapter 25 of the *2000 Highway Capacity Manual (HCM)* (Exhibit 25–14). For ramps, capacity is a function of free flow speed of ramp (mph) and number of lanes on the ramp.
c. Ramp Junction operations dependent on freeway mainline operations and ramp capacity in the influence area.
d. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated. Hence there is no diverge section.
e. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
f. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real.
g. This alternative is analyzed as a Collector-Distributor alternative between Carmel Creek Road and El Camino Real on WB SR-56.
h. This diverge junction has 2 mainlines downstream, which equals to capacity of 4700 pc/h. The volume (4575) to capacity ratio (4700) is 0.97 and hence LOS E is reported.
i. The lanes for this diverge section refer to the No Build and Auxiliary lane scenarios.
j. The diverge section 56D8 adds an auxiliary lane on WB SR 56 between Carmel Creek Road and Carmel Country Road in these scenarios. Hence this section is treated as a weaving section in these scenarios.

General Notes:

DNE = Does not exist for specified scenario.
The lanes shown in the table refer to the Year 2030 Direct Connectors (Run G) scenario.

TABLE 8–12
EXISTING AND YEAR 2030 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Volume		Ramp Capacity Analysis			
		AM	PM	Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)? AM	Under/ Over Capacity (O/U)? PM
ON1) On-ramp from Carmel Mountain Road to Bypass NB I-5 ▪ *2 lane on-ramp*	*Existing*	500	600	3800	35	U	U
	E: No Build	720	960	3800	35	U	U
	F: Auxiliary Lane Alternative	720	960	3800	35	U	U
	G: Direct Connectors Alternative	720	960	3800	35	U	U
	H: Hybrid Alternative	720	960	3800	35	U	U
	H1: Hybrid with Flyover Alternative	720	960	3800	35	U	U
ON2) On-ramp from Carmel Valley Road to Bypass NB I-5 ▪ *1 lane on-ramp*	*Existing*	880	680	2000	35	U	U
	E: No Build	1348	1156	2000	35	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1348	1156	3800 [c]	35	U	U
	F2: No EB slip off-ramp, no WB barrier	1348	1156	3800 [c]	35	U	U
	F3: With EB slip off-ramp, with WB barrier	1348	1156	3800 [c]	35	U	U
	F4: No EB slip off-ramp, with WB barrier	1348	1156	3800 [c]	35	U	U
	G: Direct Connectors, *With EB slip off-ramp, no WB barrier*	390	520	2000	35	U	U
	G2: No EB slip off-ramp, no WB barrier [d]	390	520	2000	35	U	U
	G3: With EB slip off-ramp, with WB barrier [e]	782	1007	2000	35	U	U
	G4: No EB slip off-ramp, with WB barrier [f]	782	1007	2000	35	U	U
	G5: No EB slip off-ramp, with WB C-D system [g]	390	520	2000	35	U	U
	H: Hybrid Alternative	390	520	2000	35	U	U
	H1: Hybrid with Flyover Alternative	390	520	2000	35	U	U
ON3) On-ramp from Del Mar Heights Road to NB I-5 ▪ *2-lane on-ramp*	*Existing*	1040	1250	3800	35	U	U
	E: No Build	1671	1637	3800	35	U	U
	F: Auxiliary Lane Alternative	1671	1637	3800	35	U	U
	G: Direct Connectors Alternative	1300	1390	3800	35	U	U
	H: Hybrid Alternative	1300	1390	3800	35	U	U
	H1: Hybrid with Flyover Alternative	1300	1390	3800	35	U	U
ON4) Loop on-ramp from EB Via de la Valle to NB I-5 ▪ *1 lane on-ramp*	*Existing*	320	600	1900	25	U	U
	E: No Build	430	720	1900	25	U	U
	F: Auxiliary Lane Alternative	430	720	1900	25	U	U
	G: Direct Connectors Alternative	430	720	1900	25	U	U
	H: Hybrid Alternative	430	720	1900	25	U	U
	H1: Hybrid with Flyover Alternative	430	720	1900	25	U	U

TABLE 8–12 *continued*

EXISTING AND YEAR 2030 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
ON5) On-ramp from WB Via de la Valle to NB I-5 ▪ *1-lane on-ramp*	*Existing*	470	400	2000	35	U	U
	E: No Build	501	557	2000	35	U	U
	F: Auxiliary Lane Alternative	501	557	2000	35	U	U
	G: Direct Connectors Alternative	460	530	2000	35	U	U
	H: Hybrid Alternative	460	530	2000	35	U	U
	H1: Hybrid with Flyover Alternative	460	530	2000	35	U	U
ON6) Loop on-ramp from WB Via de la Valle to SB I-5 ▪ *1-lane on-ramp*	*Existing*	670	520	1900	25	U	U
	E: No Build	800	750	1900	25	U	U
	F: Auxiliary Lane Alternative	800	750	1900	25	U	U
	G: Direct Connectors Alternative	800	750	1900	25	U	U
	H: Hybrid Alternative	800	750	1900	25	U	U
	H1: Hybrid with Flyover Alternative	800	750	1900	25	U	U
ON7) On-ramp from EB Via de la Valle to SB I-5 ▪ *2 lane on-ramp*	*Existing*	910	760	3800	35	U	U
	E: No Build	980	820	3800	35	U	U
	F: Auxiliary Lane Alternative	980	820	3800	35	U	U
	G: Direct Connectors Alternative	980	820	3800	35	U	U
	H: Hybrid Alternative	980	820	3800	35	U	U
	H1: Hybrid with Flyover Alternative	980	820	3800	35	U	U
ON8) Loop on-ramp from WB Del Mar Heights Road to Bypass SB I-5 ▪ *2 lane on-ramp*	*Existing*	900	600	3500	25	U	U
	E: No Build	1250	800	3500	25	U	U
	F: Auxiliary Lane Alternative	1250	800	3500	25	U	U
	G: Direct Connectors Alternative	1250	800	3500	25	U	U
	H: Hybrid Alternative	1250	800	3500	25	U	U
	H1: Hybrid with Flyover Alternative	1250	800	3500	25	U	U
ON9) On-ramp from EB Del Mar Heights Road to Bypass SB I-5 ▪ *2-lane on ramp*	*Existing*	550	550	3800	35	U	U
	E: No Build	790	600	3800	35	U	U
	F: Auxiliary Lane Alternative	790	600	3800	35	U	U
	G: Direct Connectors Alternative	790	600	3800	35	U	U
	H: Hybrid Alternative	790	600	3800	35	U	U
	H1: Hybrid with Flyover Alternative	790	600	3800	35	U	U
FF1) SB I-5 Freeway connector to EB SR-56 ▪ *2-lane freeway connector*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	E: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors Alternative	1050	1471	4100	45	U	U
	H: Hybrid Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	H1: Hybrid with Flyover Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*

TABLE 8–12 *continued*

EXISTING AND YEAR 2030 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
FF2) WB SR-56 Freeway connector to Bypass NB I-5 ▪ *2-lane freeway connector*	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	E: No Build	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	F: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*	*DNE*
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1730	1150	4100	45	U	U
	G2: No EB slip off-ramp, no WB barrier	1730	1150	4100	45	U	U
	G3: With EB slip off-ramp, with WB barrier	1338	663	4100	45	U	U
	G4: No EB slip off-ramp, with WB barrier	1338	663	4100	45	U	U
	G5: No EB slip off-ramp, with WB C-D system	1730	1150	4100	45	U	U
	H: Hybrid Alternative	1730	1150	4100	45	U	U
	H1: Hybrid with Flyover Alternative	1730	1150	4100	45	U	U
FF3) Bypass NB I-5 Freeway connector to EB SR-56 ▪ *2-lane freeway connector*	*Existing*	1770	3600	4100	45	U	U
	E: No Build	2520	3940	4100	45	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	2520	3940	4100	45	U	U
	F2: No EB slip off-ramp, no WB barrier	1580	2877	4100	45	U	U
	F3: With EB slip off-ramp, with WB barrier	2520	3940	4100	45	U	U
	F4: No EB slip off-ramp, with WB barrier	1580	2877	4100	45	U	U
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	2520	3940	4100	45	U	U
	G2: No EB slip off-ramp, no WB barrier	1580	2877	4100	45	U	U
	G3: With EB slip off-ramp, with WB barrier	2520	3940	4100	45	U	U
	G4: No EB slip off-ramp, with WB barrier[g]	1580	2877	4100	45	U	U
	G5: No EB slip off-ramp, with WB C-D system	1580	2877	4100	45	U	U
	H: Hybrid Alternative	1580	2877	4100	45	U	U
	H1: Hybrid with Flyover Alternative	1580	2877	4100	45	U	U

TABLE 8–12 *continued*
EXISTING AND YEAR 2030 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
FF3) WB SR-56 Freeway connector to SB I-5 ▪ *2-lane freeway connector*	*Existing*	3700	1600	4100	45	U	U
	E: No Build	3998	2000	4100	45	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	3998	2000	4100	45	U	U
	F2: No EB slip off-ramp, no WB barrier	3998	2000	4100	45	U	U
	F3: With EB slip off-ramp, with WB barrier	3621	1601	4100	45	U	U
	F4: No EB slip off-ramp, with WB barrier	3621	1601	4100	45	U	U
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	3998	2000	4100	45	U	U
	G2: No EB slip off-ramp, no WB barrier	3998	2000	4100	45	U	U
	G3: With EB slip off-ramp, with WB barrier	3621	1601	4100	45	U	U
	G4: No EB slip off-ramp, with WB barrier	3621	1601	4100	45	U	U
	G5: No EB slip off-ramp, with WB C-D system	3621	1601	4100	45	U	U
	H: Hybrid Alternative	3621	1601	4100	45	U	U
	H1: Hybrid with Flyover Alternative	3621	1601	4100	45	U	U
ON10) On-ramp from Carmel Valley Road to SB I-5 ▪ *2-lane on-ramp*	*Existing*	840	800	3800	35	U	U
	E: No Build	1080	1050	3800	35	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1080	1050	3800	35	U	U
	F2: No EB slip off-ramp, no WB barrier	1080	1050	3800	35	U	U
	F3: With EB slip off-ramp, with WB barrier	1457	1449	3800	35	U	U
	F4: No EB slip off-ramp, with WB barrier	1457	1449	3800	35	U	U
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	530	529	3800	35	U	U
	G2: No EB slip off-ramp, no WB barrier	530	529	3800	35	U	U
	G3: With EB slip off-ramp, with WB barrier	1457	1449	3800	35	U	U
	G4: No EB slip off-ramp, with WB barrier	1457	1449	3800	35	U	U
	G5: No EB slip off-ramp, with WB C-D system	1457	1449	3800	35	U	U
	H: Hybrid Alternative	1457	1449	3800	35	U	U
	H1: Hybrid with Flyover Alternative	1457	1449	3800	35	U	U

TABLE 8–12
EXISTING AND YEAR 2030 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
ON11) On-ramp from Carmel Mountain Road to Bypass SB I-5 ▪ *2 lane on-ramp*	*Existing*	750	700	3800	35	U	U
	E: No Build	1120	880	3800	35	U	U
	F: Auxiliary Lane Alternative	1120	880	3800	35	U	U
	G: Direct Connectors Alternative	1120	880	3800	35	U	U
	H: Hybrid Alternative	1120	880	3800	35	U	U
	H1: Hybrid with Flyover Alternative	1120	880	3800	35	U	U
ON12) On-ramp from El Camino Real to EB SR-56 ▪ *2-lane on-ramp*	*Existing*	942	1511	3800	35	U	U
	E: No Build	1570	3285	3800	35	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1570	3285	3800 [h]	35	U	U
	F2: No EB slip off-ramp, no WB barrier	2510	4348	3800 [h]	35	U	U
	F3: With EB slip off-ramp, with WB barrier	1570	3285	3800 [h]	35	U	U
	F4: No EB slip off-ramp, with WB barrier	2510	4348	3800 [h]	35	U	U
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	940	2407	3800 [h]	35	U	U
	G2: No EB slip off-ramp, no WB barrier	1880	3470	3800 [h]	35	U	U
	G3: With EB slip off-ramp, with WB barrier	940	2407	3800 [h]	35	U	U
	G4: No EB slip off-ramp, with WB barrier	1880	3470	3800 [h]	35	U	U
	G5: No EB slip off-ramp, with WB C-D system	1880	3470	3800 [h]	35	U	U
	H: Hybrid Alternative	2510	4348	3800 [h]	35	U	U
	H1: Hybrid with Flyover Alternative	1818	3381	3800 [h]	35	U	U

TABLE 8–12
EXISTING AND YEAR 2030 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
ON13) On-ramp from Carmel Creek Road to EB SR-56 ▪ *2-lane on-ramp*	*Existing*	237	477	3800	35	U	U
	E: No Build	372	738	3800	35	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	372	738	3800	35	U	U
	F2: No EB slip off-ramp, no WB barrier	372	738	3800	35	U	U
	F3: With EB slip off-ramp, with WB barrier	395	763	3800	35	U	U
	F4: No EB slip off-ramp, with WB barrier	395	763	3800	35	U	U
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	355	715	3800	35	U	U
	G2: No EB slip off-ramp, no WB barrier	355	715	3800	35	U	U
	G3: With EB slip off-ramp, with WB barrier	403	771	3800	35	U	U
	G4: No EB slip off-ramp, with WB barrier	403	771	3800	35	U	U
	G5; No EB slip off-ramp, with WB C-D system	379	740	3800	35	U	U
	H: Hybrid Alternative	396	763	3800	35	U	U
	H1: Hybrid with Flyover Alternative	396	763	3800	35	U	U
ON14) On-ramp from Carmel Country Road to EB SR-56 ▪ *2-lane on-ramp*	*Existing*	393	273	3800	35	U	U
	E: No Build	716	586	3800	35	U	U
	F: Auxiliary Lane Alternative	716	586	3800	35	U	U
	G: Direct Connectors Alternative	590	410	3800	35	U	U
	H: Hybrid Alternative	716	586	3800	35	U	U
	H1: Hybrid with Flyover Alternative	716	586	3800	35	U	U
ON15) On-ramp from Carmel Valley Road to EB SR-56 ▪ *2-lane on-ramp*	*Existing*	54	41	3800	35	U	U
	E: No Build	367	414	3800	35	U	U
	F: Auxiliary Lane Alternative	367	414	3800	35	U	U
	G: Direct Connectors Alternative	325	355	3800	35	U	U
	H: Hybrid Alternative	367	414	3800	35	U	U
	H1: Hybrid with Flyover Alternative	367	414	3800	35	U	U
ON16) On-ramp from Carmel Valley Road to WB SR-56 ▪ *2-lane on-ramp*	*Existing*	816	319	3800	35	U	U
	E: No Build	839	593	3800	35	U	U
	F: Auxiliary Lane Alternative	839	593	3800	35	U	U
	G: Direct Connectors Alternative	880	620	3800	35	U	U
	H: Hybrid Alternative	880	620	3800	35	U	U
	H1: Hybrid with Flyover Alternative	880	620	3800	35	U	U

TABLE 8–12
EXISTING AND YEAR 2030 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
ON17) Loop on-ramp from Carmel Country Road to WB SR-56 ▪ *2-lane on-ramp*	*Existing*	1126	632	3500	25	U	U
	E: No Build	1700	950	3500	25	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1700	950	3500	25	U	U
	F2: No EB slip off-ramp, no WB barrier	1700	950	3500	25	U	U
	F3: With EB slip off-ramp, with WB barrier	1700	950	3500	25	U	U
	F4: No EB slip off-ramp, with WB barrier	1700	950	3500	25	U	U
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1700	950	3500	25	U	U
	G2: No EB slip off-ramp, no WB barrier	1888	1163	3500	25	U	U
	G3: With EB slip off-ramp, with WB barrier	1892	1171	3500	25	U	U
	G4: No EB slip off-ramp, with WB barrier	2080	1384	3500	25	U	U
	G5: No EB slip off-ramp, with WB C-D system	1982	1262	3500	25	U	U
	H: Hybrid Alternative	1982	1262	3500	25	U	U
	H1: Hybrid with Flyover Alternative	1982	1262	3500	25	U	U

TABLE 8–12
EXISTING AND YEAR 2030 ON-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
ON18) Loop on-ramp from Carmel Creek Road to WB SR-56 ▪ *2-lane on-ramp*	*Existing*	641	738	3500	25	U	U
	E: No Build	961	1107	3500	25	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	961	1107	3500	25	U	U
	F2: No EB slip off-ramp, no WB barrier	961	1107	3500	25	U	U
	F3: With EB slip off-ramp, with WB barrier	843	983	3500	25	U	U
	F4: No EB slip off-ramp, with WB barrier	843	983	3500	25	U	U
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	961	1107	3500	25	U	U
	G2: No EB slip off-ramp, no WB barrier	961	1107	3500	25	U	U
	G3: With EB slip off-ramp, with WB barrier	721	830	3500	25	U	U
	G4: No EB slip off-ramp, with WB barrier	721	830	3500	25	U	U
	G5: No EB slip off-ramp, with WB C-D system	819	952	3500	25	U	U
	H: Hybrid Alternative	819	952	3500	25	U	U
	H1: Hybrid with Flyover Alternative	819	952	3500	25	U	U

Footnotes:

a. Capacity based on methodology found in Chapter 25 *(Exhibit 25- 3)* of the *2000 Highway Capacity Manual (HCM)*. Capacity is a function of free flow speed on the ramp (mph) and number of lanes on the ramp.
b. Estimated free-flow speed based on ramp geometry.
c. Carmel Valley Road on-ramp to Bypass NB I-5 in Year 2030 Auxiliary Lane Alternative (Run F) is 2 SOV + 1 HOV on-ramp. HCM 2000 does not specify capacity for a 3-lane on-ramp. Hence the capacity for a 2-lane on-ramp is used as a worst case.
d. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
e. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
f. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
g. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
h. HCM 2000 does not specify capacity for a 3-lane on-ramp. Hence the capacity for a 2-lane on-ramp is used as a worst case. Since the ramp consists of 3 lanes, the volume is considered to be less than capacity.

General Notes:
The lanes shown in the table refer to the Year 2030 Direct Connectors (Run G) scenario.

TABLE 8–13
EXISTING AND YEAR 2030 OFF-RAMP CAPACITY ANALYSIS

Ramp Diverge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
OF1) Off-ramp from Bypass NB I-5 to Carmel Mountain Road ▪ *1 lane off-ramp*	*Existing*	650	900	2000	35	U	U
	E: No Build	850	1120	2000	35	U	U
	F: Auxiliary Lane Alternative	850	1120	2000	35	U	U
	G: Direct Connectors Alternative	850	1120	2000	35	U	U
	H: Hybrid Alternative	850	1120	2000	35	U	U
	H1: Hybrid with Flyover Alternative	850	1120	2000	35	U	U
OF2) Off-ramp from Mainline NB I-5 to Carmel Valley Road ▪ *2 lane off-ramp*	*Existing*	750	800	3800	35	U	U
	E: No Build	1150	1300	3800	35	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1150	1300	3800	35	U	U
	F2: No EB slip off-ramp, no WB barrier	2090	2363	3800	35	U	U
	F3: With EB slip off-ramp, with WB barrier	1150	1300	3800	35	U	U
	F4: No EB slip off-ramp, with WB barrier	2090	2363	3800	35	U	U
	G: Direct Connectors, *With EB slip off-ramp, no WB barrier*	1150	1300	3800	35	U	U
	G2: No EB slip off-ramp, no WB barrier [c]	2090	2363	3800	35	U	U
	G3: With EB slip off-ramp, with WB barrier [d]	1150	1300	3800	35	U	U
	G4: No EB slip off-ramp, with WB barrier [e]	2090	2363	3800	35	U	U
	G5: No EB slip off-ramp, with WB C-D system [f]	2090	2363	3800	35	U	U
	H: Hybrid Alternative	2090	2363	3800	35	U	U
	H1: Hybrid with Flyover Alternative	2090	2363	3800	35	U	U
OF3) Off-ramp from Bypass NB I-5 to Del Mar Heights Road ▪ *2 lane off-ramp*	*Existing*	1200	1150	3800	35	U	U
	E: No Build	1600	1600	3800	35	U	U
	F: Auxiliary Lane Alternative	1600	1600	3800	35	U	U
	G: Direct Connectors Alternative	1600	1600	3800	35	U	U
	H: Hybrid Alternative	1600	1600	3800	35	U	U
	H1: Hybrid with Flyover Alternative	1600	1600	3800	35	U	U
OF4) Off-ramp from Mainline NB I-5 to Via de la Valle ▪ *2 lane off-ramp*	*Existing*	1300	1400	3800	35	U	U
	E: No Build	1470	1790	3800	35	U	U
	F: Auxiliary Lane Alternative	1470	1790	3800	35	U	U
	G: Direct Connectors Alternative	1470	1790	3800	35	U	U
	H: Hybrid Alternative	1470	1790	3800	35	U	U
	H1: Hybrid with Flyover Alternative	1470	1790	3800	35	U	U

TABLE 8–13 *continued*
EXISTING AND YEAR 2030 OFF-RAMP CAPACITY ANALYSIS

Ramp Diverge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
OF5) Off-ramp from Mainline SB I-5 to Via de la Valle ▪ *2 lane off-ramp*	*Existing*	500	500	3800	35	U	U
	E: No Build	1125	1135	3800	35	U	U
	F: Auxiliary Lane Alternative	1125	1135	3800	35	U	U
	G: Direct Connectors Alternative	1100	1100	3800	35	U	U
	H: Hybrid Alternative	1125	1135	3800	35	U	U
	H1: Hybrid with Flyover Alternative	1125	1135	3800	35	U	U
OF6) Off-ramp from Mainline SB I-5 to Del Mar Heights Road ▪ *2 lane off-ramp*	*Existing*	1000	1050	3800	35	U	U
	E: No Build	1597	1597	3800	35	U	U
	F: Auxiliary Lane Alternative	1597	1597	3800	35	U	U
	G: Direct Connectors Alternative	1370	1280	3800	35	U	U
	H: Hybrid Alternative	1597	1597	3800	35	U	U
	H1: Hybrid with Flyover Alternative	1597	1597	3800	35	U	U
OF7) Off-ramp from Bypass SB I-5 to Carmel Valley Road ▪ *1 lane off-ramp*	*Existing*	800	810	2000	35	U	U
	E: No Build	1118	1348	2000	35	U	U
	F: Auxiliary Lane Alternative	1118	1348	3800	35	U	U
	G: Direct Connectors Alternative	530	529	2000	35	U	U
	H: Hybrid Alternative	1118	1348	3800	35	U	U
	H1: Hybrid with Flyover Alternative	1118	1348	3800	35	U	U
OF8) Off-ramp from Bypass SB I-5 to Carmel Mountain Road ▪ *1 lane off-ramp*	*Existing*	750	400	2000	35	U	U
	E: No Build	960	760	2000	35	U	U
	F: Auxiliary Lane Alternative	960	760	2000	35	U	U
	G: Direct Connectors Alternative	960	760	2000	35	U	U
	H: Hybrid Alternative	960	760	2000	35	U	U
	H1: Hybrid with Flyover Alternative	960	760	2000	35	U	U
OF9) Off-ramp from EB SR-56 (frontage road) to Carmel Creek Road ▪ *2 lane off-ramp*	*Existing*	849	1018	3800	35	U	U
	E: No Build	1273	1527	3800	35	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1273	1527	3800	35	U	U
	F2: No EB slip off-ramp, no WB barrier	960	1173	2000	35	U	U
	F3: With EB slip off-ramp, with WB barrier	1273	1527	3800	35	U	U
	F4: No EB slip off-ramp, with WB barrier	960	1173	3800	35	U	U
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1273	1527	3800	35	U	U
	G2: No EB slip off-ramp, no WB barrier	960	1173	2000	35	U	U
	G3: With EB slip off-ramp, with WB barrier	1273	1527	3800	35	U	U
	G4: No EB slip off-ramp, with WB barrier	960	1173	2000	35	U	U
	G5: No EB slip off-ramp, with WB C-D system	960	1173	2000	35	U	U
	H: Hybrid Alternative	960	1173	2000	35	U	U
	H1: Hybrid with Flyover Alternative	960	1173	2000	35	U	U

TABLE 8–13 *continued*
EXISTING AND YEAR 2030 OFF-RAMP CAPACITY ANALYSIS

Ramp Diverge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
OF10) Off-ramp from EB SR-56 to Carmel Country Road ▪ *2 lane off-ramp*	*Existing*	476	1170	2000	35	U	U
	E: No Build	710	1755	2000	35	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	710	1755	2000 [g]	35	U	U
	F2: No EB slip off-ramp, no WB barrier	1023	**2109**	2000 [g]	35	U	**O**
	F3: With EB slip off-ramp, with WB barrier	733	1780	2000 [g]	35	U	U
	F4: No EB slip off-ramp, with WB barrier	1046	**2134**	2000 [g]	35	U	**O**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	710	1755	3800	35	U	U
	G2: No EB slip off-ramp, no WB barrier	1023	2109	3800	35	U	U
	G3: With EB slip off-ramp, with WB barrier	758	1811	3800	35	U	U
	G4: No EB slip off-ramp, with WB barrier	1071	2165	3800	35	U	U
	G5: No EB slip off-ramp, with WB C-D system	1047	2134	3800	35	U	U
	H: Hybrid Alternative	1047	**2134**	2000 [g]	35	U	**O**
	H1: Hybrid with Flyover Alternative	1047	**2134**	2000 [g]	35	U	**O**
OF11) Off-ramp from EB SR-56 to Carmel Valley Road ▪ *1 lane off-ramp*	*Existing*	465	536	3800	35	U	U
	E: No Build	525	1015	2000	35	U	U
	F: Auxiliary Lane Alternative	525	1015	2000	35	U	U
	G: Direct Connectors Alternative	550	1050	2000	35	U	U
	H: Hybrid Alternative	525	1015	2000	35	U	U
	H1: Hybrid with Flyover Alternative	525	1015	2000	35	U	U
OF12) Off-ramp from WB SR-56 to Carmel Valley Road ▪ *1 lane off-ramp*	*Existing*	73	42	2000	35	U	U
	E: No Build	309	646	2000	35	U	U
	F: Auxiliary Lane Alternative	309	646	2000	35	U	U
	G: Direct Connectors Alternative	240	600	2000	35	U	U
	H: Hybrid Alternative	240	600	2000	35	U	U
	H1: Hybrid with Flyover Alternative	240	600	2000	35	U	U
OF13) Off-ramp from WB SR-56 to Carmel Country Road ▪ *1 lane off-ramp*	*Existing*	261	195	2000	35	U	U
	E: No Build	606	437	2000	35	U	U
	F: Auxiliary Lane Alternative	606	437	2000	35	U	U
	G: Direct Connectors Alternative	400	300	2000	35	U	U
	H: Hybrid Alternative	400	300	2000	35	U	U
	H1: Hybrid with Flyover Alternative	400	300	2000	35	U	U

TABLE 8–13
EXISTING AND YEAR 2030 OFF-RAMP CAPACITY ANALYSIS

Ramp Diverge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
OF14) Off-ramp from WB SR-56 to Carmel Creek Road ▪ *2 lane off-ramp*	*Existing*	581	296	2000	35	U	U
	E: No Build	898	459	2000	35	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	898	459	3800	35	U	U
	F2: No EB slip off-ramp, no WB barrier	1086	672	3800	35	U	U
	F3: With EB slip off-ramp, with WB barrier	898	459	3800	35	U	U
	F4: No EB slip off-ramp, with WB barrier	1086	672	3800	35	U	U
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	871	441	3800	35	U	U
	G2: No EB slip off-ramp, no WB barrier	1059	654	3800	35	U	U
	G3: With EB slip off-ramp, with WB barrier	871	441	3800	35	U	U
	G4: No EB slip off-ramp, with WB barrier	1059	654	3800	35	U	U
	G5: No EB slip off-ramp, with WB C-D system	1059	654	3800	35	U	U
	H: Hybrid Alternative	1059	654	3800	35	U	U
	H1: Hybrid with Flyover Alternative	1059	654	3800	35	U	U

TABLE 8–13
EXISTING AND YEAR 2030 OFF-RAMP CAPACITY ANALYSIS

Ramp Merge Location	Model Run: Scenario	Ramp Capacity Analysis					
		Volume		Capacity [a]	Speed (mph) (est.) [b]	Under/ Over Capacity (O/U)?	
		AM	PM			AM	PM
OF15) Off-ramp from WB SR-56 to El Camino Real ▪ *2-lane off-ramp*	*Existing*	1596	872	3800	35	U	U
	E: No Build	2787	1282	3800	35	U	U
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	2787	1282	3800	35	U	U
	F2: No EB slip off-ramp, no WB barrier	2787	1282	3800	35	U	U
	F3: With EB slip off-ramp, with WB barrier	3140	1657	3800	35	U	U
	F4: No EB slip off-ramp, with WB barrier	3140	1657	3800	35	U	U
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1760	600	3800	35	U	U
	G2: No EB slip off-ramp, no WB barrier	1760	600	3800	35	U	U
	G3: With EB slip off-ramp, with WB barrier	2481	1430	3800	35	U	U
	G4: No EB slip off-ramp, with WB barrier	2481	1430	3800	35	U	U
	G5: No EB slip off-ramp, with WB C-D system	2089	943	3800	35	U	U
	H: Hybrid Alternative	2089	943	3800	35	U	U
	H1: Hybrid with Flyover Alternative	2089	943	3800	35	U	U

Footnotes:

a. Capacity based on methodology found in Chapter 25 *(Exhibit 25- 3)* of the *2000 Highway Capacity Manual (HCM)*. Capacity is a function of free flow speed (mph) on the ramp and number of lanes on ramp.
b. Estimated free-flow speed based on ramp geometry.
c. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
d. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
e. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
f. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
g. Carmel Country Road is a one-lane off-ramp in Auxiliary Lane (Run F) and Hybrid Alternatives.

General Notes:
The lanes shown in the table refer to the Year 2030 Direct Connectors (Run G) scenario.

TABLE 8–14
EXISTING AND YEAR 2030 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Mountain Road to I-5 NB Bypass (2 S0V + 1 HOV)	*Existing*	NM	540	NM	398	-	142	-	**21**
	E: No Build	648	864	670	910	-	-	-	-
	F: Auxiliary Lane Alternative	648	864	670	910	-	-	-	-
	G: Direct Connectors Alternative	648	864	670	910	-	-	-	-
	H: Hybrid Alternative	648	864	670	910	-	-	-	-
	H1: Hybrid with Flyover Alternative	648	864	670	910	-	-	-	-
Carmel Mountain Road to I-5 SB Bypass (2 S0V + 1 HOV)	*Existing*	NM	NM	NM	NM	-	-	-	-
	E: No Build	1008	792	1045	830	-	-	-	-
	F: Auxiliary Lane Alternative	1008	792	1045	830	-	-	-	-
	G: Direct Connectors Alternative	1008	792	1045	830	-	-	-	-
	H: Hybrid Alternative	1008	792	1045	830	-	-	-	-
	H1: Hybrid with Flyover Alternative	1008	792	1045	830	-	-	-	-
Carmel Valley Road to I-5 NB (1 S0V + 1 HOV)	*Existing*	-	612	-	677	-	0	-	0
	E: No Build	1213	1040	340	470	873	570	**154**	**73**
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1213	1040	680	940	533	100	**47**	6
	F2: No EB slip off-ramp, no WB barrier	1213	1040	680	940	533	100	**47**	6
	F3: With EB slip off-ramp, with WB barrier	1213	1040	680	940	533	100	**47**	6
	F4: No EB slip off-ramp, with WB barrier	1213	1040	680	940	533	100	**47**	6
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	351	468	340	470	11	-	2	-
	G2: No EB slip off-ramp, no WB barrier [e]	351	468	340	470	11	-	2	-
	G3: With EB slip off-ramp, with WB barrier [f]	704	906	340	470	364	436	**64**	**56**
	G4: No EB slip off-ramp, with WB barrier [g]	704	906	340	470	364	436	**64**	**56**
	G5: No EB slip off-ramp, with WB C-D system	351	468	340	470	11	-	2	-
	H: Hybrid Alternative	351	468	340	470	11	-	2	-
	H1: Hybrid with Flyover Alternative	351	468	340	470	11	-	2	-

TABLE 8–14 *continued*
EXISTING AND YEAR 2030 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Valley Road to I-5 SB (2 S0V)	*Existing*	840	NM	710	NM	130	-	11	-
	E: No Build	1080	1050	1300	1000	-	50	-	3
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1080	1050	1300	1000	-	50	-	3
	F2: No EB slip off-ramp, no WB barrier	1080	1050	1300	1000	-	50	-	3
	F3: With EB slip off-ramp, with WB barrier	1457	1449	1300	1000	157	449	7	**27**
	F4: No EB slip off-ramp, with WB barrier	1457	1449	1300	1000	157	449	7	**27**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1080	1050	1300	1000	-	50	-	3
	G2: No EB slip off-ramp, no WB barrier	1080	1050	1300	1000	-	50	-	3
	G3: With EB slip off-ramp, with WB barrier	1457	1449	1300	1000	157	449	7	**27**
	G4: No EB slip off-ramp, with WB barrier	1457	1449	1300	1000	157	449	7	**27**
	G5: No EB slip off-ramp, with WB C-D system	1457	1449	1300	1000	157	449	7	**27**
	H: Hybrid Alternative	1457	1449	1300	1000	157	449	7	**27**
	H1: Hybrid with Flyover Alternative	1457	1449	1300	1000	157	449	7	**27**
Del Mar Heights Road to I-5 NB (2 S0V + 1 HOV)	*Existing*	NM	1125	NM	593	-	532	-	**54**
	E: No Build	1504	1473	1225	1290	279	183	14	9
	F: Auxiliary Lane Alternative	1504	1473	1225	1290	279	183	14	9
	G: Direct Connectors Alternative	1170	1251	1225	1290	-	-	-	-
	H: Hybrid Alternative	1170	1251	1225	1290	-	-	-	-
	H1: Hybrid with Flyover Alternative	1170	1251	1225	1290	-	-	-	-
WB Del Mar Heights Road (loop ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	810	540	368	368	442	172	**72**	**28**
	E: No Build	1125	720	740	550	385	170	**31**	**19**
	F: Auxiliary Lane Alternative	1125	720	740	550	385	170	**31**	**19**
	G: Direct Connectors Alternative [h]	1125	720	740	550	385	170	**31**	**19**
	H: Hybrid Alternative	1125	720	740	550	385	170	**31**	**19**
	H1: Hybrid with Flyover Alternative	1125	720	740	550	385	170	**31**	**19**
EB Del Mar Heights Road (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	495	495	492	492	3	3	0	0
	E: No Build	711	540	1175	750	-	-	-	-
	F: Auxiliary Lane Alternative	711	540	1175	750	-	-	-	-
	G: Direct Connectors Alternative [h]	711	540	1175	750	-	-	-	-
	H: Hybrid Alternative	711	540	1175	750	-	-	-	-
	H1: Hybrid with Flyover Alternative	711	540	1175	750	-	-	-	-

TABLE 8–14
EXISTING AND YEAR 2030 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
WB Via de la Valle (direct ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	360	NM	343	-	17	-	3
	E: No Build	451	501	460	480	-	21	-	3
	F: Auxiliary Lane Alternative	451	501	460	480	-	21	-	3
	G: Direct Connectors Alternative	414	477	460	480	-	-	-	-
	H: Hybrid Alternative	414	477	460	480	-	-	-	-
	H1: Hybrid with Flyover Alternative	414	477	460	480	-	-	-	-
EB Via de la Valle (loop ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	540	NM	318	-	222	-	**42**
	E: No Build	387	648	430	670	-	-	-	-
	F: Auxiliary Lane Alternative	387	648	430	670	-	-	-	-
	G: Direct Connectors Alternative	387	648	430	670	-	-	-	-
	H: Hybrid Alternative	387	648	430	670	-	-	-	-
	H1: Hybrid with Flyover Alternative	387	648	430	670	-	-	-	-
WB Via de la Valle (loop ramp) to I-5 SB (1 S0V + 1 HOV)	*Existing*	603	468	343	343	260	125	**45**	**22**
	E: No Build	720	675	750	700	-	-	-	-
	F: Auxiliary Lane Alternative	720	675	750	700	-	-	-	-
	G: Direct Connectors Alternative	720	675	750	700	-	-	-	-
	H: Hybrid Alternative	720	675	750	700	-	-	-	-
	H1: Hybrid with Flyover Alternative	720	675	750	700	-	-	-	-
EB Via de la Valle (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	819	684	593	593	226	91	**23**	9
	E: No Build	882	738	930	770	-	-	-	-
	F: Auxiliary Lane Alternative	882	738	930	770	-	-	-	-
	G: Direct Connectors Alternative	882	738	930	770	-	-	-	-
	H: Hybrid Alternative	882	738	930	770	-	-	-	-
	H1: Hybrid with Flyover Alternative	882	738	930	770	-	-	-	-
Carmel Valley Road to SR-56 WB (2 S0V + 1 HOV)	*Existing*	734	NM	343	NM	391	-	**68**	-
	E: No Build	755	534	686	686	69	-	6	-
	F: Auxiliary Lane Alternative	755	534	686	686	69	-	6	-
	G: Direct Connectors Alternative	792	558	686	686	106	-	9	-
	H: Hybrid Alternative	792	558	686	686	106	-	9	-
	H1: Hybrid with Flyover Alternative	792	558	686	686	106	-	9	-
WB SR 56 to NB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	E: No Build	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	F: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	G: Direct Connectors Alternative [i]	865	575	760	510	105	65	8	8
	G2: No EB slip off-ramp, no WB barrier	865	575	760	510	105	65	8	8
	G3: With EB slip off-ramp, with WB barrier	669	332	760	510	0	0	0	0
	G4: No EB slip off-ramp, with WB barrier	669	332	760	510	0	0	0	0
	G5: No EB slip off-ramp, with WB C-D system	865	575	760	510	105	65	8	8
	H: Hybrid Alternative [i]	865	575	760	510	105	65	8	8
	H1: Hybrid with Flyover Alternative	865	575	760	510	105	65	8	8

TABLE 8–14
EXISTING AND YEAR 2030 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
WB SR 56 to SB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	E: No Build	1998	1000	1750 [j]	900 [j]	249	100	9	7
	F: Auxiliary Lane Alternative	1998	1000	1750	900	249	100	9	7
	F2: No EB slip off-ramp, no WB barrier	1998	1000	1750	900	249	100	9	7
	F3: With EB slip off-ramp, with WB barrier	1811	801	1750	900	61	0	2	0
	F4: No EB slip off-ramp, with WB barrier	1811	801	1750	900	61	0	2	0
	G: Direct Connectors Alternative	1998	1000	1750	900	249	100	9	7
	G2: No EB slip off-ramp, no WB barrier	1998	1000	1750	900	249	100	9	7
	G3: With EB slip off-ramp, with WB barrier	1811	801	1750	900	61	0	2	0
	G4: No EB slip off-ramp, with WB barrier	1811	801	1750	900	61	0	2	0
	G5: No EB slip off-ramp, with WB C-D system	1811	801	1750	900	61	0	2	0
	H: Hybrid Alternative	1811	801	1750	900	61	0	2	0
	H1: Hybrid with Flyover Alternative	1811	801	1750	900	61	0	2	0

Footnotes:

a. Peak hour ramp volumes obtained from Year 2030 Traffic Volumes. SOV peak hour volumes calculated to be 90% of the total on ramp volume (10% accounted for HOV).
b. Peak hour ramp meter rate derived by Caltrans Ramp Metering Branch for the I-5 North Coast Project.
c. Excess demand = SOV Peak hour volume - ramp meter rate.
d. Delay (min) = (Excess demand / Meter rate) * 60.
e. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
f. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
g. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
h. Del Mar Heights Road on-ramp to I-5 SB merges with I-5 SB Bypass in the Year 2030 Direct Connectors (Run G) scenario.
i. The ramp meter rate for the WB SR 56 to NB I-5 freeway connector calculated based on a maximum delay of 8 minutes.
j. The ramp meter rate for the WB SR 56 to SB I-5 freeway connector obtained from I-5 North Coast Year 2030 Freeway Operations Report.

General Notes:
Bold typeface indicates delays 15 minutes or more.
Ramp Meter Methodology based on SANTEC/ ITE Guidelines.
The lanes shown in the table refer to the Year 2030 Direct Connectors (Run G) scenario.
Blank cells (dashes) means ramp volumes are less than ramp metering rate.
NM – Not metered.
DNE – Does not exist.

TABLE 8–15
EXISTING AND YEAR 2030 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Mountain Road to I-5 NB Bypass (2 S0V + 1 HOV)	*Existing*	NM	540	NM	398	-	142	-	**15**
	E: No Build	648	864	670	910	-	-	-	-
	F: Auxiliary Lane Alternative	648	864	670	910	-	-	-	-
	G: Direct Connectors Alternative	648	864	670	910	-	-	-	-
	H: Hybrid Alternative	648	864	670	910	-	-	-	-
	H1: Hybrid with Flyover Alternative	648	864	670	910	-	-	-	-
Carmel Mountain Road to I-5 SB Bypass (2 S0V + 1 HOV)	*Existing*	NM	NM	NM	NM	-	-	-	-
	E: No Build	1008	792	1045	830	-	-	-	-
	F: Auxiliary Lane Alternative	1008	792	1045	830	-	-	-	-
	G: Direct Connectors Alternative	1008	792	1045	830	-	-	-	-
	H: Hybrid Alternative	1008	792	1045	830	-	-	-	-
	H1: Hybrid with Flyover Alternative	1008	792	1045	830	-	-	-	-
Carmel Valley Road to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	612	NM	677	-	0	-	0
	E: No Build	1213	1040	*970* [e]	*830* [e]	243	210	**15**	**15**
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1213	1040	*970* [e]	940	243	210	**15**	-
	F2: No EB slip off-ramp, no WB barrier	1213	1040	*970* [e]	940	243	210	**15**	-
	F3: With EB slip off-ramp, with WB barrier	1213	1040	*970* [e]	940	243	210	**15**	-
	F4: No EB slip off-ramp, with WB barrier	1213	1040	*970* [e]	940	243	210	**15**	-
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	351	468	340	470	11	-	2	-
	G2: No EB slip off-ramp, no WB barrier [f]	351	468	340	470	11	-	2	-
	G3: With EB slip off-ramp, with WB barrier [g]	704	906	*560* [e]	*725* [e]	144	181	**15**	**15**
	G4: No EB slip off-ramp, with WB barrier [h]	704	906	*560*	*725*	144	181	**15**	**15**
	G5: No EB slip off-ramp, with WB C-D system	351	468	340	470	11	-	2	-
	H: Hybrid Alternative	351	468	340	470	11	-	2	-
	H1: Hybrid with Flyover Alternative	351	468	340	470	11	-	2	-

TABLE 8–15 *continued*
EXISTING AND YEAR 2030 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Valley Road to I-5 SB (2 S0V)	*Existing*	840	NM	710	NM	130	-	11	-
	E: No Build	1080	1050	1300	1000	-	-	-	-
	F: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1080	1050	1300	1000	-	-	-	-
	F2: No EB slip off-ramp, no WB barrier	1080	1050	1300	1000	-	-	-	-
	F3: With EB slip off-ramp, with WB barrier	1457	1449	1300	*1160* [e]	157	289	7	**15**
	F4: No EB slip off-ramp, with WB barrier	1457	1449	1300	*1160* [e]	157	289	7	**15**
	G: Direct Connectors, With EB slip off-ramp, no WB barrier	1080	1050	1300	1000	-	-	-	-
	G2: No EB slip off-ramp, no WB barrier	1080	1050	1300	1000	-	-	-	-
	G3: With EB slip off-ramp, with WB barrier	1457	1449	1300	*1160* [e]	157	289	7	**15**
	G4: No EB slip off-ramp, with WB barrier	1457	1449	1300	*1160* [e]	157	289	7	**15**
	G5: No EB slip off-ramp, with WB C-D system	1457	1449	1300	*1160* [e]	157	289	7	**15**
	H: Hybrid Alternative	1457	1449	1300	*1160* [e]	157	289	7	**15**
	H1: Hybrid with Flyover Alternative	1457	1449	1300	*1160* [e]	157	289	7	**15**
Del Mar Heights Road to I-5 NB (2 S0V + 1 HOV)	*Existing*	NM	1125	NM	593	-	532	-	**15**
	E: No Build	1504	1473	1225	1290	279	183	14	9
	F: Auxiliary Lane Alternative	1504	1473	1225	1290	279	183	14	9
	G: Direct Connectors Alternative	1170	1251	1225	1290	-	-	-	-
	H: Hybrid Alternative	1170	1251	1225	1290	-	-	-	-
	H1: Hybrid with Flyover Alternative	1170	1251	1225	1290	-	-	-	-

TABLE 8–15
EXISTING AND YEAR 2030 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
WB Del Mar Heights Road (loop ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	810	540	368	368	442	172	**15**	**15**
	E: No Build	1125	720	*900* [e]	*575* [e]	225	145	**15**	**15**
	F: Auxiliary Lane Alternative	1125	720	*900* [e]	*575* [e]	225	145	**15**	**15**
	G: Direct Connectors Alternative [i]	1125	720	*900*	*575*	385	170	**15**	**15**
	H: Hybrid Alternative	1125	720	*900* [e]	*575* [e]	225	145	**15**	**15**
	H1: Hybrid with Flyover Alternative	1125	720	*900* [e]	*575* [e]	225	145	**15**	**15**
EB Del Mar Heights Road (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	495	495	492	492	3	3	0	0
	E: No Build	711	540	1175	750	-	-	-	-
	F: Auxiliary Lane Alternative	711	540	1175	750	-	-	-	-
	G: Direct Connectors Alternative [i]	711	540	1175	750	-	-	-	-
	H: Hybrid Alternative	711	540	1175	750	-	-	-	-
	H1: Hybrid with Flyover Alternative	711	540	1175	750	-	-	-	-
WB Via de la Valle (direct ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	360	NM	343	-	17	-	3
	E: No Build	451	501	460	480	-	21	-	3
	F: Auxiliary Lane Alternative	451	501	460	480	-	21	-	3
	G: Direct Connectors Alternative	414	477	460	480	-	-	-	-
	H: Hybrid Alternative	414	477	460	480	-	-	-	-
	H1: Hybrid with Flyover Alternative	414	477	460	480	-	-	-	-
EB Via de la Valle (loop ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	-	540	-	318	-	222	-	**42**
	E: No Build	387	648	430	670	-	-	-	-
	F: Auxiliary Lane Alternative	387	648	430	670	-	-	-	-
	G: Direct Connectors Alternative	387	648	430	670	-	-	-	-
	H: Hybrid Alternative	387	648	430	670	-	-	-	-
	H1: Hybrid with Flyover Alternative	387	648	430	670	-	-	-	-
WB Via de la Valle (loop ramp) to I-5 SB (1 S0V + 1 HOV)	*Existing*	603	468	343	343	260	125	**15**	**15**
	E: No Build	720	675	750	700	-	-	-	-
	F: Auxiliary Lane Alternative	720	675	750	700	-	-	-	-
	G: Direct Connectors Alternative	720	675	750	700	-	-	-	-
	H: Hybrid Alternative	720	675	750	700	-	-	-	-
	H1: Hybrid with Flyover Alternative	720	675	750	700	-	-	-	-
EB Via de la Valle (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	819	684	593	593	226	91	**15**	9
	E: No Build	882	738	930	770	-	-	-	-
	F: Auxiliary Lane Alternative	882	738	930	770	-	-	-	-
	G: Direct Connectors Alternative	882	738	930	770	-	-	-	-
	H: Hybrid Alternative	882	738	930	770	-	-	-	-
	H1: Hybrid with Flyover Alternative	882	738	930	770	-	-	-	-
Carmel Valley Road to SR-56 WB (2 S0V + 1 HOV)	*Existing*	734	NM	343	NM	391	-	**15**	-
	E: No Build	755	534	686	686	69	-	6	-
	F: Auxiliary Lane Alternative	755	534	686	686	69	-	6	-
	G: Direct Connectors Alternative	792	558	686	686	106	-	9	-
	H: Hybrid Alternative	792	558	686	686	106	-	9	-
	H1: Hybrid with Flyover Alternative	792	558	686	686	106	-	9	-

TABLE 8–15
EXISTING AND YEAR 2030 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Delay (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
WB SR 56 to NB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	E: No Build	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	F: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	G: Direct Connectors Alternative	865	575	760 [j]	510 [j]	105	65	8	8
	G2: No EB slip off-ramp, no WB barrier	865	575	760	510	105	65	8	8
	G3: With EB slip off-ramp, with WB barrier	669	332	760	510	0	0	0	0
	G4: No EB slip off-ramp, with WB barrier	669	332	760	510	0	0	0	0
	G5: No EB slip off-ramp, with WB C-D system	865	575	760	510	105	65	8	8
	H: Hybrid Alternative	865	575	760	510	105	65	8	8
	H1: Hybrid with Flyover Alternative	865	575	760	510	105	65	8	8
WB SR 56 to SB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	E: No Build	1998	1000	1750 [k]	900 [k]	249	100	9	7
	F: Auxiliary Lane Alternative	1998	1000	1750	900	249	100	9	7
	F2: No EB slip off-ramp, no WB barrier	1998	1000	1750	900	249	100	9	7
	F3: With EB slip off-ramp, with WB barrier	1811	801	1750	900	61	0	2	0
	F4: No EB slip off-ramp, with WB barrier	1811	801	1750	900	61	0	2	0
	G: Direct Connectors Alternative	1998	1000	1750	900	249	100	9	7
	G2: No EB slip off-ramp, no WB barrier	1998	1000	1750	900	249	100	9	7
	G3: With EB slip off-ramp, with WB barrier	1811	801	1750	900	61	0	2	0
	G4: No EB slip off-ramp, with WB barrier	1811	801	1750	900	61	0	2	0
	G5: No EB slip off-ramp, with WB C-D system	1811	801	1750	900	61	0	2	0
	H: Hybrid Alternative	1811	801	1750	900	61	0	2	0
	H1: Hybrid with Flyover Alternative	1811	801	1750	900	61	0	2	0

Footnotes:

a. Peak hour ramp volumes obtained from Year 2030 Traffic Volumes. SOV peak hour volumes calculated to be 90% of the total on ramp volume (10% accounted for HOV).
b. Peak hour ramp meter rate derived by Caltrans Ramp Metering Branch for the I-5 North Coast Project.
c. Excess demand = SOV Peak hour volume - ramp meter rate.
d. Delay (min) = (Excess demand / Meter rate) * 60. Delay more than 15 minutes is equal to 15 minutes as any demand exceeding 15-minutes will seek an alternative route or will choose to use the ramp during a less busy time period. In the existing scenario, ramp meter experiencing delays more than 15 minutes have been bolded. Ramp meter rates for 15-minute maximum delay have been derived for the future scenarios only.
e. The flow rates for the alternatives have been derived based on a maximum delay of 15 minutes at the ramp.
f. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
g. This scenario assumes a barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement. The EB slip off-ramp to Carmel Creek Road is maintained in this scenario.
h. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated and barrier on SR-56 WB between Carmel Creek Road and El Camino Real, thereby eliminating the weaving movement.
i. Del Mar Heights Road on-ramp to I-5 SB merges with I-5 SB Bypass in the Year 2030 Direct Connectors (Run G) scenario.
j. The ramp meter rate for the WB SR 56 to NB I-5 freeway connector calculated based on a maximum delay of 8 minutes.
k. The ramp meter rate for the WB SR 56 to SB I-5 freeway connector obtained from I-5 North Coast Year 2030 Freeway Operations Report.

General Notes:

Bold typeface indicates 15-minute delays.
Blank cells (dashes) means ramp volumes are less than ramp metering rate. NM – Not metered. DNE – Does not exist.
The lanes shown in the table refer to the Year 2030 Direct Connectors (Run G) scenario.

TABLE 8–16
YEAR 2030 FREEWAY METER OPERATIONS

Location/Condition	Lane Configuration	Meter Peak	Total Peak Hour Volume[a]	SOV Peak Hour Volume[b]	Peak Hour Demand/Lane[c]	Meter Flow Rate/Lane[d]	Excess Demand	Delay (min)	Queue (ft)[e]
SR-56 at Carmel Creek Interchange									
SR-56 WB Meter – Upstream of Carmel Creek loop ramp (LOS D weaving)	4 SOV	AM	6527	6527	1632	697	935	80	23,369
		PM	*Ramp Meter Not Activated*						
SR-56 WB Meter – Upstream of Carmel Creek loop ramp (LOS E weaving)	4 SOV	AM	6527	6527	1632	942	690	44	17,244
		PM	*Ramp Meter Not Activated*						

Footnotes:

a. Peak hour ramp volumes obtained from 2030 Direct Connectors Run G analysis.
b. SOV peak hour volumes calculated to be 90% of the total on ramp volume (10% accounted for HOV).
c. Peak hour demand per lane calculated with lane utilization factors. (For eg: 2 SOV lanes would have 50% lane utilization factor in each lane).
d. Freeway meter rate calculated by analyzing the LOS (D or E) of weaving section between Carmel Creek Road and El Camino Real off-ramp.
   Freeway meter rate calculated as: Total AM peak hour volume upstream of Carmel Creek ramp (6527 veh/h) – Total volume that can be discharged to achieve LOS D weaving (2784 veh/h) = Excess demand of 3743 veh/h (or 935 veh/h/lane).
   Freeway meter rate calculated as: Total AM peak hour volume upstream of Carmel Creek ramp (6527 veh/h) – Total volume that can be discharged to achieve LOS E weaving (3769 veh/h) = Excess demand of 2758 veh/h (or 690 veh/h/lane).
e. Queue calculated as Excess demand * 25' (assumed car length for conservative analysis). Ramp meters were assumed to be operating at unacceptable conditions, if the peak hour traffic demand/ lane/ hour is greater than the maximum meter rate.

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9.0 QUEUING ANALYSES

This section presents the Year 2030 queuing analyses for the following alternatives:

- No Build Alternative (Model Run E)
- Auxiliary Lane Alternative (Model Run F2)
- Direct Connector Alternative (Model Run G5)
- Hybrid Alternative (Model Run H)
- Hybrid Alternative (Model Run H1)

Table 9–1 shows the queuing analyses for the above alternatives. ***Appendix G*** contains the Year 2030 queuing analyses calculation sheets.

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TABLE 9–1
YEAR 2030 QUEUING ANALYSIS (FEET)

Signalized Intersection	Movement	Available Length No Build (Run E) (Feet)[a]	Available Length Aux. Lane (Run F2) (Feet)[a]	Available Length Direct Conn (Run G5) (Feet)[a]	Available Length Hybrid (Run H) (Feet)[a]	Available Length Hybrid with Flyover (Run H1) (Feet)[a]	Total Peak Hour Queue (Feet)[b]														
							No Build (Model Run E)		Auxiliary Lane (Model Run F(2)		Direct Connector (Model Run G5)		Hybrid (Model Run H)		Hybrid with Flyover (Model Run H1)		Backup onto freeway or adjacent intersection (AM/PM)				
							AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	Run E	Run F(2)	Run G(5)	Run H	Run H1
9. Del Mar Heights Road/ I-5 NB ramps	NB L	1360	1360	1280	1280	1280	350	610	350	610	340	600	350	610	350	610	No/No	No/No	No/No	No/No	No/No
	NB R	1400	1400	1380	1380	1380	**1810**	**1590**	**1810**	**1590**	**1730**	**1490**	**1810**	**1590**	**1810**	**1590**	**Yes**/No	**Yes**/No	No/No	No/No	No/No
	WB R	200	200	200	200	200	**810**	**640**	**810**	**640**	**620**	**520**	**570**	**500**	**620**	**520**	No/No	No/No	No/No	No/No	No/No
	EB T	1310	1310	1345	1310	1310	**1520**	1150	**1520**	1150	1230	830	**1520**	1150	**1520**	1150	**Yes**/No	**Yes**/No	No/No	**Yes**/No	**Yes**/No
	EB L	930	930	940	930	930	680	730	680	730	620	720	680	730	680	730	No/No	No/No	No/No	No/No	No/No
24. Carmel Valley Road/ I-5 SB ramps	SB L	1570	1570	1170	1570	1570	**1630**	**1910**	1350	**1600**	490	390	1350	**1600**	1350	**1600**	**Yes /Yes**	No/**Yes**	No/No	No/**Yes**	No/**Yes**
	WB T	980	980	980	980	980	370	280	370	280	230	190	370	280	370	280	No/No	No/No	No/No	No/No	No/No
	WB L	590	590	590	590	590	**810**	**920**	**810**	**920**	**930**	**1380**	**900**	**1660**	**900**	**1660**	**Yes/Yes**	**Yes/Yes**	**Yes/Yes**	**Yes/Yes**	**Yes/Yes**
25. Carmel Valley Road/ I-5 NB ramps[c]	WB R	460	460	460	460	460	50	30	40	60	80	120	50	50	50	50	No/No	No/No	No/No	No/No	No/No
	NB L[d]	830	725	775	775	1030	410	780	470	**1030**	350	660	470	**1030**	420	840	No/No	No/**Yes**	No/No	No/**Yes**	No/No
	NB R[d]	1100	1400	1455	1455	1060	840	770	**2240**	**2990**	1040	1340	**2240**	**2990**	**2990**	**3280**	No/No	**Yes/Yes**	No/ No	**Yes/ Yes**	**Yes/ Yes**
	EB T	980	980	980	980	1410	**1890**	**2430**	**2420**	**2880**	**1710**	**2280**	**2420**	**2880**	**1870**	**2120**	**Yes/Yes**	**Yes/Yes**	**Yes/Yes**	**Yes/Yes**	**Yes/Yes**
	EB L	260	260	260	260	260	200	180	200	180	230	180	200	180	200	180	No/No	No/No	No/No	No/No	No/No
28. El Camino Real/ SR-56 WB off-ramp	WB T	1970	1970	1340	1340	1340	1530	930	1470	770	1260	590	1260	590	1260	590	No/No	No/No	No/No	No/No	No/No
29. El Camino Real/ SR-56 EB on-ramp	EB T	2360	3310	3310	3310	2360	550	**2370**	1150	**3320**	630	1650	1150	**3320**	1030	**2920**	No/**Yes**	No/**Yes**	No/No	No/**Yes**	No/**Yes**
30. Carmel Creek Road/ SR-56 WB ramps	SB L	530	530	530	530	530	630	**820**	560	**770**	420	**720**	440	**720**	440	**720**	No/ No	No/No	No/No	No/No	No/No
	WB T	970	1080	1080	1080	1080	840	510	540	330	530	320	560	330	560	330	No/No	No/No	No/No	No/No	No/No
	NB R	480	480	480	480	480	40	10	50	10	30	10	30	10	30	10	No/No	No/No	No/No	No/No	No/No
	EB T	520	520	520	520	520	150	330	160	330	160	340	160	160	160	160	No/No	No/No	No/No	No/No	No/No
31. Carmel Creek Road/ SR-56 EB ramps	SB L	690	690	690	690	690	**730**	**780**	260	**710**	240	610	260	680	260	680	No/No	No/No	No/No	No/No	No/No
	EB	1600	1710	1330	1710	1200	1260	1620	800	1100	780	1040	780	1040	780	1040	No/No	No/No	No/No	No/No	No/No
33. Carmel Country Road/ SR-56 WB ramps	SB L	340	340	340	340	340	**750**	**450**	**920**	**450**	**940**	**520**	**940**	**520**	**940**	**520**	**Yes/Yes**	**Yes/Yes**	**Yes/Yes**	**Yes/Yes**	**Yes/Yes**
	WB	2130	2130	2130	2130	2130	240	310	540	360	210	150	210	150	210	150	No/No	No/No	No/No	No/No	No/No
34. Carmel Country Road/ SR-56 EB ramps	SB L	720	720	720	720	720	550	360	640	650	420	250	690	650	690	650	No/No	No/No	No/No	No/No	No/No
	EB	2230	2230	2230	2230	2230	420	1120	680	2030	680	1790	680	1790	680	1790	No/No	No/No	No/No	No/No	No/No

Footnotes:

a. Available pocket length for "non-ramp intersections" measured from stop line of intersection to bay taper flare. Pocket length for ramp intersections measured from stop line of intersection to off-ramp nose.
b. 95th percentile queue lengths from Synchro software reported. 95th percentile queues are defined as the queue length that has only a 5% probability of being exceeded. Total approach peak hour queues reported in above table. All queues rounded to the nearest 10.
c. Analyses for this intersection assumes an exclusive left, shared left-thru-*right* and two exclusive right-turn lanes for the Auxiliary Lane, Direct Connector, Hybrid Alternatives. The Hybrid with flyover Alternative assumes only dual right-turn lanes.
d. In this intersection, the storage for LTR approach is spilt up 50/50 and added to the NBL and NBR movements. Likewise, the calculated queue lengths are split up into NBL and NBR movements based on the proportions of turning movement volumes.

General Notes:

Bold typeface indicates calculated queues exceed storage length. Even though the s queue spillback may exceed available storage, No or Yes represents possible spillback onto freeway or adjacent intersection.

9.1 Analyses/ Results

9.1.1 *No Build Alternative (Model Run E)*

The No Build (Model Run E) Alternative shows poor queuing operations along the intersections of Del Mar Heights Road and Carmel Valley Road. The SB left-turn queue at the I-5 SB/Carmel Valley Road exit is calculated to spillback beyond the off-ramp gore in the AM and PM peak hours. This is due to the heavy freeway-to-freeway traffic between I-5 and SR 56 on Carmel Valley Road. The freeway-to-freeway traffic would be forced to use the Carmel Valley diamond interchange, leading to poor intersection and queuing operations.

In the PM peak hour, the EB through movement at the El Camino Real/ SR 56 Eastbound on-ramp intersection is calculated to spillback beyond the I-5 NB ramps at Carmel Valley Road. This directly impacts the I-5 SB ramps/ Carmel Valley Road intersection, leading to long off-ramp queues and queue spillback beyond the off- ramp gore at I-5 SB/Carmel Valley Road exit.

There are a number of locations where the queues exceed the storage length. Some of these locations are more problematic than others. It was decided that the queuing onto the freeway or an upstream intersection deserved special attention.

The queues for the following intersections are calculated to spillback onto the freeway or an upstream intersection:

- Del Mar Heights Road/ I-5 NB ramps, EBT – AM peak hour
- Del Mar Heights Road/ I-5 NB ramps, NBR – AM peak hour
- Carmel Valley Road/ I-5 SB ramps, SBL – AM and PM peak hours
- Carmel Valley Road/ I-5 SB ramps, WBL – AM and PM peak hours
- Carmel Valley Road/ I-5 NB ramps, EBT– AM and PM peak hours
- El Camino Real/ SR 56 EB on- ramp, EBT – PM peak hour
- Carmel Country Road/ SR 56 WB ramps, SBL – AM and PM peak hours

9.1.2 *Auxiliary Lane Alternative (Model Run F2)*

The Auxiliary Lane Alternative proposes the following improvements:

- Addition of a fourth lane at the SB approach of I-5 SB ramps/Carmel Valley Road and re-striping the SB approach to show dual left-turn lanes, a shared thru-right and an exclusive right-turn lane *(intersection improvement)*.
- Addition of a westbound right-turn lane at I-5 Northbound ramps/Carmel Valley Road intersection *(intersection improvement)*.
- Widening of the NB I-5 on-ramp at Carmel Valley Road to add a second SOV lane on the ramp *(ramp widening)*.
- Addition of a WB thru lane at Old El Camino/ Carmel Valley Road intersection *(intersection improvement)*.
- Addition of a third and fourth EB through lane at the intersection of El Camino Real/SR-56 EB on-ramp and re-striping the EB approach to show dual left-turn

lanes, two through lanes, one shared through right lane and an exclusive right-turn lane and thereby addition of a third lane on the SR-56 EB on-ramp at El Camino Real *(intersection improvement)*.
- Addition of a fourth WB through lane at the intersection of El Camino Real/ SR-56 WB off-ramp and re-striping the approach to show an exclusive left-turn lane, a shared left through lane, three exclusive through lanes and a right-turn lane *(intersection improvement)*.

Even with the proposed improvements, the Auxiliary Lane F(2) Alternative shows poor queuing operations along Carmel Valley Road. The EB queuing is further increased in comparison to the No Build scenario at El Camino Real/SR-56 EB on-ramp intersection because of the re-routed traffic due to the removal of slip-off ramp to Carmel Creek Road.

The queues for the following intersections are calculated to spillback onto the freeway or an upstream intersection:

- Del Mar Heights Road/ I-5 NB ramps, EBT – AM peak hour
- Del Mar Heights Road/ I-5 NB ramps, NBR – AM peak hour
- Carmel Valley Road/ I-5 SB ramps, SBL – PM peak hour
- Carmel Valley Road/ I-5 SB ramps, WBL – AM and PM peak hours
- Carmel Valley Road/ I-5 NB ramps:
  - NBL – PM peak hour
  - NBR – AM and PM peak hours
  - EBT– AM and PM peak hours
- El Camino Real/ SR 56 EB on- ramp, EBT – PM peak hour
- Carmel Country Road/ SR 56 WB ramps, SBL – AM and PM peak hours

9.1.3 *Direct Connector Alternative (Model Run G5)*

The following are the queues that are calculated to backup onto the adjacent intersection in the Direct Connector G(5) scenario:

- Carmel Valley Road/ I-5 SB ramps, WBL – AM and PM peak hours
- Carmel Valley Road/ I-5 NB ramps, EBT – AM and PM peak hours
- Carmel Country Road/ SR 56 WB ramps, SBL – AM and PM peak hours

It was decided that the queuing onto the freeway mainline deserved special attention in comparison to the queuing onto the local streets. The WBL queue at the Carmel Valley Road/ I-5 SB ramps in the G(5) scenario is due to the additional trips from Carmel Creek Road to I-5 SB that are restricted in the collector-distributor (C-D) alternative. The WB queues are calculated to spillback between the I-5 NB ramps and Old El Camino. This is expected with the heavy WBL volume at the I-5 SB ramps/ Carmel Valley Road intersection and the inadequate storage due to the relatively short back-back left-turn lanes.

The NBR queue at the Carmel Valley Road/ I-5 NB ramps is calculated to be contained within the off-ramp gore at I-5 NB/ Carmel Valley Road exit in the Direct Connector G(5) scenario. The analysis for the No EB slip off-ramp to Carmel Creek Road assumed 75% of the vehicles would use the Carmel Valley diamond interchange and 25% would use diverted routes like Carmel Creek Road and Carmel Country Road. This analysis is considered conservative leading to high NB turning volumes at the I-5 NB ramps/ Carmel Valley Road intersection. The queues calculated represent "what if" 75% arrive at the ramp. The travel patterns are more likely to change with time with people identifying long queues and seeking alternative routes and setting a balance within the system.

The queues shown in *Table 9–1* includes an exclusive left, a shared left/thru/*right* and two exclusive right-turn lanes for the NB approach at the I-5 NB ramps/ Carmel Valley Road intersection for the Auxiliary Lane, Direct Connector and Hybrid Alternatives. This concept of "triple right-turn lanes" is used at some locations across San Diego County (Eg: I-805 NB ramps/ Mira Mesa Blvd intersection and Scranton Road/Mira Mesa Blvd SB approach) to enhance capacity and prevent queuing problems. Based on field observations, these locations operate well. With the triple right-turns and four departure lanes on EB Carmel Valley Road, the queues at the NB off-ramp at I-5 NB ramps/ Carmel Valley Road intersection are calculated to be contained without spillback onto the freeway in the Direct Connector Alternative.

The striping change from dual right-turns to triple right-turns can be implemented based on the traffic operations at the I-5 NB ramps/ Carmel Valley Road intersection. In the interim or horizon year, if the observed queues exceed the storage lengths, this striping change can be implemented with minimal cost and labor. Further the EB departure side of the I-5 NB ramps/ Carmel Valley Road intersection is wide enough for four lanes, which should help right-turning vehicles transition from the off-ramp onto EB Carmel Valley Road. The triple right turns should be striped to turn into the number 1, 2 and 3 lane on Carmel Valley Road, providing the largest turning radius possible. The fourth lane on EB Carmel Valley Road would add extra segment capacity and enhance arterial operations.

Alternatively, the triple rights could turn into only three departure lanes instead of four. This would allow for slightly larger lane widths in the number 1 and 2 lanes while still providing a wide number 3 lane for trucks. Three departure lanes would still provide large turning radii and wider departure lane widths than four departure lanes. The fourth EB lane on Carmel Valley Road could begin about 200'west of the Old El Camino Real traffic signal

The short intersection spacing (250 feet) between the I-5 NB ramps and Old El Camino Real on Carmel Valley Road should be noted. There could be a lane utilization issue for drivers turning from the number 3 right-turn lane at the I-5 NB off-ramp trying to access the gas station at Old El Camino Real. Drivers desiring to do this would have to make two lane changes in about 200 feet. Drivers wanting to turn left onto Old El Camino Real should be using the number 1 right-turn lane, but not all drivers will adequately plan ahead. In the interim or horizon year, if the observed queues exceed the available storage between the NB ramps and Old El Camino Real intersections, LLG

recommends that the City either eliminate the EB left-turn lane access into gas station and still maintain the traffic signal at Old El Camino Real (allow left-turn out from the gas station) or eliminate the traffic signal completely and allow a right-in/right-out access to the gas station by closing the median.

With the removal of the traffic signal at Old El Camino Real on Carmel Valley Road, LLG foresees the following pros and cons:

Pros:
Enhance Arterial Operations: With the removal of the traffic signal at Old El Camino Real, traffic progression is expected to get better. It is generally discouraged to have traffic signals in a short distance as spacing of traffic signals has a major impact on traffic progression. Further removal of the gas station also provides more intersection spacing and queue storage between the I-5 NB ramps and El Camino Real intersections.

Travel Time Savings: LLG believes that the removal of the traffic signal will improve travel time along EB and WB Carmel Valley Road but the travel time savings will be minimal (between 0 and 30 seconds) as the conflicting movements at this intersection are low. The travel time savings will be based on traffic signal coordination and traffic signal phasing at I-5 NB ramps and El Camino Real intersections. Based on field observations and existing traffic volumes, Carmel Valley Road currently has majority of the green time and the signal delay at Old El Camino Real is minimal.

Cons:
Out of direction travel: The gas station customers along EB Carmel Valley Road would no longer be able to access the gas station by making a left-turn. They would have make u-turns at the SR 56 EB and WB/ El Camino Real intersections, travel on WB Carmel Valley Road and turn right into the gas station. Similarly vehicles intending to go east on Carmel Valley Road from the gas station would have to travel on WB Carmel Valley Road before making a u-turn at Sorrento Valley Road/ Carmel Valley Road intersection.

9.1.4 *Hybrid Alternative (Model Run H)*

The queuing operations for the Hybrid Alternative are calculated to be similar to the Auxiliary Lane (in the SB I-5 to EB SR 56 movement) and Direct Connector Alternatives (WB SR 56 to NB I-5 movement). The following are the queues that are calculated to backup onto the adjacent intersection in the Hybrid scenario:

- Del Mar Heights Road/ I-5 NB ramps, EBT – AM peak hour
- Carmel Valley Road/ I-5 SB ramps, SBL – PM peak hour
- Carmel Valley Road/ I-5 SB ramps, WBL – AM and PM peak hours
- Carmel Valley Road/ I-5 NB ramps:
    - NBL – PM peak hour
    - NBR – AM and PM peak hours

    - EBT– AM and PM peak hours
- El Camino Real/ SR 56 EB on- ramp, EBT – PM peak hour
- Carmel Country Road/ SR 56 WB ramps, SBL – AM and PM peak hours

The Hybrid Alternative is a combination of the Auxiliary Lane Alternative and Direct Connector Alternatives. The critical movements that are calculated to backup onto the freeway in the Auxiliary Lane Alternative are also calculated to spillback in the Hybrid Alternative as well. The WB collector-distributor re-routes traffic from the Carmel Creek loop on-ramp onto WB Carmel Valley Road. These rerouted trips utilize additional signal green time and increase queues on Carmel Valley Road.

9.1.5 *Hybrid with Flyover Alternative (Model Run H1)*

The queuing operations for the Hybrid with Flyover Alternative are calculated to be similar to the Hybrid Alternative (in the SB I-5 to EB SR 56 movement) and Direct Connector Alternatives (WB SR 56 to NB I-5 movement). The only difference between the Hybrid and Hybrid with Flyover Alternative is the traffic from SB I-5 to EB SR 56 would use the flyover and "miss" the El Camino Real/ SR 56 EB on-ramp intersection.

The following are the queues that are calculated to backup onto the adjacent intersection in the Hybrid scenario:

- Del Mar Heights Road/ I-5 NB ramps, EBT – AM peak hour
- Carmel Valley Road/ I-5 SB ramps, SBL – PM peak hour
- Carmel Valley Road/ I-5 SB ramps, WBL – AM and PM peak hours
- Carmel Valley Road/ I-5 NB ramps:
    - NBL – PM peak hour
    - NBR – AM and PM peak hours
    - EBT– AM and PM peak hours
- El Camino Real/ SR 56 EB on- ramp, EBT – PM peak hour
- Carmel Country Road/ SR 56 WB ramps, SBL – AM and PM peak hours

The critical movements that are calculated to backup onto the freeway in the Auxiliary Lane Alternative are also calculated to spillback in the Hybrid with Flyover Alternative. Even with the flyover, queuing issues are calculated on Carmel Valley Road between the I-5 ramps. Further with only 2 EB lanes on Carmel Valley Road feeding El Camino Real, significant queuing is expected because of the re-routed traffic due to the elimination of the EB slip off-ramp to Carmel Creek Road.

9.2 Conclusions

Based on the above queuing analyses, the Direct Connector G(5) Alternative shows improved operations when compared to the No Build, Auxiliary Lane F(2) and Hybrid Alternatives. Even with proposed intersection improvements in the Auxiliary Lane F(2), Hybrid and Hybrid with Flyover Alternatives, the queuing at the critical intersections exceeds capacity. The traffic in these

alternatives are forced to use the Carmel Valley Road diamond interchange causing severe queuing issues, degrading intersection operations.

10.0 TRAVEL TIME STUDY

This section highlights the Year 2030 travel times among the different routes in the I-5/SR 56 project study area. The travel time study include the No Build (Run E), Auxiliary lane F(2), Direct Connector G(5), Hybrid and Hybrid with Flyover Alternatives.

10.1 Existing Travel Time Data Collection and Travel Routes

The travel routes were developed in discussions with Caltrans and the City of San Diego. All the travel routes had the same start and end point. Each route included either a *Freeway route* or a *Local Street route* through the neighboring intersections and community. The travel time analyses identified the starting and end points as I-5 at Del Mar Heights Road and SR 56 at Carmel Valley Road respectively. Between these cordon points, this analysis forecasted Year 2030 travel times among different alternatives a driver might possibly experience by either traveling completely on the freeway (SR 56 and I-5) or by driving on local streets like Carmel Valley Road, Carmel Country Road, Carmel Creek Road and El Camino Real to avoid freeway congestion.

The existing travel time data for the various routes were collected with pilot car runs completed on June 4 and 5, 2008 during the AM, mid-day and PM peak periods. Schools were in session. Two runs for every route were completed.

The following are the different travel time routes that are analyzed in this study:

WB SR 56/ Carmel Valley Road to NB I-5/ Del Mar Heights Road

Freeway Routes

- ***Route F1:*** WB SR 56 freeway to NB I-5 freeway route (Auxiliary Lane and No Build alternatives would use the Carmel Valley diamond interchange and the Direct Connector alternative would use the proposed freeway-to-freeway connectors).

Local Routes

- ***Route L1:*** WB SR 56 freeway exit at Carmel Valley Road, travel north on Carmel Valley Road through local street intersections, left on Del Mar Heights Road and enter I-5 NB on-ramp at Del Mar Heights Road.

- ***Route L2:*** WB SR 56/ Carmel Valley Road freeway route to exit at Carmel Country Road, travel north on Carmel Country Road through local street intersections, left on Del Mar Heights Road and enter I-5 NB on-ramp at Del Mar Heights Road.

- ***Route L3:*** WB SR 56/ Carmel Valley Road freeway route to exit at Carmel Creek Road, travel north on Carmel Creek Road, turn left at Carmel Country Road through local street intersections, left on Del Mar Heights Road and enter I-5 NB on-ramp at Del Mar Heights Road.

- ***Route L4:*** WB SR 56/ Carmel Valley Road freeway route to exit at El Camino Real, travel north on El Camino Real through local street intersections, turn left at Del Mar Heights Road and enter I-5 NB on-ramp at Del Mar Heights Road

Routes F2, L5, L6, L7 and L8 represent the same routes in the opposite direction of SB I-5/ Del Mar Heights Road to EB SR 56/ Carmel Valley Road. ***Appendix H*** contains existing travel time data completed by pilot car runs.

10.2 Analysis Methodology

The travel time analysis for this project utilized a manual method of calculating travel time between a start point and an end point. The total travel time between these points involves freeway travel time, intersection delays, segment travel time and ramp meter delays. ***Appendix I*** contains the worksheet tables that contain the calculated travel times for the different alternatives and different routes.

10.2.1 *Freeway Travel Time*

The Year 2030 Freeway Mainline analyses in the Draft Traffic Operations Report conducted by LLG Engineers reports freeway volume to capacity ratio's (v/c) and LOS. LLG developed an LOS scheme comparing v/c ratios and freeway speeds. Since freeway distance and speeds between two points are known, freeway travel times are calculated.

Linscott, Law & Greenspan, Engineers also conducted HCM Freeway Mainline analyses using the HCS 2000 software which reports density and speeds to get a suitable comparison. Based on the results, the assumed speeds were comparable to the HCS 2000 results.

To be more conservative, LLG assumed lower speeds than the HCS software for a particular LOS range (for example: HCS 2000 software assumes 65 mph for free flow (LOS A, B and C) and 64.9 mph for LOS D whereas LLG assumed 65 mph for freeflow (LOS A, B and C) and a more conservative 50 mph for LOS D to account for increasing densities with degrading LOS.

10.2.2 *Intersection/ Segment Delays*

LLG used the *Synchro 6.0* software, which reports a particular movement delay in addition to the overall intersection delay and LOS. Based on the intersection operations and the Year 2030 street segment operations, LLG assumed speeds for roadway segments based on peak direction of travel, queuing at intersections, existing intersection operations during the peak hours and ramp meter delays. Since roadway segment and speeds between two points are known, the segment travel time is calculated. ***Appendix I*** contains the Year 2030 intersection calculation worksheets for the different alternatives and different routes.

10.2.3 *Ramp Meter Delays*

The Year 2030 ramp meter analyses based on the SANTEC/ ITE Guidelines is included in the Draft Year 2030 Traffic Operations Report. The 15-minute "Maximum Delay" method overstates the delay at the ramp meters and reports "unreasonable" queue lengths. To avoid "skewing" the travel time analysis by assuming 15-minute delays at the on-ramps, LLG assumed a lower ramp meter delay (For example: A delay of 5 minutes in the AM peak hour and 7.5 minutes in the PM peak hour at the NB I-5 on-ramps at Carmel Valley Road and Del Mar Heights Road). A ramp meter delay of 7.5 minutes in the AM and PM peak hours for the WB SR 56 to NB I-5 freeway connector was also assumed to keep the analyses consistent and conservative.

10.2.4 *Mid-day Travel Time Analyses*

Year 2030 AM/PM travel times for the different alternatives were calculated based on the manual methodology described above. Year 2030 travel times for the mid-day periods were "qualitatively" estimated for the different alternatives based on the relationship between existing AM, mid-day and PM peak hour pilot car runs. Year 2030 mid-day travel times were also compared to the Year 2030 AM/PM travel times along the freeway and local street routes for consistency.

10.3 Calibration Methodology

LLG utilized the manual method described above to calculate the existing travel time between the start and end points for two routes for calibration purposes. Calibration calculations were conducted for the freeway route F1 (start point: WB SR 56 at Carmel Valley Road and end point: NB at I-5 Del Mar Heights Road) and local route L2 (start point: WB SR 56 at Carmel Valley Road through Carmel Country Road and end point: NB I-5 at Del Mar Heights Road).

Based on the existing travel time data collected and the manual travel time calculated, on an average, the calculated travel time is generally 10 to 15% higher than the observed travel time. The travel time between two points fluctuate highly based on the peak periods, signal timing, congestion on freeways, ramp meter delays etc. Hence the calculated Year 2030 travel time analyses for the various routes conducted in this study represents the worst situations and is considered conservative.

Table 10–1 and Table 10–2 show the Year 2030 travel time summary for the freeway and local routes for the different alternatives. ***Figures 10–1 through 10– 4*** show the Year 2030 calculated travel time from WB SR 56 at Carmel Valley Road to NB I-5 at Del Mar Heights Road through the freeway route and all the local routes. ***Figures 10–5 through 10–8*** show the Year 2030 travel time from SB I-5 at Del Mar Heights Road to EB SR 56 at Carmel Valley Road through the freeway route and all the local routes.

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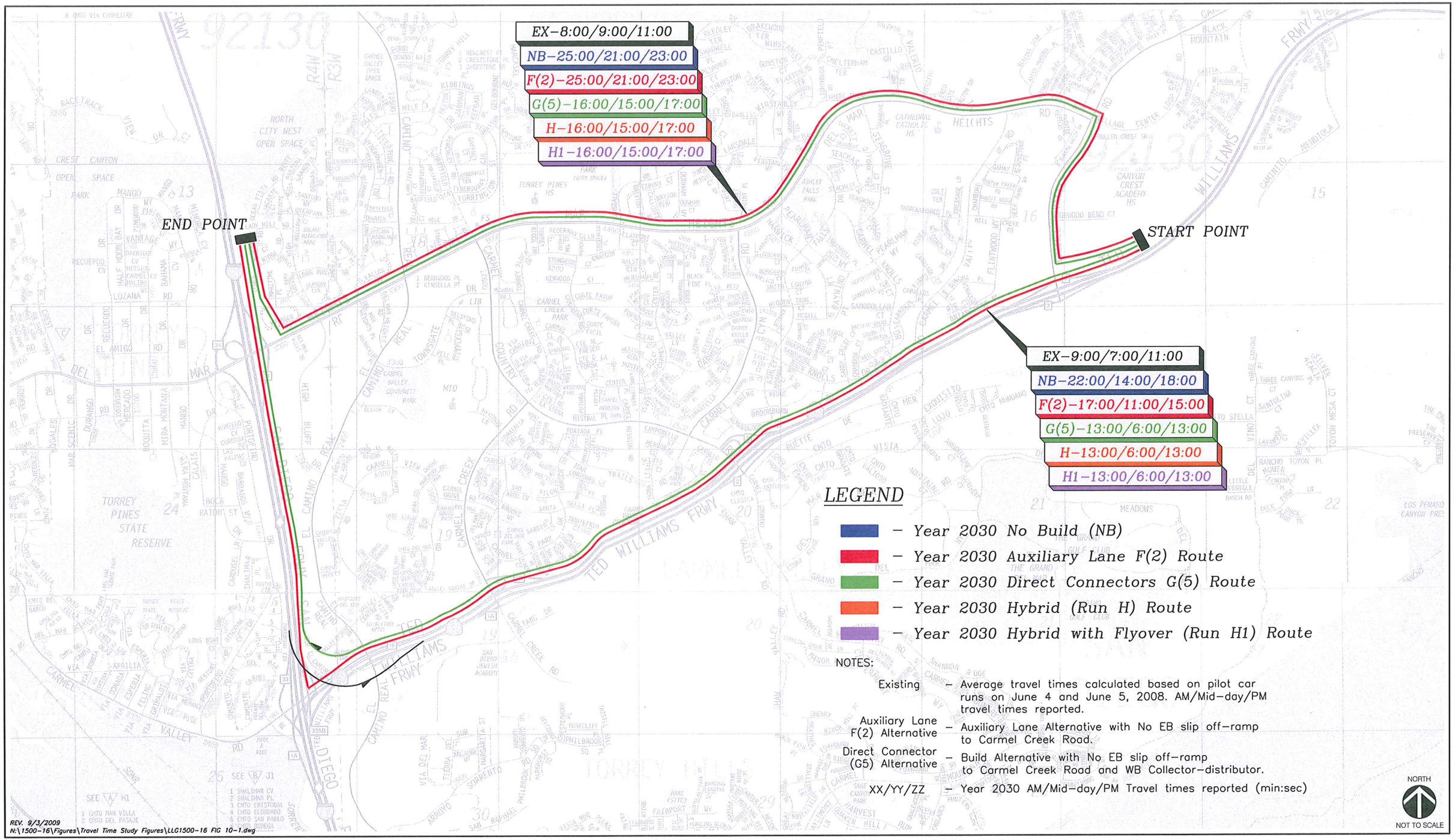

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Figure 10-1

WB SR 56 through Carmel Valley Road to NB I-5/Del Mar Heights Road

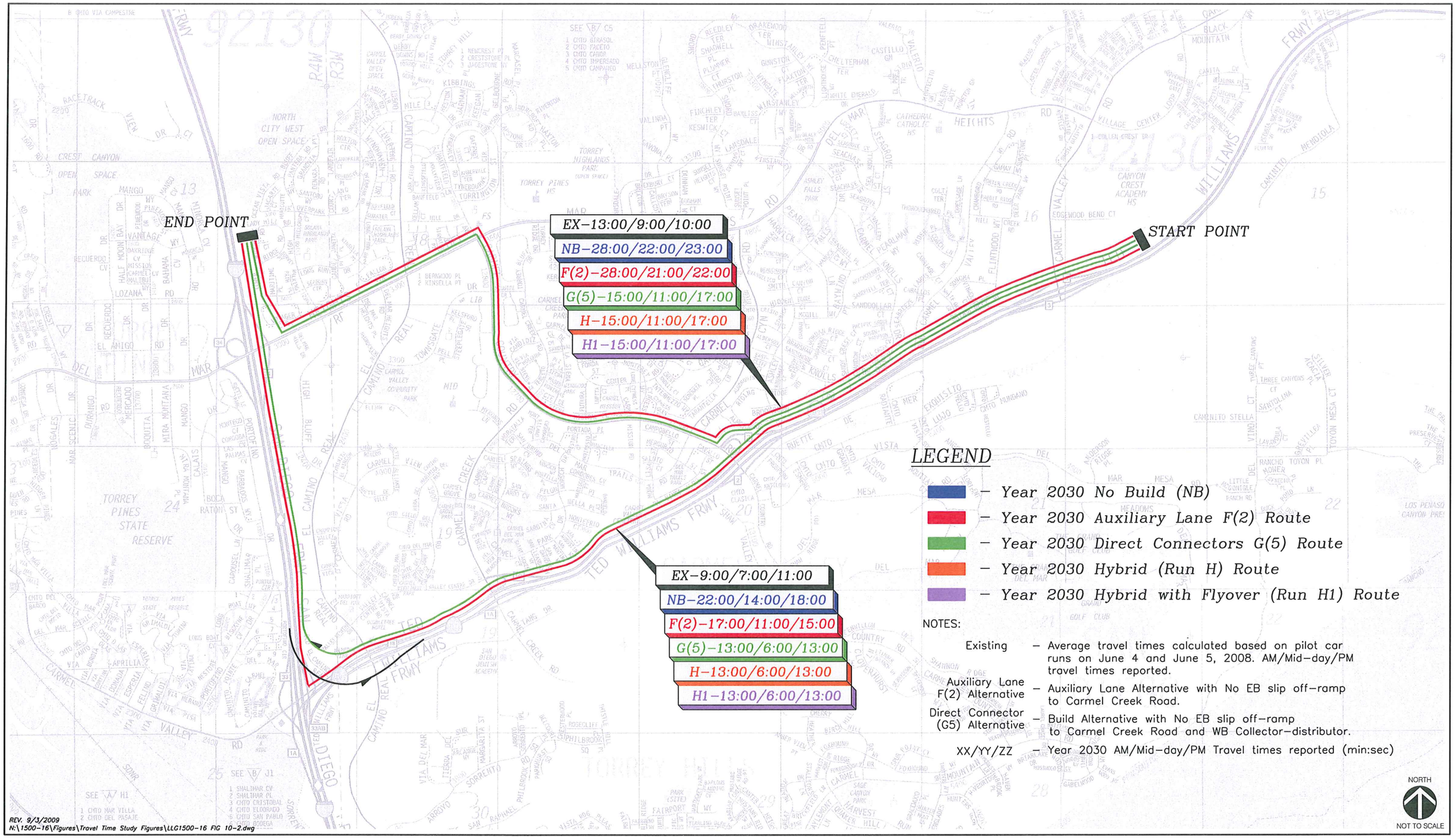

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Figure 10-2

WB SR 56 through Carmel Country Road to NB I-5/Del Mar Heights Road

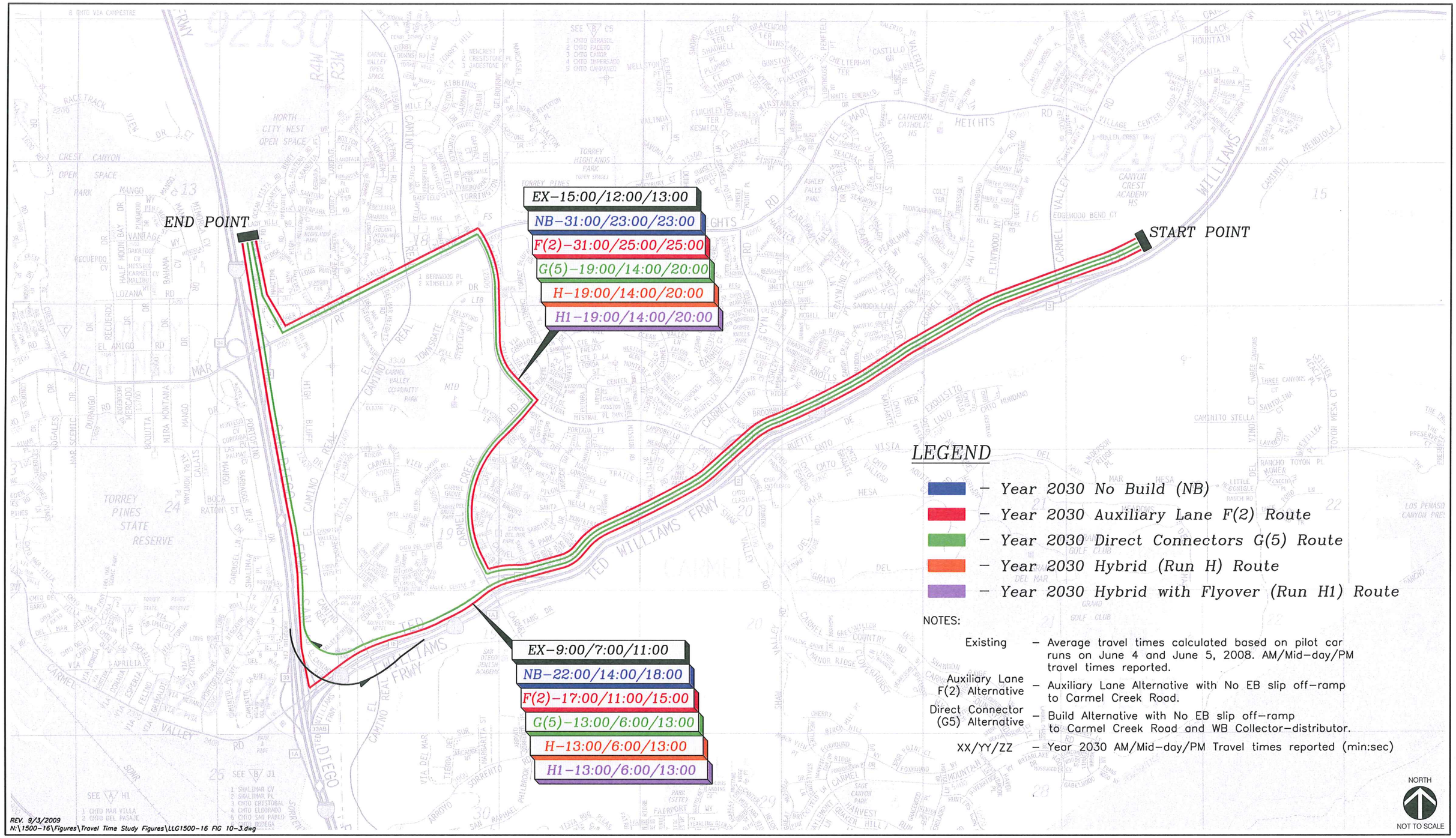

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Figure 10-3

WB SR 56 through Carmel Creek Road to NB I-5/Del Mar Heights Road

END POINT

START POINT

EX–13:00/11:00/11:00
NB–26:00/25:00/25:00
F(2)–24:00/20:00/20:00
G(5)–16:00/14:00/16:00
H–16:00/14:00/16:00
H1–16:00/14:00/16:00

EX–9:00/7:00/11:00
NB–22:00/14:00/18:00
F(2)–17:00/11:00/15:00
G(5)–13:00/6:00/13:00
H–13:00/6:00/13:00
H1–13:00/6:00/13:00

LEGEND

- Year 2030 No Build (NB)
- Year 2030 Auxiliary Lane F(2) Route
- Year 2030 Direct Connectors G(5) Route
- Year 2030 Hybrid (Run H) Route
- Year 2030 Hybrid with Flyover (Run H1) Route

NOTES:

Existing	– Average travel times calculated based on pilot car runs on June 4 and June 5, 2008. AM/Mid–day/PM travel times reported.
Auxiliary Lane F(2) Alternative	– Auxiliary Lane Alternative with No EB slip off–ramp to Carmel Creek Road.
Direct Connector (G5) Alternative	– Build Alternative with No EB slip off–ramp to Carmel Creek Road and WB Collector–distributor.
XX/YY/ZZ	– Year 2030 AM/Mid–day/PM Travel times reported (min:sec)

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Figure 10-4

WB SR 56 through El Camino Real to NB I-5/Del Mar Heights Road

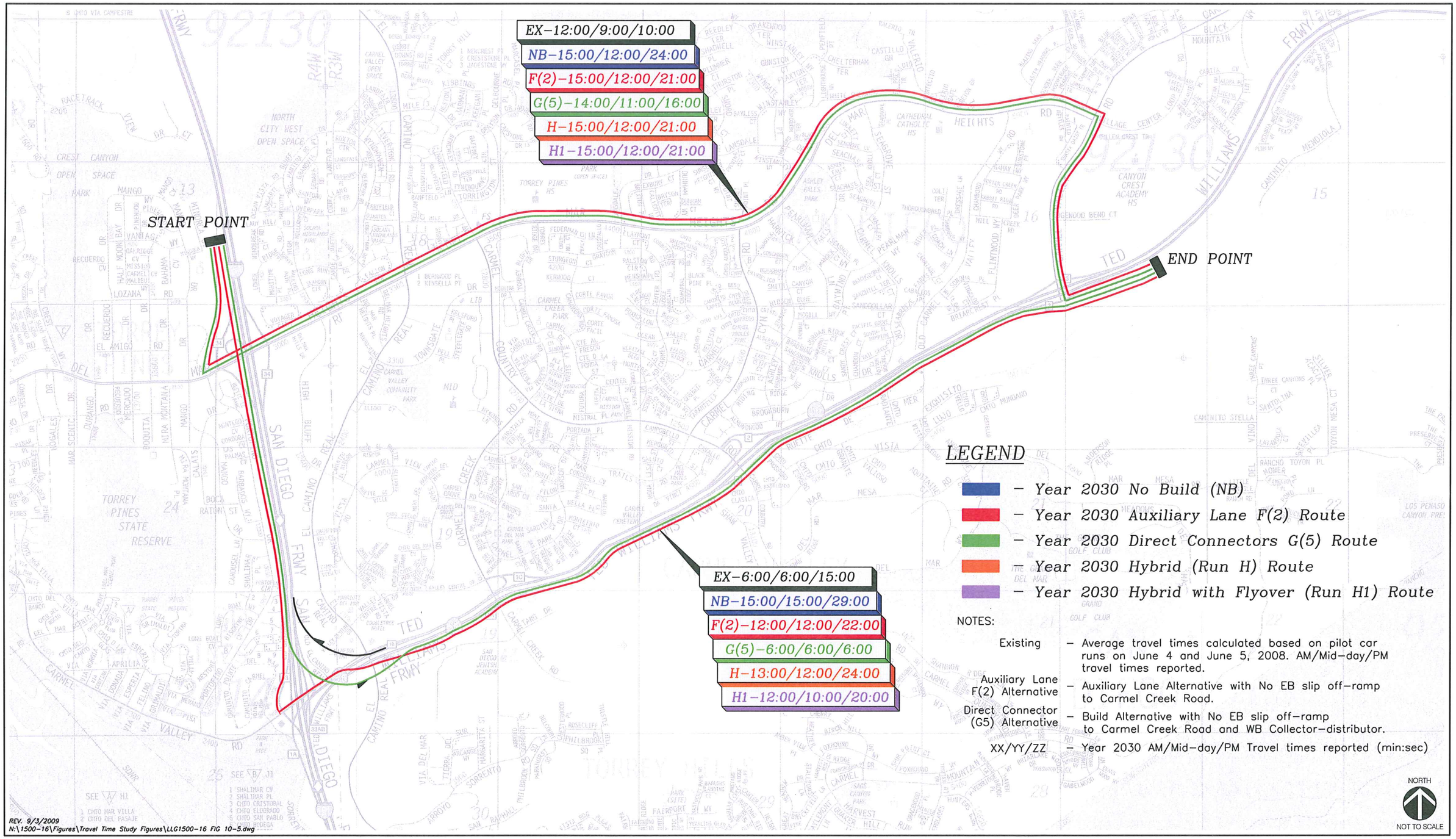

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Figure 10-5

SB I-5 through Del Mar Heights Road to EB SR 56/Carmel Valley Road

START POINT

END POINT

EX–10:00/11:00/12:00

NB–13:00/14:00/23:00

F(2)–13:00/14:00/24:00

G(5)–11:00/8:00/15:00

H–13:00/14:00/24:00

H1–13:00/14:00/24:00

EX–6:00/6:00/15:00

NB–15:00/15:00/29:00

F(2)–13:00/12:00/22:00

G(5)–6:00/6:00/6:00

H–13:00/12:00/24:00

H1–12:00/10:00/20:00

LEGEND

- Year 2030 No Build (NB)
- Year 2030 Auxiliary Lane F(2) Route
- Year 2030 Direct Connectors G(5) Route
- Year 2030 Hybrid (Run H) Route
- Year 2030 Hybrid with Flyover (Run H1) Route

NOTES:

Existing	– Average travel times calculated based on pilot car runs on June 4 and June 5, 2008. AM/Mid-day/PM travel times reported.
Auxiliary Lane F(2) Alternative	– Auxiliary Lane Alternative with No EB slip off-ramp to Carmel Creek Road.
Direct Connector (G5) Alternative	– Build Alternative with No EB slip off-ramp to Carmel Creek Road and WB Collector-distributor.
XX/YY/ZZ	– Year 2030 AM/Mid-day/PM Travel times reported (min:sec)

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Figure 10-6

SB I-5 through Carmel Country Road to EB SR 56/Carmel Valley Road

START POINT

END POINT

EX–11:00/13:00/17:00

NB–15:00/17:00/26:00

F(2)–15:00/17:00/26:00

G(5)–12:00/9:00/17:00

H–15:00/17:00/26:00

H1–15:00/17:00/26:00

EX–6:00/6:00/15:00

NB–15:00/15:00/29:00

F(2)–12:00/12:00/22:00

G(5)–6:00/6:00/6:00

H–13:00/12:00/24:00

H1–12:00/10:00/20:00

LEGEND

- Year 2030 No Build (NB)
- Year 2030 Auxiliary Lane F(2) Route
- Year 2030 Direct Connectors G(5) Route
- Year 2030 Hybrid (Run H) Route
- Year 2030 Hybrid with Flyover (Run H1) Route

NOTES:

Existing	– Average travel times calculated based on pilot car runs on June 4 and June 5, 2008. AM/Mid–day/PM travel times reported.
Auxiliary Lane F(2) Alternative	– Auxiliary Lane Alternative with No EB slip off–ramp to Carmel Creek Road.
Direct Connector (G5) Alternative	– Build Alternative with No EB slip off–ramp to Carmel Creek Road and WB Collector–distributor.
XX/YY/ZZ	– Year 2030 AM/Mid–day/PM Travel times reported (min:sec)

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Figure 10-7

SB I-5 through Carmel Creek Road to EB SR 56/Carmel Valley Road

START POINT

END POINT

EX–10:00/10:00/17:00
NB–13:00/13:00/20:00
F(2)–13:00/13:00/22:00
G(5)–11:00/11:00/14:00
H–13:00/13:00/22:00
H1–13:00/13:00/22:00

EX–6:00/6:00/15:00
NB–15:00/15:00/29:00
F(2)–12:00/12:00/22:00
G(5)–6:00/6:00/6:00
H–13:00/12:00/24:00
H1–12:00/10:00/20:00

LEGEND

- Year 2030 No Build (NB)
- Year 2030 Auxiliary Lane F(2) Route
- Year 2030 Direct Connectors G(5) Route
- Year 2030 Hybrid (Run H) Route
- Year 2030 Hybrid with Flyover (Run H1) Route

NOTES:

Existing	– Average travel times calculated based on pilot car runs on June 4 and June 5, 2008. AM/Mid-day/PM travel times reported.
Auxiliary Lane F(2) Alternative	– Auxiliary Lane Alternative with No EB slip off-ramp to Carmel Creek Road.
Direct Connector (G5) Alternative	– Build Alternative with No EB slip off-ramp to Carmel Creek Road and WB Collector-distributor.
XX/YY/ZZ	– Year 2030 AM/Mid-day/PM Travel times reported (min:sec)

NORTH

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Figure 10-8

SB I-5 through El Camino Real to EB SR 56/Carmel Valley Road

TABLE 10–1
YEAR 2030 TRAVEL TIME SUMMARY
FROM WB SR 56/ CARMEL VALLEY ROAD TO NB I-5/ DEL MAR HEIGHTS ROAD

Travel Routes	Length of Route (mile)[a]	Travel Time (minutes)																	
		Existing (observed)[a]			No Build (E)[c]			Auxiliary Lane - F(2)[d]			Direct Connector G(5)[e]			Hybrid[i]			Hybrid with Flyover[h]		
		AM	Mid-day[f]	PM	AM	Mid-day[f]	PM	AM	Mid-day[f]	PM	AM	Mid-day[f]	PM	AM	Mid-day[f]	PM	AM	Mid-day[f]	PM
Freeway Route (F1)	4.40	9:00	7:00	11:00	22:00	14:00	18:00	17:00	11:00	15:00	13:00	6:00[g]	13:00	13:00	6:00	13:00	13:00	6:00	13:00
Local Routes																			
L1: Via Carmel Valley Road	4.17	8:00	9:00	11:00	25:00	21:00	23:00	25:00	21:00	23:00	16:00	15:00	17:00	16:00	15:00	17:00	16:00	15:00	17:00
L2: Via Carmel Country Road	3.70	13:00	9:00	10:00	28:00	22:00	23:00	28:00	21:00	22:00	15:00	11:00	17:00	15:00	11:00	17:00	15:00	11:00	17:00
L3: Via Carmel Creek Road[b]	4.70	15:00	12:00	13:00	31:00	23:00	23:00	31:00	25:00	25:00	19:00	14:00	20:00	19:00	14:00	20:00	19:00	14:00	20:00
L4: Via El Camino Real	4.94	13:00	11:00	11:00	26:00	25:00	25:00	24:00	20:00	20:00	16:00	14:00	16:00	16:00	14:00	16:00	16:00	14:00	16:00

TABLE 10–2
YEAR 2030 TRAVEL TIME SUMMARY
FROM SB I-5/ DEL MAR HEIGHTS ROAD TO EB SR 56/ CARMEL VALLEY ROAD

Travel Routes	Length of Route (mile)[a]	Travel Time (minutes)																	
		Existing (observed)[a]			No Build (E)[c]			Auxiliary Lane - F(2)[d]			Direct Connector - G(5)[e]			Hybrid			Hybrid with Flyover		
		AM	Mid-day[f]	PM	AM	Mid-day[f]	PM	AM	Mid-day[f]	PM	AM	Mid-day[f]	PM	AM	Mid-day[f]	PM	AM	Mid-day[f]	PM
Freeway Route (F2)	4.60	6:00	6:00	15:00	15:00	15:00	29:00	12:00	12:00	22:00	6:00	6:00	6:00	13:00	12:00	24:00	12:00	10:00	20:00
Local Routes																			
L5: Via Carmel Valley Road	4.21	12:00	9:00	10:00	15:00	12:00	24:00	15:00	12:00	21:00	14:00	11:00	16:00	15:00	12:00	21:00	15:00	12:00	21:00
L6: Via Carmel Country Road	3.99	10:00	11:00	12:00	13:00	14:00	23:00	13:00	14:00	24:00	11:00	8:00	15:00	13:00	14:00	24:00	13:00	14:00	24:00
L7: Via Carmel Creek Road[b]	4.94	11:00	13:00	17:00	15:00	17:00	26:00	15:00	17:00	26:00	12:00	9:00	17:00	15:00	17:00	26:00	15:00	17:00	26:00
L8: Via El Camino Real	5.25	10:00	10:00	17:00	13:00	13:00	20:00	13:00	13:00	22:00	11:00	11:00	14:00	13:00	13:00	22:00	13:00	13:00	22:00

Footnotes:

a. Existing travel time and length of route obtained from existing pilot car runs.
b. Existing travel time for Carmel Creek Road was estimated as pilot car runs were not available. Travel times for the remaining portion of the route (Carmel Country Road and Del Mar Heights Road) were taken from the Carmel Country Road pilot car run (Runs L2 and L6).
c. Year 2030 No Build (Run E) scenario deals with the absence of proposed Direct Connector and any local improvements.
d. Year 2030 Auxiliary Lane alternative F(2) includes the addition of auxiliary lanes on SB I-5 and WB SR 56 and intersections improvements on Carmel Valley Road. This scenario also eliminates the EB slip off-ramp to Carmel Creek Road.
e. Year 2030 Direct Connector G(5) includes the proposed Direct Connector from WB SR 56 to NB I-5 and SB I-5 to EB SR 56. This alternative also includes proposed local street improvements and the elimination on EB slip off-ramp to Carmel Creek Road. WB SR 56 is assumed to be a collector-distributor system.
f. Year 2030 travel times for the mid-day scenarios have been estimated based on existing travel time differences between AM, mid-day and PM peak hours. For example: The existing travel time during mid-day on freeway route F1 from WB SR 56 to NB I-5 Del Mar Heights Road is 7:00 minutes. Existing PM travel time on the same route is 11:00 minutes. The difference is 4:00 minutes and this difference has been applied to all the other alternatives. In the W-N direction, Year 2030 mid-day travel times have been estimated based on the difference between existing mid-day and PM peak travel times and in the S-E direction, Year 2030 mid-day travel times have been estimated based on the difference between existing mid-day and AM peak. This difference between existing AM, mid-day and PM pilot car runs were applied to the local street travel times for Direct Connectors as well.
g. The travel times for freeway route F1 are 13:00 in the AM and PM peak hour due to freeway connector ramp meter. The proposed ramp meter would be turned "off" during the mid-day periods.
h. It is assumed that the WB SR 56 to NB I-5 travel times for Hybrid and Hybrid with Flyover Alternative would be similar to the Direct Connector Alternative because of similar network configuration.

General Notes:

a. The start point and end points were fixed as Del Mar Heights Road on I-5 and Carmel Valley Road on SR 56. However the routes between these two cordon points were different.

10.4 Analysis Results Discussion

10.4.1 *Year 2030 No Build (Run E) – WB SR 56 to NB I-5*

Based on the above table, the travel times for the No Build Alternative are calculated as 22/14/18 (AM/mid-day/PM) minutes from WB SR 56 at Carmel Valley Road to NB I-5 at Del Mar Heights Road using the freeway route. The travel times during the AM and mid-day periods in the No Build scenario are expected to almost double in comparison to the existing scenario. The mid-day travel times along the freeway and local street routes are calculated to be lower than the AM and PM peak hours but are higher in comparison with mid-day travel times calculated in the Direct Connector alternative.

The travel time on the local streets is calculated to be higher than the freeway route in the AM and PM peak hours. With degraded freeway operations (LOS F or worse) leading to poor speeds on SR 56 between Carmel Valley Road and El Camino Real, lack of intersection improvements at I-5/Carmel Valley Road and SR 56/ El Camino Real interchanges, more "cut-through" traffic through the community could be expected with drivers trying to avoid congestion on the direct freeway route.

10.4.2 *Year 2030 No Build (Run E) – SB I-5 to EB SR 56*

Based on the above table, the travel times for the No Build Alternative are calculated as 15/15/29 (AM/mid-day/PM) minutes from SB I-5 at Del Mar Heights Road to EB SR 56 at Carmel Valley Road using the freeway route. The travel times during the mid-day and PM peak hour in the No Build scenario is expected to almost double in comparison to the existing scenario. The increase in traffic volumes, absence of any link for freeway-to-freeway traffic between I-5 and SR 56 and lack of local street intersection improvements lead to excessive travel times between I-5 and SR 56 in the PM peak hour.

Further the mid-day travel times along the freeway and local street routes in the No Build scenario are calculated to be higher in comparison with mid-day travel times calculated in the Direct Connector alternative. The travel time on local streets and communities is calculated to be lower than the freeway route, making it more attractive to drivers. The travel time through the community (especially Carmel Country Road) would be faster for drivers by approximately 6 minutes in the PM peak hour by avoiding the congestion on I-5/Carmel Valley Road and SR 56/ El Camino Real interchanges. This time saving route would increase cut-through traffic in the neighboring communities.

10.4.3 *Year 2030 Auxiliary Lane Run F(2) – WB SR 56 to NB I-5*

Based on the above table, the travel times for the Auxiliary Lane F(2) Alternative are calculated as 17/11/15 (AM/mid-day/PM) minutes from WB SR 56 at Carmel Valley Road to NB I-5 at Del Mar Heights Road using the freeway route. The overall travel time improves in comparison to the No Build scenario due to the addition of an auxiliary lane on WB SR 56 between Carmel Country Road and Carmel Creek Road and the proposed intersection improvements at the SR 56 WB off-ramp/ El Camino Real and I-5 NB ramps/ Carmel Valley Road intersections. The travel time through the local streets is calculated to be very similar to the No Build scenario.

The freeway route is calculated to be an attractive option in the mid-day and PM peak periods. The mid-day travel times are calculated to be similar to the No Build scenario but are higher in comparison to the Direct Connector alternative. Overall, with the Auxiliary Lane alternative, traffic operations improve at locations where improvements are proposed but the overall congestion does not improve.

10.4.4 *Year 2030 Auxiliary Lane Run F(2) – SB I-5 to EB SR 56*

The travel times for the Auxiliary Lane F(2) Alternative are calculated as 12/12/22 (AM/mid-day/PM) minutes from SB I-5 at Del Mar Heights Road to EB SR 56 at Carmel Valley Road using the freeway route. The travel time in the PM peak hour in the Auxiliary Lane F(2) Alternative improves in comparison to No Build scenario along the freeway route due to the addition of an auxiliary lane on SB I-5 between Del Mar Heights Road and Carmel Valley Road. In the Auxiliary Lane F(2) Alternative, drivers would use the local streets and communities (local route L5) as the travel time is calculated to be faster than the freeway route in the PM peak hour. The travel time through the community (local route L5) would be faster by 1 minute in the PM peak hour by avoiding the congestion at the I-5/Carmel Valley Road and SR 56/El Camino Real interchanges.

Further the freeway route is calculated to be an attractive option in the AM and mid-day periods. The mid-day travel times are calculated to be similar to the No Build scenario but are higher in comparison to the Direct Connector Alternative. The absence of any link for freeway-to-freeway traffic and the elimination of the EB slip-off ramp to Carmel Creek Road degrades the travel time through the freeway, intersections, segments and ramp meter.

10.4.5 *Year 2030 Direct Connector Run G(5) – WB SR 56 to NB I-5*

The travel times for the Direct Connector Alternative are calculated as 13/6/13 (AM/mid-day/PM) minutes from WB SR 56 at Carmel Valley Road to NB I-5 at Del Mar Heights Road through the freeway route. Even with the assumed ramp meter delay of 7.5 minutes on the WB SR 56 to NB I-5 freeway connector in the AM and PM peak hours, the Direct Connector Alternative shows the fastest travel time in comparison to the Auxiliary Lane Alternative. A comparison of travel times between the alternatives show that travel time savings in the Direct Connector Alternative is between 2 and 9 minutes along the freeway route in the AM/PM peak hours. The Direct Connector Alternative also shows lower mid-day travel times in comparison to the No Build and Auxiliary Lane Alternatives through the freeway and local street routes.

Furthermore the travel time using the local streets like Carmel Valley Road, Carmel Country Road, Carmel Creek Road and El Camino Real is calculated to be faster in the Direct Connector alternative in comparison with the other alternatives. In addition, cut through neighborhood traffic is not expected in the Direct Connector Alternative as the travel time on the freeway route is shorter than on the local streets.

10.4.6 *Year 2030 Direct Connector Run G(5) – SB I-5 to EB SR 56*

The travel times for the Direct Connector Alternative are calculated as 6/6/6 (AM/mid-day/PM) minutes from SB I-5 at Del Mar Heights Road to EB SR 56 at Carmel Valley Road through the freeway route. The Direct Connector Alternative shows the fastest travel time among the different alternatives in the AM/PM peak hours. A comparison of travel times between the alternatives show that travel time savings in the Direct Connector Alternative is between 6 and 23 minutes along the freeway route in the AM/PM peak hours. The Direct Connector alternative also shows lower mid-day travel times in comparison to the No Build and Auxiliary Lane alternatives through the freeway and local street routes.

The travel time in the PM peak hour in the Direct Connector Alternative improves in comparison to the No Build and Auxiliary lane scenarios due to the addition of an auxiliary lane on SB I-5 between Del Mar Heights Road and Carmel Valley Road and the SB I-5 to EB SR 56 freeway-to-freeway connector, which helps the traffic flow leading to reduction in the overall travel time.

The elimination of the EB slip off-ramp to Carmel Creek Road does not affect the Direct Connector Alternative as the trips from SB I-5 to EB SR 56 would use the proposed connector instead of using the Carmel Valley diamond interchange as in the Auxiliary lane Alternative. Furthermore, the travel time on the local streets like Carmel Valley Road, Carmel Country Road, Carmel Creek Road and El Camino Real is calculated to be lower in the Direct Connector alternative in comparison with the other alternatives. In addition, cut through neighborhood traffic is not expected in the Direct Connector Alternative as the travel time on the freeway route is shorter than on the local streets.

10.4.7 *Year 2030 Hybrid (Run H) – WB SR 56 to NB I-5*

The travel times for the Hybrid Alternative are assumed to be similar to the Direct Connector Alternative from WB SR 56 to NB I-5 because of similar roadway network configuration.

10.4.8 *Year 2030 Hybrid (Run H) – SB I-5 to EB SR 56*

The travel times for the Hybrid Alternative are calculated to be slightly higher in comparison to the Auxiliary Lane F(2) Alternative along the freeway route. This is due to the WB collector-distributor system, which re-routes traffic from the Carmel Creek loop on-ramp onto WB Carmel Valley Road. These rerouted trips utilize additional signal green time and increase travel times for SB I-5 to EB SR 56 trips on Carmel Valley Road.

The travel times for the Hybrid Alternative along the local routes are assumed to be similar to the Auxiliary Lane F(2) Alternative.

10.4.9 *Year 2030 Hybrid with Flyover (Run H1) – WB SR 56 to NB I-5*

The travel times for the Hybrid with Flyover Alternative are assumed to be similar to the Direct Connector Alternative from WB SR 56 to NB I-5 because of similar roadway network configuration.

10.4.10 *Year 2030 Hybrid with Flyover (Run H1) – SB I-5 to EB SR 56*

The travel times for the Hybrid with Flyover Alternative are calculated to be slightly lower than the Auxiliary Lane F(2) Alternative and Hybrid Alternative along the freeway route in the PM peak hour. This time savings (2:00 in the PM peak hour) is due to the fact that traffic from SB I-5 to EB SR 56 would use the flyover and "skip" the El Camino Real/ SR 56 EB on-ramp intersection.

The travel times for the Hybrid with Flyover Alternative along the local routes are assumed to be similar to the Auxiliary Lane F(2) Alternative.

10.5 El Camino Real Travel Time Savings

LLG also conducted a travel time analyses to determine the Year 2030 travel time savings for local street traffic on El Camino Real. *Appendix I* contains the calculation worksheets for the different alternatives.

Based on the analyses, the local street traffic using El Camino Real is calculated to experience a travel time savings of approximately 2 minutes in the Direct Connector Alternative and Hybrid with Flyover Alternative in comparison to the Auxiliary Lane and Hybrid Alternatives. This is because of lower traffic volumes on El Camino Real in the Direct Connector Alternative and Hybrid with Flyover Alternatives as the freeway-to-freeway traffic would be using the proposed connectors and flyover respectively. The lower traffic volumes (WB and EB movements on Carmel Valley Road) utilize lesser signal green times in the Direct Connector and Hybrid with Flyover Alternatives. The remainder of the signal cycle can be provided to serve the NB and SB traffic on El Camino Real.

10.6 Summary

In the No Build alternative, travel time increases substantially between I-5 and SR 56 on the freeway and local street routes. In the Auxiliary Lane, Hybrid and Hybrid with Flyover Alternatives, traffic operations improve at locations where improvements are proposed but the overall congestion does not improve. Further, in the No Build, Auxiliary Lane and Hybrid Alternatives, since the local street travel times are calculated to be comparable to the freeway travel times (especially in the SB I-5 to EB SR 56 movement), it is expected that drivers might avoid the direct route along the freeway and use the local streets to avoid congestion at the I-5/Carmel Valley Road and SR 56/El Camino Real interchanges.

The mid-day travel times are calculated to be higher in the No Build and Auxiliary lane Alternatives in comparison to the Direct Connector Alternative through the local street and freeway facilities. With the above travel time analyses, the Direct Connector alternative shows the fastest travel time during the AM/mid-day/PM among the different alternatives. Based on the forecasted travel times, the Direct Connector Alternative performs well and provides the fastest travel time among the different alternatives.

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11.0 PACIFIC HIGHLANDS RANCH DEVELOPMENT

Linscott, Law and Greenspan, Engineers (LLG) in coordination with Caltrans and Dokken Engineering has prepared the following section regarding assumptions made for the I-5/SR-56 Interchange Project's Year 2030 traffic models, vehicle trips generated by the Pacific Highlands Ranch (PHR) Project, and the overall affect of the PHR Project on the Year 2030 traffic demand for the existing and proposed direct freeway-to-freeway connectors at the I-5/SR-56 interchange.

Pacific Highlands Ranch is located north of the Carmel Valley Road interchange with SR 56. The total anticipated residential development of Pacific Highlands Ranch is estimated at 4,907 single and multi-family dwelling units, a fire or police station site, three elementary school sites, two high school sites, 6.4 acres of library, 118 acres of agriculture use, 21 acres of commercial use, and 21 acres of industrial park use. The Year 2030 traffic models for the I-5/SR-56 Interchange Project assume a total of 4,907 single and multi-family dwelling units for the Pacific Highlands Ranch (PHR) Project.

LLG coordinated with *City of San Diego* to obtain trip generation and trip distribution data for the *Pacific Highlands Ranch Traffic Study* conducted by *Urban System Associates*. Based on the traffic study, the PHR Project is calculated to generate 74,220 average daily trips (ADT) at full build-out. Of the 74,220 ADT generated by the PHR Project, a total of 4,230 ADT are expected to use the proposed southbound I-5 to eastbound SR-56 (South-to-East) and westbound SR-56 to northbound I-5 (West-to-North) direct connectors.

A combined ADT of 42,220 has been predicted for the proposed direct connectors. Therefore the PHR Project traffic would make up approximately 10% (4,230/42,220) of the total traffic volume using the proposed South-to-East and West-to-North direct connectors. Of the 74,220 ADT generated by the PHR Project, a total of 16,740 ADT are expected to use the existing northbound I-5 to eastbound SR-56 (North-to-East) and westbound SR-56 to southbound I-5 (West-to-South) direct connectors. A combined ADT of 69,980 has been predicted for the existing direct connectors. Therefore the PHR Project traffic will make up approximately 24% (16,740/69,980) of the total traffic volume using the existing North-to-East and West-to-South direct connectors.

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12.0 ALTERNATIVE COMPARISON SUMMARY

The purpose of this report is to analyze the interim and long-term street system operations of the various project alternatives for the I-5/SR 56 Interchange Project. This traffic study includes a comprehensive assessment of the street system operations both for local urban street facilities (segments, local intersections, etc) and for freeway facilities, including mainline segments, ramp junctions, and weaves locations.

12.1 Year 2015

12.1.1 *No Build Alternative (Model Run A)*

The operational analyses of the Year 2015 No Build (Model Run A) alternative is based on the following assumptions:

- **I-5** freeway configuration is planned to include 10 general-purpose lanes (5 lanes in each direction) with 4 managed/ HOV lanes (two lanes in each direction) with direct access ramps (DAR's) connections to HOV/managed lanes **(10 + 4)**. As per I-5 North Coast Project, the direct access ramps are planned at Voigt Drive, Manchester Avenue, Cannon Road and Oceanside Boulevard at I-5.
- **SR-56** freeway configuration in Year 2015 is assumed to be the same as existing (4 general-purpose and no HOV lanes). This alternative **does not include** the construction of direct connectors (southbound I-5 to eastbound SR 56 and from westbound SR 56 to northbound I-5 connectors).
- No improvements to the local streets are proposed with this alternative.

Table 12–1 shows a comparison matrix for the different Year 2015 alternatives showing the deficient (LOS E or worse) local street segments and intersections. ***Table 12–2*** shows a comparison matrix for the different Year 2015 alternatives showing the deficient (LOS F) freeway segments.

Based on the analyses discussed in Section 7.0 and the summary of the results shown in *Table 12–1 and Table 12–2*, the No Build (Run A) alternative has various failing street segments, intersections and freeway operations. Currently, local streets and the surrounding communities experience increased demand and congestion during peak hours from I-5 and SR-56 traffic. Continued regional development and inter-regional travel increases traffic volumes and reduce traffic operational quality as shown in the failing traffic operations in the urban and freeway facilities in the No Build scenario.

The No Build network forces drivers to exit the freeway to travel between SB I-5 to EB SR-56 and WB SR-56 to NB I-5. This would lead to severe congestion at the Carmel Valley and El Camino Real interchanges, thereby significantly impacting all the corridor intersections and street segments. Further, the absence of the proposed direct connectors would significantly impact the freeway operations on I-5 and SR-56.

During peak hours, to avoid traffic congestion at the I-5/SR-56 interchange, drivers are expected to use alternate routes including El Camino Real, Del Mar Heights Road, Carmel Creek Road and Carmel Country Road increasing traffic on surface streets, thereby impacting all the surrounding communities.

It is evident that the local street network, freeway network and the surrounding communities to the I-5/SR 56 interchange cannot accommodate the forecasted traffic volumes without the construction of the proposed direct connectors.

12.1.2 *Auxiliary Lane Alternative (Model Run B)*

The operational analyses of the Year 2015 Auxiliary Lane (Model Run B) alternative is based on the following assumptions:

- **I-5** freeway configuration is planned to include 10 general-purpose lanes (5 lanes in each direction) with 4 managed/ HOV lanes (two lanes in each direction) with direct access ramps (DAR's) connections to HOV/managed lanes **(10 + 4)**. As per I-5 North Coast Project, the direct access ramps are planned at Voigt Drive, Manchester Avenue, Cannon Road and Oceanside Boulevard at I-5.
- **SR-56** freeway configuration in Year 2015 is assumed to be the same as existing (4 general-purpose and no HOV lanes). This alternative **does not include** the construction of direct connectors (southbound I-5 to eastbound SR 56 and from westbound SR 56 to northbound I-5 connectors).

The following improvements to the local streets and freeway facilities are proposed in the Auxiliary Lane Alternative:

- Addition of an auxiliary lane on SB I-5 between Del Mar Heights Road and Carmel Valley Road *(freeway improvement)*
- Addition of auxiliary lanes on WB SR-56 between Carmel Country Road and Carmel Creek Road *(freeway improvement)*.
- Addition of a freeway mainline on WB SR-56 between Carmel Creek Road and El Camino Real *(freeway improvement)*
- Reconstruction of Del Mar Heights Road overcrossing *(freeway improvement)*.
- Addition of a fourth lane at the SB approach of I-5 SB ramps/Carmel Valley Road and re-striping the SB approach to show dual left-turn lanes, a shared thru-right and an exclusive right-turn lane *(intersection improvement)*
- Addition of a westbound right-turn lane at I-5 Northbound ramps/Carmel Valley Road intersection *(intersection improvement)*
- Widening of the NB I-5 on-ramp at Carmel Valley Road to add a second single occupancy vehicle lane (SOV) *(ramp widening)*.

- Widening of the NB I-5 off-ramp at Carmel Valley Road to add a second dedicated NB right-turn lane *(intersection improvement)*.
- Addition of a WB thru lane at Old El Camino/ Carmel Valley Road intersection *(intersection improvement)*
- Addition of a third EB through lane at the intersection of El Camino Real/SR-56 EB on-ramp and re-striping the EB approach to show dual left-turn lanes, two through lanes, one shared through right lane and an exclusive right-turn lane and thereby addition of a third lane on the SR-56 EB on-ramp at El Camino Real *(intersection improvement)*
- Addition of a fourth WB through lane at the intersection of El Camino Real/ SR-56 WB off-ramp and re-striping the approach to show an exclusive left-turn lane, a shared left through lane, three exclusive through lanes and a right-turn lane *(intersection improvement)*

The local street operational analyses of Model Run B show similar operations to Model Run A. The local street and intersection operations improve at the Carmel Valley corridor wherein intersection and street segment improvements are proposed but the overall street congestion is not alleviated. The following intersections show an improved level of service in the Auxiliary lane alternative during the AM/PM peak hours:

- I-5 Southbound ramps/ Carmel Valley Road (LOS E improves to LOS D in the AM peak hour and intersection delay improves in the PM peak hour)
- I-5 Northbound ramps/ Carmel Valley Road (delay improves in the AM peak hour and LOS E improves to LOS D in the PM peak hour)
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road (delay improves in the AM and PM peak hours)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS D/F improves to LOS B/D in the AM/PM peak hours)

The minor improvements proposed in the Carmel Valley corridor has little to no effect on the freeway-to-freeway traffic and the levels of service along the Carmel Valley intersections are still calculated to operate at LOS E and LOS F.

The freeway operations in the Auxiliary Lane Alternative improve at locations where auxiliary lanes are proposed. But the freeway-to-freeway traffic would still use surface streets leading to severe congestion on Carmel Valley Road and El Camino Real intersections.

In addition, to avoid traffic congestion at the I-5/SR-56 interchange, drivers would use alternate local street routes increasing cut-through traffic through surrounding neighborhoods. Even with some planned intersection, street segment and freeway improvements in the Auxiliary Lane Alternative, it is evident that the local street network, freeway network and the surrounding communities to the I-5/SR 56 interchange would experience severe traffic congestion and increased delay.

12.1.3 *Direct Connector Alternative (Model Run C)*

The Year 2015 "Direct Connector" scenario is based on the following improvements:

- Addition of a fourth lane at the SB approach of I-5 SB ramps/Carmel Valley Road and re-striping the SB approach to show dual left-turn lanes, a shared thru-right and an exclusive right-turn lane *(intersection improvement)*.
- Addition of a westbound right-turn lane at I-5 Northbound ramps/ Carmel Valley Road intersection *(intersection improvement)*.
- Widening of the NB I-5 off-ramp at Carmel Valley Road to add a second dedicated NB right-turn lane *(intersection improvement)*.
- Addition of a WB thru lane at Old El Camino/ Carmel Valley Road intersection *(intersection improvement)*.
- Addition of a third EB through lane at the intersection of El Camino Real/SR-56 EB on-ramp and re-striping the EB approach to show dual left-turn lanes, two through lanes, one shared through right lane and an exclusive right-turn lane and thereby addition of a third lane on the SR-56 EB on-ramp at El Camino Real *(intersection improvement)*.
- Addition of a fourth WB through lane at the intersection of El Camino Real/ SR-56 WB off-ramp and re-striping the approach to show an exclusive left-turn lane, a shared left through lane, three exclusive through lanes and a right-turn lane *(intersection improvement)*.

The street segment operational analyses of Model Run C show significantly improved operations. The levels of service in Year 2015 along the following roadway segments improve with the construction of direct connectors:

- Del Mar Heights Road between I-5 NB ramps and High Bluff Drive (LOS D to LOS C)
- Del Mar Heights Road between El Camino Real to Carmel Country Road (LOS B to LOS A)
- Carmel Valley Road between I-5 and El Camino Real (LOS E to LOS C)
- Carmel Creek Road between Carmel Country Road and Del Mar Trails Road (LOS B to LOS A)
- Carmel Country Road between Del Mar Heights Road and Townsgate Drive (LOS C to LOS B)
- Carmel Country Road between Townsgate Drive and Carmel Creek Road (LOS C to LOS B)

The direct connectors removes the freeway-to-freeway traffic from the local street intersections along Del Mar Heights Road and Carmel Valley Road, thereby improving the level of service in comparison to the No Build (Run A) and Auxiliary Lane (Run B) Alternatives. The following intersections show an improved level of service in the Direct Connectors (Run C) scenario in comparison with the No Build (Run A) scenario:

- I-5 Southbound ramps/ Del Mar Heights Road (LOS D/D improves to LOS C/C in the AM/PM peak hours)
- High Bluff Drive/ Del Mar Heights Road (LOS D/D improves to LOS C/C in the AM/PM peak hours)
- El Camino Real/ Del Mar Heights Road (LOS D improves to LOS C in the AM peak hour)
- I-5 Southbound ramps/ Carmel Valley Road (LOS E/F improves to LOS C/C in the AM/PM peak hours)
- I-5 Northbound ramps/ Carmel Valley Road (LOS D/E improves to LOS C/C in the AM/PM peak hours)
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road (LOS D improves to LOS C in the AM peak hour)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS D/F improves to LOS B/C in the AM/PM peak hours)

In the Direct Connector Alternative (Run C), the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Del Mar Heights Road, LOS E – AM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F– PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS E – AM peak hour

The above intersections are calculated to operate at LOS E or F in the No build (Run A), Auxiliary Lane (Run B) and Direct Connectors (Run C) scenario. The construction of the direct connectors maintains the same level of service at these intersections and does not degrade the level of service when compared to the No Build scenario.

The different freeway analyses (like freeway mainline, local bypass, merge, diverge and weaving) also show improved operations and levels of service for the Direct Connectors (Run C) scenario in comparison with the No Build and Auxiliary lane (Run F) scenarios.

After the construction of the direct connector (Run C), the following freeway segments show an improved level of service in the Direct Connectors (Run C) scenario in comparison with the No Build (Run A) scenario:

SR-56 Mainline:

- Between El Camino Real and Carmel Creek Road (LOS F(0) improves to LOS D – AM (WB))

However, the following freeway segments are calculated to operate at LOS F or worse in at least one of the peak hours (AM/PM).

SR-56 Mainline:

- Between Carmel Country Road and Carmel Valley Road, LOS F(2) – AM (WB)
- Between Carmel Country Road and Carmel Valley Road, LOS F(1) – PM (EB)
- East of Carmel Valley Road, LOS F(0) – AM (WB)
- East of Carmel Valley Road, LOS F(0) – PM (EB)

As discussed previously, in the interim scenario (Year 2015), SR 56 configuration is assumed to be the same as existing (4 mainlines and no HOV lanes). Hence the levels of service along WB SR 56 in the AM peak hour and EB SR 56 in the PM peak hour are calculated to operate at LOS F or worse. With the addition of the third mainline lane (SR 56 widening project), the levels of service improve significantly in the long-term as shown in the Year 2030 freeway mainline operations.

The weaving sections on SR-56 EB and WB between Carmel Creek Road and El Camino Real are calculated to operate at LOS E or worse in No Build (Run A), Auxiliary lane (Run B) and Direct Connectors (Run C) scenarios in the AM/PM peak hours. The speed and densities along these weaving sections improve in the Year 2015 Direct Connector (Run C) scenario but are still calculated to operate at LOS E or F. Because of these failing weaving sections in the Year 2015 scenarios, the following variation alternatives were developed to improve the deficient weaving problems:

- Elimination of the EB slip off-ramp to Carmel Creek Road (to eliminate the weaving problem on SR-56 EB between El Camino Real and Carmel Creek Road) – *B(2) and C(2)*
- Elimination of the EB slip off-ramp to Carmel Creek Road and collector-distributor alternative (C-D) on WB SR-56 between Carmel Creek Road and El Camino Real – *C(5)*

By implementing these alternatives, the weaving sections are eliminated. However, these restrictions force traffic to use the Carmel Valley diamond interchange.

12.1.4 *Year 2015 Improvement Alternatives – Auxiliary Lane (Run B) vs. Direct Connector (Run C)*

No EB Slip off-ramp to Carmel Creek Road

Street Segment Operations – With the elimination of the EB slip off-ramp in the Auxiliary lane Alternative B(2), the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS F.

With the elimination of the EB slip off-ramp in the Direct Connectors Alternative C(2), Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS C. The direct connectors remove the freeway-to-freeway traffic on Carmel Valley Road and El Camino Real.

- Carmel Valley Road between I-5 and El Camino Real (LOS F in *Auxiliary Lane B2 alternative* to LOS C *in Direct Connector C2 alternative*)

Intersection Operations – With the elimination of the EB slip off-ramp in the Auxiliary Lane Alternative B(2), the following intersections are calculated to operate at LOS E or F:

- I-5 Southbound ramps/ Carmel Valley Road, LOS F – PM peak hour
- I-5 Northbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS F – PM peak hour

With the elimination of the EB slip off-ramp in the Direct Connector Alternative C(2), the following intersections show an improved level of service in the Direct Connector C(2) scenario in comparison with the Auxiliary lane B(2) scenario:

- I-5 Southbound ramps/ Carmel Valley Road (LOS D/F improves to LOS C/C in the AM/PM peak hours)
- I-5 Northbound ramps/ Carmel Valley Road (LOS F/F improves to LOS D/D in the AM/PM peak hours)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS F improves to LOS D in the PM peak hour)
- Carmel Country Road/ SR-56 WB off- ramp (LOS D improves to LOS C in the AM peak hour)
- Carmel Country Road/ SR-56 EB ramps (LOS D improves to LOS C in the PM peak hour)

No EB slip off-ramp and with WB Collector-Distributor (C-D) Alternative

Street Segment Operations – With the additional traffic on Carmel Valley Road due to the elimination of slip off-ramp to Carmel Creek Road and collector-distributor on WB SR 56, the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS C in this alternative.

Intersection Operations – With the EB slip off-ramp to Carmel Creek Road eliminated and the collector-distributor alternative on WB SR-56 between Carmel Creek Road and El Camino Real, a majority of the intersections are calculated to operate at a similar level of service as in the No EB slip off-ramp (Run C2) scenario.

12.1.5 *Hybrid Alternative (Run D)*

Street Segment Operations – The Hybrid Alternative includes the WB SR 56 to I-5 NB direct connector and Auxiliary Lane improvements from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector), traffic from I-5 to SR 56 would still be forced to use Carmel Valley Road. Hence the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS E. The following roadway segments are calculated to operate at LOS E or F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Carmel Valley Road between I-5 and El Camino Real, LOS E
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F

Intersection Operations – In the Hybrid Alternative, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Del Mar Heights Road, LOS E – AM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F – PM peak hour
- I-5 Southbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E – AM and PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- El Camino Real/ Carmel Mountain Road, LOS E – AM peak hour

The Hybrid Alternative includes the WB SR 56 to I-5 NB direct connector ("half connector") and Auxiliary Lane improvements from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector), traffic from I-5 to SR 56 would still be forced to use Carmel Valley Road. Hence the intersections along Carmel Valley Road are still calculated at LOS E or F.

The following intersections show an improved level of service in the Hybrid Alternative in comparison to the Auxiliary lane Alternative F(2) during the AM/PM peak hours:

- El Camino Real West/ Via de la Valle (LOS D improves to LOS C in the PM peak hour)
- High Bluff Drive/ Del Mar Heights Road (LOS D improves to LOS C in the AM and PM peak hours)
- El Camino Real/ SR 56 WB off-ramp/ Carmel Valley Road (LOS D improves to LOS C in the AM peak hour)

- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive (LOS D improves to LOS C in the PM peak hour)

The Hybrid Alternative shows similar freeway operations to the Direct Connector scenario along WB SR 56 and Auxiliary Lane alternative along EB SR 56. Similar to the No Build scenario and Auxiliary Lane Alternatives, traffic from SB I-5 to EB SR 56 would use alternate local street routes increasing cut-through traffic through surrounding neighborhoods.

12.1.6 *Hybrid with Flyover Alternative (Run D1)*

Street Segment Operations – The Hybrid with Flyover Alternative includes the WB SR 56 to I-5 NB direct connector and a flyover ramp on Carmel Valley Road from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector) and a flyover ramp, traffic from SB I-5 to EB SR 56 would still be forced to use Carmel Valley Road. The following roadway segments are calculated to operate at LOS E or F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Carmel Valley Road between I-5 and El Camino Real, LOS E
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F

Intersection Operations – In the Hybrid with Flyover Alternative, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- I-5 Northbound ramps/ Del Mar Heights Road, LOS E – AM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F – PM peak hour
- I-5 Southbound ramps/ Carmel Valley Road, LOS E – PM peak hour
- I-5 Northbound ramps/ Carmel Valley Road, LOS E – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS E – AM peak hour

The Hybrid Alternative includes the WB SR 56 to I-5 NB direct connector ("half connector") and a flyover ramp from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector) and a flyover ramp, traffic from I-5 to SR 56 would be forced to use Carmel Valley Road. The benefit of the flyover is for the SB I-5 to EB SR 56 traffic to use the "flyover" and bypass the El Camino Real intersection.

The following intersections show an improved level of service in the Hybrid with Flyover Alternative in comparison to the Auxiliary lane Alternative F(2) during the AM/PM peak hours:

- I-5 Southbound ramps/ Carmel Valley Road (LOS F improves to LOS E in the PM peak hour)
- I-5 Northbound ramps/ Carmel Valley Road (LOS F/E improves to LOS D/E in the AM and PM peak hours)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS F improves to LOS D in the PM peak hour)

The Hybrid with Flyover Alternative shows similar freeway operations to the Direct Connector scenario along SR 56. However, similar to the No Build scenario and Auxiliary Lane Alternatives, traffic from SB I-5 would have to exit Carmel Valley Road and use the local street intersections to access SR 56. Because of congestion on Carmel Valley Road, cut-through traffic on alternate local street routes like Carmel Creek Road and Carmel Country Road would increase.

12.2 Year 2030

12.2.1 *No Build Alternative (Model Run E)*

The operational analyses of the Year 2030 No Build (Model Run E) alternative is based on the following assumptions:

- I-5 freeway configuration is planned to include 10 general-purpose lanes (5 lanes in each direction) with 4 managed/ HOV lanes (two lanes in each direction) with direct access ramps (DAR's) connections to HOV/managed lanes. As per I-5 North Coast Project, the direct access ramps are planned at Voigt Drive, Manchester Avenue, Cannon Road and Oceanside Boulevard at I-5.
- SR-56 freeway configuration is planned to include 6 general-purpose lanes (3 lanes in each direction) with 2 managed/ HOV lanes (one lane in each direction). This alternative **does not include** the construction of direct connectors (southbound I-5 to eastbound SR-56 and from westbound SR-56 to northbound I-5 connectors).
- No improvements to the local streets are assumed.

Table 12–3 shows a comparison matrix for the different Year 2030 alternatives showing the deficient (LOS E or worse) local street segments and intersections. ***Table 12–4*** shows a comparison matrix for the different Year 2030 alternatives showing the deficient (LOS F) freeway operational analyses.

Based on the analyses discussed in Section 8.0 and the summary of the results shown in *Table 12–3 and Table 12–4*, the No Build (Run E) alternative has various failing street segments, intersections and freeway operations. Currently, local streets and the surrounding communities experience increased demand and congestion during peak hours from I-5 and SR-56 traffic. Continued regional development and inter-regional travel increases traffic volumes and reduces traffic operational quality as shown in the failing traffic operations in the urban and freeway facilities in the No Build scenario.

The No Build network forces drivers to exit the freeway to travel between SB I-5 to EB SR-56 and WB SR-56 to NB I-5. This would lead to severe congestion at the Carmel Valley and El Camino Real interchanges, thereby significantly impacting all the corridor intersections and street segments. Further, the absence of the proposed direct connectors would significantly impact the freeway operations between Del Mar Heights Road and Carmel Valley Road on I-5 and SR-56.

During peak hours, to avoid traffic congestion at the I-5/SR-56 interchange, drivers would use alternate routes including El Camino Real, Del Mar Heights Road, Carmel Creek Road and Carmel

Country Road increasing traffic on surface streets, thereby impacting all the surrounding communities.

12.2.2 *Auxiliary Lane Alternative (Model Run F)*

The operational analyses of the Year 2030 Auxiliary Lane (Model Run F) alternative is based on the following assumptions:

- I-5 freeway configuration is planned to include 10 general-purpose lanes (5 lanes in each direction) with 4 managed/ HOV lanes (two lanes in each direction) with direct access ramps (DAR's) connections to HOV/managed lanes. As per I-5 North Coast Project, the direct access ramps are planned at Voigt Drive, Manchester Avenue, Cannon Road and Oceanside Boulevard at I-5.
- SR-56 freeway configuration is planned to include 6 general-purpose lanes (3 lanes in each direction) with 2 managed/ HOV lanes (one lane in each direction). This alternative **does not include** the construction of direct connectors (southbound I-5 to eastbound SR-56 and from westbound SR-56 to northbound I-5 connectors).

The following improvements to the local streets and freeway facilities are proposed:

- Addition of an auxiliary lane on SB I-5 between Del Mar Heights Road and Carmel Valley Road *(freeway improvement)*
- Addition of auxiliary lanes on WB SR-56 between Carmel Country Road and Carmel Creek Road *(freeway improvement)*.
- Addition of a freeway mainline on WB SR-56 between Carmel Creek Road and El Camino Real *(freeway improvement)*
- Reconstruction of Del Mar Heights Road overcrossing *(freeway improvement)*.
- Addition of a fourth lane at the SB approach of I-5 SB ramps/Carmel Valley Road and re-striping the SB approach to show dual left-turn lanes, a shared thru-right and an exclusive right-turn lane *(intersection improvement)*
- Addition of a westbound right-turn lane at I-5 Northbound ramps/Carmel Valley Road intersection *(intersection improvement)*.
- Widening of the NB I-5 on-ramp at Carmel Valley Road to add a second single occupancy vehicle lane (SOV) *(ramp widening)*.
- Addition of a third NB right-turn lane at I-5 Northbound ramps/Carmel Valley Road intersection *(intersection improvement)*.
- Addition of a WB thru lane at Old El Camino/ Carmel Valley Road intersection *(intersection improvement)*.
- Addition of a fourth EB lane on EB Carmel Valley Road between I-5 NB ramps and El Camino Real. Reconfiguring the EB approach of El Camino Real/SR-56 EB on-ramp to show an exclusive left-turn lane, a shared left-through lane, two

through lanes, and two exclusive right-turn lanes *(segment and intersection improvement)*.

- Addition of a fourth WB through lane at the intersection of El Camino Real/ SR-56 WB off-ramp and re-striping the approach to show an exclusive left-turn lane, a shared left through lane, three exclusive through lanes and a right-turn lane *(intersection improvement)*.

The local street operational analyses of Model Run F show similar operations to Model Run E. The local street and intersection operations improve at the Carmel Valley corridor wherein intersection and street segment improvements are planned but the overall street congestion is not alleviated. The following intersections show an improved level of service in the Auxiliary lane alternative in comparison to the No Build Alternative during the AM/PM peak hours:

- I-5 Southbound ramps/ Carmel Valley Road (LOS F improves to LOS E in the AM peak hour)
- I-5 Northbound ramps/ Carmel Valley Road (LOS E/E improves to LOS D/D)
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road (LOS E/D improves to LOS D/C)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS E improves to LOS C in the AM peak hour)
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive (LOS E improves to LOS D in the AM peak hour)

The minor improvements proposed in the Carmel Valley corridor has little to no effect on the freeway-to-freeway traffic and the level of service along the Carmel Valley intersections is still calculated to operate at LOS E and LOS F. Similar to the No Build scenario, to avoid traffic congestion at the I-5/SR-56 interchange, drivers are expected to use alternate local street routes increasing cut-through traffic through surrounding neighborhoods.

Even with some planned intersection, street segment and freeway improvements in the Auxiliary Lane Alternative, it is evident that the local street network, freeway network and the surrounding communities to the I-5/SR 56 interchange would experience severe traffic congestion and increased delay.

12.2.3 *Direct Connector Alternative (Model Run G)*

The Year 2030 "Direct Connector" scenario is based on the following improvements that are assumed in the Auxiliary Lane (Run F) Alternative as well.

- Addition of a fourth lane at the SB approach of I-5 SB ramps/Carmel Valley Road and re-striping the SB approach to show dual left-turn lanes, a shared thru-right and an exclusive right-turn lane *(intersection improvement)*.
- Addition of a westbound right-turn lane at I-5 Northbound ramps/ Carmel Valley Road intersection *(intersection improvement)*.
- Addition of a third NB right-turn lane at I-5 Northbound ramps/Carmel Valley Road intersection *(intersection improvement)*.
- Addition of a WB thru lane at Old El Camino/ Carmel Valley Road intersection *(intersection improvement)*.
- Addition of a fourth EB lane on EB Carmel Valley Road between I-5 NB ramps and El Camino Real. Reconfiguring the EB approach of El Camino Real/SR-56 EB on-ramp to show an exclusive left-turn lane, a shared left-through lane, two through lanes, and two exclusive right-turn lanes *(segment and intersection improvement)*.
- Addition of a fourth WB through lane at the intersection of El Camino Real/ SR-56 WB off-ramp and re-striping the approach to show an exclusive left-turn lane, a shared left through lane, three exclusive through lanes and a right-turn lane *(intersection improvement)*.

The street segment operational analyses of Direct Connector Alternative (Model Run G) show significantly improved operations. The level of service along the following roadway segments improves with the construction of direct connectors in comparison with the No Build (Run E) scenario:

- Via de la Valle – San Andres Drive to El Camino Real (LOS D to LOS C)
- Del Mar Heights Road between I-5 NB ramps and High Bluff Drive (LOS F to LOS D)
- Del Mar Heights Road between High Bluff Drive and El Camino Real (LOS D to LOS C)
- Del Mar Heights Road between Carmel Country Road and Carmel Canyon Road (LOS C to LOS B)
- Carmel Valley Road between I-5 and El Camino Real (LOS F to LOS C)
- Carmel Creek Road between Carmel Country Road and Del Mar Trails Road (LOS B to LOS A)
- Carmel Country Road between Townsgate Drive and Carmel Creek Road (LOS C to LOS B)
- Carmel Country Road between Del Mar Trails Road and SR-56 WB ramps (LOS D to LOS C)

The direct connectors remove the freeway-to-freeway traffic from the local street intersections along Del Mar Heights Road and Carmel Valley Road. The following intersections show an improved level of service in the Direct Connector (Run G) scenario in comparison with the No Build (Run E) scenario:

- I-5 Southbound ramps/ Del Mar Heights Road (LOS E/E improves to LOS C/C)
- I-5 Northbound ramps/ Del Mar Heights Road (LOS F improves to LOS E in the AM peak hour)
- High Bluff Drive/ Del Mar Heights Road (LOS D/E improves to LOS C/C)
- El Camino Real/ Del Mar Heights Road (LOS E/E improves to LOS D/D)
- Signature Pointe Driveway/ Del Mar Heights Road (LOS E improves to LOS D in the PM peak hour)
- Carmel Country Road/ Hartfield Avenue/ Del Mar Heights Road (LOS E/E improves to LOS D/D).
- Carmel Country Road/ Townsgate Drive (LOS E improves to LOS D in the AM peak hour)
- El Camino Real/ High Bluff Drive (LOS D improves to LOS C in the AM peak hour)
- Carmel Country Road/ Carmel Creek Road (LOS E/E improves to LOS D/D)
- I-5 Southbound ramps/ Carmel Valley Road (LOS F/F improves to LOS C/C)
- I-5 Northbound ramps/ Carmel Valley Road (LOS E/E improves to LOS C/C)
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road (LOS E/D improves to LOS D/C)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS E/F improves to LOS C/D)
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive (LOS E improves to LOS D in the AM peak hour)
- Carmel Country Road/ SR-56 EB ramps (LOS D improves to LOS C in the PM peak hour)

In the Direct Connector Alternative, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- Camino Del Mar/ Del Mar Heights Road, LOS F – PM peak hour
- Mango Drive/ Del Mar Heights Road, LOS E – AM peak hour
- I-5 Northbound ramps/ Del Mar Heights Road, LOS E– AM and PM peak hours
- Carmel Valley Road/ Del Mar Heights Road, LOS E – AM peak hour

- Portofino Drive/ Carmel Valley Road, LOS F– AM and PM peak hours
- I-5 Northbound ramps/ Carmel Mountain Road, LOS E – AM peak hour
- Vista Sorrento Parkway/ Torrey View Court/ Carmel Mountain Road, LOS E – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS F – AM and PM peak hours

The above intersections are calculated to operate at LOS E or F in the No build (Run E), Auxiliary Lane and Direct Connector scenarios. The direct connectors maintain the same level of service at these intersections and do not degrade the level of service when compared to the No Build scenario.

The different freeway analyses (like freeway mainline, local bypass, merge, diverge and weaving) also show improved operations and levels of service for the Direct Connector (Run G) scenario in comparison with the No Build and Auxiliary lane (Run F) scenarios.

The weaving sections on SR-56 EB and WB between Carmel Creek Road and El Camino Real are calculated to operate at LOS F in No Build (Run E), Auxiliary lane (Run F) and Direct Connector (Run G) scenarios in the AM/PM peak hours. The speed and densities along these weaving sections improves in the Year 2030 Direct Connector (Run G) scenario but are still calculated to operate at LOS E or F. Because of these failing weaving sections in the Year 2030 scenarios, the following variation alternatives were developed to improve the deficient weaving problems:

- Elimination of the EB slip off-ramp to Carmel Creek Road (to eliminate the weaving section on SR-56 EB between El Camino Real and Carmel Creek Road).
- Installation of a WB barrier between Carmel Creek Road and El Camino Real (to eliminate the weaving section on SR-56 WB between Carmel Creek Road and El Camino Real).
- Elimination of the EB slip off-ramp to Carmel Creek Road and installation of a WB barrier between Carmel Creek Road and El Camino Real.
- Elimination of the EB slip off-ramp to Carmel Creek Road and collector-distributor alternative (C-D) on WB SR-56 between Carmel Creek Road and El Camino Real – *G(5)*

By implementing these alternatives, the weaving sections are eliminated. However, the implementation of these restrictions force traffic to use the Carmel Valley diamond interchange.

12.2.4 *Year 2030 Improvement Alternatives – Auxiliary Lane (Run F) vs. Direct Connector (Run G)*

No EB Slip off-ramp to Carmel Creek Road

Street Segment Operations – With the elimination of the EB slip off-ramp in the Auxiliary lane Alternative F(2), the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS F.

With the elimination of the EB slip off-ramp in the Direct Connector Alternative G(2), Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS C. The direct connectors remove the freeway-to-freeway traffic on Carmel Valley Road and El Camino Real.

Intersection Operations – With the elimination of the EB slip off-ramp in the Auxiliary lane Alternative F(2), the following intersections are calculated to operate at LOS E or F:

- Carmel Country Road/ Carmel Creek Road, LOS E – AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS E/F – PM AM/PM peak hours
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive, LOS E – AM and PM peak hours
- Carmel Country Road/ Carmel Canyon Road, LOS E – PM peak hour
- Carmel Country Road/ SR-56 EB ramps, LOS E – PM peak hour

With the elimination of the EB slip off-ramp in the Direct Connector Alternative G(2), the following intersections show an improved level of service in the Direct Connectors G(2) scenario in comparison with the Auxiliary lane F(2) scenario:

- Carmel Country Road/ Carmel Creek Road (LOS E/E improves to LOS D/D)
- I-5 Southbound ramps/ Carmel Valley Road (LOS E/F improves to LOS C/C)
- I-5 Northbound ramps/ Carmel Valley Road (LOS E/F improves to LOS D/D)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS E/F improves to LOS D/E)
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive (LOS E improves to LOS D in the AM and PM peak hours)
- Carmel Country Road/ Carmel Canyon Road (LOS E improves to LOS D in the PM peak hour)
- Carmel Country Road/ SR-56 EB ramps (LOS E improves to LOS D in the PM peak hour)

With WB Barrier

Street Segment Operations – With the installation of a WB barrier between Carmel Creek Road and El Camino Real in the Auxiliary Lane Alternative F(3), the following segments are calculated to operate at LOS E or worse:

- Carmel Valley Road between I-5 and El Camino Real, LOS F
- El Camino Real between Valley Center Drive and Carmel Valley Road, LOS E

With the installation of a barrier between Carmel Creek Road and El Camino Real in the Direct Connectors Alternative G(3), the above segments are calculated to operate level of service at LOS C.

Intersection Operations – With the installation of a barrier between Carmel Creek Road and El Camino Real in the Auxiliary Lane Alternative F(3), the following intersections are calculated to operate at LOS E or worse:

- Carmel Country Road/ Carmel Creek Road, LOS E –AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E – AM peak hour
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS F – PM peak hour

With the installation of a WB barrier in the Direct Connectors Alternative G(3) scenario, the following intersections show an improved level of service in comparison with the Auxiliary lane F(3) scenario:

- Carmel Country Road/ Carmel Creek Road (LOS E/E improves to LOS D/D)
- I-5 Southbound ramps/ Carmel Valley Road (LOS F/F improves to LOS C/C)
- I-5 Northbound ramps/ Carmel Valley Road (LOS E improves to LOS D in the AM peak hour)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS F improves to LOS D in the PM peak hour)

No EB slip off-ramp and with WB Barrier

Street Segment Operations – With the elimination of the EB slip off-ramp to Carmel Creek Road and the installation of a barrier between Carmel Creek Road and El Camino Real in the Auxiliary lane Alternative F(4), the following segments are calculated to operate at LOS E or worse:

- Carmel Valley Road between I-5 and El Camino Real, LOS F
- El Camino Real between Valley Center Drive and Carmel Valley Road, LOS E

With the elimination of the EB slip off-ramp to Carmel Creek Road and the installation of a barrier between Carmel Creek Road and El Camino Real in the Direct Connectors alternative G(4), the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS E. The segment of El Camino Real between Valley Center Drive and Carmel Valley Road is calculated to operate at LOS D. The direct connectors remove the freeway-to-freeway traffic on Carmel Valley Road and El Camino Real.

Intersection Operations – With the elimination of the EB slip off-ramp to Carmel Creek Road and the installation of a barrier between Carmel Creek Road and El Camino Real in the Auxiliary Lane Alternative (Run F), the following intersections are calculated to operate at LOS E or worse:

- Carmel Country Road/ Carmel Creek Road, LOS E – AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive, LOS E – AM peak hour
- Carmel Country Road/ Carmel Canyon Road, LOS E – PM peak hour
- Carmel Country Road/ SR-56 WB off- ramp, LOS F – AM peak hour
- Carmel Country Road/ SR-56 EB ramps, LOS E – PM peak hour

With the EB slip off-ramp to Carmel Creek Road eliminated and with the installation of a WB barrier in the Direct Connectors alternative G(4) scenario, the following intersections show an improved level of service in comparison with the Auxiliary lane F(4)scenario:

- Carmel Country Road/ Carmel Creek Road (LOS E/E improves to LOS D/D)

- I-5 Southbound ramps/ Carmel Valley Road (LOS F/F improves to LOS C/C)
- I-5 Northbound ramps/ Carmel Valley Road (LOS F/F improves to LOS D/E)
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road (LOS E/F improves to LOS D/E)
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive (LOS E improves to LOS D in the PM peak hour)
- Carmel Country Road/ Carmel Canyon Road (LOS E improves to LOS D in the PM peak hour)
- Carmel Country Road/ SR-56 WB off- ramp (LOS F improves to LOS E in the AM peak hour)
- Carmel Country Road/ SR-56 EB ramps (LOS E improves to LOS D in the PM peak hour).

No EB slip off-ramp and with WB Collector-Distributor (C-D) Alternative

Street Segment Operations – In this Direct Connector Alternative G(5), the segment of Carmel Valley Road between I-5 and El Camino Real is calculated to operate at LOS E. This is an improvement over the level of service F calculated for the Auxiliary Lane Alternatives and its variations.

Intersection Operations – With the EB slip off-ramp to Carmel Creek Road eliminated and the collector-distributor alternative on WB SR-56 between Carmel Creek Road and El Camino Real, the following intersections show delay improvements in comparison with the Direct Connectors (No EB slip + WB barrier) G(4) scenario:

- Carmel Country Road/ Carmel Creek Road (delay improves in the AM and PM peak hours)
- I-5 Northbound ramps/ Carmel Valley Road (LOS E improves to LOS D in the AM peak hour)
- El Camino Real/ SR-56 WB off-ramp/ Carmel Valley Road (delay improves in the AM and PM peak hours)
- Carmel Country Road/ SR-56 WB off- ramp (delay improves in the AM and PM peak hours)
- Carmel Country Road/ SR-56 EB ramps (delay improves in the AM and PM peak hours)

12.2.5 *Hybrid Alternative (Run H)*

Street Segment Operations – The Hybrid Alternative includes the WB SR 56 to I-5 NB direct connector and Auxiliary Lane improvements from SB I-5 to EB SR 56. Even with the WB SR 56 to NB I-5 freeway connector, the following roadway segments are calculated to operate at LOS E or F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS F
- Del Mar Heights Road between Camino Del Mar and Mango Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Del Mar Heights Road between I-5 NB ramps and High Bluff Drive, LOS E
- Carmel Valley Road between I-5 and El Camino Real, LOS F
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F

Intersection Operations – In the Hybrid Alternative, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- Camino Del Mar/ Del Mar Heights Road, LOS F – PM peak hour
- Mango Drive/ Del Mar Heights Road, LOS E – AM peak hour
- I-5 Southbound ramps/ Del Mar Heights Road, LOS E – AM and PM peak hours
- I-5 Northbound ramps/ Del Mar Heights Road, LOS F/E – AM/PM peak hours
- High Bluff Drive/ Del Mar Heights Road, LOS E – PM peak hour
- El Camino Real/ Del Mar Heights Road, LOS E – PM peak hour
- Signature Pointe Driveway/ Del Mar Heights Road, LOS E – PM peak
- Carmel Valley Road/ Del Mar Heights Road, LOS E – AM peak hour
- Carmel Country Road/ Carmel Creek Road, LOS E – PM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS F – PM peak hour
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive, LOS E – AM and PM peak hours
- Carmel Country Road/ Carmel Canyon Road, LOS E – PM peak hour
- Carmel Country Road/ SR 56 WB off-ramp, LOS E– AM peak hour
- Carmel Country Road/ SR 56 EB ramps, LOS E– PM peak hour
- I-5 Northbound ramps/ Carmel Mountain Road, LOS E – AM peak hour

- Vista Sorrento Parkway/ Torrey View Court/ Carmel Mountain Road, LOS E – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS F – AM and PM peak hours

The Hybrid Alternative includes the WB SR 56 to I-5 NB direct connector and Auxiliary Lane improvements from SB I-5 to EB SR 56. The WB SR 56 to NB I-5 direct connector reduces traffic volumes at Via de Valle, Del Mar Heights Road and Carmel Valley Road in comparison to the No Build (Run E) scenario, but the intersections along Carmel Valley Road and Del Mar Heights Road are still calculated at LOS E or F.

The minor improvements proposed in the Carmel Valley corridor has little to no effect on the freeway-to-freeway traffic (especially SB I-5 to EB SR 56) and the level of service along the Carmel Valley intersections is still calculated to operate at LOS E and LOS F. The additional third mainline lane and proposed auxiliary lanes on SR 56 improves downstream freeway mainline, merge and diverge operations on SR 56 but the freeway-to-freeway traffic would still use surface streets leading to severe congestion on Carmel Valley Road and El Camino Real intersections.

12.2.6 *Hybrid with Flyover Alternative (Run H1)*

Street Segment Operations – The Hybrid with Flyover Alternative includes the WB SR 56 to I-5 NB Direct Connector and a flyover ramp on Carmel Valley Road from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector) and a flyover ramp, traffic from SB I-5 to EB SR 56 would still be forced to use Carmel Valley Road. The following roadway segments are calculated to operate at LOS E or F:

- Via de la Valle between Jimmy Durante Blvd and I-5 SB ramps, LOS F
- Via de la Valle between I-5 NB ramps and San Andres Drive, LOS E
- Del Mar Heights Road between Camino Del Mar and Mango Drive, LOS E
- Del Mar Heights Road between Mango Drive and Portofino Drive, LOS E
- Del Mar Heights Road between I-5 NB ramps and High Bluff Drive, LOS E
- Carmel Valley Road between I-5 and El Camino Real, LOS E
- Camino Del Mar between Del Mar Heights Road and Carmel Valley Road, LOS F
- Camino Del Mar south of Carmel Valley Road, LOS F

Intersection Operations – In the Hybrid with Flyover Alternative, the following intersections are calculated to operate at LOS E or LOS F in at least one of the peak hours (AM/PM).

- Camino Del Mar/ Del Mar Heights Road, LOS F – PM peak hour
- Mango Drive/ Del Mar Heights Road, LOS E – AM peak hour

- I-5 Southbound ramps/ Del Mar Heights Road, LOS E – AM and PM peak hours
- I-5 Northbound ramps/ Del Mar Heights Road, LOS F/E – AM/PM peak hours
- High Bluff Drive/ Del Mar Heights Road, LOS E – PM peak hour
- El Camino Real/ Del Mar Heights Road, LOS E – PM peak hour
- Signature Pointe Driveway/ Del Mar Heights Road, LOS E – PM peak
- Carmel Valley Road/ Del Mar Heights Road, LOS E – AM peak hour
- Carmel Country Road/ Carmel Creek Road, LOS E – PM peak hour
- Portofino Drive/ Carmel Valley Road, LOS F – AM and PM peak hours
- I-5 Southbound ramps/ Carmel Valley Road, LOS F/F – AM/PM peak hours
- I-5 Northbound ramps/ Carmel Valley Road, LOS E/F – AM/PM peak hours
- El Camino Real/ SR-56 EB on-ramp/ Carmel Valley Road, LOS F – PM peak hour
- Carmel Creek Road/ SR-56 WB ramps/ Valley Center Drive, LOS E – AM and PM peak hours
- Carmel Country Road/ Carmel Canyon Road, LOS E – PM peak hour
- Carmel Country Road/ SR 56 WB off-ramp, LOS E– AM peak hour
- Carmel Country Road/ SR 56 EB ramps, LOS E– PM peak hour
- I-5 Northbound ramps/ Carmel Mountain Road, LOS E – AM peak hour
- Vista Sorrento Parkway/ Torrey View Court/ Carmel Mountain Road, LOS E – PM peak hour
- El Camino Real/ Carmel Mountain Road, LOS F – AM and PM peak hours

The Hybrid with Flyover Alternative includes the WB SR 56 to I-5 NB direct connector ("half connector") and a flyover from SB I-5 to EB SR 56. Even with the "half connector" (WB SR 56 to NB I-5 freeway connector) and a flyover ramp, traffic from I-5 to SR 56 would be forced to use Carmel Valley Road. The benefit of the flyover is for the SB I-5 to EB SR 56 traffic to use the "flyover" and bypass the El Camino Real intersection.

The minor improvements proposed in the Carmel Valley corridor has little to no effect on the freeway-to-freeway traffic and the level of service along the Carmel Valley intersections is still calculated to operate at LOS E and LOS F. The additional third mainline lane and proposed auxiliary lanes on SR 56 improves downstream freeway mainline, merge and diverge operations on SR 56 but the freeway-to-freeway traffic would still use surface streets leading to severe congestion on Carmel Valley Road and El Camino Real intersections.

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TABLE 12–1
YEAR 2015 ALTERNATIVES COMPARISON (LOCAL STREET FACILITIES)

Run	Analysis Scenario/Model	Local Street Facilities Operational Analyses (operating at LOS E or F)	
		Street Segment Operations	**Intersection Operations (AM or PM peak hours)**
A	No Build	Via de la Valle – Jimmy Durante Blvd to I-5 Via de la Valle – I-5 NB ramps to San Andres Drive Del Mar Heights Road – Mango Drive to Portofino Drive Carmel Valley Road – I-5 to El Camino Real Camino Del Mar – Del Mar Heights Road to Carmel Valley Road Camino Del Mar – South of Carmel Valley Road ***Total – 6 segments***	9. I-5 NB ramps/ Del Mar Heights Road 24. I-5 SB ramps/ Carmel Valley Road 29. El Camino Real/ SR-56 EB on-ramp 22. Portofino Drive/ Carmel Valley Road 25. I-5 NB ramps/ Carmel Valley Road 41. El Camino Real/ Carmel Mountain Road ***Total – 6 intersections***
B	Auxiliary Lane	Via de la Valle – Jimmy Durante Blvd to I-5 Via de la Valle – I-5 NB ramps to San Andres Drive Del Mar Heights Road – Mango Drive to Portofino Drive Camino Del Mar – Del Mar Heights Road to Carmel Valley Road Camino Del Mar – South of Carmel Valley Road ***Total – 5 segments***	9. I-5 NB ramps/ Del Mar Heights Road 24. I-5 SB ramps/ Carmel Valley Road 22. Portofino Drive/ Carmel Valley Road 41. El Camino Real/ Carmel Mountain Road ***Total – 4 intersections***
C	Direct Connector	Via de la Valle – Jimmy Durante Blvd to I-5 Via de la Valle – I-5 NB ramps to San Andres Drive Del Mar Heights Road – Mango Drive to Portofino Drive Camino Del Mar – Del Mar Heights Road to Carmel Valley Road Camino Del Mar – South of Carmel Valley Road ***Total – 5 segments***	9. I-5 NB ramps/ Del Mar Heights Road 41. El Camino Real/ Carmel Mountain Road 22. Portofino Drive/ Carmel Valley Road ***Total – 3 intersections***
D	Hybrid	Via de la Valle – Jimmy Durante Blvd to I-5 Via de la Valle – I-5 NB ramps to San Andres Drive Del Mar Heights Road – Mango Drive to Portofino Drive Carmel Valley Road – I-5 to El Camino Real Camino Del Mar – Del Mar Heights Road to Carmel Valley Road Camino Del Mar – South of Carmel Valley Road ***Total – 6 segments***	9. I-5 NB ramps/ Del Mar Heights Road 24. I-5 SB ramps/ Carmel Valley Road 29. El Camino Real/ SR-56 EB on-ramp 22. Portofino Drive/ Carmel Valley Road 25. I-5 NB ramps/ Carmel Valley Road 41. El Camino Real/ Carmel Mountain Road ***Total – 6 intersections***
D1	Hybrid with Flyover	Via de la Valle – Jimmy Durante Blvd to I-5 Via de la Valle – I-5 NB ramps to San Andres Drive Del Mar Heights Road – Mango Drive to Portofino Drive Carmel Valley Road – I-5 to El Camino Real Camino Del Mar – Del Mar Heights Road to Carmel Valley Road Camino Del Mar – South of Carmel Valley Road ***Total – 6 segments***	9. I-5 NB ramps/ Del Mar Heights Road 24. I-5 SB ramps/ Carmel Valley Road 41. El Camino Real/ Carmel Mountain Road 22. Portofino Drive/ Carmel Valley Road 25. I-5 NB ramps/ Carmel Valley Road ***Total – 5 intersections***

TABLE 12–2
YEAR 2015 ALTERNATIVES COMPARISON (FREEWAY FACILITIES)

Run	Analysis Scenario/Model	Freeway Facilities Operational Analyses (operating at LOS F)			
		Freeway Mainline Operations	**Weaving Operations**	**Merge Operations**	**Diverge Operations**
A	No Build	SR-56: El Camino Real and Carmel Creek Road (WB) SR-56: Carmel Creek Road and Carmel Country Road (EB & WB) SR-56: Carmel Country Road and Carmel Valley Road (EB & WB) SR-56: East of Carmel Valley Road (EB & WB) ***Total – 7 segments***	SR-56: El Camino Real to Carmel Creek Road (EB & WB) ***Total – 2 segments***	5M6: Carmel Valley Road to SB I-5 56M3: Carmel Country Road to EB SR-56 56M4: Carmel Valley Road to WB SR-56 56M5: Carmel Valley Road to EB SR-56 ***Total – 4 segments***	5D5: Bypass exit from Mainline SB I-5 56D3: Carmel Creek Road from WB SR-56 56D5: Carmel Country Road from WB SR-56 56D6: Carmel Valley Road from WB SR-56 ***Total – 4 segments***
B	Auxiliary Lane	SR-56: Carmel Creek Road and Carmel Country Road (EB) SR-56: Carmel Country Road and Carmel Valley Road (EB & WB) SR-56: East of Carmel Valley Road (EB & WB) ***Total – 5 segments***	SR-56: El Camino Real to Carmel Creek Road (EB & WB) ***Total – 2 segments***	5M6: Carmel Valley Road to SB I-5 56M3: Carmel Country Road to EB SR-56 56M4: Carmel Valley Road to WB SR-56 56M5: Carmel Valley Road to EB SR-56 ***Total – 4 segments***	5D5: Bypass exit from Mainline SB I-5 56D5: Carmel Country Road from WB SR-56 56D6: Carmel Valley Road from WB SR-56 ***Total – 3 segments***
C	Direct Connector	SR-56: Carmel Country Road and Carmel Valley Road (EB & WB) SR-56: East of Carmel Valley Road (EB & WB) ***Total – 4 segments***	SR-56: El Camino Real to Carmel Creek Road (EB) ***Total – 1 segment***	5M6: Carmel Valley Road to SB I-5 56M3: Carmel Country Road to EB SR-56 56M4: Carmel Valley Road to WB SR-56 56M5: Carmel Valley Road to EB SR-56 ***Total – 4 segments***	56D4: Carmel Valley Road from EB SR-56 56D5: Carmel Country Road from WB SR-56 56D6: Carmel Valley Road from WB SR-56 ***Total – 3 segments***
D	Hybrid	SR-56: Carmel Creek Road and Carmel Country Road (EB) SR-56: Carmel Country Road and Carmel Valley Road (EB & WB) SR-56: East of Carmel Valley Road (EB & WB) ***Total – 5 segments***	SR-56: Carmel Creek Road to Carmel Country Road (EB) ***Total – 1 segment***	5M6: Carmel Valley Road to SB I-5 56M3: Carmel Country Road to EB SR-56 56M4: Carmel Valley Road to WB SR-56 56M5: Carmel Valley Road to EB SR-56 ***Total – 4 segments***	5D5: Bypass exit from Mainline SB I-5 56D5: Carmel Country Road from WB SR-56 56D6: Carmel Valley Road from WB SR-56 ***Total – 3 segments***
D1	Hybrid with Flyover	SR-56: Carmel Country Road and Carmel Valley Road (EB & WB) SR-56: East of Carmel Valley Road (EB & WB) ***Total – 4 segments***	-	5M6: Carmel Valley Road to SB I-5 56M3: Carmel Country Road to EB SR-56 56M4: Carmel Valley Road to WB SR-56 56M5: Carmel Valley Road to EB SR-56 ***Total – 4 segments***	5D5: Bypass exit from Mainline SB I-5 56D5: Carmel Country Road from WB SR-56 56D6: Carmel Valley Road from WB SR-56 ***Total – 3 segments***

TABLE 12–3
YEAR 2030 ALTERNATIVES COMPARISON (LOCAL STREET FACILITIES)

Run	Analysis Scenario/Model	Local Street Facilities Operational Analyses (operating at LOS E or F)	
		Street Segment Operations	**Intersection Operations (AM or PM peak hours)**
E	No Build	Via de la Valle – Jimmy Durante Blvd to I-5 Via de la Valle – I-5 NB ramps to San Andres Drive Del Mar Heights Road – Camino Del Mar to Mango Drive Del Mar Heights Road – Mango Drive to Portofino Drive Del Mar Heights Road – I-5 NB ramps to High Bluff Drive Carmel Valley Road – I-5 to El Camino Real Camino Del Mar – Del Mar Heights Road to Carmel Valley Road Camino Del Mar – South of Carmel Valley Road ***Total – 8 segments***	5. Camino Del Mar/ Del Mar Heights Road 6. Mango Drive/ Del Mar Heights Road 8. I-5 SB ramps/ Del Mar Heights Road 9. I-5 NB ramps/ Del Mar Heights Road 10. High Bluff Drive/Del Mar Heights Road 11. El Camino Real/ Del Mar Heights Road 12. Signature Pointe Dwy/ Del Mar Heights Road 13. Carmel Country Road/ Del Mar Heights Road 15. Carmel Valley Road/ Del Mar Heights Road 17. Carmel Country Road/ Townsgate Drive 19. Carmel Country Road/ Carmel Creek Road 22. Portofino Drive/ Carmel Valley Road 24. I-5 SB ramps/ Carmel Valley Road 25. I-5 NB ramps/ Carmel Valley Road 28. El Camino Real/ SR-56 WB off-ramp 29. El Camino Real/ SR-56 EB on-ramp 30. Carmel Creek Road/ SR-56 WB ramps 39. I-5 NB ramps/ Carmel Mountain Road 40. Vista Sorrento Pkwy/ Carmel Mountain Road 41. El Camino Real/ Carmel Mountain Road ***Total – 20 intersections***
F	Auxiliary Lane	Via de la Valle – Jimmy Durante Blvd to I-5 Via de la Valle – I-5 NB ramps to San Andres Drive Del Mar Heights Road – Camino Del Mar to Mango Drive Del Mar Heights Road – Mango Drive to Portofino Drive Del Mar Heights Road – I-5 NB ramps to High Bluff Drive Carmel Valley Road – I-5 to El Camino Real Camino Del Mar – Del Mar Heights Road to Carmel Valley Road Camino Del Mar – South of Carmel Valley Road ***Total – 8 segments***	5. Camino Del Mar/ Del Mar Heights Road 6. Mango Drive/ Del Mar Heights Road 8. I-5 SB ramps/ Del Mar Heights Road 9. I-5 NB ramps/ Del Mar Heights Road 10. High Bluff Drive/Del Mar Heights Road 11. El Camino Real/ Del Mar Heights Road 12. Signature Pointe Dwy/ Del Mar Heights Road 13. Hartfield Avenue/ Del Mar Heights Road 15. Carmel Valley Road/ Del Mar Heights Road 17. Carmel Country Road/ Townsgate Drive 19. Carmel Country Road/ Carmel Creek Road 22. Portofino Drive/ Carmel Valley Road 24. I-5 SB ramps/ Carmel Valley Road 29. El Camino Real/ SR-56 EB on-ramp 39. I-5 NB ramps/ Carmel Mountain Road 40. Vista Sorrento Pkwy/ Carmel Mountain Road 41. El Camino Real/ Carmel Mountain Road ***Total – 17 intersections***
G	Direct Connector	Via de la Valle – Jimmy Durante Blvd to I-5 Via de la Valle – I-5 NB ramps to San Andres Drive Del Mar Heights Road – Camino Del Mar to Mango Drive Del Mar Heights Road – Mango Drive to Portofino Drive Camino Del Mar – Del Mar Heights Road to Carmel Valley Road Camino Del Mar – South of Carmel Valley Road ***Total – 6 segments***	5. Camino Del Mar/ Del Mar Heights Road 6. Mango Drive/ Del Mar Heights Road 9. I-5 NB ramps/ Del Mar Heights Road 15. Carmel Valley Road/ Del Mar Heights Road 22. Portofino Drive/ Carmel Valley Road 39. I-5 NB ramps/ Carmel Mountain Road 40. Vista Sorrento Pkwy/ Carmel Mountain Road 41. El Camino Real/ Carmel Mountain Road ***Total – 8 intersections***
H	Hybrid	Via de la Valle – Jimmy Durante Blvd to I-5 Via de la Valle – I-5 NB ramps to San Andres Drive Del Mar Heights Road – Camino Del Mar to Mango Drive Del Mar Heights Road – Mango Drive to Portofino Drive Del Mar Heights Road – I-5 NB ramps to High Bluff Drive Carmel Valley Road – I-5 to El Camino Real Camino Del Mar – Del Mar Heights Road to Carmel Valley Road Camino Del Mar – South of Carmel Valley Road ***Total – 8 segments***	5. Camino Del Mar/ Del Mar Heights Road 6. Mango Drive/ Del Mar Heights Road 8. I-5 SB ramps/ Del Mar Heights Road 9. I-5 NB ramps/ Del Mar Heights Road 10. High Bluff Drive/Del Mar Heights Road 11. El Camino Real/ Del Mar Heights Road 12. Signature Pointe Dwy/ Del Mar Heights Road 15. Carmel Valley Road/ Del Mar Heights Road 19. Carmel Country Road/ Carmel Creek Road 22. Portofino Drive/ Carmel Valley Road 24. I-5 SB ramps/ Carmel Valley Road 25. I-5 NB ramps/ Carmel Valley Road 29. El Camino Real/ SR-56 EB on-ramp 30. Carmel Creek Road/ SR-56 WB ramps 32. Carmel Country Road/ Carmel Canyon Road 33. Carmel Country Road/ SR-56 WB off-ramp 34. Carmel Country Road/ SR-56 EB ramps 39. I-5 NB ramps/ Carmel Mountain Road 40. Vista Sorrento Pkwy/ Carmel Mountain Road 41. El Camino Real/ Carmel Mountain Road ***Total – 20 intersections***

TABLE 12–3
YEAR 2030 ALTERNATIVES COMPARISON (LOCAL STREET FACILITIES)

Run	Analysis Scenario/Model	Local Street Facilities Operational Analyses (operating at LOS E or F)	
		Street Segment Operations	**Intersection Operations (AM or PM peak hours)**
H1	Hybrid with Flyover	Via de la Valle – Jimmy Durante Blvd to I-5 Via de la Valle – I-5 NB ramps to San Andres Drive Del Mar Heights Road – Camino Del Mar to Mango Drive Del Mar Heights Road – Mango Drive to Portofino Drive Del Mar Heights Road – I-5 NB ramps to High Bluff Drive Carmel Valley Road – I-5 to El Camino Real Camino Del Mar – Del Mar Heights Road to Carmel Valley Road Camino Del Mar – South of Carmel Valley Road ***Total – 8 segments***	5. Camino Del Mar/ Del Mar Heights Road 6. Mango Drive/ Del Mar Heights Road 8. I-5 SB ramps/ Del Mar Heights Road 9. I-5 NB ramps/ Del Mar Heights Road 10. High Bluff Drive/Del Mar Heights Road 11. El Camino Real/ Del Mar Heights Road 12. Signature Pointe Dwy/ Del Mar Heights Road 15. Carmel Valley Road/ Del Mar Heights Road 19. Carmel Country Road/ Carmel Creek Road 22. Portofino Drive/ Carmel Valley Road 24. I-5 SB ramps/ Carmel Valley Road 25. I-5 NB ramps/ Carmel Valley Road 29. El Camino Real/ SR-56 EB on-ramp 30. Carmel Creek Road/ SR-56 WB ramps 32. Carmel Country Road/ Carmel Canyon Road 33. Carmel Country Road/ SR-56 WB off-ramp 34. Carmel Country Road/ SR-56 EB ramps 39. I-5 NB ramps/ Carmel Mountain Road 40. Vista Sorrento Pkwy/ Carmel Mountain Road 41. El Camino Real/ Carmel Mountain Road ***Total – 20 intersections***

TABLE 12–4
YEAR 2030 ALTERNATIVES COMPARISON (FREEWAY FACILITIES)

Run	Analysis Scenario/Model	Freeway Facilities Operational Analyses (operating at LOS F)			
		Freeway Mainline Operations	**Weaving Operations**	**Merge Operations**	**Diverge Operations**
E	No Build	I-5: Carmel Valley and Carmel Mountain Road (SB) SR-56: El Camino Real and Carmel Creek Road (WB) SR-56: Carmel Creek Road and Carmel Country Road (WB) ***Total – 3 segments***	SR-56: El Camino Real to Carmel Creek Road (EB & WB) ***Total – 2 segments***	5M6: Carmel Valley Road to SB I-5 5M9: Del Mar Heights Road to NB I-5 ***Total – 2 segments***	5D5: Bypass exit from Mainline SB I-5 5D6: Carmel Valley Road from SB I-5 56D3: Carmel Creek Road from WB SR-56 ***Total – 3 segments***
F	Auxiliary Lane	I-5: Carmel Valley and Carmel Mountain Road (SB) ***Total – 1 segment***	SR-56: El Camino Real to Carmel Creek Road (EB & WB) ***Total – 2 segments***	5M6: Carmel Valley Road to SB I-5 5M9: Del Mar Heights Road to NB I-5 ***Total – 2 segments***	5D5: Bypass exit from Mainline SB I-5 ***Total – 1 segment***
G	Direct Connector	I-5: North of Via de la Valle (NB) ***Total – 1 segment***	SR-56: El Camino Real to Carmel Creek Road (EB & WB)[a] ***Total – 2 segments***	5M6: Carmel Valley Road to SB I-5 ***Total – 1 segment***	-
H	Hybrid	I-5: North of Via de la Valle (NB) I-5: Carmel Valley and Carmel Mountain Road (SB) SR-56: Carmel Creek Road and Carmel Country Road (EB) ***Total –3 segments***	-[b]	5M6: Carmel Valley Road to SB I-5 ***Total – 1 segment***	5D5: Bypass exit from Mainline SB I-5 56D8: Carmel Country Road from EB SR-56 ***Total – 2 segments***
H1	Hybrid with Flyover	I-5: North of Via de la Valle (NB) I-5: Carmel Valley and Carmel Mountain Road (SB) ***Total –2 segments***	-[b]	5M6: Carmel Valley Road to SB I-5 ***Total – 1 segment***	5D5: Bypass exit from Mainline SB I-5 ***Total –1 segment***

Footnotes:

a. The weaving operations for Year 2030 Direct Connector (Run G) show improved densities and speed but the alternative continues to operate at LOS F.
b. The Hybrid and Hybrid with Flyover scenarios assumes "No EB slip off-ramp" to Carmel Creek Road and "C-D" system on WB SR 56

13.0 CONCLUSIONS

LLG has completed the preceding evaluation of the I-5/SR 56 Interchange Project. A "No Build" and four "Build" alternatives were reviewed using forecast volumes consistent with the *I-5 North Coast Corridor Project.*

As shown in *Table 12–1 through 12–4*, the "No Build" Alternative operates at LOS F at majority of the study intersections and freeway segments with expected future traffic. Queues are calculated to exceed storage capacity and forecasted travel times are expected to almost double from today.

In the "Auxiliary Lane" Alternative, intersection and segment improvements are proposed at Carmel Valley Road between I-5 and El Camino Real as part of local street improvements. In addition, freeway improvements like addition of auxiliary lanes on SB I-5 (Del Mar heights Road to Carmel Valley Road) and WB SR 56 (Carmel Country Road to Carmel Creek Road) are also proposed. Even with these "spot" improvements, the critical intersections along Carmel Valley Road and El Camino Real are calculated to operate at LOS F. Queues are calculated to exceed storage capacity. Forecasted travel times are better than the No Build Alternative but due to the poor interchange operations at Carmel Valley Road and El Camino Real, the direct freeway route may not favorable. This may lead to traffic diverting through local communities and increasing congestion in the surrounding neighborhoods.

In the "Hybrid" and "Hybrid with Flyover" Alternative, the "half" connector provides relief to WB SR 56 to NB I-5 traffic but traffic operations from SB I-5 to EB SR 56 are substantially degraded. It should be also noted that the Hybrid with Flyover alternative may create a lane imbalance between the I-5 ramps along Carmel Valley Road in the eastbound direction. The signing and striping for a complicated design in a short distance between the two ramp intersections is also an issue.

The Auxiliary Lane, Hybrid and Hybrid with Flyover Alternatives provide relief at locations where improvements are proposed. However, these alternatives have little to no effect in relieving congestion at the I-5/Carmel Valley Road and SR 56/ El Camino Real interchanges.

The "Direct Connector" Alternative performs better than any of the above alternatives. The proposed freeway connectors provide relief to the local traffic on Carmel Valley Road and El Camino Real. The intersections, roadway segments and freeway mainline show improved operations. Queues that exceed storage capacity at the ramps are minimized, but storage lengths are exceeded at a few locations because of tight interchange geometrics. Forecasted travel times are better than any of the above alternatives. Traffic diversion through surrounding communities is not expected as the direct freeway route provides the fastest travel time.

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