6.14 Traffic and Circulation

6.14.1 Introduction

The analysis in this section summarizes the findings and recommendations presented in the "Marywood Development Traffic Impact Study, City of Orange, California" (TIS) and “Additional All-Way Stop and Traffic Calming Review” (AWS&TCR) prepared by RK Engineering Group (RK), and dated October 20, 2014 and April 22, 2015, respectively. The TIS is intended to evaluate the potential effects of the Project from a traffic circulation standpoint and to determine whether the additional traffic generated by the proposed Project will have a significant impact on the adjacent roadway and/or circulation network and key study intersections. The AWS&TCR includes a warrants analysis to determine whether traffic control (i.e. stop signs) are warranted along Villareal Drive and a speed analysis of existing traffic on Villareal to determine appropriate traffic calming recommendations.

The TIS has been prepared in accordance with the guidelines and methodologies prescribed by the City of Orange. The Intersection Capacity Utilization (ICU) and Highway Capacity Manual (HCM) methodologies have been used to analyze signalized and unsignalized intersections, respectively. The objectives of the TIS include: (1) documentation of Existing traffic conditions in the vicinity of the site; (2) evaluation of Existing Plus Project traffic conditions; (3) evaluation of Project Buildout (Year 2017) Without Project traffic conditions; (4) evaluation of Project Buildout (Year 2017) With Project traffic conditions; and (5) determination of on-site and off-site improvements and system management actions needed to achieve the City of Orange Level of Service (LOS) requirements described below in Section 6.14.4. The AWS&TCR has been prepared in accordance with the California Manual of Uniform Traffic Control Devices (CAMUTCD) and the City of Orange’s Residential Neighborhood Traffic Management Program. The TIS and AWS&TCR prepared by RK and related appendices are included as Appendix J to the Draft EIR. The TIS study area roadways and intersections are shown in Figure 6.14-1. The AWS&TCR study area consists of East Villareal Drive between Santiago Boulevard and Nohl Ranch Road.

6.14.2 Existing Conditions

Study Area Roadways

Four roadways have been analyzed as part of the TIS study area based on anticipated routes that would serve the Project’s single access point: East Villareal Drive, Santiago Boulevard, Meats Avenue and Lincoln Avenue/Nohl Ranch Canyon Road. A hierarchical classification system is used to distinguish roadways in the City of Orange. Roadway categories are differentiated by size, function, and capacity. The City of Orange has 6 classifications for roadway systems within its jurisdiction. The classifications include Smart Streets, Principal Arterials, Major Arterials, Primary Arterials, Secondary Arterials and Collector Streets. The Study area roadways include one Major Arterial, three Secondary Arterials and one Collector Street.

City roadways consist of both divided and undivided roadways. All roadways within the study area are undivided, with the exception of Lincoln Avenue and Meats Avenue (east of Santiago Boulevard).
Divided roadways generally contain a physical barrier or buffer, such as a raised median or a continuous two-way left turn lane, between each direction of travel. Divided roadways remove vehicles making a left turn from the travel lanes so as not to impede through traffic and constrict roadway capacity. Undivided roadways do not contain a buffer between each direction of travel, and therefore left-turning traffic can impede through traffic. Undivided roadways may provide turn movement pockets at intersections. Table 6.14-1 below shows the classification and attributes of the study area’s roadways, including each roadway’s Level of LOS D capacity and existing average daily traffic (ADT) volumes. The same existing ADT Volumes are graphically represented in Figure 6.14-2, which were obtained from the City of Orange Traffic Engineering Division. As shown in Table 6.14-1, all of the study area roadway segments are operating well within the LOS D criterion prescribed by the City of Orange. Per the General Plan Circulation Element Table CM-3, there are no specified roadway capacity ADT volume ranges for roadway segments operating at above LOS D or LOS E (i.e. those operating at LOS A, LOS B, or LOS C).

Table 6.14-1. Roadway Existing Conditions

<table>
<thead>
<tr>
<th>Roadway</th>
<th>Classification</th>
<th>Lanes</th>
<th>Capacity 1</th>
<th>2014 ADT 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Villareal Drive</td>
<td>Collector</td>
<td>2U</td>
<td>10,800</td>
<td>2,200</td>
</tr>
<tr>
<td>Santiago Boulevard</td>
<td>Secondary Arterial</td>
<td>4U</td>
<td>21,600</td>
<td>18,700</td>
</tr>
<tr>
<td>Meats Avenue</td>
<td>Secondary Arterial</td>
<td>4U/D</td>
<td>21,600/33,750</td>
<td>14,600</td>
</tr>
<tr>
<td>Lincoln Avenue</td>
<td>Major Arterial</td>
<td>4D</td>
<td>50,700</td>
<td>28,000</td>
</tr>
<tr>
<td>Nohl Ranch Canyon Road</td>
<td>Secondary Arterial</td>
<td>2U</td>
<td>21,600</td>
<td>9,200</td>
</tr>
</tbody>
</table>

1 Capacity is based on LOS D, which is the City’s lowest acceptable level of service.
2 Highest average ADT shown in this table for each roadway segment.

U = Undivided
D = Divided

Sources: City of Orange Traffic Engineering Division; Orange General Plan; TIS (RK Engineering, 2014).
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Exhibit D
Existing Traffic Volumes

Legend:
10/20 = AM/PM Peak Hour Volumes
10.0 = 2014 City Provided Average Daily Traffic (1000's)

Data Source: RK Engineering Group, Inc.

Marywood
Existing Traffic Volumes

FIGURE 6.14-2
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Study Area Intersections

Intersections serve as traffic control points for the circulation system, regulating the flow of vehicles along City streets and sometimes limiting the capacity of the system. In the long term, system capacity and efficiency can both be increased if intersections are designed to handle future anticipated traffic volumes. Typically, the design of the roadways forming an intersection dictates the intersection configuration. City of Orange Department of Public Works standards indicate that a left-turn pocket may or may not be provided, depending on traffic volumes through the intersection. However, one pocket may not be adequate to handle vehicles during peak hours. Traffic may back up into a through travel lane, resulting in congestion at the intersection and at other locations along the roadway. One way of providing additional intersection capacity at critical locations is through the use of special intersection configurations known as “critical intersections”.

Critical intersections deviate from typical City design standards by increasing the number of lanes at an intersection beyond what typically would be required. By increasing capacity at the intersection, the circulation link increases overall system capacity.

Five “key” intersections including four “critical” intersections as identified by the City of Orange were selected for the TIS study area based on location of the Site’s single access point on East Villareal Drive and based on proximity to nearby roadways anticipated to serve the Project. The associated TIS study area intersections are provided in the list below.

- Santiago Boulevard and Lincoln Avenue (critical intersection)
- Santiago Boulevard and SR-55 NB Off-Ramp / Vista Park (not critical intersection)
- Santiago Boulevard and East Villareal Drive (not critical intersection)
- Santiago Boulevard and Meats Avenue (critical intersection)
- Project Access Point and East Villareal Drive (not critical intersection)

Table 6.14-2 summarizes existing traffic conditions at the key study area intersections. Figure 6.14-3 shows the Existing Intersection Geometry and Traffic Control. Figure 6.14-2 shows existing traffic volumes for the selected TIS study area intersections, which are based on manual AM and PM peak hour turning movement counts collected for RK in May 2014. As reflected in the table, all of the key study intersections are currently operating at acceptable levels of service (i.e., LOS D or better) during both the AM and PM peak hours.

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1 Critical intersection locations are identified in the City’s General Plan Circulation Element.
### Table 6.14-2. Intersection Existing Conditions

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Traffic Control¹</th>
<th>Intersection Approach Lane(s)²</th>
<th>ICU Critical V/C Ratio or Delay (sec.)²</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Northbound</td>
<td>Southbound</td>
<td>Eastbound</td>
</tr>
<tr>
<td>Santiago Boulevard (NS)</td>
<td>TS</td>
<td>2.0</td>
<td>1.0</td>
<td>1&gt;</td>
</tr>
<tr>
<td>• Lincoln Avenue (EW)</td>
<td>TS</td>
<td>2.0</td>
<td>1.5</td>
<td>0.5</td>
</tr>
<tr>
<td>• SR-55 Fwy. NB On/Off Ramp (EW)</td>
<td>TS</td>
<td>0.0</td>
<td>1.5</td>
<td>0.5</td>
</tr>
<tr>
<td>• East Villareal Drive (EW)</td>
<td>TS</td>
<td>1.0</td>
<td>1.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Project Access (NS)</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>• East Villareal Drive (EW)</td>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

¹ When a right turn lane is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes. Where "1" is indicated for the through movement and "0"s are indicated for R/L movements, the R and/or L turns are shared with the through movement.

L = Left; T = Through; R = Right; > = Right Turn Overlap; >> = Free Right Turn; **Bold** = Improvement

² Analysis Software: Traffix, Version 8.0. Per the Intersection Capacity Utilization methodology, overall volume to capacity ratios and levels of service are shown for intersections controlled by traffic signals. Per the Highway Capacity Manual (HCM 2000) methodology, overall average intersection delay and level of service are shown for intersections controlled by all-way stop, and worst individual movement (or movements sharing a single lane) are shown for intersections with cross-street stop control.

³ TS = Traffic Signal

CSS = Cross Street Stop

V/C = Volume-to-Capacity

Source: RK Engineering 2014
Existing Intersection Geometry and Traffic Control

Legend:
- = Traffic Signal
4 = Number of Lanes
D = Divided
U = Undivided
RTO = Right Turn Overlap

FIGURE 6.14-3
Study Area Traffic Controls

Access to the project site occurs from an uncontrolled driveway off of Villareal Drive. Access to the project site from other roadways is not feasible because of topography and landownership constraints. Villareal Drive between Santiago Boulevard and Nohl Ranch Canyon Road does not have any traffic controls. Side streets, such as Lake Hill Drive, Echo Hill Way, Marywood Lane, Chapel Hill Road, and Ridepark Lane, all have stop signs at the intersection with Villareal Drive. Existing traffic controls are shown in Figure 6.14-4.

Study Area Speed Survey

In response to comments on the Notice of Preparation, a speed survey was conducted on Villareal Drive between Nohl Ranch Canyon Road and Santiago Boulevard. Currently Villareal Drive is posted for a 25 mile per hour speed. Radar speed surveys were taken at four locations along East Villareal Drive. At each location, at least 100 speed surveys were taken in order to have a large enough sample size. All speed surveys were also conducted outside of the morning and afternoon peak traffic periods. The 85th percentile speeds (the speed that 85 percent of the vehicles are traveling or less) and the 10 mph pace speed (10 mph of speeds that is most frequent) indicate that the 25 mph speed limit is regularly exceeded as shown on Figure 6.14-4 and as summarized in Table 6.14-3.

<table>
<thead>
<tr>
<th>Location</th>
<th>85th Percentile</th>
<th>(10-mph Pace Speed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Villareal Drive</td>
<td>37 mph</td>
<td>29-38 mph</td>
</tr>
<tr>
<td>East of Santiago Boulevard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Villareal Drive</td>
<td>34 mph</td>
<td>24-33 mph</td>
</tr>
<tr>
<td>South of Project Access</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Villareal Drive</td>
<td>32 mph</td>
<td>24-33 mph</td>
</tr>
<tr>
<td>South of Marywood Lane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Villareal Drive</td>
<td>36 mph</td>
<td>27-36 mph</td>
</tr>
<tr>
<td>North of Lakehill Drive</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Per the City of Orange’s Residential Neighborhood Traffic Management Program (Appendix D), if the 85th percentile speed is greater than 35 mph and the roadway maintains an ADT greater than 700 vehicles, there is indication of a demonstrated speed concern. The ADT for East Villareal Drive is above 700 vehicles at 2,200 vehicles as shown in Table 6.14-1; therefore, a speed concern issue along East Villareal Drive located East of Santiago Boulevard and located North of Lakehill Drive is present under current conditions.
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Exhibit B

Existing Conditions & Traffic Controls

Road Conditions:
- Speed Limit: 25 MPH
- Sidewalks: Northern side of roadway
- Curb: Present
- On-Street Parking: Parking on majority of roadway
- Street Lighting: Sufficient
- Street Striping: Faded
- Street Width: 36' (South of Project Driveway); 40' (North of Project Driveway)
- Street Signs: As shown above
- Vertical Traffic Calming Measures: No.
- Horizontal Traffic Calming Measures: Minor

FIGURE 6.14-4
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Public Transportation

Public transportation in the Project study area is provided by the Orange County Transportation Authority (OCTA). The Project would be serviced by OCTA Route 167, the nearest bus route to the site located approximately 0.35 mile away on Santiago Boulevard. Route service is provided between Anaheim and Irvine along the service corridors of Santiago Boulevard, Hewes Street and Bryan Avenue. Key activity centers connected by the 167 route include the Village at Orange and Lincoln Avenue Park and Ride.

Recreational Trails and Bikeways

A goal in the City of Orange’s General Plan is to provide a system of complete streets that accommodate safe and convenient access and travel for all users and to promote a healthy and sustainable transportation system throughout the community. The following two bicycle facilities are located approximately 0.35 and 0.67 mile of the Project site, respectively:

1. Santiago Boulevard – Class II (Bike Lane)
2. Meats Avenue – Class II (Bike Lane)

Class II Bike Lanes are on-road bike lanes located along arterial roadways that are delineated by painted stripes.

6.14.3 Regulatory Setting

Regional Regulations

Congestion Management Program

The Orange County Congestion Management Program (CMP), administered by Orange County Transportation Authority (OCTA), is a requirement of the Proposition 111 gas tax passed in 1990. The CMP requires that designated intersections throughout the County be maintained at a specified LOS. Guidelines with respect to CMP traffic studies require that the potential impacts at CMP intersections be analyzed for any significant land use proposals. Per review of the 2013 Orange County Congestion Management Program (CMP), Figure 2: 2013 Congestion Management Program Highway System, the nearest CMP facility in the project vicinity is located at Tustin Avenue and Katella Avenue. None of the Project’s study area roadway segments or intersections are located within the CMP system. Therefore, neither CMP Traffic Impact Analysis Requirements nor CMP thresholds of significance apply to the Project.

Regional Transportation Plan

SCAG has various policies related to the Regional Transportation Plan (RTP) regarding transportation and circulation. Policies relate to how land-use decisions influence the circulation system.
Growth Management Plan

The Orange County Measure M Growth Management Plan (GMP) was developed to assess and mitigate the impacts of local land use decisions on the County’s transportation system. Central to the program is the requirement that each jurisdiction in the County adopt a Growth Management Element of its General Plan to be applied in the development review process in order to receive transportation revenues generated from the Measure M half-cent sales tax. The GMP includes specific guidelines for traffic impact studies, establishing LOS thresholds and requirements for mitigation, and the information contained in this report satisfies the requirements of those guidelines.

Local Regulations

City of Orange General Plan

The purpose of the City’s General Plan Circulation Element is “to provide for a safe, convenient, and efficient circulation system for the City.” Issue areas discussed in the Circulation Element include the Local Circulation System; Regional Circulation System; Public Transportation; Sidewalks, Trails, and Bikeways; Parking Facilities and Circulation System Aesthetics. The issue area goals and policies applicable to the Project are evaluated for the Project’s consistency with the Circulation Element in Section 4.14.7.

City of Orange Transportation Systems Improvement Program

Pursuant to Chapter 15.41 of the Municipal Code and California Government Code section 66000 et seq, the City has established the Transportation Systems Improvement Program (“TSIP”) for imposition of development impact fees to ensure the construction of transportation facilities and expansion of services and other infrastructure to meet and accommodate new residential development projects. The City TSIP imposes fees to finance transportation facilities required by new development in order to avoid adversely impacting existing transportation facilities. Compliance with the TSIP in accordance with all provision of Municipal Code Chapter 15.41 ensures construction of TSIP facilities to mitigate impacts to transportation facilities.

6.14.4 Thresholds of Significance

The following thresholds of significance have been established for the evaluation of the proposed Project’s potential traffic and transportation impacts consistent with Appendix G of the State CEQA Guidelines and with the City of Orange Thresholds of Significance for roadway and intersection operations LOS requirements.

Roadway Segment Thresholds

Based on City thresholds, the proposed Project would cause a significant impact if it causes a roadway segment to have a change in capacity from LOS D or better, to LOS E or F with addition of project traffic; or, if the project adds 0.010 V/C (volume-to-capacity) to a roadway segment that is operating at LOS E or F in the baseline condition. The City’s acceptable LOS standard for roadway segments is LOS D, or daily V/C to not exceed 0.90 V/C. As previously indicated, a total of five study area roadway segments were analyzed using the V/C method based on the allowable average daily traffic (ADT) capacities for roadway
types. The existing roadway conditions and respective allowable capacities are provided above in Table 6.14-1.

**Intersection Thresholds**

The acceptable LOS for intersections within the City of Orange is LOS D or better. Therefore, any intersections operating at a LOS E or F will be considered deficient. For the TIS, the ICU methodology has been utilized to analyze the signalized study area intersections and the HCM method has been used for analysis of the unsignalized intersection. A significant traffic impact will occur at an intersection if the project-related increase in the V/C ratio equals or exceeds 0.01, and it is operating at LOS E or LOS F, or if the intersection is currently operating at a level at or above LOS D and the project-related traffic causes the intersection to operate at LOS E or LOS F with the addition of the additional traffic.

**Threshold TRA-1**  
Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.

City thresholds:
- The proposed project causes a roadway segment to have a change in capacity from LOS D or better, to LOS E or F with the addition of project traffic; or, the project adds 0.010 V/C (volume-to-capacity) to a roadway segment that is operating at LOS E or F.
- The proposed project causes an increase in the V/C ratio of 0.01 or more at an intersection currently operating at LOS E or LOS F; or, project-related traffic causes an intersection to change in LOS A, B, C or D to operate at an LOS E or LOS F.

**Threshold TRA-2**  
Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.

**Threshold TRA-3**  
Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.

**Threshold TRA-4**  
Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

**Threshold TRA-5**  
Result in inadequate emergency access.
Threshold TRA-6  Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

Methodology of Analysis

Roadway segments were analyzed using existing condition ADTs with the additional combined post-Project and cumulative Project ADTs. The total projected ADTs for each roadway segment were then compared against their maximum allowable capacity for each segment type (e.g. collector, arterial, etc.). Allowable capacity was based on LOS D standards, the City’s lowest acceptable LOS. Refer to Table 6.14-1 above for the roadway segment existing conditions and allowable capacities.

The methodology used to assess the operation of the signalized study area intersections is ICU. To calculate the ICU, the volume of traffic using the intersection is compared with the capacity of the intersection. ICU is usually expressed as a ratio. This ratio represents that portion of the hour required to provide sufficient capacity to accommodate all intersection traffic if all approaches operate at capacity. Study area intersections that are stop-sign-controlled with stop control on the minor street only have been analyzed using the unsignalized intersection methodology of the HCM. For these intersections, the calculation of level of service is dependent on the occurrence of gaps occurring in the traffic flow of the main street. Using data collected describing the intersection configuration and traffic volumes at these locations, the level of service has been calculated. The level of service is determined based on the worst individual movement or movements sharing a single lane. The relationship between the level of service and delay is different than for signalized intersections.

The intersection of East Villareal Drive at the Project’s access and intersection of East Villareal Drive at Ridgepark Lane were evaluated for all-way stop warrants based upon Caltrans and CAMUTCD Section 2B.07 criteria. The criteria listed below are applicable to the analysis.

Local road intersections with more than three approaches in consideration of:

- Frequency of collisions;
- Minimum traffic volumes;
- Eighty percent of minimum volumes and collision criteria;
- The need to control left-turn conflicts;
- The need to control vehicle pedestrian conflicts;
- Sight distance constraints; and
- An intersection of two (2) residential neighborhood collector streets.

Collision reports were generated from the City of Orange’s Crossroads database. The reports show that there were no accidents recorded within the last five years at either of these intersections.
6.14.5 Standard Conditions and Project Design Features

This section describes the standard conditions that are required and project design features that will be implemented for the proposed Project. Key aspects of the SCs are to comply with the City’s TISP and to minimize impacts of project construction related traffic. The PDFs are included to ensure safe movement of pedestrians and vehicles entering and exiting the Project’s single access point on East Villareal Drive. The SCs and PDFs identified below will be implemented to ensure that impacts to the traffic and the circulation system are minimized or avoided.

Standard Conditions

SC TRA-1 Comply with the Transportation Systems Improvement Program (TSIP) in accordance with all provision of Municipal Code Chapter 15.41 through the payment of applicable development impact fees.

Project Design Features

PDF TRA-1 The Project Applicant/Construction Contractor shall implement a Construction Management Plan to time the delivery of construction materials on a schedule that reduces potential impacts to roadways and intersections by minimizing vehicle queuing and stacking. Material delivery shall be limited between the hours of 7 AM and 3 PM. The Construction Management Plan shall be approved by the City and a copy shall be kept on-site and made available for inspection by City staff.

PDF TRA-2 Construct the on-site circulation system per the detailed site plan and include the following design elements:

- Install red curb a minimum of 40 feet on both sides of project access driveway to restrict on-street parking; and
- Install guard gate entry a minimum of 100 feet back from East Villareal curb line.

6.14.6 Evaluation of Impacts

6.14.6.1 Short Term Impacts

Threshold TRA-1 Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system.

Short-term traffic impacts are those resulting from site preparation and construction activities. Site preparation and construction activities are anticipated to occur from August 2015 through October 2017. During this period, the Project would generate a temporary increase in traffic on the local roadway system associated with the transport of materials and equipment and associated with construction workers traveling to and from the Site. The amount of traffic generated during this time would vary in intensity based on the stage of construction and type of construction activity taking place. The most intensive amount of traffic would be generated during the grading phase, which includes the import of approximately 8,000 cubic yards of soil material necessary for building the retaining wall. This
activity would require the use of trucks utilizing the local roadways to transport the material to the Site. In order to forecast the potential construction related impacts associated with the material import, the following estimations have been assumed:

- The quantity of imported material for the retaining wall is estimated at 8,000 cubic yards;
- All trucks have a capacity of 15 cubic yards;
- The import process would be completed in approximately 5 days;
- There would be approximately 13 full loads per hour for 8 hours each day;
- Based on the above, there would be 107 full loads per day;
- 1,600 cubic yards would be imported per day;
- A five-day work week window for import of materials (Monday through Friday from 7:00 AM to 3:00 PM);
- A total of 10 employees will be on the Project site Monday through Friday from 7:00 AM to 3:00 PM;
- The above scenario assumes the Project’s worst case scenario for temporary traffic related impacts during the site preparation and construction stages (August 2015 through October 2017).

Based on the aforementioned assumptions, there would be approximately 107 truckloads per day. Assuming one truckload requires an inbound trip and an outbound trip, the result is approximately 214 truck trips per day. Assuming an eight-hour workday, approximately 26 truck trips would be generated per hour (13 inbound truck trips and 13 outbound truck trips). To provide a conservative analysis of potential impacts, the truck trips were converted to passenger car equivalents (PCEs) using a 3.0 PCE conversion factor. A PCE factor is utilized to account for the extra length that a truck takes up on the roadway in order to give a more conservative estimate of potential impacts resulting from vehicle queues and stacking. Using the PCE factor of 3.0 results in 636 daily truck trips with 78 truck trips forecasted during the AM peak hour (39 inbound and 39 outbound). No truck trips are forecasted during the PM peak hour based on daily activities scheduled to conclude at 3:00 PM.

As mentioned previously, a total of 10 employees would be on site during the import and export process. It was assumed that each employee would make 2 trips per day (1 during the AM peak hour and 1 prior to the PM peak hour) resulting in 20 daily employee trips with 10 AM peak hour employee trips (10 inbound and 0 outbound) and 0 PM peak hour employee trips (0 inbound and 0 outbound).

Table 6.14-4 provides a summary of the forecast Project construction peak hour and daily traffic volumes. Review of the table shows that on a “typical” weekday of construction, the import and export of material to and from the Project site plus the trips from the construction workers are expected to generate 656 daily trips with 88 trips (49 inbound and 39 outbound) produced during the AM peak hour and 0 trips produced during the PM peak hour based on construction schedule. It should be noted that the proposed Project would require additional construction activities, such as site demolition/preparation, grading, underground of utilities, building construction, etc. However, these additional
construction activities would result in fewer trips generated at one time than that of material import activities.

Table 6.14-4. Project Construction Traffic Generation Forecast Worst-Case

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Daily 2-Way</th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enter</td>
<td>Exit</td>
<td>Total</td>
</tr>
<tr>
<td>Construction Trip Generation Forecast:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Construction Truck Traffic</td>
<td>212</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Passenger Car Equivalent Factor(^1)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Subtotal</td>
<td>636</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>• Employees (10 Employees)</td>
<td>20</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Total Construction-Related Trips</td>
<td>656</td>
<td>49</td>
<td>39</td>
</tr>
</tbody>
</table>

\(^1\) A PCE factor of 3.0 was applied to the truck trips to convert them into passenger car tips.  
Source: RK Engineering 2014

The haul route for the import and return of truck traffic is identified below. The distribution of temporary truck traffic is based on the anticipated haul route and is shown on Figure 6.14-5.

- **Import Route**: SR-55 Freeway (south), Lincoln Avenue, Santiago Boulevard, East Villareal, Project Access.
- **Return Route**: Project Access, East Villareal, Santiago Boulevard, SR-55 Freeway (north).

**Roadway Analysis**

The additional 656 ADTs generated during project construction, would not cause local roadways to exceed the City’s acceptable LOS D threshold for any of the study area roadways. Per the General Plan Circulation Element Table CM-3, there are no specified roadway capacity ADT volume ranges for roadway segments operating at above LOS D or LOS E (i.e. those operating at LOS A, LOS B, or LOS C). All roadways will continue to operate at a LOS D or better with the addition of the 656 ADTs, accounting for existing ADT conditions and in consideration of each roadway’s allowable capacity as shown in Table 6.14-5 on the following page. Therefore, no impacts would occur and no mitigation is required.
### Table 6.14-5. Roadway Analysis of Short-Term Construction Impacts

<table>
<thead>
<tr>
<th>Roadway</th>
<th>2014 ADT&lt;sup&gt;1&lt;/sup&gt;</th>
<th>2014 ADT plus Construction ADT&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Capacity&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Significant?</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Villareal Drive</td>
<td>2,200</td>
<td>2,856</td>
<td>10,800</td>
<td>No</td>
</tr>
<tr>
<td>Santiago Boulevard</td>
<td>18,700</td>
<td>19,356</td>
<td>21,600</td>
<td>No</td>
</tr>
<tr>
<td>Meats Avenue</td>
<td>14,600</td>
<td>15,256</td>
<td>21,600 / 33,750</td>
<td>No</td>
</tr>
<tr>
<td>Lincoln Avenue</td>
<td>28,000</td>
<td>28,656</td>
<td>50,700</td>
<td>No</td>
</tr>
<tr>
<td>Nohl Ranch Canyon Road</td>
<td>9,200</td>
<td>9,856</td>
<td>21,600</td>
<td>No</td>
</tr>
</tbody>
</table>

<sup>1</sup> Highest average ADT shown in this table for each roadway segment.

<sup>2</sup> Assumes worst-case construction traffic scenario.

<sup>3</sup> Capacity is based on LOS D, which is the City’s lowest acceptable level of service.

Sources: TIS (RK Engineering 2014); Orange General Plan

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Intersection Analysis

The results of short-term construction impact analysis are provided in Table 6.14-6 on the following page. Based on the anticipated worst-case construction traffic scenario described above and in consideration of existing LOS for the study area intersections, which are currently operating at levels LOS A, LOS B and LOS C during the AM peak hour, temporary traffic impacts associated with construction would not reduce the study area intersections’ LOS to an unacceptable level (i.e., LOS E or LOS F). The temporary addition of 656 total daily trips with 88 trips occurring in the AM peak hour and 0 trips occurring in the PM peak hour would not cause a significant delay or a change in LOS at any of the study area intersections. Therefore, potential short-term impacts to intersections would be less than significant. Nonetheless, as a project design feature, implementation of a Construction Management Plan would require the delivery of construction materials on a schedule that reduces potential impacts to roadways and intersections by minimizing vehicle queuing and stacking (refer to PDF TRA-1 in Section 6.14.5).
### Table 6.14-6. Intersection Analysis of Short-Term Construction Impacts

| Intersection                  | Existing ICU Critical V/C Ratio or Delay (sec.) | Existing LOS | Existing Plus Construction Impacts ICU Critical V/C Ratio or Delay (sec.) | Existing Plus Construction Impacts LOS | Change as a Result of Construction Impacts ICU Critical V/C Ratio or Delay (sec.) | Change as a Result of Construction Impacts LOS | Significant Impact |
|-------------------------------|-----------------------------------------------|--------------|**************************************************************************** |----------------------------------------|**************************************************************************** |----------------------------------------------- |-----------------------------------------------|
|                               | AM    | PM    | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM | AM | PM |
| Santiago Boulevard (NS)       |       |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| • Lincoln Avenue (EW)         | 0.713 | 0.560 | C  | A  | 0.713| 0.560 | C  | A  | 0.000| 0.000| NC | NC | NO | NO |
| • SR-55 Fwy. NB On/Off Ramp (EW) | 0.515 | 0.544 | A  | A  | 0.541| 0.544 | A  | A  | 0.026| 0.000| NC | NC | NO | NO |
| • East Villareal Drive (EW)   | 0.529 | 0.376 | A  | A  | 0.552| 0.376 | A  | A  | 0.023| 0.000| NC | NC | NO | NO |
| • Meats Avenue (EW)           | 0.667 | 0.560 | B  | A  | 0.667| 0.560 | B  | A  | 0.000| 0.000| NC | NC | NO | NO |

1. LOS = Level of Service
2. In Accordance with the City of Orange General Plan, LOS "D" or better is the acceptable Level of Service for peak hour operation at City intersections. A significant impact is considered when an intersection exceeds the acceptable LOS and the impact of the development results in a v/c increase of 0.01 or more.

Source: RK Engineering 2014
Threshold TRA-2  Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.

No potential impacts would result from short-term construction activities. Any potential impacts would be considered long-term due to post-construction residential land use and occupation of the proposed 40 single-family homes. Therefore, potential impacts to congestion management are discussed in Section 6.14.6.2.

Threshold TRA-3  Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.

The Project proposes construction of 40 single-family homes on an existing developed property within an existing residential community. No direct association with air travel or air traffic exists and no increased demand on air travel or airport facilities would occur from construction workers. Therefore, no impacts would occur and no mitigation is required.

Threshold TRA-4  Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

Temporary construction activities would not require alteration of existing roadways, including the roadway of East Villareal Drive that serves the Project site’s single access point. In addition, entry and exit of construction worker vehicles and delivery trucks would be managed through implementation of a Construction Management Plan to reduce potential impacts on roadways and intersections by minimizing vehicle queuing and stacking (refer to PDF TRA-1 in Section 6.14.5). Therefore, potential impacts from temporary construction activities would be less than significant and no mitigation is required.

Threshold TRA-5  Result in inadequate emergency access.

As part of the City’s standard conditions for issuance of a building permit, the Applicant would be required to submit a Construction Phase Emergency Fire Access Plan and a Construction Phase Emergency Access Plan to the Fire Chief, Police Chief and Community Development Director or their Designees. Preparation of the emergency access plans and coordination with emergency responders and City staff through these standard conditions would ensure adequate response is available in the event of an emergency. Therefore, impacts would be considered less than significant and no mitigation would be required.
Threshold TRA-6 Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

No potential impacts would result from short-term construction activities. Any potential impacts would be considered long-term due to post-construction residential land use and occupation of the proposed 40 single-family homes. Therefore, potential impacts are discussed in Section 6.14.6.2.

6.14.6.2 Long Term Impacts

The Project will generate vehicle trips on local roadways from residents of the new development once constructed and occupied. Trip generation represents the amount of traffic that is attracted and produced by a development. The traffic generation for the Project is based upon the specific land uses that have been planned for the development. The proposed Maywood Development will consist of 40 single-family residential homes.

Trip Generation

Trip generation rates for the proposed development are shown in Table 6.14-7 and are from the Institute of Transportation Engineers (ITE) Trip Generation, 9th Edition. This publication provides a comprehensive evaluation of trip generation rates for a variety of land uses.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>ITE Code</th>
<th>Units²</th>
<th>AM</th>
<th>PM</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
<td>Total</td>
</tr>
<tr>
<td>Single Family Homes</td>
<td>210</td>
<td>DU</td>
<td>0.19</td>
<td>0.56</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.63</td>
<td>0.37</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 6.14-7: Project Trip Generation Rates¹

² DU = Dwelling Units

Both daily and peak-hour trip generation for the proposed development are shown in Table 6.14-8. The proposed development is projected to generate approximately 381 trip-ends per day, with 31 vehicles per hour during the AM peak hour and 40 vehicles per hour during the PM peak hour.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Quantity</th>
<th>Units²</th>
<th>AM</th>
<th>PM</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
<td>Total</td>
</tr>
<tr>
<td>Single Family Homes</td>
<td>40</td>
<td>DU</td>
<td>8</td>
<td>23</td>
<td>31</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>8</td>
<td>23</td>
<td>31</td>
</tr>
</tbody>
</table>

Table 6.14-8: Project Trip Generation¹

² DU = Dwelling Units
Trip Distribution and Assignment

Trip distribution represents the directional orientation of traffic to and from the Project site. Trip distribution is heavily influenced by the geographical location of the site, the location of residential, employment, school, and recreational uses, and the proximity to the regional freeway system. The directional orientation of traffic was determined by evaluating existing and proposed land uses and highways within the community. Project-related trip distribution was discussed with and confirmed by the City of Orange staff before completing the TIS.

Trip distribution patterns for the TIS have been based upon near-term conditions as well as the existing highway facilities, which represents the buildout occupancy for the proposed development. The trip distribution patterns for the Project are graphically depicted on Figure 6.14-6.

The assignment of traffic from the site to the adjoining roadway system has been based upon the Site's trip generation, trip distribution, and existing arterial highway and local street systems that would be in place at the time of initial occupancy of the Project.

Modal Split

Modal split denotes the proportion of traffic generated by a project that would use any of the transportation modes, namely buses, cars, bicycles, motorcycles, trains, carpools, etc. The traffic reducing potential of public transit and other modes can be substantial. However, the traffic projections in this study are "conservative" in that neither public transit nor alternative transportation has been utilized to reduce the estimated traffic volumes and associated potential impacts to local roadways. Thus, no modal split reduction is applied to the projections.

Project Peak Hour Traffic Volumes

Project AM and PM peak hour intersection turning movement volumes and average daily traffic are shown on Figure 6.14-7. Existing Plus Project traffic conditions include existing traffic volumes on surrounding roadways plus the project traffic. The AM and PM peak hour intersection turning movement volumes and average daily traffic are shown on Figure 6.14-8.
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Exhibit G

Project Traffic Volumes

Legend:
10/20 = AM/PM Peak Hour Volumes
100 = Average Daily Traffic

FIGURE 6.14-7
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Cumulative Projects

In order to assess Project Buildout (Year 2017) Without Project traffic conditions, traffic from cumulative projects occurring in the area is combined with existing traffic and area wide growth. The City of Orange has provided a list of cumulative projects in the vicinity of the proposed Project. The two projects include a 2,868 square feet fast-food restaurant with drive thru located at 1325 North Tustin Street and a 982 square feet automated carwash located at 2844 North Santiago Boulevard. The general location of these two projects in relationship to the Project is shown on Figure 6.14-9. Trip generation rates based upon the Institute of Transportation Engineers (ITE) Trip Generation, 9th Edition for the cumulative developments are shown in Table 6.14-9. Both daily and peak-hour trip generation for the cumulative developments are shown in Table 6.14-10.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>ITE Code</th>
<th>Units^2</th>
<th>Peak Hour</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>AM</td>
<td>PM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>Fast Food with Drive Thru</td>
<td>934</td>
<td>TSF</td>
<td>23.16</td>
<td>22.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16.98</td>
<td>15.67</td>
</tr>
<tr>
<td>Automated Car Wash</td>
<td>948</td>
<td>TSF</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.83</td>
<td>2.71</td>
</tr>
</tbody>
</table>

2 TSF = Thousand Square Feet

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Quantity</th>
<th>Units^2</th>
<th>Peak Hour</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast Food with Drive Thru</td>
<td>2.868</td>
<td>TSF</td>
<td>66</td>
<td>64</td>
</tr>
<tr>
<td>Automated Car Wash</td>
<td>2</td>
<td>Stalls</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>TOTAL</td>
<td>74</td>
<td></td>
<td>72</td>
<td>72</td>
</tr>
</tbody>
</table>

2 TSF = Thousand Square Feet

Trip distribution for the two cumulative projects are shown on Figure 6.14-10 and Figure 6.14-11. Cumulative project AM and PM peak hour intersection turning movement volumes and average daily traffic for the cumulative projects are shown on Figure 6.14-12.

Background Traffic Growth Rate

The TIS has assumed a background traffic growth rate of one percent per year for a period of three years. Therefore, a total rate of three percent was assumed for background growth for Project Buildout conditions that occur in the Year 2017^2.

^2 Traffic consultant’s (RK Engineering Group) conversation with City of Orange staff.
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Exhibit 1

Cumulative Projects Location Map

Legend:
1. (1325 N. Tustin St.) 2,868 SF Fast Food with Drive Thru
2. (2844 N. Santiago Blvd.) 982 SF Automated Carwash

Marywood
Cumulative Projects Location Map

FIGURE 6.14-9
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Exhibit J-1

Zone 1 Cumulative Project Trip Distribution

Legend:

1 = (1325 N. Tustin St.) 2,868 SF Fast Food with Drive Thru
10 = Percent to/from Project

2388-2014-06 (Ex-J-1)
MARYWOOD DEVELOPMENT TRAFFIC IMPACT STUDY, City of Orange, California

Map Created: 11/14/2014

Data Source: RK Engineering Group, Inc.
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Cumulative Projects Traffic Volumes

Legend:
10/20 = AM/PM Peak Hour Volumes
100 = Average Daily Traffic

DATA SOURCE: RK Engineering Group, Inc.

Prepared By: VCS Environmental

Map Created: 11/14/2014

Marywood Development Traffic Impact Study, City of Orange, California

FIGURE 6.14-12
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Threshold TRA-1  Would the project conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system...

City of Orange General Plan

The Circulation Element of the City of Orange General Plan includes policies related to the Local Circulation System; Regional Circulation System; Public Transportation; Sidewalks, Trails, and Bikeways; Parking Facilities and Circulation System Aesthetics. The issue area goals and policies applicable to the Project are evaluated for the Project’s consistency with the Circulation Element in Table 6.14-11.

<table>
<thead>
<tr>
<th>Policy No.</th>
<th>Policy</th>
<th>Project Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Plan, build, and maintain an integrated hierarchical, and multi-modal system of roadways, pedestrian walkways, and bicycle paths throughout the City.</td>
<td>The Project includes pedestrian walkways (sidewalks) and internal streets for vehicle and bicycle travel within the site and to the access point at East Villareal Drive, consistent with the residential neighborhood surroundings.</td>
</tr>
<tr>
<td>1.2</td>
<td>Identify key intersections and street with historical or projected traffic congestion problems and apply creative traffic management measures to improve overall circulation.</td>
<td>Potential traffic impacts to key intersections and roadways are analyzed in this section and there are no intersections that are projected to operate at a worse level of service than the City’s threshold.</td>
</tr>
<tr>
<td>1.3</td>
<td>Consider various methods to increase safety on City arterials and neighborhood streets, including landscaping, provision of bike/transit lanes, and consideration of traffic calming on neighborhood streets in accordance with the City’s Neighborhood Residential Traffic Management Program.</td>
<td>This section has analyzed potential safety issues in accordance with the City’s Neighborhood Residential Traffic Management Program. The Project will use short and curved street segments, cul-de-sacs, and a stop sign at the site access point for traffic calming on neighborhood streets.</td>
</tr>
<tr>
<td>1.4</td>
<td>Prohibit on-street parking where possible to reduce bicycle/automobile conflicts in appropriate target areas as recommended by the Bikeways Master Plan.</td>
<td>Does not apply to the proposed Project. The Project is not located in an area where on-street parking would conflict with the Bikeways Master Plan.</td>
</tr>
<tr>
<td>1.6</td>
<td>Maintain and repair roadways and sidewalks as necessary to improve circulation and safety.</td>
<td>The Project will maintain onsite roadways and sidewalks through HOA fees and management.</td>
</tr>
<tr>
<td>4.5</td>
<td>Ensure that pedestrian sidewalks, trails, and bikeways are safe environments through the use of crime prevention-oriented trail design features, lighting where appropriate, access for emergency vehicles, and links to the roadway signal system.</td>
<td>The Project site would contain residential sidewalks and roadways only. It does not contain designated trails or bikeways. The Project will include street lighting for safety and a utility easement that is designed for secondary emergency vehicle access.</td>
</tr>
<tr>
<td>4.7</td>
<td>Provide ADA accessible sidewalks and pedestrian amenities throughout the City.</td>
<td>The Project includes use of a flared curb, which reduces the sidewalk slope at points where sidewalks meet residential driveways, to improve...</td>
</tr>
</tbody>
</table>
Section 6.14 – Traffic and Circulation

<table>
<thead>
<tr>
<th>Policy No.</th>
<th>Policy</th>
<th>Project Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>Supply adequate, clear, and correctly placed signage to direct both motorists and non-motorists toward destinations and away from hazards.</td>
<td>The Project will install stop signs, stop bars and stop sign legends at the Project access point to ensure safe movement of pedestrians and vehicles entering and exiting the site and those traveling past the site via East Villareal Drive.</td>
</tr>
<tr>
<td>6.2</td>
<td>Provide clear indicators in the right-of-way for where pedestrians and bicyclists are encouraged to walk, bike, or cross safely. These may include special paving, line stripes, and crosswalks.</td>
<td>The Project will install stop signs, stop bars and stop sign legends at the Project access point to ensure safe movement of pedestrians and vehicles entering and exiting the site and those traveling past the site via East Villareal Drive.</td>
</tr>
</tbody>
</table>

Roadway Analysis

The proposed development is projected to generate approximately 381 trip-ends per day. The additional 381 trip-ends will not cause any of the roadway segments to operate at an unacceptable level of service (i.e., LOS E or F) when the traffic is added to either existing or buildout (2017) traffic conditions. Furthermore, Existing + Project +Cumulative ADTs are also not anticipated to cause roadways to operate below acceptable levels of service as shown in Table 6.14-12 below. Therefore, the Project’s potential impacts to roadway segments are considered less than significant. Per the General Plan Circulation Element Table CM-3, there are no specified roadway capacity ADT volume ranges for roadway segments operating at above LOS D or LOS E (i.e. those operating at LOS A, LOS B, or LOS C).

Table 6.14-12. Roadway Segment LOS Impacts Analysis

<table>
<thead>
<tr>
<th>Roadway</th>
<th>Existing¹</th>
<th>Existing + Project</th>
<th>Existing + Project + Cumulative²</th>
<th>Capacity²</th>
<th>Significant?</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Villareal Drive</td>
<td>2,200</td>
<td>3,420</td>
<td>5,059</td>
<td>10,800</td>
<td>No</td>
</tr>
<tr>
<td>Santiago Boulevard</td>
<td>18,700</td>
<td>19,920</td>
<td>21,559</td>
<td>21,600</td>
<td>No</td>
</tr>
<tr>
<td>Meats Avenue</td>
<td>14,600</td>
<td>15,820</td>
<td>17,459</td>
<td>21,600 / 33,750</td>
<td>No</td>
</tr>
<tr>
<td>Lincoln Avenue</td>
<td>28,000</td>
<td>29,220</td>
<td>30,859</td>
<td>50,700</td>
<td>No</td>
</tr>
<tr>
<td>Nohl Ranch Canyon Road</td>
<td>9,200</td>
<td>10,420</td>
<td>12,059</td>
<td>21,600</td>
<td>No</td>
</tr>
</tbody>
</table>

¹ Highest average 2014 ADT shown in this table for each roadway segment.
² Total Cumulative 1,639 ADTs added to each segment for worst-case conditions because it does not account for distribution.
³ Capacity is based on LOS D, which is the City’s lowest acceptable level of service.
Source: TIS (RK Engineering, 2014); Orange General Plan
Intersection Analysis

Existing Plus Project Conditions

Intersection levels of service for the existing network with the proposed Project are shown on Table 6.14-13. As shown on Table 6.14-13, ICU and HCM calculations are based on the existing intersection geometrics. For Existing Plus Project traffic conditions, all study area intersections are projected to operate at acceptable levels of service during the peak hours. As reflected in Table 6.14-13, AM and PM peak hour levels of service will remain unchanged when the traffic generated by the proposed Project is added to existing traffic. As a result, Project traffic impacts are less than significant. ICU calculation worksheets for this scenario are provided in Appendix C of the TIS.

Project Buildout (Year 2017) Without Project Traffic

In order to assess Project Buildout (Year 2017) Without Project traffic conditions, the background growth (3 years at 1% per year growth rate) and cumulative project traffic were added to the existing peak hour intersection traffic counts. Project Buildout (Year 2017) Without Project AM and PM peak hour intersection turning movement volumes and average daily traffic are shown on Figure 6.14-13. Intersection levels of service for the existing network with background growth in the Year 2017 are shown in Table 6.14-14. As shown in Table 6.14-14, ICU calculations are based on the existing intersection geometrics. For Project Buildout (Year 2017) Without Project traffic conditions, all study area intersections are projected to operate at acceptable levels of service during the peak hours. ICU calculation worksheets for Project Buildout (Year 2017) conditions are provided in Appendix D of the TIS.

Project Buildout (Year 2017) With Project Traffic Volumes

In order to assess Project Buildout (Year 2017) With Project traffic conditions, the Project traffic and cumulative project traffic were added to the existing peak hour intersection volumes increased by the background growth (three years at one percent per year growth rate). Project Buildout (Year 2017) With Project AM and PM peak hour intersection turning movement volumes and average daily traffic are shown on Figure 6.14-14. Intersection Levels of Service for the existing network with background growth and the proposed Project are shown in Table 6.14-15. As shown in Table 6.14-15, ICU calculations are based on the existing intersection geometrics. For Project Buildout (Year 2017) With Project traffic conditions, all study area intersections are projected to operate at acceptable levels of service during the peak hours. ICU calculation worksheets for Project Buildout (Year 2017) With Project conditions are provided in Appendix E of the TIS.

Intersection Analysis Summary

For existing traffic conditions, all the study area intersections are currently operating at acceptable levels of service during peak hours (i.e., LOS C or better). The proposed development is projected to generate approximately 381 trip-ends per day, with 31 vehicles per hour during the AM peak hour and 40 vehicles per hour during the PM peak hour. For Existing Plus Project traffic conditions, the study area intersections are projected to operate at acceptable levels of service during the peak hours. The Project is not expected to significantly impact any of the study area intersections. For Project Buildout (Year 2017) Without Project traffic conditions, all study area intersections are projected to operate at
acceptable levels of service during the peak hours. In addition, for Project Buildout (Year 2017) With Project traffic conditions, all study area intersections are also projected to operate at acceptable levels of service during the peak hours. A summary of the level of service analysis for each condition is included in Table 6.14-16.

Remainder of page left intentionally blank.
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### Table 6.14-13. Intersection Analysis for Existing Plus Project Conditions

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Traffic Control¹</th>
<th>Intersection Approach Lane(s)¹</th>
<th>ICU Critical V/C Ratio or Delay (sec.)²</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Northbound</td>
<td>Southbound</td>
<td>Eastbound</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>R</td>
</tr>
<tr>
<td>Santiago Boulevard (NS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Lincoln Avenue (EW)</td>
<td>TS</td>
<td>2.0</td>
<td>1.0</td>
<td>1&gt;</td>
</tr>
<tr>
<td>• SR-55 Fwy. NB On/Off Ramp (EW)</td>
<td>TS</td>
<td>2.0</td>
<td>1.5</td>
<td>0.5</td>
</tr>
<tr>
<td>• East Villareal Drive (EW)</td>
<td>TS</td>
<td>0.0</td>
<td>1.5</td>
<td>0.5</td>
</tr>
<tr>
<td>• Meats Avenue (EW)</td>
<td>TS</td>
<td>1.0</td>
<td>1.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Project Access (NS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• East Villareal Drive (EW)</td>
<td>CSS</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

1 When a right turn lane is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes. Where "1" is indicated for the through movement and "0"s are indicated for R/L movements, the R and/or L turns are shared with the through movement.

L = Left; T = Through; R = Right; > = Right Turn Overlap; >> = Free Right Turn; **Bold** = Improvement

2 Analysis Software: Traffix, Version 8.0. Per the Intersection Capacity Utilization methodology, overall volume to capacity ratios and levels of service are shown for intersections controlled by traffic signals. Per the Highway Capacity Manual (HCM 2000) methodology, overall average intersection delay and level of service are shown for intersections controlled by all-way stop, and worst individual movement (or movements sharing a single lane) are shown for intersections with cross-street stop control.

3 TS = Traffic Signal
   CSS = Cross Street Stop

Source: RK Engineering 2014
### Table 6.14-14. Intersection Analysis for Project Buildout (Year 2017) Without Project Conditions

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Traffic Control</th>
<th>Intersection Approach Lane(s)</th>
<th>ICU Critical V/C Ratio or Delay (sec.)</th>
<th>Level of Service</th>
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<td>Southbound</td>
<td>Eastbound</td>
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<td>• Lincoln Avenue (EW)</td>
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</tbody>
</table>

1 When a right turn lane is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes. Where “1” is indicated for the through movement and “0”s are indicated for R/L movements, the R and/or L turns are shared with the through movement.

L = Left; T = Through; R = Right; > = Right Turn Overlap; >> = Free Right Turn; **Bold** = Improvement

2 Analysis Software: Traffix, Version 8.0. Per the Intersection Capacity Utilization methodology, overall volume to capacity ratios and levels of service are shown for intersections controlled by traffic signals. Per the Highway Capacity Manual (HCM 2000) methodology, overall average intersection delay and level of service are shown for intersections controlled by all-way stop, and worst individual movement (or movements sharing a single lane) are shown for intersections with cross-street stop control.

3 TS = Traffic Signal

CSS = Cross Street Stop

Source: RK Engineering 2014
### Table 6.14-15. Intersection Analysis for Project Buildout (Year 2017) with Project Conditions

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Traffic Control</th>
<th>Intersection Approach Lane(s)</th>
<th>ICU Critical V/C Ratio or Delay (sec.)</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Northbound</td>
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<tr>
<td>Santiago Boulevard (NS)</td>
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<tr>
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</table>

1. When a right turn lane is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes. Where "1" is indicated for the through movement and "0"s are indicated for R/L movements, the R and/or L turns are shared with the through movement.

L = Left; T = Through; R = Right; >> = Free Right Turn; **Bold** = Improvement

2. Analysis Software: Traffix, Version 8.0. Per the Intersection Capacity Utilization methodology, overall volume to capacity ratios and levels of service are shown for intersections controlled by traffic signals. Per the Highway Capacity Manual (HCM 2000) methodology, overall average intersection delay and level of service are shown for intersections controlled by all-way stop, and worst individual movement (or movements sharing a single lane) are shown for intersections with cross-street stop control.

3. TS = Traffic Signal
   CSS = Cross Street Stop

Source: RK Engineering 2014
### Table 6.14-16. Intersection Analysis for Existing Plus Project Conditions

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Year 2017 without Project</th>
<th>Year 2017 with Project</th>
<th>Change as a Result of Project</th>
</tr>
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<tr>
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<td>Change as a Result of Project ICU Critical V/C</td>
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<td>9.1 8.7 A A</td>
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<table>
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<tr>
<th>Intersection</th>
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<th>Year 2017 with Project</th>
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<td>• Meats Avenue (EW)</td>
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<td>Project Access (NS)</td>
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<td>9.2 8.8 A A</td>
<td>9.2 8.8 NC NC NO NO</td>
</tr>
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</table>

1 LOS = Level of Service
2 In Accordance with the City of Orange General Plan, LOS "D" or better is the acceptable Level of Service for peak hour operation at City intersections. A significant impact is considered when an intersection exceeds the acceptable LOS and the impact of the development results in a v/c increase of 0.01 or more.

Source: RK Engineering 2014
Section 6.14 – Traffic and Circulation

**Threshold TRA-2** Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.

As discussed in Section 6.14.3 above, none of the Project’s study area roadway segments or intersections are located within the CMP system. Therefore, neither CMP Traffic Impact Analysis Requirements nor CMP thresholds of significance apply to the Project.

SCAG has various policies related to the Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) regarding transportation and circulation. These policies are implemented on a broad policy level through long-range planning and coordination between municipalities including the City of Orange. Thus, the proposed Project would be consistent with the RTP/SCS because the Project is consistent with existing general plan and zoning designations for the Project site and consistent with General Plan policies. The Project would also be consistent with the RTP/SCS by providing additional housing through infill development within an established community. Therefore, the Project would not conflict with a congestion management program and no mitigation would be required.

**Threshold TRA-3** Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

The Project proposes construction of 40 single-family dwellings on an existing developed property within an existing residential community. No direct association with air travel or air traffic exists. Additional units may indirectly place a higher demand on air travel in the region as additional residents may utilize existing airports for travel. However, the amount of increased demand would be incremental and negligible considering the relatively small size of the new development. Therefore, impacts would be less than significant and no mitigation would be required.

**Threshold TRA-4** Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

**Intersection Sight Distance, Safety and Operational Improvements**

One of the most important issues to consider in the design and construction of new development is the safety and efficiency of vehicles entering and exiting the site.

Based on City of Orange Standard Plan #126, intersection sight distance analysis applies to intersections without traffic signals and without four-way stop signs. This Project will have one (1) unsignalized full access drive onto East Villareal Drive. The presence and maintenance of adequate sight distance is crucial in ensuring the satisfactory operation of this intersection.

The driver’s eye height is assumed to be 3.5 feet while in a vehicle at an intersection 10 feet back from the projection of the curb line. The object height is assumed to be 4.25 feet. A copy of the reference...
material is available in Appendix F of the TIS. At unsignalized intersections a substantially clear line of sight (corner sight distance) should be maintained between the driver of a vehicle, bicyclist, or pedestrian waiting at the crossroad and the driver of an approaching vehicle (along the main highway). Line of sight for all users should be included in right-of-way. The area between the right-of-way and the line of sight is known as the limited use area.

The limited use area shall be kept free of walls, signs, slopes, or any other obstruction that could restrict a driver’s view within the limited use area. In addition, adequate time must be provided for the waiting user to either cross all lanes of through traffic, cross the near lanes and turn left, or turn right, without requiring through traffic to radically alter their speed. Corner sight distance requirements provide 7.5 seconds for the driver on the crossroad to complete the necessary maneuver while the approaching vehicle travels at the assumed design speed of the main highway.

Corner sight distance requirements are based on the highway designation. East Villareal Drive is designated as a Collector in the City of Orange Master Plan of Streets and Highways. Based on the City of Orange Design Standard Plan #126, the minimum required corner sight distance to be provided for all project access driveways is 390 feet.

Figure 6.14-15 shows the sight distance diagrams for the Project access driveway. It should be noted that the proposed Project will be using the existing driveway along East Villareal Drive as its primary access point. Based on preliminary review of the site plan and the surroundings, adequate sight distance would only be obtainable on right-out turning movements from the Project driveway. In order to accommodate these requirements, the Project should maintain a limited use area, to be kept clear of all obstructions over 12 inches high, including vegetation, and restrict on-street parking adjacent to the Project driveway. There are currently existing large trees south of the Project site, which may require trimming in order to provide sufficient sight distance. The Project Applicant (or subsequent Homeowner’s Association) would be responsible for maintaining the appropriate vegetation height. As indicated in the TIS, it is recommended that on-street parking be restricted for a minimum of 40 feet on both sides of the proposed Project driveway.

However, adequate sight distance would not be attainable on left-out movements from the Project access driveway due to the existing roadway restrictions along East Villareal Drive. Based on the preliminary review of the site plan, left-turn movements from the proposed driveway would provide a total of 275 feet of intersection sight distance, rather than the required 390 feet. However, this distance is greater than the stopping sight distance standard for a collector road, which is 250 feet. These conditions provide a potentially significant safety risk. In order to reduce impacts, Mitigation Measure MM TRA-1 would be implemented, which includes landscaping requirements and chevron striping to improve sight distance as shown in Figures 6.14-16 and 6.14-17. With implementation of mitigation measure MM TRA-1, potential impacts would be reduced to less than significant.

**Impact TRA-1** Potentially inadequate site distance for right-out movements and left-out turn movements from the Project’s driveway exist based on City Standards.
Sight Distance Evaluation

FIGURE 6.14-15

Exhibit N

Sight Distance Evaluation

Based on City of Orange Std. Plan 126, the intersection sight distance standard is not met due to roadway restrictions.

Due to roadway restrictions, the driver is given a total intersection sight distance of approximately 375 feet. It should be noted that this is greater than the stopping sight distance standard for a Collector road, 250 feet.

Legend:
- Limited Use Area
- Road Centerline
- Proposed Curbs/Gutter
- Right of Way

Notes
1. Sight distance based upon Intersection Sight Distance (ISD) with "Collector" highway designation and 7.5 second critical head way. ISD = 390 Feet
2. A limited use area should be established and maintained to provide a clear line of sight for vehicles negotiating the project across intersection. Trees, bushes, and architectural decor, and on-street parking should not block the line of sight requirements at this intersection.
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Exhibit H
East Villa Real at Project Access Recommendations

Establish and maintain limited use area, per the Traffic Impact Study (Exhibit N). Trees, brushes, decor, and on-street parking should not block the line of sight requirements at this intersection.

Marywood Development Project Access

Childcare Access

Legend:
Install stop sign with stop legend/striping

Note:
It should be noted that the roadway width transitions from 36 feet to 40 feet, east of the project access driveway.

Source: RK Engineering, Inc.
Map Created: May 2015
RECOMMENDATIONS

1. Construct the on-site circulation system per the detailed site plan.
2. Provide one (1) project access driveway on East Villa Real Drive.
3. Install stop signs, stop bars, and stop legends at project access point.
4. Install red curb to restrict on-street parking a minimum of 40 feet on both sides of project access driveway along East Villa Real Drive.
5. Install guard gate entry a minimum of 100 feet from East Villa Real Drive curb line.
6. Complete any remaining half-section street improvements for East Villa Real Drive adjacent to the project.
7. Sight distances at the project access points should be revived at the time of construction per City of Orange standards.
8. As is the case for any roadway design, City of Orange should periodically review traffic operations in the vicinity of the site once the project is constructed to assure that the traffic operations are satisfactory.

Legend:
- Install stop sign, stop bar, and stop legend
- Install 40' Red Curb
- Install Guard Gate Entry

FIGURE 6.14-17

Prepared By: Map Created: 11/14/2014
Data Source: RK Engineering Group, Inc.
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Guard Gate Entry

The Project is proposing an entry gate into the community. Per Orange County Standard Plan 1107, “entry gates shall be set back from near the curb line of any public street to provide a minimum 100 feet of storage for entering vehicles to stack without interfering with through traffic.” The design criteria requires one foot per dwelling unit served with a 100 feet minimum set back. The proposed community has 40 dwelling units. Per the proposed site plan, the gate entry is located 120 feet back from the curb line of East Villareal Drive; therefore, the gate entry design criteria are met. Driveway throat lengths are sufficient and access to residential driveways is not impacted by internal vehicle queuing/stacking. Project traffic is not anticipated to cause significant queuing/stacking on the Project driveway because Site design and compliance with City design standards. The alignment, spacing and throat length of the Project driveway is also adequate and does not create any circulation conflicts. The proposed throat length at the Project driveway is sufficient for storing potential queuing vehicles. As such, motorists entering and exiting the Project site from this driveway will be able to do so comfortably, safely, and without undue congestion. A copy of the reference material is available in Appendix G of the TIS.

Internal Circulation

The on-site circulation was evaluated to assess potential vehicle-pedestrian conflicts. The overall Project design does not create significant vehicle-pedestrian conflict points. Figure 6.14-17 illustrates the Recommended Traffic Control Plan for the Project based on an evaluation of internal circulation design. As presented in that exhibit, “STOP” signs, bars, and pavement messages are recommended at the intersection approaches from each of the cul-de-sacs. On-street parking will be available along the internal roadways within the Project. All traffic control devices will comply with the current CAMUTCD standards.

Study Area Traffic Controls

Based on the criteria methodology described in section 14.14.4, the AWS&TCR found that an all-way stop is not warranted at the Project access but is warranted at the intersection of East Villareal Drive and Ridgepark Lane.

The AWS&TCR field review determined that vertical and horizontal sight distance was an issue at the intersection of East Villareal Drive and Project access; however, recommendations to obtain adequate sight distance such as parking restrictions, landscaping requirements and chevron striping have been provided in the Project’s mitigation under MM TRA-1. Implementation of MM TRA-1 would provide adequate site distance without the need for an all-way stop at this location.

The findings of the AWS&TCR field review for the intersection of East Villareal Drive and Ridgepark Lane determined that limited sight distance, the presence of a pedestrian crosswalk, and the intersection of two residential neighborhood collector streets provide sufficient justification to warrant a stop sign on Villareal Drive at Ridgepark Lane. Although this is an existing condition and not a result of Project implementation, additional traffic generated by the Project once occupation of the new homes takes place would potentially contribute to this existing safety concern at this intersection. Therefore,
mitigation measure MM TRA-2 would provide for an all-way stop sign at this intersection, stop-ahead signs, and temporary beacons to signify that a new stop has been added as shown in Figure 6.14-18. Implementation of MM TRA-2 would reduce potential impacts to below significance.

**Impact TRA-2**  
*Increased traffic volumes generated by the new residents of the Project could incrementally contribute to an existing safety condition at the intersection of East Villareal Drive and Ridgepark Lane.*

**Study Area Speed Analysis**

Comments received on the Notice of Preparation indicate a concern by neighbors about existing vehicle speeds on Villareal Drive between Santiago Boulevard and Nohl Ranch Canyon Road. Although this is an existing condition and not a result of Project implementation, additional traffic generated by the Project once occupation of the new homes takes place would potentially contribute to this existing safety concern. Therefore, a speed survey at four locations presented in the AWS&TCR (Appendix J) determined that 85% percentile speeds range from 32 mph to 37 mph, which exceeds the posted speed limit of 25 mph.

The AWS&TCR analyzed the feasibility of several traffic calming measures in an effort to reduce vehicle speeds on Villareal Drive. One possible measure is greater speed enforcement by the Orange Police Department. This is an operational measure to be determined by the City and beyond the control of this analysis. Speed humps on Villareal Drive were considered, but not recommended at this time due to the grade of Villareal Drive. According to the City of Orange’s Residential Neighborhood Traffic Management Program “speed humps shall not be installed on residential roadway with grades of five percent (5%) or greater.” The traffic calming measures recommended in the AWS&TCR include restriping existing faded lines for increased visibility; new striping of white edge-lines to narrow the perception of lane-width to encourage drivers to slow down; new side-road signs at the approaches of the Project access to indicate potential merging traffic ahead, and restriping of the double yellow striped centerline, which includes reflective pavement markers per Caltrans Detail 22, narrowing the driving lanes to allow vehicles to negotiate bend in the road safely. These traffic calming measures are shown in Figure 6.14-17. In addition, mitigation measure MM TRA-3b would provide for an additional radar speed survey to be conducted after Project completion and implementation of MM TRA-3a to evaluate the effectiveness of the traffic calming measures and determine if any additional recommendations should be made to the City. With implementation of mitigation measures MM TRA-3a and MM TRA-3b, potential impacts would be reduced to less than significant.

**Impact TRA-3**  
*Increased traffic volumes generated by the new residents of the Project could incrementally contribute to an existing safety condition on Villareal Drive due to existing vehicle speeds.*

**Threshold TRA-5**  
*Result in inadequate emergency access.*
The Project would provide emergency access via East Villareal Drive. Driveway design for the Site’s access point and internal roadways would be built consistent with City design requirements to allow for movement of emergency response vehicles entering, exiting and within the Site. The Project would also include a utility easement that is designed for secondary emergency vehicle access.

**Threshold TRA-6** Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

The nearest public transit facilities are a Class II Bike lane and OCTA bus Route No. 166 both located approximately 0.35 mile from the Project site on Santiago Boulevard. The Project would not directly or indirectly impact these facilities.

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6.14.7 Impacts and Mitigation Measures

Impact TRA-1 Potentially inadequate site distance for right-out movements and left-out turn movements from the Project’s driveway exist based on City Standards.

MM TRA-1 Final sight distance shall be reviewed at the Project driveway in conjunction with the preparation of final grading/construction plans as per City of Orange standards. During the final review, any additional sight distance obstructions shall be noted and final design determinations shall be made. Final design considerations include the following:
- Landscape modifications;
- Utility box placement;
- Road-signs at the approaches to the Project access to signify merging traffic;
- Chevron striping at the Project access; and
- Restricted parking for a minimum of 40 feet on both sides of the Project driveway.

Impact TRA-2 Increased traffic volumes generated by the new residents of the Project could incrementally contribute to an existing safety condition at the intersection of East Villareal Drive and Ridgepark Lane.

MM TRA-2 Prior to the issuance of the final Certificate of Occupancy for the proposed project, the Applicant shall install an all-way stop at the intersection of East Villareal Drive and Ridgepark Lane. The all-way stop shall include:
- Stop signs, stop bars, and stop legend; and
- Stop-ahead signs with temporary flashing beacons to remain for a period of three months.

Impact TRA-3 Increased traffic volumes generated by the new residents of the Project could incrementally contribute to an existing safety condition on Villareal Drive due to existing vehicle speeds.

MM TRA-3a Prior to the issuance of the final Certificate of Occupancy for the proposed project, the Applicant shall install traffic calming measures along East Villareal Drive in accordance with the recommendations included in the AWS&TCR.

MM TRA-3b Within 4 months after implementation of mitigation measures MM TRA-1, MM TRA-2 and MM TRA-3a, the Applicant shall perform a follow-up radar speed survey on East Villareal Drive to evaluate the effectiveness of the traffic calming measures and determine if any additional recommendations should be made to the City.

6.14.8 Level of Significance after Mitigation

Implementation of the mitigation measures prescribed in Section 6.14.7 will ensure that potentially significant traffic impacts related to traffic safety would be reduced to a less than significant level.