RIVERSIDE COUNTY TRANSPORTATION COMMISSION	
DATE:	May 8, 2019
TO:	Riverside County Transportation Commission
FROM:	Lorelle Moe-Luna, Multimodal Services Director John Standiford, Deputy Executive Director
THROUGH:	Anne Mayer, Executive Director
SUBJECT:	Approval of the Logistics Mitigation Fee Nexus Study

STAFF RECOMMENDATION:

This item is for the Commission to approve the Logistics Mitigation Fee Nexus Study.

BACKGROUND INFORMATION:

Purpose of the Study

In 2015, the Commission and the County of Riverside (County) filed a lawsuit against the city of Moreno Valley and Highland Fairview, the developer of the World Logistics Center (WLC) project. The lawsuit challenged the environmental impact report to ensure adequate mitigation to impacts created by the WLC project. The WLC is proposed to be located in the eastern portion of the city, southerly of State Route 60, between Redlands Boulevard and Gilman Springs Road as shown in Figure 1 below. The project would encompass over 2,610 acres with 40 million square feet for a large-scale logistics operation and is estimated to attract over 14,000 truck trips and 68,721 trips daily.

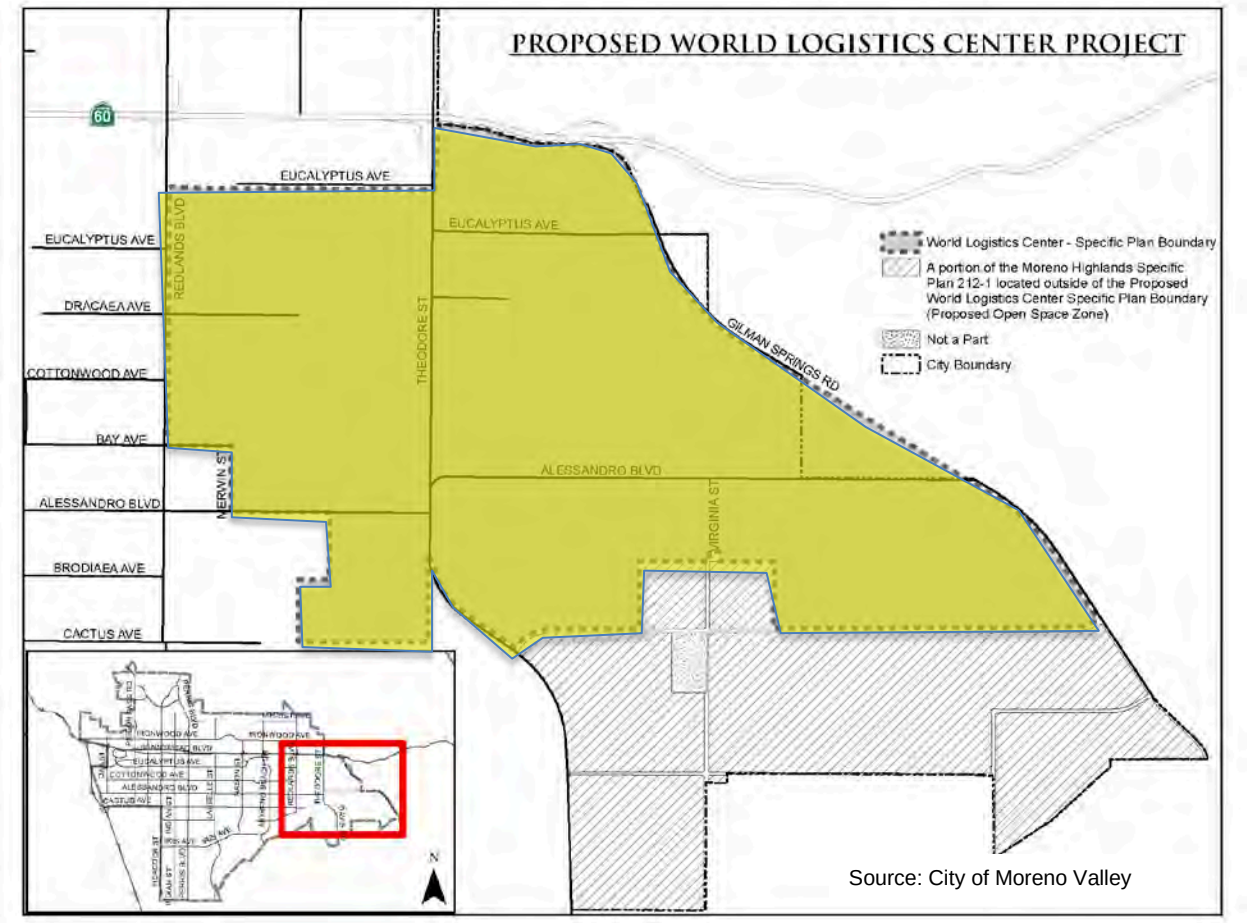
In July 2016, a settlement agreement was reached between the Commission, the County, the city of Moreno Valley, and Highland Fairview. A key provision of the settlement required that the four parties each contribute $250,000, for a total of $1 million, for the Commission to conduct a regional transportation study to evaluate a logistics-related regional fee, including the fee structure and implementing mechanism.

A result of the study could be a new fee program that would, for example, set a fee on new distribution center warehouses, based on facility size, to help pay for highway improvements. This fee would differ from existing Transportation Uniform Mitigation Fee (TUMF) Programs in that it would only focus on highway projects, as compared to the regional TUMF Programs, which collect funds for regional arterials and local streets.

Per the settlement agreement, if the County or at least 75 percent of the Commission's member cities adopt a regional warehouse fee within two years after a final court judgment is issued, Highland Fairview will pay 65 cents per square foot for each operating warehouse within the WLC. If no regional fee is adopted, the fee would be 50 cents per square foot. Proceeds would be used for projects identified as part of the regional truck study.

The purpose of this item and staff's recommendation is to approve the study. Implementing a fee program would require additional action by the Commission and local jurisdictions.

Figure 1: Location of Project



Summary of Completed Tasks

At its January 2017 meeting, the Commission approved the award for a regional truck study and development and implementation of a regional logistics mitigation fee to WSP USA, formerly Parsons Brinckerhoff, Inc. The study was kicked off in spring 2017 and a study advisory team was created to review and discuss the data and deliverables provided by the consultant team. The study advisory team consisted of staff representatives from the Commission, County, city of Moreno Valley, Highland Fairview, Western Riverside Council of Governments (WRCOG), Coachella Valley Association of Governments, Caltrans, South Coast Air Quality Management District (SCAQMD), Southern California Association of Governments (SCAG), and NAIOP Commercial Real Estate Development Association.

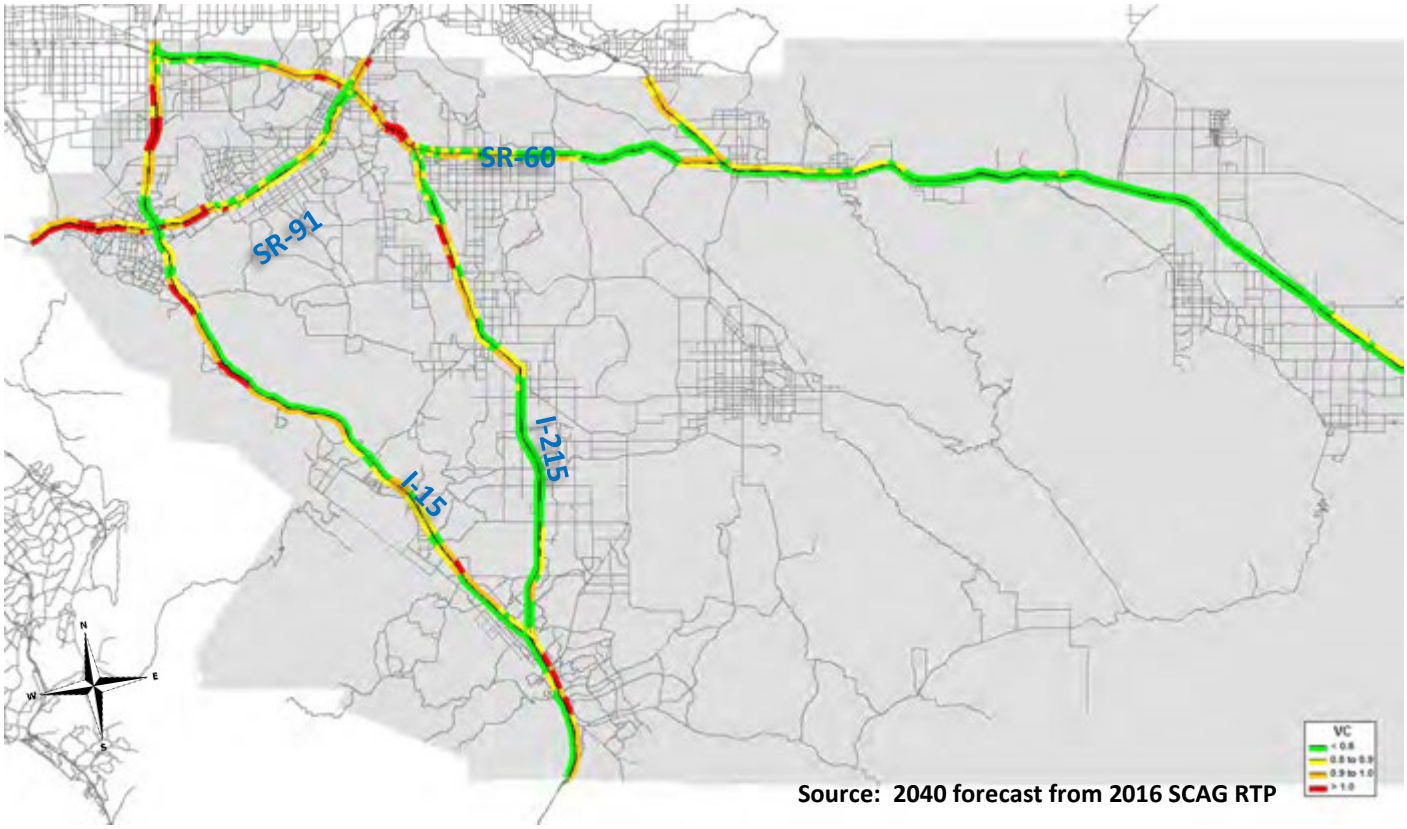
Existing and Future Conditions Analysis and Funding and Cost Analysis

At its June 2018 Commission meeting, staff and the project consultant provided an update on the study. At that time, the Existing and Future Conditions Analysis and Funding and Cost Analysis were completed and concluded the following:

- Existing and future warehousing related land use inventory was needed to forecast trips for each type of warehousing activity (i.e. high-cube such as fulfillment centers/parcel hubs, industrial parks, etc);
- Sufficient data sources are available to justify the completion of a Nexus Study;
- The SCAG 2016 Regional Transportation Plan (RTP) and its forecasted modeling was found to be the most comprehensive data source to evaluate existing and future conditions;
- Other datasets such as SCAQMD's Warehouse Study and ITE's Trip Generation Model were evaluated but had limitations such as lack of forecasting data and concentrations on certain warehousing activities such as high-cube;
- Diagnostic tests using Caltrans' truck count data were conducted to check that the SCAG model provided reasonable forecasts and were found to be pretty accurate;
- Origin-destination patterns were also collected using cellphone GPS data to analyze patterns within the County and between other regions;
- Origin-destination data reveals that about half of the heavy-duty truck trips in Riverside County either begin or end in the County, about two-thirds of the medium heavy-duty truck trips begin or end in the County, and highways in the County have the largest share of truck traffic for both heavy-duty and medium-duty trips in the SCAG region;
- The SCAG 2016 RTP model was used to determine traffic flows in the AM and PM peak hours, which is critical to identifying the attributable deficiencies by logistic activities;
- Logistics warehousing is estimated to grow in Riverside County by about 37.3 million square feet by 2040; and
- Future deficiencies in the highway network caused by logistics growth were identified in western county (see Figure 2).

Figure 2 identifies deficiencies based on new warehousing development as forecasted in the 2016 SCAG RTP.

Figure 2: Identified Deficiencies Based on New Warehousing Development



Source: 2040 forecast from 2016 SCAG RTP

Cost Estimation Methodology

Proposed projects to mitigate the logistics growth could range from the addition of an auxiliary lane at on-and-off ramps, or, the widening of a mainline. Conceptual costs were developed based on the quantification of construction elements in conceptual designed using Google imaging data. Existing capacity deficiencies, pass-through trips in Riverside County, and infrastructure improvements that are already planned or have been completed (i.e. SR-91 Capital Improvement Program or French Valley Parkway Projects) were excluded from the calculation of the potential fee.

Total cost of infrastructure improvements is estimated at $383.3 million (Table 1), of which the attributable share to logistics growth is about $47.8 million, or 12 percent (Table 2).

Table 1: Total Conceptual Cost Estimate

RCTC Truck Study and Regional Logistics Mitigation Fee Capacity Improvement Project Conceptual Cost Estimate Summary						
ID	**Route Name**	**Dir**	**Beginning**	**End**	**Total Conceptual Project Cost**	**Findings**
1	I-15	NB	SR-79 S	Rancho California Rd	$36,237,000	Cost reduced by TUMF inclusion of I-15 at Rancho California
			Rancho California Rd	Winchester Rd		
2			Winchester Rd	Lane Add south of I-15/I-215 Split	-	Mitigated by French Valley Parkway Project
3			Clinton Keith Rd	Baxter Rd	$7,406,000	Cost reduced by TUMF inclusion of I-15 at Baxter
4			El Cerrito Rd	Ontario Ave	-	Mitigated by I-15 Tolled Express Lanes (TEL)
5			Norco Dr/6th St	Limonite Ave	-	Mitigated by I-15 Tolled Express Lanes (TEL)
6		SB	Cantu Galeano Ranch Rd	Limonite Ave	-	Mitigated by I-15 Tolled Express Lanes (TEL)
			Limonite Ave	Norco Dr/6th		
7			Cajalco Rd	Indian Truck Trail	$37,825,000	Cost reduced by TUMF inclusion of I-15 at Temescal Canyon
8			El Cerrito Rd	Cajalco Rd	$10,408,000	Cost reduced by TUMF inclusion of I-15 at Cajalco
9	SR-60	EB	Rubidoux Blvd	Market St	$40,234,000	
			Market St	Main St		
10	I-215	NB	Box Springs Rd	Central Ave/Watkins Dr	$26,513,000	
			Central Ave/Watkins	Martin Luther King		
10c			Martin Luther King Blvd	SR-91	$55,081,000	
11			Center St Off-Ramp	Riverside County Line/Iowa	$42,212,000	Cost reduced by TUMF inclusion of I-215 at Highgrove/Center
12		SB	Martin Luther King Jr	Sycamore Canyon Rd	$13,403,000	
13			Van Buren Blvd	Case Rd	$95,365,000	Cost reduced by TUMF inclusion of I-215 at Perris, Nuevo, Placentia (MCP), Ramona and Harley Knox
14	SR-91	NB	Riverside County Line	Green River Rd Off-Ramp	-	Mitigated by SR-91 Express Lane Extension Project
			Green River Rd Off-Ramp	SR-71		
			SR-71	Serfas Club Dr Off-Ramp		
15			Serfas Club Dr Off-Ramp	Grand Blvd Rd Off-Ramp	-	Mitigated by SR-91 Express Lane Extension Project
16			On-Ramp from SB-I-15	On Ramp from NB- I-15	$7,611,000	
17			McKinley St Off Ramp	Pierce St	-	Mitigated by SR-91 Express Lane Extension Project
18			Pierce St	Magnolia St	$13,040,000	
19		SB	Serfas Club Dr Off-Ramp	Lane Add at SR-71	-	Mitigated by SR-91 Express Lane Extension Project
			Lane Add at SR-71	Riverside County Line/Iowa	-	
Sum Total:					***$385,335,000***	

Table 2: Total Logistics Cost Share

RCTC Truck Study and Regional Logistics Mitigation Fee Capacity Improvement Project Adjusted Conceptual Cost Share Summary							
ID	*Route Name*	*Dir*	*Beginning*	*End*	*Total Conceptual Project Cost*	*Logistics Attributable Share*	*Logistics Cost Share*
1	I-15	NB	SR-79 S	Rancho California Rd	$36,237,000	0.7%	$258,000
			Rancho California Rd	Winchester Rd			
3			Clinton Keith Rd	Baxter Rd	$7,406,000	0.3%	$19,000
7		SB	Cajalco Rd	Indian Truck Trail	$37,825,000	2.2%	$820,000
8			El Cerrito Rd	Cajalco Rd	$10,408,000	1.4%	$142,000
9	SR-60	EB	Rubidoux Blvd	Market St	$40,234,000	31.8%	$12,802,000
			Market St	Main St			
10	I-215	NB	Box Springs Rd	Central Ave/Watkins Dr	$26,513,000	30.0%	$7,963,000
			Central Ave/Watkins	Martin Luther King			
10c			Martin Luther King Blvd	SR-91	$55,081,000	13.3%	$7,317,000
11			Center St Off-Ramp	Riverside County Line/Iowa	$42,212,000	11.8%	$4,978,000
12		SB	Martin Luther King Jr	Sycamore Canyon Rd	$13,403,000	57.1%	$7,658,000
13			Van Buren Blvd	Case Rd	$95,365,000	4.4%	$4,235,000
16	SR-91	NB	On-Ramp from SB-I-15	On Ramp from NB- I-15	$7,611,000	7.5%	$571,000
18			Pierce St	Magnolia St	$13,040,000	8.3%	$1,078,000
Sum Total:					***$385,335,000***	***12.4%***	***$47,841,000***

A potential fee could be up to $1.28 per square foot (SF) of gross floor area based on the projected growth of about 37.3 million square feet of new warehousing anticipated by 2040 per the 2016 SCAG RTP.

Nexus Study

The California Mitigation Fee Act requires that an impact fee program fulfill the following:

- ✓ Establish a rational nexus/reasonable relationship between the infrastructure need and development impact
- ✓ Fees must be roughly proportional with the impacts of development and the cost of the infrastructure; and
- ✓ A development does not have to exclusively benefit from the infrastructure but can substantially benefit from the overall improvement in regional mobility.

The Nexus Study fulfills these requirements and builds upon the data compiled from the Existing and Future Conditions Analysis and Cost Analysis to establish the relationship between growth related to logistics facilities and truck traffic and the improvements needed to mitigate such growth. The study process includes the confirmation of expected growth in population and employment in the region, and specifically growth in warehousing and logistics uses in the county, applies the regional travel demand model to generate traffic data outputs to identify future capacity deficiencies in the highway network (Table 1 above), and then determines the proportion of those deficiencies that are attributable to new warehousing and logistics related development (Table 2 above). The resultant information is then cross-referenced with project cost information to determine the overall cost of mitigating logistics impacts as the basis for estimating a fee. That cost is then divided by the anticipated rate of growth in new warehousing and logistics developments in Riverside County to determine the fair share fee amount, as shown in Table 3 below.

Table 3: Potential Logistics Impact Fee

Logistics and Warehouse Impact Fee for Riverside County	
Logistics Cost Share of Freeway Mitigation	$47,841,000
Growth in Warehouse Gross Floor Area in Square Feet	37,332,179
Fee per Square Foot of Gross Floor Area	**up to $1.28**

Public Outreach

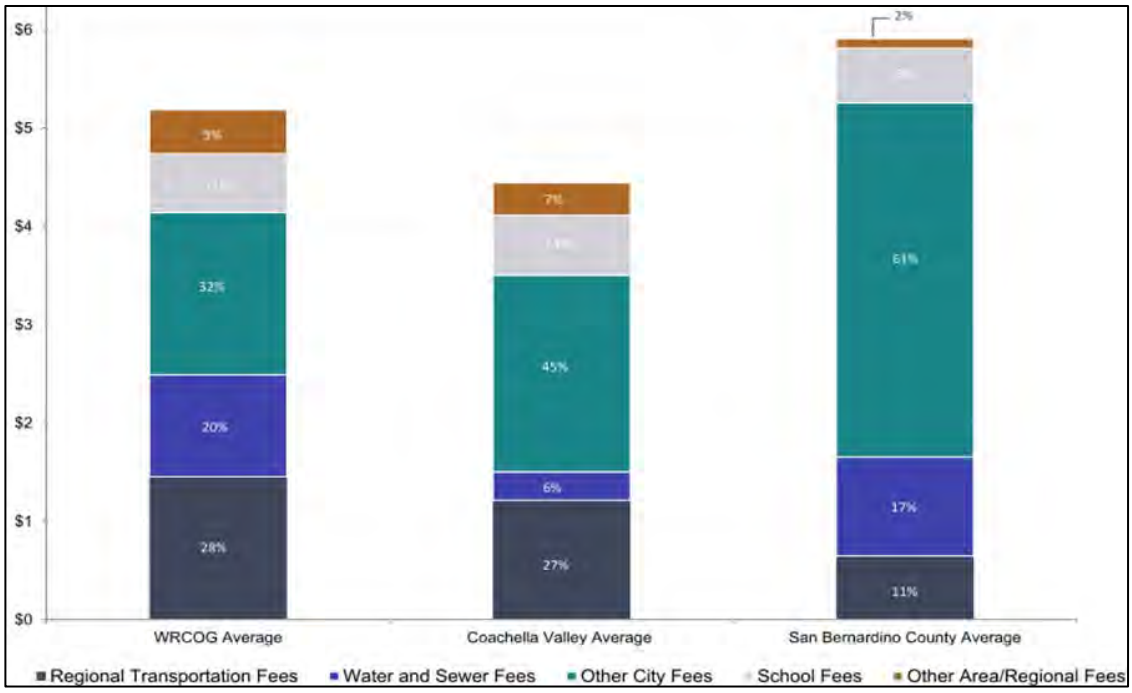
In addition to working with the study advisory team, staff also provided updates on the study to the Commission's Technical Advisory Committee (TAC), comprised of Public Works Directors and City Engineers, and other regional bodies such as the WRCOG City Managers TAC and, the SCAG Transportation Committee.

Stakeholder workshops were held on September 28, 2018 and December 7, 2018, to target public and private stakeholders, such as local and regional agencies and the development community. The workshops were advertised via the website, social media, the study advisory team, and partnering-agency distribution lists. In addition, a webpage for the study, located at www.rctc.org/feestudy was also made accessible for stakeholders to submit comments and review study materials. There was a total of about 42 attendees at both workshops. The majority of the comments and questions received were general in nature regarding who the fee would apply to and what types of projects the fee revenues would be allocated towards. Some comments were more technical regarding the methodology and calculation of the fee and were addressed with specific parties during study advisory meetings.

Potential Locational Effects of a Logistics Fee

The study also analyzed the potential locational impacts a logistics mitigation fee might have on economic development in the county. Research indicates that a logistics mitigation fee would likely have limited impacts on demand for warehouse development in Riverside County. For example, it is estimated that total development costs in Western Riverside County is about $121.10 per square feet for industrial buildings and a proposed logistics fee of up to $1.28 would increase the total by about 1 percent. In comparison, the total development costs in Los Angeles County is about 55 percent higher than the Inland Empire. Additionally, impact fees are generally higher in San Bernardino County compared to Riverside County, although fees vary widely. A potential logistics fee of $1.28/SF in Riverside County would make the average for Western Riverside County about $0.50 higher than the San Bernardino County average as shown in Figure 2 below.

Figure 2: Current Average Development Impact Fee Costs Per Square Foot and Proportions in Inland Empire Jurisdictions



Source: WRCOG, Updated Analysis of Development Impact Fees in Western Riverside County, 2019

Next Steps

Staff is recommending the Commission approve the Logistics Mitigation Fee Nexus Study. The approval of the Nexus Study does not constitute the pursuit of a fee program, but rather fulfills the Commission's obligation to complete the analysis per the settlement agreement. Should the Commission decide to pursue a fee program, staff would return at a later time for the approval of an implementation plan including a proposal on the establishment of a fee administrator. The Commission's current governing authority does not allow for fees to be collected directly by the Commission; therefore, should a program be implemented the Commission would either have to create a Joint Powers Authority or another regional governing body would have to be responsible for administering the fee program. If implemented, the formal adoption and public hearing process for the Nexus Study and fee program would take place.

Fiscal Impact

There is no financial impact for this item.

Attachments:

1) Nexus Study, April 2019
2) Existing and Future Conditions, October 2017
3) Supplemental: Existing and Future Conditions, March 2018
4) Funding and Cost Analysis, June 2018
5) Potential Locational Effects of a Riverside County Logistics Mitigation Fee, April 2019

RCTC TRUCK STUDY AND REGIONAL LOGISTICS MITIGATION FEE

Final Technical Memorandum: Task 3 – Nexus Study

Prepared for :

RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Prepared by:

WSP

In partnership with

FEHR & PEERS

Revised: April 2019

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1. INTRODUCTION, BACKGROUND AND PURPOSE

Despite the recent slow-down in the rate of development in the region due to the lasting effects of the economic recession, Western Riverside County remains one of the fastest growing regions in the country. The proximity to Los Angeles, Orange County and San Diego, the availability of comparatively affordable land, and the generally high quality of life in area communities each contribute to making Riverside County an attractive place to live and work. However, the continuing rapid rate of growth in the region exceeds the capacity of existing financial resources to meet demand for transportation infrastructure. Traditional transportation funding sources, Measure A and the respective Transportation Uniform Mitigation Fee (TUMF) programs, as well motor fuel tax revenues generated by the recent enactment of Senate Bill 1 (SB1), substantially contribute to building and maintaining transportation infrastructure, although these funding sources are considered insufficient to address all the area's transportation funding needs into the future. This is particularly the case for the freeway system in Western Riverside County where existing needs, anticipated future growth and the fluctuating increase in land and material costs exceed the capability of current local, state and federal programs to meet future funding needs.

The projected growth in Western Riverside County can be expected to significantly increase congestion and degrade mobility if substantial additional investments are not made in the transportation infrastructure. This challenge is especially critical for the freeway system which provides the foundation for the area's transportation system and is recognized as an essential element for sustaining the regional economy. Further increases in congestion and degradation in mobility on the freeway system will have a considerable impact on the economy and overall quality of life in Western Riverside County.

The impact of trucks and other traffic associated with warehousing and logistics uses has increasingly emerged as an issue of concern in Riverside County as more of these developments are located within the county. The issue of adequate mitigation of the impacts of these uses on regional freeways recently culminated with a multi-party lawsuit involving mitigation of the Highland Fairview development in Moreno Valley. As part of a settlement agreement between the respective parties to the lawsuit, it was agreed that the Riverside County Transportation Commission (RCTC) would undertake a regional truck study to verify the cumulative level of impact of warehousing and logistics uses on the freeway system in Riverside County as the basis for establishing a regional logistics mitigation fee. This Nexus Study represents a critical milestone in the RCTC Truck Study and Development and Implementation of Regional Logistics Mitigation Fee work effort.

The RCTC Truck Study and Development and Implementation of Regional Logistics Mitigation Fee is intended to verify the anticipated rate of growth in warehousing and logistics-related development in Riverside County, and to quantify the associated level of traffic impacts on the Riverside County highway system because of the expected growth in warehousing and logistics

activities. In quantifying impacts, the study is also intended to determine the amount that each new warehousing or logistics development should pay in lieu of completing actual freeway improvements to mitigate the cumulative regional traffic impacts specifically associated with truck trips generated by new warehousing and logistics developments. The findings of this study are intended to provide the framework for implementing a program to collect impact fees that will contribute to mitigating the truck traffic impacts associated with new warehousing and logistics developments in Riverside County. Such a program can help to ensure that all new logistics-related development approved in Riverside County will bear a proportional fair share of the cost of building transportation infrastructure to address future transportation needs.

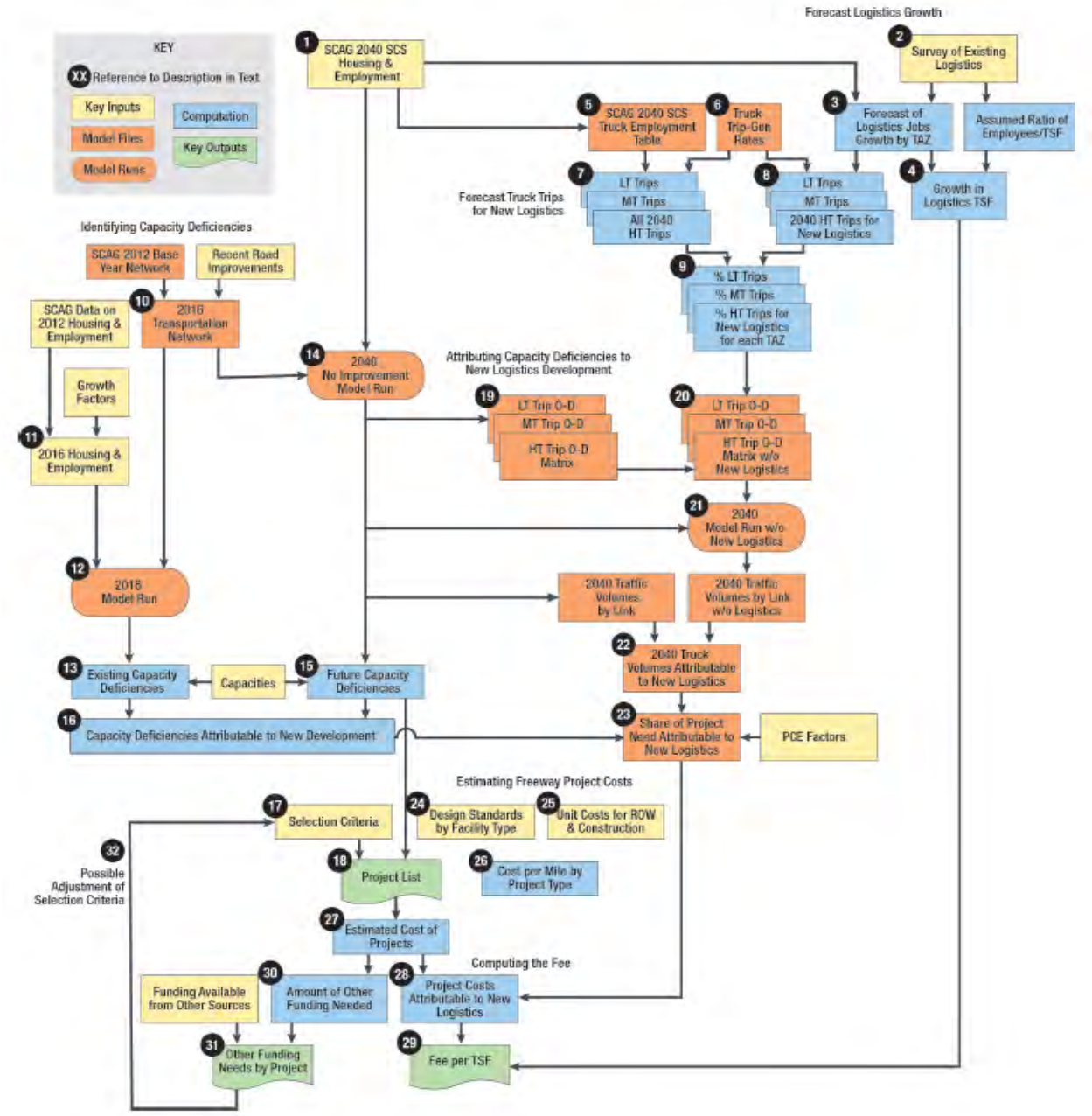
This technical memorandum represents the third in a series of documents that will verify the rate of new warehousing and logistics related developments in Riverside County, the associated truck trip generation rates and cumulative regional traffic impacts, the cost to mitigate these impacts, and the fair share basis for collecting a potential fee. This document summarizes the technical evaluation efforts and presents the analysis findings developed as part of the prior study tasks to calculate a fair share fee amount and document the rational nexus for a regional logistics mitigation fee.

1.1. Nexus Study Process

The various steps of the fee calculation process that contribute to accomplishing this task are summarized in the following sections of this document. The study process starts by confirming the expected growth in population and employment in the region, and specifically growth in warehousing and logistics uses in Riverside County, applies the regional travel demand model to generate traffic data outputs to identify future capacity deficiencies in the highway network, and then determines the proportion of those deficiencies that are attributable to new warehousing and logistics related development. The resultant information is then cross-referenced with project cost information to determine the overall cost of mitigating logistics impacts as the basis for estimating a fee. This cost is then divided by the anticipated rate of growth in new warehousing and logistics developments in Riverside County to determine the fair share fee amount.

The subsequent chapters of this Nexus Study document describe the various assumptions, data inputs and analysis leading to the determination of a fee that represents the maximum "fair share" amount that can be charged to new warehouse and logistics uses to mitigate the indirect cumulative regional impacts of the development on the freeway network. The overall process for establishing the fee nexus is illustrated in the flow chart in **Figure 1.1** outlining the various technical steps in this fee calculation process. Each technical step that was followed to determine the fee and establish the program nexus is described in the subsequent sections, with reference to the numbers denoted on the flow chart correlating to the various steps. The flow chart also incorporates color coding of the steps to indicate those steps that involved the application of the SCAG regional travel demand model, steps that utilized other input data, steps that are computations of various inputs, and key outputs.

Figure 1-1: Flowchart of Key Steps in the Nexus Study Process



2. FORECASTING LOGISTICS GROWTH AND TRAFFIC IMPACTS

This initial phase of the study process is to inventory existing logistics facilities in Riverside County, confirm the forecast growth in logistics facilities through 2040, and determine the magnitude and location of logistics related truck traffic impacts. This effort encompasses the first nine steps illustrated in the study process flow chart.

2.1. FORECASTING LOGISTICS GROWTH

The settlement agreement that prompted the study effort specifically cites warehouse and logistics uses as the subject of the analysis and potential fee. As a precursor to inventorying and forecasting logistics facilities and their impacts, specific types of logistics facilities were defined to be the subject of the analysis and resultant fee based on the functions they serve, the types of businesses that utilize them, and their design and trip generation characteristics. A range of data sources were reviewed including the South Coast Air Quality Management District (SCAQMD) *High-Cube Warehouse Vehicle Trip Generation Analysis*, the SCAG *Industrial Warehousing Study*, the Institute of Traffic Engineers (ITE) *Trip Generation Manual*, and the recently-released SCAQMD/NAIOP/ITE study of vehicle trip generation for high-cube warehouses, as well as available industry databases to identify an appropriate definition of the subject uses. The various datasets use different systems to classify industries; the North American Industry Classification System (NAICS) and the Standard Industrial Classification (SIC). The U.S. Census Bureau uses the NAICS structure. Similarly, SCAG uses the NAICS structure as the basis for developing regional employment forecasts as part of its long-range planning responsibilities.

The NAICS applies a 6-digit hierarchical coding system to classify all economic activity into 20 industry sectors. Five sectors are mainly goods-producing sectors and 15 are entirely services-producing sectors. Transportation and Warehousing (Industry Code 48 & 49) is defined in NAICS as "Industries providing transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities related to modes of transportation. Establishments in these industries use transportation equipment or transportation related facilities as a productive asset. Modes of transportation include air, rail, water, road, and pipeline. (Example: Freight Trucking Companies, Warehousing and Storage, Couriers and Delivery Services.)"[1]. The Warehousing subcategory (NAICS subcategory code 493) is included within this category and was determined to be the most applicable subcategory for the purposes of this study.

The current SCAG Sustainable Community Strategy (SCS) was adopted on April 7, 2016 and constitutes the officially-adopted land use forecast for the region. The horizon year for the SCS is 2040. The primary SCS forecast for non-residential development incorporates units of jobs (as opposed to acres, square feet, etc.) for a full range of land uses, including Warehousing employment. As the adopted growth forecast for the SCAG region, the SCAG SCS provides the starting point for forecasting logistics growth in Riverside County.

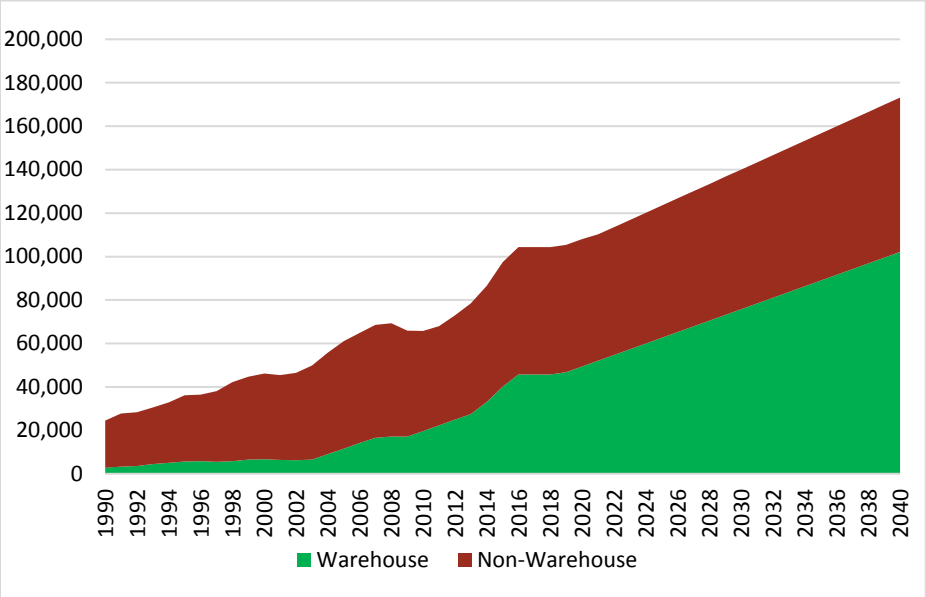
The SCAG SCS base year (2012) jobs in the Warehousing subcategory was compared to other sources as a reasonableness check. The California Employment Development Department

[1] North American Industry Classification System United States, Executive Office of the President Office of Management and Budget, 2017

(EDD) Metropolitan Statistical Area (MSA) employment data by detailed NAICS industries code were utilized for this purpose. The SCAG SCS base year (2012) employment in Warehousing in Riverside and San Bernardino Counties is 15,821 jobs, which is less than two-thirds of the 24,900 Warehousing jobs indicated for the same period in the EDD employment data for the Riverside-San Bernardino-Ontario MSA. For this reason, the SCAG SCS data were adjusted to support the travel demand forecasting completed as part of this study.

EDD collects data on employment by detailed NAICS industries, but only at the MSA geographic level. Moreover, EDD does not include long-term forecasts, only past observed data. Therefore, the EDD historical data for the Riverside-San Bernardino-Ontario MSA had to be extrapolated into the future and disaggregated by county. The adjustments were accomplished by first observing the historical trend for Warehousing jobs in the Riverside-San Bernardino-Ontario MSA and extrapolating for the years 2016 to 2040. As illustrated in **Figure 2-1**, 2003 marks a notable inflection point where the rate of growth in warehousing increases relative to the growth of transportation/warehousing employment overall. Therefore, the post-2003 trend was used to extrapolate from 2016 to 2040 for both for the Warehousing sub-category and the rest of Transportation sub-categories as the basis for adjusting the employment data in the model.

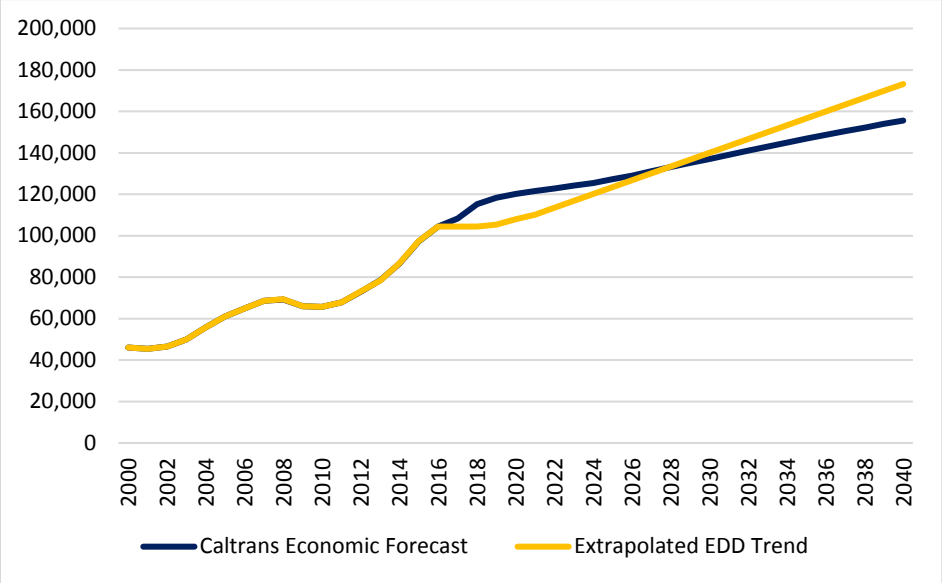
Figure 2-1: EDD Warehouse and Other Transportation Employment Extrapolated Trends (Riverside-San Bernardino-Ontario MSA)



Caltrans' Transportation Economics Branch provides annual county-level projections of employment by 2-digit NAICS industry categories through 2050. A comparison of the Caltrans data for Riverside and San Bernardino Counties combined reveals the total jobs for

Transportation and Warehousing correlates very closely with the EDD historical trend extrapolation described previously, as illustrated in **Figure 2-2**. Considering the close correlation of totals between datasets, the proportion of total jobs in Transportation and Warehousing in Riverside County compared to San Bernardino County based on the Caltrans dataset was used to disaggregate the EDD extrapolated Warehouse jobs by MSA into county subtotals.

Figure 2-2: Transportation Employment - Caltrans Transportation Economics Branch Forecast vs. Extrapolated EDD Trend (Riverside-San Bernardino-Ontario MSA)



The preceding steps produced a control total for the growth in warehouse jobs in Riverside County accomplishing Step 1 in the study process as illustrated in **Figure 1-1**. However, accomplishing this first step provided no indication about where in the county these jobs would be located. Locational data is needed so that the anticipated growth in warehouse and logistics development will be properly represented in the travel demand forecast in terms of where resultant traffic impacts will affect the freeway system. The best available data for distributing warehousing growth across Riverside County can be derived from the SCAG *Industrial Warehousing Study*, some products of which are available for Heavy Duty Truck modeling purposes. For the purposes of the *Industrial Warehousing Study*, SCAG developed forecasts of the rate of warehouse growth in terms of the gross floor area of buildings as well as jobs. **Table 2-1** summarizes the forecasts developed as part of the SCAG study effort and incorporated into the SCAG Heavy Duty Truck Model that supported the 2016 RTP/SCS.

Table 2-1: Warehouse Trends in Riverside County, 2012-2040

Year	High Cube Warehousing		Low Cube Warehousing	
	Warehouse Area (square feet)	Employment	Warehouse Area (square feet)	Employment
2012*	41,281,541	1,793	8,833,418	1,804
2016	48,837,363	2,810	14,472,627	2,533
2020	56,393,177	3,819	20,111,826	3,256
2030	64,664,947	6,120	26,810,782	5,070
2040	69,410,192	7,427	31,231,977	6,185

** The area shown in 2012 includes total available floor space. The area shown in 2016 and years after includes planned occupied floor space.*
Source: SCAG 2016 RTP/SCS Heavy Duty Truck Model

Although the SCAG warehouse employment forecast appeared to be low when compared to other data sources, as described previously, the warehouse area forecast appears to be more consistent with the amount of existing and planned warehouse development in Riverside County. Furthermore, as a check of the reasonableness of the EDD extrapolation of Warehouse sector employment in Riverside County, the jobs were multiplied by the square foot per employee ratio for warehousing uses as published by the National Association for Industrial and Office Parks (NAIOP) *Logistics Trends and Specific Industries that Will Drive Warehouse and Distribution Growth and Demand for Space* in March 2010. As indicated in **Table 2-2**, when the extrapolated EDD warehouse employment trend forecast is multiplied by the 2,241 square feet per employee ratio cited by NAIOP, the resultant interpolated growth in warehouse building area is similar, although slightly lower, than the rate forecast by SCAG in the *Industrial Warehousing Study* and utilized in the Heavy Duty Truck Model. For this reason, the rate of growth in the gross floor area of warehouses in Riverside County was accepted by the Study Review Team as the basis for calculating the fee accomplishing Step 4 in the study process, as illustrated in **Figure 1-1**. This finding also affirmed using the data to guide the disaggregation of EDD extrapolated warehouse jobs in Riverside County for travel demand modeling purposes.

Table 2-2: Warehouse Growth in Riverside County, 2016-2040

	Growth (2016 to 2040)	
	Employees	Square Feet of Gross Floor Area
SCAG 2016 RTP/SCS Forecast	8,269	37,332,179
Extrapolated EDD Forecast*	14,582	32,678,262

** Forecast based on EDD extrapolated employment trend and 2,241 square feet per employee ratio from NAIOP Logistics Trends and Specific Industries that Will Drive Warehouse and Distribution Growth and Demand for Space, March 2010*
Source: SCAG 2016 RTP/SCS Forecast & Heavy Duty Truck Model; EDD

Table 2-3 arrays the forecast growth in the gross floor area of warehousing in Riverside County based on the SCAG 2016 RTP/SCS forecast presented in the *Industrial Warehouse Study* and utilized in the Heavy Duty Truck Model. The extrapolated growth in warehouse jobs in Riverside County was multiplied by the percentage of warehouse job growth for each Traffic Analysis Zone (TAZ) as derived from the SCAG Heavy Duty Truck Model to produce the adjusted forecast of the growth in warehouse employment by TAZ to support the travel demand forecasting conducted as part of this study, accomplishing Step 3 in the study process, as illustrated in **Figure 1-1**.

Table 2-3: Warehouse Growth by TAZs in Riverside County (in thousand square feet gross floor area and percentage)

TAZ_ ID	High-cube 2016	Low-cube 2016	High-cube 2040	Low-cube 2040	Total Change 2016-2040	Percent change 2016 - 2040	Percent of total growth countywide
43344	5,417	2,323	20,136	8,628	21,024	271.63%	56.31%
43336	641	1,497	3,198	7,461	8,521	398.55%	22.82%
43338	101	231	355	822	845	254.52%	2.26%
43148	4,437	410	4,437	1,029	619	12.77%	1.66%
43571	-	-	594	-	594	0.00%	1.59%
43130	2,050	465	2,050	988	522	20.80%	1.40%
43364	-	182	331	293	442	242.86%	1.18%
43573	-	-	421	-	421	0.00%	1.13%
43302	655	-	1,072	-	417	63.66%	1.12%
43305	302	-	604	-	302	100.00%	0.81%
43264	-	-	300	-	300	0.00%	0.80%
43187	-	119	-	340	221	185.71%	0.59%
43575	156	37	311	75	193	100.00%	0.52%
43260	2,031	820	2,031	1,002	180	6.38%	0.48%
43452	172	-	343	-	172	99.42%	0.46%
43345	-	-	-	163	163	0.00%	0.44%
43448	-	60	-	209	150	248.33%	0.40%
43286	-	-	-	149	149	0.00%	0.40%
43332	101	44	202	88	145	100.00%	0.39%
43249	3,197	1,716	3,197	1,860	144	2.93%	0.39%
43395	131	-	262	-	131	100.00%	0.35%
43415	2,992	244	2,992	369	124	3.86%	0.33%
43134	474	454	474	574	120	12.93%	0.32%
43454	119	-	237	-	119	99.16%	0.32%
43168	491	-	491	116	116	23.63%	0.31%

43409	-	-	-	108	108	0.00%	0.29%
43366	-	-	-	89	89	0.00%	0.24%
43236	-	83	-	165	83	98.80%	0.22%
43399	-	81	-	162	81	100.00%	0.22%
43265	-	-	-	80	80	0.00%	0.21%
43488	-	78	-	155	78	98.72%	0.21%
43563	308	162	308	232	70	14.89%	0.19%
43246	328	487	328	547	61	7.36%	0.16%
43276	-	59	-	117	59	98.31%	0.16%
43429	-	57	-	115	57	101.75%	0.15%
43162	-	-	-	56	56	0.00%	0.15%
43181	821	61	821	112	51	5.78%	0.14%
43420	286	48	286	96	48	14.37%	0.13%
43261	-	120	-	163	43	35.83%	0.12%
43136	289	193	289	233	40	8.30%	0.11%
43310	-	40	-	80	40	100.00%	0.11%
43125	5,048	692	5,048	727	36	0.61%	0.10%
43474	-	32	-	65	32	103.13%	0.09%
43397	-	31	-	62	31	100.00%	0.08%
43188	380	145	380	175	30	5.71%	0.08%
43214	-	285	-	311	27	9.12%	0.07%
TOTAL	30,927	11,256	51,498	28,016	37,334	88.50%	100.00%

Source: SCAG Industrial Warehouse Study/Heavy Duty Truck Model

2.2. Forecasting Traffic Impacts

A key step in the process of determining the basis for any impact fee program is identifying the extent of the impact that will result from new development activity. For the purposes of this study, the SCAG regional travel demand model was the primary tool used for identifying existing and future travel demands and capacity deficiencies, and determining attribution of deficiencies to new logistics trucking[2]. While the SCAG regional model provides the primary tool for quantifying the traffic impacts of new warehousing and logistics development, additional information regarding the trip generation characteristics of warehousing and logistics land uses is used to validate and refine the SCAG model results for the purposes of the study evaluation. The process for quantifying the trips associated with new logistics centers is summarized in the following section.

[2] The following model analysis was performed by WSP based upon modeling information originally developed by the Southern California Association of Governments (SCAG). SCAG is not responsible for how the model is applied or for any changes to the model scripts, model parameters, or model input data. The resulting modeling data does not necessarily reflect the official views or policies of SCAG. SCAG shall not be held responsible for the modeling results and the content of the documentation.

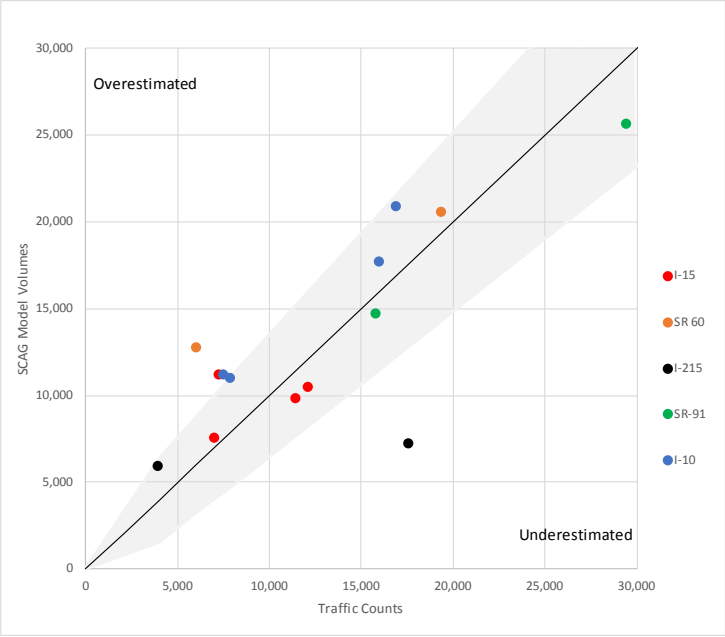
2.2.1. SCAG Model Adjustment and Re-Validation

The California Transportation Commission (CTC) *2010 California Regional Transportation Plan Guidelines* states the following about adjusting and re-validating a regional travel model prior to using it for sub-regional studies:

> *"Agencies that use MPO models for purposes other than regional planning should ensure that the model provides the appropriate scale and sensitivity for applications at a sub-regional level such as corridor, sub-area, or local planning studies. Below the regional level, model refinements are likely necessary to ensure the model meets the validation targets established in these guidelines and is appropriately sensitive to smaller scale changes associated with sub-regional studies."*

In accordance with the CTC guidelines and best industry practice, the SCAG model was reviewed, adjusted and revalidated to improve the accuracy of the results with respect to freeways in Riverside County. This process involved a series of diagnostic tests being performed on the SCAG model to test its validity for use in a freeway impact fee nexus study. The tests showed that the model reasonably represented truck traffic on Riverside County freeways. For example, **Figure 2-3** compares the volume of trucks at various freeway locations in the model versus the volumes provided in the Caltrans Performance Measurement System (PeMS) data. The results reflect a reasonable correlation between the model and actual values, and no systemic tendency towards over- or under-estimating the truck volumes and percentage of total traffic.

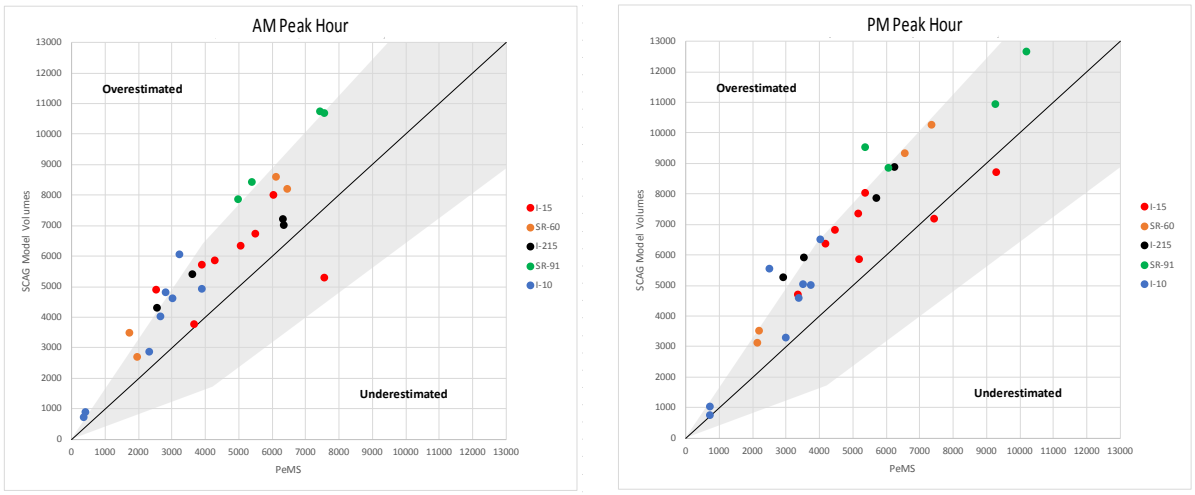
Figure 2-3: Comparison of Modeled to Actual Daily Truck Volumes on Riverside County Freeways



However, the tests also revealed that there was an issue warranting adjustment. **Figure 2-4** shows link flows from a SCAG model run for 2016 compared to PeMS data for the same year. This data was evaluated two ways, namely:

- The shaded areas in **Figure 2-3** and **Figure 2-4** show the allowable deviation based on Caltrans guidelines. The allowable deviation reflects the fact that the actual traffic volumes on roads fluctuate from day to day, so the "normal" traffic volume that a model should replicate is a range rather than a fixed value. A model is considered generally valid if 75% of the points fall within the allowable deviation. In this case 77% of the sites are within the allowable range in the AM peak hour and 86% in the PM peak hour, so the model passes this test of validity.
- The second test was to see whether there was a general tendency for the model to over-estimate or under-estimate total traffic volumes on freeways in Riverside County. **Figure 2-4** shows that the model did not satisfy this test; consistently over-estimating traffic on Riverside County freeways by an average of 26% in the AM peak hour and 20% in the PM peak hour.

Figure 2-4: AM and PM Peak Hour Comparison of PEMS Total Traffic Volumes and SCAG Model Total Traffic Volumes

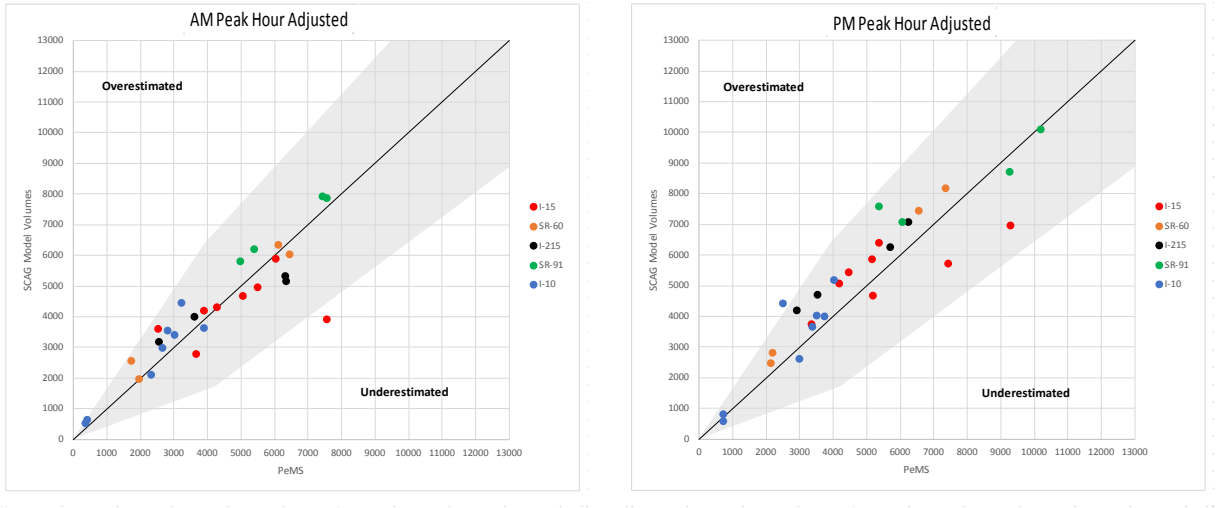


The model overestimation was corrected by factoring down model volumes in a post-model adjustment[3]. Only car volumes were factored down, not truck volumes, because truck volumes did not show the same trend of overestimation, as illustrated previously in **Figure 2-3**. **Figure 2-5** shows the results after applying factors of 0.74 and 0.80 in the AM peak hour and PM peak

[3] Additional details regarding the model testing, adjustments and re-validation are presented in *Technical Memorandum 1: Existing and Future Conditions* (WSP, October 2017) and *Technical Memorandum: Task 2 – Funding and Cost Analysis* (WSP, June 2018).

hour, respectively. After adjustments, the R-squared[4] value increased from 0.11 to 0.79 in the AM peak hour and from 0.51 to 0.84 in the PM peak hour, satisfying the recommended guidelines for model validity.

Figure 2-5: AM and PM Peak Hour Comparison of PEMS Total Traffic Volumes and SCAG Model Adjusted Total Traffic Volumes



2.2.2. Forecasting Traffic Volumes and Identifying Traffic Impacts

The SCAG Model's 2016 scenario year network was used for all model runs with the extrapolated 2016 and 2040 socio-economic forecasts described previously in **Section 2.1** providing the basis for the demand inputs in Riverside County. These model files were from the version of the SCAG model used to develop the 2016 RTP/SCS. The SCAG model outputs were factored in accordance with the post-model adjustment described in **Section 2.2.1** to yield adjusted forecast total traffic volumes on the various freeways in Riverside County for analysis years 2016 and 2040. This process to forecast 2016 and 2040 traffic volumes effectively encompasses steps 10, 12 and 14 as illustrated previously in **Figure 1-1**.

Based on the post-model adjusted total traffic volumes, the volume to capacity (V/C) ratio was computed for each freeway link in Riverside County for the AM and PM peak hours using the capacities and passenger car equivalent (PCE) factors[5] embedded in the SCAG model (steps 13 and 15 in **Figure 1-1**). Per the RCTC *Congestion Management Program*, the adopted minimum Level of Service (LOS) threshold for freeways in Riverside County is LOS "E" meaning that freeway facilities with a V/C ratio of 1.0 or higher are considered deficient.

4 R-squared is a measure of how well the forecast accounts for variations in the traffic counts. R-squared values can range from 0.00, indicating no relationship between the model values and the counts, to 1.00, indicating that the model accounts for all variation in the count data set.

5 PCE factors are used to account for the difference in size, speed, and maneuverability between different classes of vehicles, including the effect of slopes on the operating characteristics of trucks.

Figures 2-6 and **2-8** show the existing V/C ratios on Riverside County freeways for the AM peak hour and PM peak hour, respectively, with green and yellow indicating acceptable V/C ratios (<0.9), orange indicating marginal V/C ratios (0.9 – 1.0) and red indicating deficient V/C ratios (>1.0). Under existing conditions, three current deficiencies were identified on the freeway network in Riverside County: SR-91 in Corona during the both the AM and PM peak hours, I-15 in the Jurupa Valley during the PM peak hour, and I-215 between Riverside and Moreno Valley during the PM peak hour. These congested sections may result in queuing in upstream sections whose V/C ratios would not in themselves be problematic, but may be perceived by drivers as problem sections beyond the actual deficient segment.

Figures 2-7 and **2-9** show 2040 traffic demand assigned to the existing network[6] with no added capacity improvements for the AM and PM peak hours, respectively (i.e. a 2040 "No Improvement" Scenario). Comparing the existing capacity deficiencies with the future deficiencies helps to show where new deficiencies would occur that are entirely attributable to new development. Furthermore, comparing the existing and future V/C ratio on the freeway segments that are currently deficient shows the proportion of the future deficiency that is attributable to new development. The 2040 No Improvmenet results clearly indicate the existing deficiencies worsen and two additional deficiencies in the AM peak hour and five additional deficiencies in the PM peak hour would manifest.

It should be noted that although the following exhibits illustrate the model results for the Western Riverside County, modeling and V/C ratios were done for all freeways in Riverside County. However, the results did not indicate any deficient segments of freeway outside of Western Riverside County, although some modest deterioration of V/C can be observed along I-10 in the Coachella Valley during the 2040 PM peak hour, as illustrated in **Figure 2-9**.

It should also be noted that the model results reflect V/C ratio as the basis for identifying freeway capacity deficiencies. Beyond the embedded capacity of each freeway segment in the SCAG model network, the analysis did not consider operational deficiencies in the freeway network that may contribute to traffic breakdown and congestion (e.g. lane drops, weaving and merging areas, horizontal and vertical alignment, and other design characteristics). These types of operational deficiencies can be considered existing design deficiencies and therefore usually cannot be attributed to the impacts of future new development, although future new development can exacerbate the magnitude of congestion associated with these operational deficiencies. For this reason, V/C is used to identify freeway segments with a capacity deficiency that can be attributable to the additional traffic from new development, while also factoring the extent that existing traffic demand contribute to the deficiency. Operational deficiencies are considered during the development of concepts to mitigate the capacity deficiencies to the extent that addressing the operational deficiencies represents necessary improvement elements to accomplish successful mitigation of the capacity deficiency.

[6] The SCAG existing model network represents the current state of the transportation system in 2016 and does not reflect those projects completed since 2016. In Riverside County, the SR-91 Express Lanes Extension project that included various freeway improvements along SR-91 from the Orange County line to I-15 was completed after 2016. Projects completed after 2016 (as well as projects currently under construction) get reconciled during subsequent study steps, as described in Chapter 4 of this technical memorandum.

Figure 2-6: Existing Deficiencies on Riverside County Freeways during the AM Peak Hour

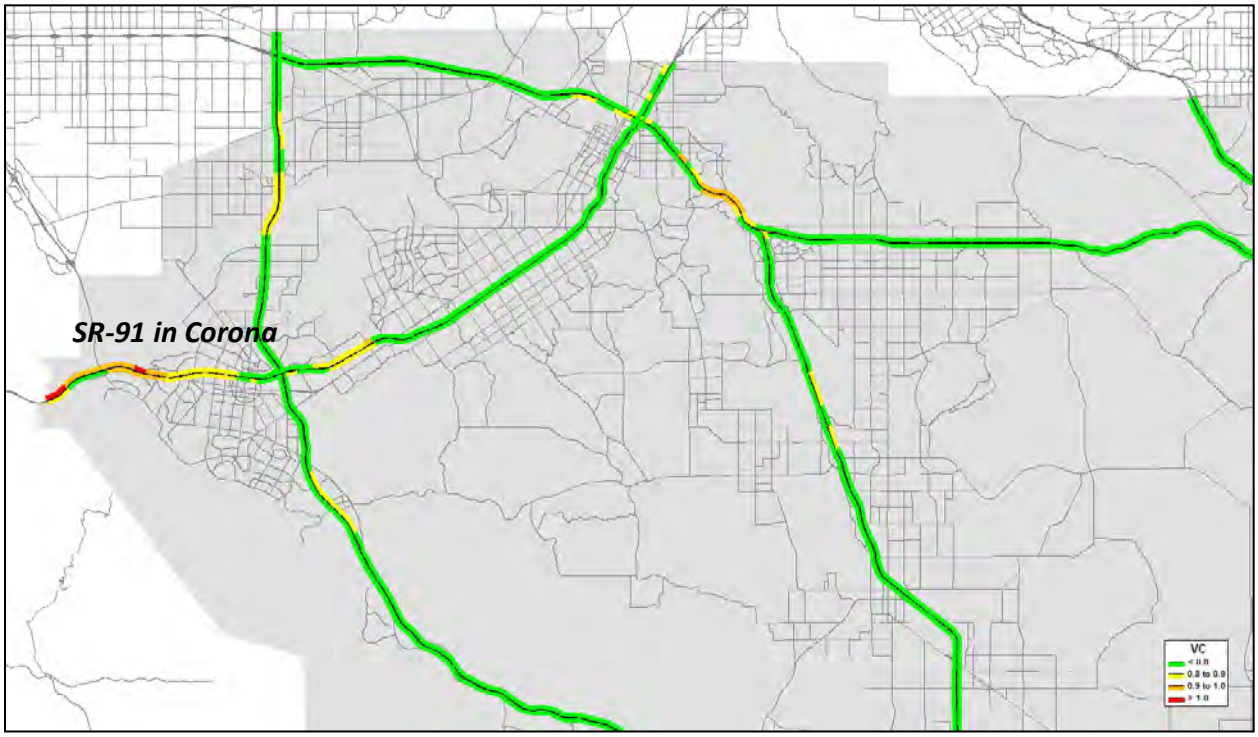


Figure 2-7: Future Deficiencies on Riverside County Freeways during the AM Peak Hour

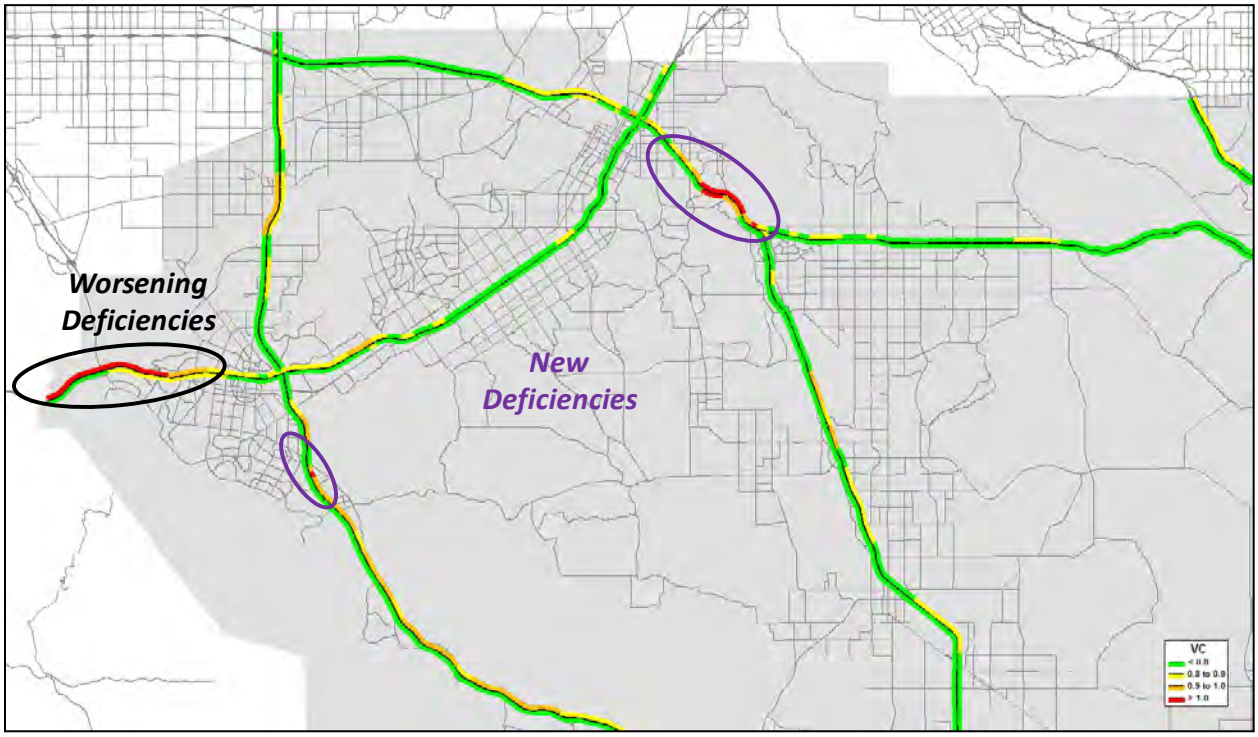


Figure 2-8: Existing Deficiencies on Riverside County Freeways during the PM Peak Hour

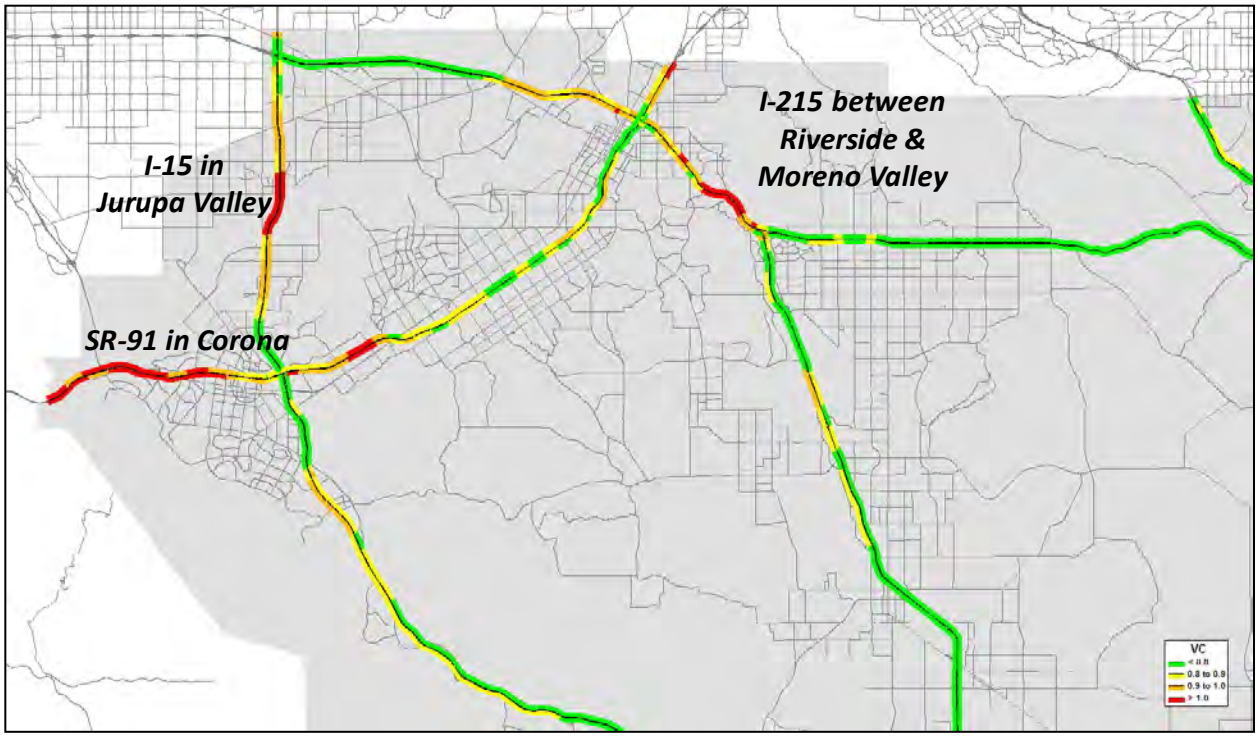
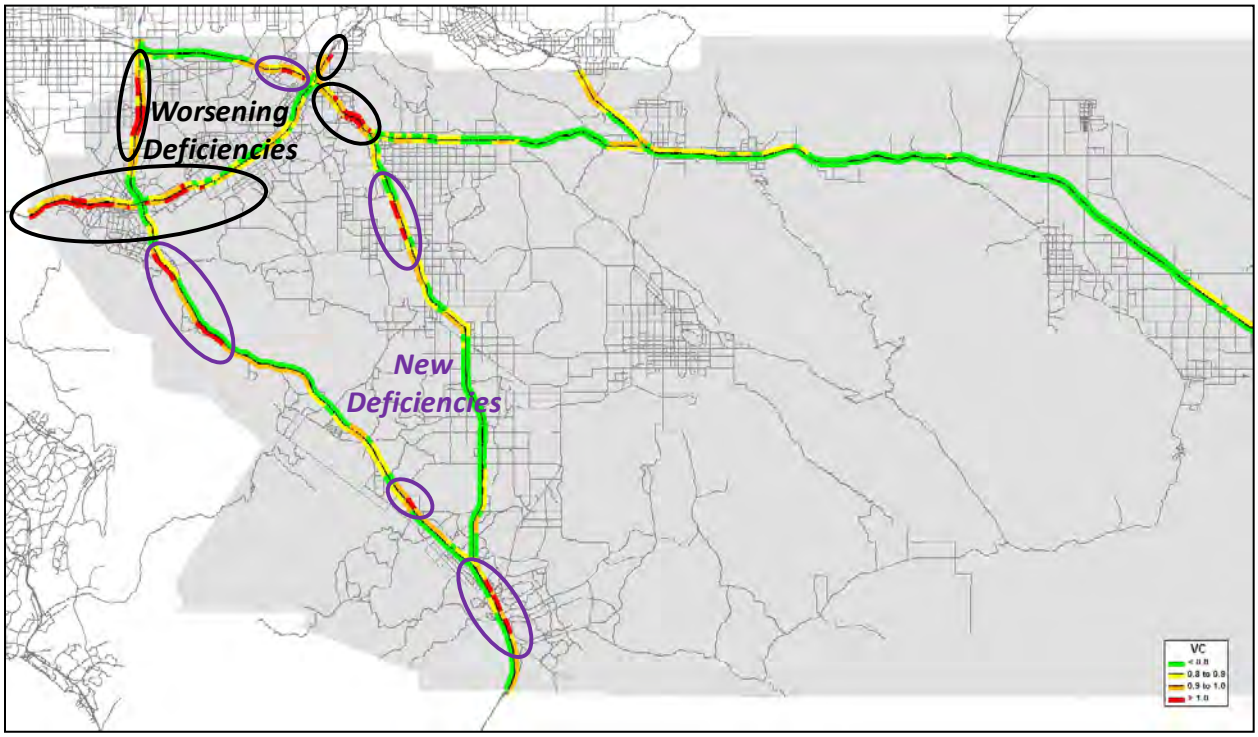


Figure 2-9: Future Deficiencies on Riverside County Freeways during the PM Peak Hour



Based on the findings of the V/C analysis, freeway segments identified as being deficient in the 2040 No Improvement Scenario were tabulated. These locations represent the freeway segments where future traffic demands exceed the existing capacity, and therefore require mitigation. These locations are listed in **Table 2-4** and illustrated in **Figure 2-10**. **Section 3** of this report describes the process that was used to determine the share of the deficiency in each of these segments that is specifically attributable to the impacts of new warehousing and logistics developments occurring in Riverside County.

Table 2.4: Capacity Deficient Segments on Riverside County Freeways (2040 No Improvement)

ID	Route	Dir	Beginning	End
1 a,b	I-15	NB	SR-79 S	Rancho California Rd
			Rancho California Rd	Winchester Rd
2			Winchester Rd	Lane Add south of I-15/I-215 Split
3			Clinton Keith Rd	Baxter Rd
4			El Cerrito Rd	Ontario Ave
5			Norco Dr/6th St	Limonite Ave
6 a,b		SB	Cantu Galeano Ranch Rd	Limonite Ave
			Limonite Ave	Norco Dr/6th
7			Cajalco Rd	Indian Truck Trail
8			El Cerrito Rd	Cajalco Rd
9 a,b	SR-60	EB	Rubidoux Blvd	Market St
			Market St	Main St
10 a,b	I-215	NB	Box Springs Rd	Central Ave/Watkins Dr
			Central Ave/Watkins	Martin Luther King
10c			Martin Luther King Blvd	SR-91
11			Center St Off-Ramp	Riverside County Line/Iowa
12		SB	Martin Luther King Jr	Sycamore Canyon Rd
13			Van Buren Blvd	Case Rd
14 a,b,c	SR-91	EB	Riverside County Line	Green River Rd Off-Ramp
			Green River Rd Off-Ramp	SR-71
			SR-71	Serfas Club Dr Off-Ramp
15			Serfas Club Dr Off-Ramp	Grand Blvd Rd Off-Ramp
16			On-Ramp from SB-I-15	On Ramp from NB- I-15
17			McKinley St Off Ramp	Pierce St
18			Pierce St	Magnolia St
19 a,b		WB	Serfas Club Dr Off-Ramp	Lane Add at SR-71
			Lane Add at SR-71	Riverside County Line

Figure 2-10: Capacity Deficient Segments on Riverside County Freeways (2040 No Improvement)

2.3. Attributing Capacity Deficiencies to New Logistics Development

In addition to generating the traffic volume forecasts used as the basis to determine V/C and identify the capacity deficiencies described previously, the SCAG model runs produce several outputs that can be used in the attribution of share to logistics uses. The following section summarizes the process for determining attribution to new logistics development using various outputs from the SCAG model runs.

2.3.1. Percent Attributable to Future Development

Impact fees must be limited to only account for a new development's "fair share" of the cost of needed improvements to mitigate associated impacts. In particular, impacts fees cannot be assessed to directly cover the cost to mitigate existing deficiencies. Therefore, the first step in attributing impacts is to complete a comparison of existing and future freeway deficiencies to determine how much of each future deficiency can be attributed to traffic from future development.

There are three possible situations for each freeway link:

- Freeway volumes are below the capacity of the freeway, even when the traffic from new development is added in. In such cases there is no deficiency. No fee can be collected because no improvement is needed.
- Existing traffic volumes are below the capacity of the freeway, but the addition of traffic from new growth creates a deficiency where none previously existed. In such cases 100% of the deficiency can be attributed to new development.
- There is an existing deficiency that will worsen with the addition of traffic from new growth. In these cases, the percent of the deficiency attributable to new growth is the portion of the excess traffic (excess being the traffic above the capacity of the road) that arises from new growth rather than from existing traffic.

The existing and future traffic for each of the deficient segments idenfied in **Table 2-4** was compared to detemine which of the three possible situations applied. The percent attributable to new development was determined based on this comparison, and the results were tabulated as the share of impact attributable to all new development.

2.3.2. Percent Attributable to New Logistics Trucks in Riverside County

In order to compute the percent of each deficiency that is attributable specifically to warehousing and logistics truck trips, it was necessary to separate the truck trips generated by warehousing and logistics uses from the total traffic forecast during the model assignment process. This process is represented by steps 5 through 9 and 19 through 23 as illustrated in the flowchart in **Figure 1-1**.

This process was accomplished by first modifying the Truck Employment table in the SED input files to the SCAG model to reflect only the growth in warehousing and logistics employment in Riverside County. A select-zone query was then generated during the model

assignment step allowing logistics only truck trips generated by warehouse and logistics uses in Riverside County to be recorded for each link in the model. This specifically isolates the truck trips associated with warehousing and logistics uses in Riverside County from the trips associated with all other land use in the county, as well as the truck trips that are generated outside the county but still traverse freeways within Riverside County (i.e. pass-through trips). A comparison of the Riverside County logistics related truck trips in 2040 to the total traffic forecast in 2040 provides the share of Riverside County logistics related truck trips in 2040 for each deficient segment on Riverside County freeways.

2.3.3. Percent of Freeway Capacity Deficiencies Attributable to New Logistics Development in Riverside County

As described in **Section 2.2.2**, the freeway segments in Riverside County with new or increased deficiencies in either peak hour in 2040 relative to the existing condition in 2016 were identified as deficient segments. For each deficient segment, the share of logistics related truck trips, as described in **Section 2.3.2**, was multiplied by the share of deficiencies attributable to all future growth, as described in **Section 2.3.1**, to determine the percent of each deficiency specifically attributable to new logistics related truck trips. Consistent with the identification of deficiencies based on AM and PM peak hour observations, all these steps were done for both AM and PM peak hour traffic, then the peak hour with the higher percent attributable was selected to represent the link.

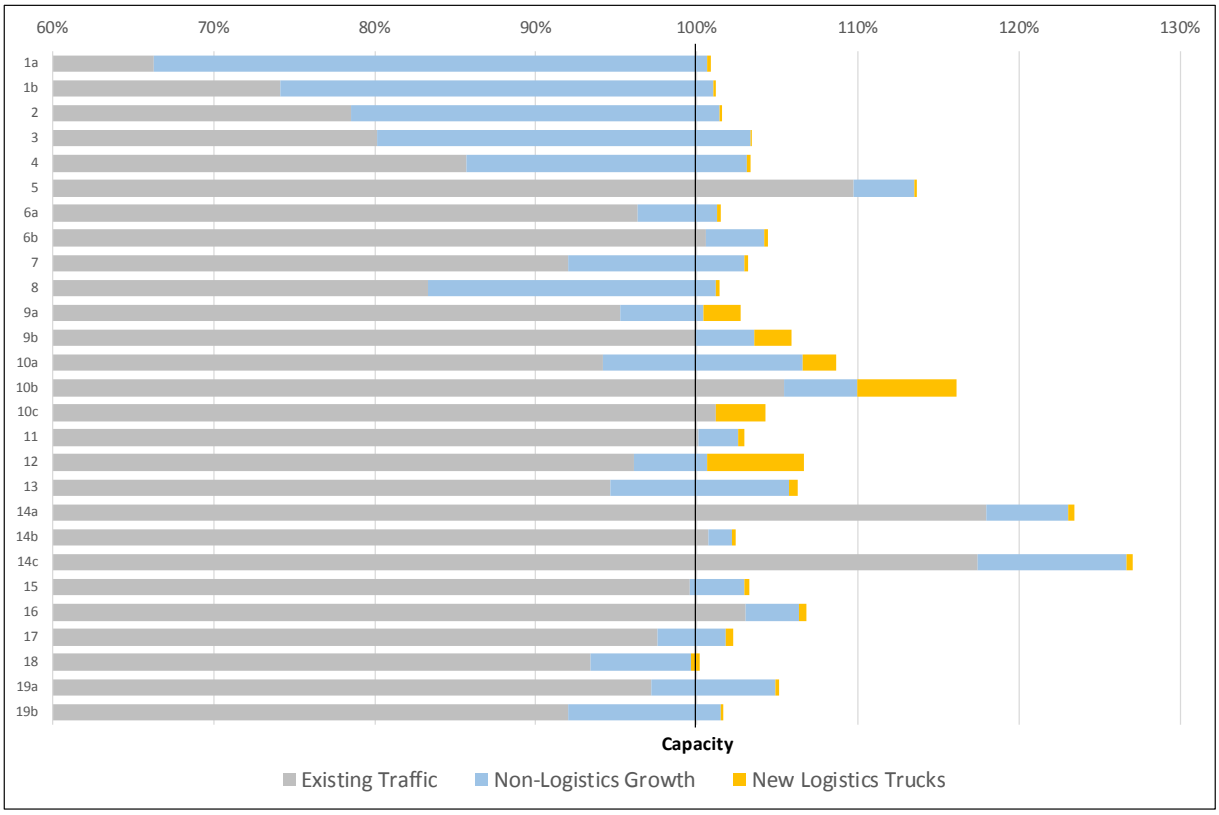
Continuous sequences of model segments, as listed in **Table 2-4**, were grouped for the purposes of assigning the percent of freeway capacity deficiencies attributable to new logistics development in Riverside County. Where multiple deficient segments were grouped, a weighted percent attributable was calculated based on the respective segment percent attributable and the length of each segment.

Table 2-5 arrays the critical V/C ratios, deficiencies, and percent attributable for each deficient segment of freeway in Riverside County. **Figure 2-11** visually represents the components of traffic (existing, non-logistics growth, and logistics growth) relative to the capacity for each deficient segment location.

Table 2-5: Deficient Segment Locations and Percent Attributable to New Logistics Development in Riverside County

Project ID	Route Name	Dir	Critical Segment		2016 GP Lanes on Critical Segment	Segment Length (mi)	Critical V/C ratio				Percent Deficiency Attributable to New Development		New Logistics Trucks as Percent of 2016 to 2040 Growth		Percent Deficiency Attributable to New Logistics Trucks by Peak Hour		Percent Deficiency Attributable to New Logistics Trucks	Weighted Average Highest % Deficiency Attributable to New Logistics Trucks
			Start	End			2016 AM V/C	2016 PM V/C	2040 AM V/C	2040 PM V/C	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour		
							(A)		(B)		(C) = 100%, for (A) < 1.0 and (B) > 1.0 (C) = [(B)-(A)]/[(B)-1], for (A) > 1.0		(D)		(E) = (C) * (D)		(F) = Max (E)	
1	I-15	NB	SR-79 S	Rancho California Rd	4	0.98	0.35	0.66	0.52	1.01	No Deficiency	100%	1.2%	0.7%	No Deficiency	0.7%	0.7%	0.7%
			Rancho California Rd	Winchester Rd	4	1.10	0.45	0.74	0.60	1.01	No Deficiency	100%	1.4%	0.7%	No Deficiency	0.7%	0.7%	
2	I-15	NB	Winchester Rd	Lane Add south of I-15/I-215 Split	4	0.75	0.46	0.79	0.58	1.02	No Deficiency	100%	2.3%	0.9%	No Deficiency	0.9%	0.9%	0.9%
3	I-15	NB	Clinton Keith Rd	Baxter Rd	3	0.76	0.52	0.80	0.65	1.03	No Deficiency	100%	1.1%	0.3%	No Deficiency	0.3%	0.3%	0.3%
4	I-15	NB	El Cerrito Rd	Ontario Ave	3	0.19	0.86	0.90	1.03	0.88	100%	No Deficiency	1.1%	100.0%	1.1%	No Deficiency	1.1%	1.1%
5	I-15	NB	Norco Dr/6th Street	Limonite Ave	3	2.03	0.82	1.10	0.87	1.14	No Deficiency	29%	4.1%	2.5%	No Deficiency	0.7%	0.7%	0.7%
6	I-15	SB	Cantu Galeano Ranch Rd	Limonite Ave	3	1.30	0.77	0.96	0.77	1.02	No Deficiency	100%	100.0%	4.3%	No Deficiency	4.3%	4.3%	4.8%
			Limonite Ave	Norco Dr/6th Street	3	2.00	0.87	1.01	0.90	1.04	No Deficiency	88%	4.7%	5.9%	No Deficiency	5.2%	5.2%	
7	I-15	SB	El Cerrito Rd	Dos Lagos Dr	3	2.14	0.65	0.92	0.61	1.03	No Deficiency	100%	100.0%	2.2%	No Deficiency	2.2%	2.2%	2.2%
8	I-15	SB	Temescal Canyon Rd	Indian Truck Trail	3	2.21	0.61	0.83	0.56	1.01	No Deficiency	100%	100.0%	1.4%	No Deficiency	1.4%	1.4%	1.4%
9	SR-60	EB	Rubidoux Blvd	Market St	3	0.79	0.84	0.95	0.81	1.03	No Deficiency	100%	100.0%	30.9%	No Deficiency	30.9%	30.9%	31.8%
			Market St	Main St	3	0.10	0.87	1.00	0.82	1.06	No Deficiency	100%	100.0%	39.0%	No Deficiency	39.0%	39.0%	
10	I-215	NB	Box Springs Rd	Central Ave	4	0.41	0.94	1.08	1.09	1.07	100%	0%	14.3%	100.0%	14.3%	0.0%	14.3%	30.0%
			Watkins Dr	Martin Luther King Jr	4	0.78	0.94	1.05	1.12	1.16	100%	66%	24.8%	57.9%	24.8%	38.4%	38.4%	
10c	I-215	NB	University Ave Off-Ramp	Upstream of Univ Ave On-ramp	3	0.36	0.90	1.04	0.98	1.04	No Deficiency	13%	26.9%	100.0%	No Deficiency	13.3%	13.3%	13.3%
11	I-215	NB	Center St Off-Ramp	Riverside County Line/Iowa Ave	3	0.53	0.79	1.00	0.79	1.03	No Deficiency	97%	91.5%	12.2%	No Deficiency	11.8%	11.8%	11.8%
12	I-215	SB	Martin Luther King Jr	Sycamore Canyon Rd	4	1.58	0.96	1.13	1.07	1.25	100%	50%	57.1%	55.2%	57.1%	27.7%	57.1%	57.1%
13	I-215	SB	Van Buren Blvd	Harley Knox Blvd	3	1.22	0.67	0.95	0.64	1.06	No Deficiency	100%	100.0%	4.4%	No Deficiency	4.4%	4.4%	4.4%
14	SR-91	NB	Riverside County Line	Green River Rd Off-Ramp	5	0.76	0.89	1.18	0.76	1.23	No Deficiency	23%	100.0%	6.1%	No Deficiency	1.4%	1.4%	4.7%
			Green River Rd Off-Ramp	SR-71	5	1.33	0.79	1.01	0.72	1.02	No Deficiency	69%	100.0%	14.1%	No Deficiency	9.8%	9.8%	
			SR-71	Serfas Club Dr Off-Ramp	4	1.35	0.92	1.17	0.85	1.27	No Deficiency	36%	100.0%	4.1%	No Deficiency	1.5%	1.5%	
15	SR-91	NB	Serfas Club Dr Off-Ramp	Grand Blvd Off-Ramp	4	2.33	0.85	1.00	0.80	1.03	No Deficiency	100%	100.0%	8.9%	No Deficiency	8.9%	8.9%	8.9%
16	SR-91	NB	On-Ramp from SB I-15	On-Ramp from NB I-15	3	0.32	0.81	1.03	0.76	1.07	No Deficiency	55%	100.0%	13.6%	No Deficiency	7.5%	7.5%	7.5%
17	SR-91	NB	McKinley St Off-Ramp	Pierce St	3	1.60	0.81	0.98	0.76	1.02	No Deficiency	100%	100.0%	10.1%	No Deficiency	10.1%	10.1%	10.1%
18	SR-91	NB	Magnolia Ave	La Sierra Ave	3	0.30	0.76	0.93	0.69	1.00	No Deficiency	100%	100.0%	8.3%	No Deficiency	8.3%	8.3%	8.3%
19	SR-91	SB	Serfas Club Dr Off-Ramp	Lane Add at SR-71	4	2.26	0.97	1.08	1.05	1.01	100%	0%	2.8%	100.0%	2.8%	0.0%	2.8%	2.3%
			Lane Add at SR-71	Riverside County Line	5	1.75	0.92	1.00	1.02	0.91	100%	No Deficiency	1.8%	100.0%	1.8%	No Deficiency	1.8%	

Figure 2-11: Components of 2040 Traffic Demand as a Percentage of Capacity



3. DETERMINING FREEWAY MITIGATION CONCEPTS AND COSTS

Having identified deficient freeway segments in **Section 2.2**, and determined the share of the deficiency in each segment that is attributable to new warehouse and logistics uses in Riverside County in **Section 2.3**, the next step in the study process involved the preparation of design concepts for the mitigation of freeway traffic impacts, and the estimation of the costs associated to implement the necessary mitigation. This section describes the process for developing mitigation concepts and determining associated costs. The resultant mitigation costs will be compared to the percent attributable to each deficient segment, as defined in **Table 2-5**, to determine the fair share of the cost to mitigate each deficient segment to is attributable to the impacts of new warehouse and logistics development in Riverside County.

3.1. Assessing Project Limits

Future capacity deficiencies on the freeway network in Riverside County were summarized in **Table 2-4** as a list of directional freeway segments where the future demand exceeded capacity and resulted in a bottleneck in the system. Limiting capacity expansion to the specific identified segment would be expected to mitigate the bottleneck in that segment, however it is likely that the bottleneck would be moved to the next adjacent segment without alleviating the capacity deficiency. Therefore, the list of deficient segments was reviewed in relation to the traffic data and the physical characteristics of the existing freeway facility to determine the extent of the improvement projects that would be necessary (i.e. to define the practical limits and logical termini for the associated improvement project) to effectively mitigate the segment deficiency.

At each freeway segment identified as having a capacity deficiency, the traffic data was reviewed to determine the location (typically an off-ramp) where the demand along the corridor was reduced enough to no longer exceed the capacity of the freeway mainline. Other considerations were physical characteristics of the freeway that might also contribute to capacity reduction, such as uphill grades where additional capacity to accommodate slower moving trucks would benefit the operation of the freeway, and system interchanges where demand changed substantially and there were opportunities for lane drops at freeway-to-freeway connectors. The practical limits of each of the 19 projects required to mitigate the deficient segments are listed in **Table 3-1**. The definition of this project list correlates to accomplishing step 18 in **Figure 1-1**.

Table 3-1: Practical Limits of Capacity Deficient Segment Improvement Projects

ID	Route Name	Dir	Beginning	End
1	I-15	NB	SR-79 S	Rancho California Rd
			Rancho California Rd	Winchester Rd
2			Winchester Rd	Lane Add south of I-15/I-215 Split
3			Clinton Keith Rd	Baxter Rd
4			El Cerrito Rd	Ontario Ave
5			Norco Dr/6th St	Limonite Ave
6		SB	Cantu Galeano Ranch Rd	Limonite Ave
			Limonite Ave	Norco Dr/6th
7			Cajalco Rd	Indian Truck Trail
8			El Cerrito Rd	Cajalco Rd
9	SR-60	EB	Rubidoux Blvd	Market St
			Market St	Main St
10	I-215	NB	Box Springs Rd	Central Ave/Watkins Dr
			Central Ave/Watkins	Martin Luther King
10c			Martin Luther King Blvd	SR-91
11			Center St Off-Ramp	Riverside County Line/Iowa
12		SB	Martin Luther King Jr	Sycamore Canyon Rd
13			Van Buren Blvd	Case Rd
14	SR-91	EB	Riverside County Line	Green River Rd Off-Ramp
			Green River Rd Off-Ramp	SR-71
			SR-71	Serfas Club Dr Off-Ramp
15			Serfas Club Dr Off-Ramp	Grand Blvd Rd Off-Ramp
16			On-Ramp from SB-I-15	On Ramp from NB- I-15
17			McKinley St Off Ramp	Pierce St
18			Pierce St	Magnolia St
19		WB	Serfas Club Dr Off-Ramp	Lane Add at SR-71
			Lane Add at SR-71	Riverside County Line

3.2. Review of Currently Funded/Programmed Improvements

Once the practical limits of the improvements were defined, each project was compared to known, programmed projects that were recently completed (and are not included in the SCAG 2016 Model existing network), are currently under construction, or are currently in

development and are funded for construction. There are three projects that are within the study area that were identified as meeting these criteria:

- The I-15/French Valley Parkway Interchange Project, Phases 1 and 2
- The I-15 Express Lane Project
- The SR-91 Express Lane Extension Project

The French Valley Parkway Project includes the implementation of the I-15/French Valley Parkway Interchange as well as improvements to the Winchester Road Interchange and a collector-distributor road system along I-15 between Winchester Road and the I-15/I-215 system interchange. This project adds as many as three lanes in each direction north of Winchester Road. Based on the Preferred Alternative Layout Plans included in the IS/EA (January 2010), the FVP Phasing Exhibit (December 2, 2015) and the Ultimate Project Exhibit (July 12, 2017), it was determined that the French Valley Parkway Project successfully eliminates the need to further mitigate deficient segment 2.

The I-15 Express Lane Project will implement one or two tolled managed lanes in each direction northbound and southbound between Cajalco Road and SR-60. This project also adds general purpose lanes and auxiliary lanes at specific locations. Based on a review of the I-15 Express Lane Project Tolling Concept Plans (June 21, 2017), the I-15 Express Lane Project successfully eliminates the need to further mitigate deficient segments 4, 5, and 6.

The SR-91 Express Lane Extension Project extends from west of the Orange County Line to east of I-15 both eastbound and westbound. In addition to the tolled express lanes, additional general purpose lanes were also constructed as part of this project. Based on a field review of the project as it has been constructed, the SR-91 Express Lane Extension Project successfully eliminates the need to further mitigate deficient segments 14, 15, 17, and 19.

Table 3-2 lists the remaining deficient segments and associated mitigation projects that would be included as the basis for the logistics fee program.

Table 3-2: Capacity Deficient Segment Improvement Projects to be Included in the Fee Program

ID	Route Name	Dir	Beginning	End
1	I-15	NB	SR-79 S	Rancho California Rd
			Rancho California Rd	Winchester Rd
3			Clinton Keith Rd	Baxter Rd
7		SB	Cajalco Rd	Indian Truck Trail
8			El Cerrito Rd	Cajalco Rd
9	SR-60	EB	Rubidoux Blvd	Market St
			Market St	Main St
10	I-215	NB	Box Springs Rd	Central Ave/Watkins Dr
			Central Ave/Watkins	Martin Luther King
10c			Martin Luther King Blvd	SR-91
11			Center St Off-Ramp	Riverside County Line/Iowa
12		SB	Martin Luther King Jr	Sycamore Canyon Rd
13			Van Buren Blvd	Case Rd
16	SR-91	EB	On-Ramp from SB-I-15	On Ramp from NB- I-15
18			Pierce St	Magnolia St

3.3. Development of Project Concepts

Using scalable, georeferenced aerial photography, project concept plans were developed consistent with Caltrans design standards for urban area freeways to show the primary quantifiable cost items for each project, including:

- Right-of-Way Impact
- Retaining Walls
- Freeway Mainline Widening
- Structure Construction
- Ramp Realignment
- Roadway Excavation
- Street Improvements
- Signalization

For the initial assessment and development of project concept plans, a combination of Google Earth and limited field reviews were used to determine existing conditions for the corridors. The conditions recorded include number of lanes, width of pavement, HOV lanes, inside (left) shoulder width, outside (right) shoulder width, assumed right-of-way boundary, freeway

structures, ramp locations, major drainage facilities, retaining walls, sounds walls, signage, and signals. All widths and lengths provided were obtained by doing desktop research on Google Earth and limited field reviews, and were based on sound engineering judgement. Although arterial highway improvement projects were not specifically examined as part of the study effort, any arterial highway improvements necessary to accommodate the proposed freeway capacity improvements (e.g. ramp realignment, bridge reconstruction, intersection signalization) were identified and included in the concept drawings. The concept plans show colored lines and areas that can be measured and used to estimate quantities for the various categories of construction or property acquisition. These project concept drawings were reviewed by the Study Advisory Team to confirm that they reasonably represent the minimum improvements necessary to mitigate the identified deficiency.

The resultant improvement concept plans are included in **Appendix A** of this technical memorandum. The completion of the design concept drawings represents the accomplishment of step 24 in the study process flow chart **Figure 1-1**. It should be noted that the conceptual designs were based on a visual analysis and that no detailed engineering or surveying has been done to verify the assumptions.

3.4. Project Cost Estimating

To accomplish step 25 and 26 in the study process, the unit costs for the various construction components were taken from the Caltrans cost database and other recent project cost estimates for projects of similar scale and scope within the Inland Empire. Right-of-way cost per residential unit and per square foot are based on recent property valuations in Riverside County. Specific elements in the unit costs include:

Roadway Item Costs

- Roadway costs include PCC pavement, tie-back walls, pavement markings and markers and replacement of signs. Unit costs were extrapolated from a similar freeway construction project.
- The quantity of each component was then multiplied by the unit cost to produce a cost item for the roadway component.

Drainage Item Costs

- Per our initial assessment, widening affects the existing drainage. Further analysis is needed as impacts to drainage can increase the costs.
- The costs associated with the potential impacts to drainage are 15% of the roadway items cost.

Specialty Item Costs

- Specialty item costs include retaining walls due to proposed widening, removal of existing retaining walls, sounds wall replacement, tie back walls and ramp adjustments.

- The quantity of each component was then multiplied by the unit cost to produce a cost item for the specialty item costs.

Minor Items Costs

- Minor items can include anything from ADA items to other minor items that are not considered high costs items. Typical Caltrans value is 5-10%.

Mobilization Costs

- Mobilization includes costs incurred due to mobilization of personnel and equipment as well as pre-construction expenses. Typical value of 10% can be adjusted when actual costs are available.

Roadway Additions

- Roadway addition items can include price index fluctuations, value analysis, maintaining traffic, removal of rock and debris, etc. These supplemental items cover work for items that cannot be quantified as contract bid item. All roadway supplemental items would be within the FHWA approved items list. At this stage it is appropriate to assume there will be supplemental items. Typical Caltrans value is 5-10%.

Contingency

- Contingency of 25% is within Caltrans recommended values: Pre-PSR 30%, PSR 25%, Draft PR 20%, PR 15%, after PR approval 10% and final PS&E is 5%. Caltrans contingencies allow for unforeseen increases. Due to the level of detail and engineering available, the contingency percentage is appropriate. As more information becomes available, costs would be refined and contingency would be decreased. This is typical per Caltrans.

Support Costs

- Support costs are 35% of the capital outlay costs. Support costs include design costs, construction management, Caltrans reimbursed costs and Metro internal costs. These costs are functional overhead costs not administrative overhead. The support costs can be refined as more information becomes available.

The unit costs were multiplied by the quantities determined from the conceptual design plans to yield a conceptual cost estimate for each proposed project.

The proposed improvement project conceptual cost estimates were compared to the Western Riverside Council of Governments (WRCOG) *Transportation Uniform Mitigation Fee (TUMF) 2016 Nexus Study Report*, with a focus on identifying arterial-freeway interchange and bridge projects that are also included in TUMF. The TUMF program assesses all development types, including warehouse and logistics uses, impact fees to mitigate the cumulative regional transportation impacts of new development on the arterial highway system, including arterial-freeway

interchanges and bridges. As such, new warehouse and logistics uses are already contributing toward the cost of these improvement projects to the extent they are included in the TUMF program. Where the conceptual improvement projects were determined to include project elements that were also identified in the TUMF program, the conceptual cost estimate for the project was reduced by an amount equal to the lesser of the estimated conceptual cost of the relevant project element (i.e. the conceptual cost of the arterial interchange and/or bridge improvements) or the maximum eligible amount prescribed in the 2016 TUMF Nexus Study. This reduction in the conceptual improvement costs as part of this study eliminates overlap with the TUMF program in terms of the cost for implementing arterial interchange and bridge improvements necessary to accommodate the proposed freeway capacity expansion necessary to mitigate the cumulative regional impacts of new development, including warehousing and logistics uses, on the freeway network.

The resultant conceptual project cost estimates are summarized in **Table 3-3Error! Reference source not found.**. A more detailed breakout of the conceptual project cost estimates to mitigate the deficient segments is included in **Appendix B** of this technical memorandum.

Table 3-3: Capacity Deficient Segment Improvement Project Conceptual Cost Estimates

ID	Route Name	Dir	Beginning	End	Cost Estimate
1	I-15	NB	SR-79 S	Rancho California Rd	$36,237,000
			Rancho California Rd	Winchester Rd	
3			Clinton Keith Rd	Baxter Rd	$7,406,000
7		SB	Cajalco Rd	Indian Truck Trail	$37,825,000
8			El Cerrito Rd	Cajalco Rd	$10,408,000
9	SR-60	EB	Rubidoux Blvd	Market St	$40,234,000
			Market St	Main St	
10	I-215	NB	Box Springs Rd	Central Ave/Watkins Dr	$26,513,000
			Central Ave/Watkins	Martin Luther King	
10c			Martin Luther King Blvd	SR-91	$55,081,000
11			Center St Off-Ramp	Riverside County Line/Iowa	$42,212,000
12		SB	Martin Luther King Jr	Sycamore Canyon Rd	$13,403,000
13			Van Buren Blvd	Case Rd	$95,365,000
16	SR-91	EB	On-Ramp from SB-I-15	On Ramp from NB- I-15	$7,611,000
18			Pierce St	Magnolia St	$13,040,000
Total Project Cost Estimate				**$385,335,000**	

3.4.1. Project Costs Attributable to New Logistics Development

The conceptual cost estimate of $385,335,000 presented in **Table 3-3** represents the unfunded amount of the total cost to implement the minimum improvements necessary to mitigate the impacts of new development on Riverside County Freeways. However, as described in **Section 2.3**, this cost cannot be entirely attributed to the impact of new logistics developments and must be adjusted as the basis for calculating a fair share fee to reflect only the share of the cost for each segment that can be attributed to the impact of new logistics developments. This key step in the study process, represented by step 28 in the study process flowchart in **Figure 1-1**, is accomplished by multiplying the unfunded project costs summarized in **Table 3-3** by the share of each segments impact attributable to new logistics development summarized in **Table 2-5**. **Table 3-4** presents the outcome of this step with a total of $47,841,000 or 12.4% of the conceptual cost estimate being determined to be the maximum share of the cost attributable to mitigate the cumulative regional impacts of new warehousing and logistics developments in Riverside County.

Table 3-4: Capacity Deficient Segment Improvement Project Logistics Cost Share

ID	Route Name	Dir	Beginning	End	Conceptual Cost Estimate	Logistics Attributable Share	Logistics Cost Share
1	I-15	NB	SR-79 S	Rancho California Rd	$36,237,000	0.7%	$258,000
			Rancho California Rd	Winchester Rd			
3			Clinton Keith Rd	Baxter Rd	$7,406,000	0.3%	$19,000
7		SB	Cajalco Rd	Indian Truck Trail	$37,825,000	2.2%	$820,000
8			El Cerrito Rd	Cajalco Rd	$10,408,000	1.4%	$142,000
9	SR-60	EB	Rubidoux Blvd	Market St	$40,234,000	31.8%	$12,802,000
			Market St	Main St			
10	I-215	NB	Box Springs Rd	Central Ave/Watkins Dr	$26,513,000	30.0%	$7,963,000
			Central Ave/Watkins	Martin Luther King			
10c			Martin Luther King Blvd	SR-91	$55,081,000	13.3%	$7,317,000
11			Center St Off-Ramp	Riverside County Line/Iowa	$42,212,000	11.8%	$4,978,000
12		SB	Martin Luther King Jr	Sycamore Canyon Rd	$13,403,000	57.1%	$7,658,000
13			Van Buren Blvd	Case Rd	$95,365,000	4.4%	$4,235,000
16	SR-91	EB	On-Ramp from SB-I-15	On Ramp from NB- I-15	$7,611,000	7.5%	$571,000
18			Pierce St	Magnolia St	$13,040,000	8.3%	$1,078,000
Total Project Cost Estimate					**$385,335,000**	**12.4%**	**$47,841,000**

4. FUNDING GAP ANALYSIS

As described in **Section 3**, the fair share of costs to mitigate future freeway deficiencies that are attributable to new warehousing and logistics uses varies by segment, but is a relatively small proportion of the total cost to complete the necessary improvements. Furthermore, although the project concepts and associated cost estimates have identified a minimum level of improvement necessary to reasonably mitigate the identified impact, it is likely the scale and scope of any proposed improvement project would be greater to account for the accomplishment of other transportation goals and/or freeway operational needs, including rehabilitation and roadway maintenance, resolution of existing needs, or anticipation of addition future demands beyond the horizon year of the fee program. Since the resolution of these items cannot be fairly attributed to the mitigation of new development impacts, it is necessary to ensure that sufficient alternative funding sources are expected to be available to complete the necessary improvements and establish an implementable program. This section summarizes projections of alternative transportation funding sources that might be available to complete freeway capacity expansion projects identified as part of this study.

4.1. RIVERSIDE COUNTY STRATEGIC ASSESSMENT

In 2015, the RCTC directed its staff to conduct an assessment to assist the Commission in examining the County's need for transportation investments. In early 2016, the RCTC approved the *Riverside County Strategic Assessment*[7]. The Strategic Assessment includes a detailed review of federal, state and local revenues through 2040.[8] [9] It looked at 37 different funding sources covering all modes and categorized them into three levels (A, B and C), depending on their level of certainty. Category A represents existing revenues that can be reasonably expected to be available in the future, Category B includes existing and programmed revenues that Riverside County might realistically secure on a discretionary or competitive basis and those in Category C are considered strategy revenues.

According to the Strategic Assessment, the total costs of freeway and interchange projects between 2016 and 2039 were expected to be $8.724 billion and the anticipated revenues were $5.326 billion, representing funding for 61% of the freeway needs, thus leaving an unfunded gap of $3.326 billion through 2039. **Table 4-1** summarizes the breakdown of funding contained in the Strategic Assessment by program and risk.

[7] HDR, January 2016, *Riverside County Strategic Assessment: Executive Summary*, RCTC.
[8] Since the document was prepared in 2015, it did not include several recent funding sources, which are discussed later in this memo.
[9] HDR, November 4, 2015, *RCTC Strategic Assessment Technical Memorandum: Task 4 Funding Gap Analysis.*

Table 4-1: Freeway Funding Program Amount (in millions) and Risk, 2016 to 2039

Funding Program	Category A	Category B	Category C
Federal			
Congestion Mitigation and Air Quality (CMAQ)	$219.7		
Regional Surface Transportation Program (RSTP)	$315.2		
State			
Regional Improvement Program (RIP)	$441.9		
Interregional Improvement Program (IIP)		$58.8	
Mileage Based User-Fees (MBUF)			$2,233.5
Local			
Measure A*	$915.7		
SR 91 Net Toll Revenues*	$618.5		
I-15 Express Lane Toll Revenues*	$319.7		
Mid County Parkway (MCP) toll revenues			$153.5
Total (2016-2039)	**$2,880**	**$59**	**$2,387**

*Debt service and operations and maintenance costs have been deducted from these amounts.

Because the assessment was prepared in 2015 it did not include certain funding sources approved after that. New funding sources and their potential implications are described in the following sections.

4.2. Fixing America's Surface Transportation Act

On December 4, 2015, President Obama signed Fixing America's Surface Transportation Act (FAST) Act[10] into law. Overall, the FAST Act largely maintains program structures and funding shares between highways and transit.

The FAST Act provided two new grant programs – the Nationally Significant Freight and Highway Projects (NSFHP) and the Advanced Technology and Congestion programs – that could reasonably be expected to provide funding for freeway and interchange projects in Riverside County. **Table 4-2** shows the new FAST funding amounts by program and risk category that could reasonably be expected to be available to RCTC each year based on a proportional allocation of total program funding:

[10] Pub. L. No. 114-94

Table 4-1: Projected RCTC Funding from FAST (in millions), 2017 to 2040

Funding Program	Category A	Category B	Category C
NSFHP (INFRA)		$159.8	
Advanced Technology and Congestion Management Deployment Program		$10.7	
Total		**$170.5**	

4.3. Road Repair and Accountability Act of 2017 (Senate Bill 1)

In 2017 the California legislature passed and the governor signed into law a major transportation funding bill.[11] The Road Repair and Accountability Act of 2017 (referred to as SB1) provided additional funding to several existing programs, including the STIP, and established several new funding programs that are relevant to this study.

Most of the SB1 funds that could go to freeways and interchanges are via competitive grant programs. **Table 4-3** shows the projected allocation Riverside County could reasonably be expected to obtain based on a proportional share of the total funding proposed.

Table 4-3: Projected RCTC Funding from SB1 (in millions), 2017 to 2040

Funding Program	Category A	Category B	Category C
LPP (county allocation)	$162.9		
TCEP		$623.9	
SCCP		$360	
LPP (competitive grant)		$162.9	
	$162.9	**$1,146.8**	

4.4. Summary of Available Funding from All Sources

To quantify the total funds that might be available to freeway and interchange projects in Riverside County through 2040, sources identified in the Strategic Assessment were combined those from FAST and SB1 programs. **Table 4-4** combines funding sources to establish a total of anticipated freeway project funding through 2040 from all sources by risk category.

[11] http://catc.ca.gov/

Table 4-4: RCTC Projected Freeway Project Funding 2017-2040 - All Sources (in millions)

Funding Source	Category A	Category B	Category C
Total Strategic Assessment Sources	$2,948.6	$61	$2,465.8
Total New Sources	$162.9	$1,317.3	
Grand Total of All Sources	**$3111.5**	**$1,378.3**	**$2,465.8**

As can be seen in **Table 4-4**, the infusion of SB1 funds, which are mostly allocated through competitive grants and therefore are considered risk category B, creates better balance across the risk categories than that found in the Strategic Assessment, which was heavily reliance on high-risk, category C funds. It should be noted that although the SB1 program has been legislated, there is an on-going repeal effort that jeopardizes the future availability of SB1 funding programs.

The total estimated conceptual cost to complete the reasonable mitigation of deficient segments identified as part of this study is $385,335,000. Although only 12.4% of this cost can be attributed to new warehousing and logistics developments, the estimates of alternative funding sources described in this section clearly indicate that the remaining costs to complete these improvement projects could reasonably be expected to be obtained from existing and proposed funding sources after the logistics impact fee contributes a fair share for mitigation of logistics related impacts. Furthermore, the projected availability of future funding for freeway and interchange improvement projects is over six times the amount of the conceptual cost estimates to mitigate the impacts of new development on the freeway system indicating that sufficient funding might reasonably be expected to account for the expansion of scale and scope of associated freeway projects to address other project needs not directly attributable to the impacts of new development.

5. LOGISTICS MITIGATION FEE AND NEXUS DETERMINATION

The foundation established by accomplishing the various steps in the prior tasks provides the basis for computing the amount and value of the in-lieu fee to mitigate the cumulative regional impact of new warehousing and logistics developments on the freeway network in Riverside County, as well as establishing the relationship between future growth of logistics related facilities within Riverside County, truck traffic growth, and the need for additional freeway improvements to mitigate the impacts of this growth. The maximum defensible fair-share fee that could be charged to new logistics uses for mitigating their impacts is presented in this section, along with a summary of the study findings that support the nexus determination.

5.1. LOGISTICS MITIGATION FEE CALCULATION

Utilizing the findings of the prior study tasks as presented in the previous sections of this report, the process for computing the fee requires dividing the project costs attributable to new logistics development as determined in Step 28 and summarized in **Table 3-4** by the forecast amount of new warehousing and logistics facilities in square feet as determined in Step 4 and presented in **Table 2-2** to produce a fee per square foot.

Table 5-1: Logistics and Warehouse Impact Fee Calculation

Logistics and Warehouse Impact Fee for Riverside County	
Logistics Cost Share of Freeway Mitigation	$47,841,000
Growth in Warehouse Gross Floor Area in Square Feet	37,332,179
Fee per Square Foot of Gross Floor Area	***$1.28***

As derived from **Table 2-2** and summarized in **Table 5-1**, the growth in warehousing gross floor area is forecast to grow by 37,332,179 square feet of gross floor area from 2016 to 2040, according to the SCAG *Industrial Warehousing Study* and as utilized in the Heavy Duty Truck Model. The travel demand modeling and deficiency analysis completed for this study indicates the growth in warehousing will result in the need to contribute $47,841,000 toward the cost of freeway capacity improvements throughout Riverside County to cover the logistics share of mitigating future freeway deficiencies, as presented in **Table 3-4**. This equates to a value of $1.28 per square foot of gross floor area of new warehousing and logistics developments to fully satisfy the fair share contribution. As such, this amount represents the *maximum* fee permissible to be collected under California law and in accordance with legal precedents to address the cumulative regional impacts of new warehousing and logistics developments on the freeways network in Riverside County.

5.2. Nexus Determination

The Mitigation Fee Act, as set forth in the California Government Code Sections 66000 through 66008, establishes the framework for mitigation fees in the State of California. In establishing the basis for a fee to be implemented, the Act requires agencies to make five findings with respect to a proposed fee. These findings are described in the following sections.

5.2.1. Purpose of the Fee

Identify the Purpose of the Fee

The purpose of the Regional Logistics Mitigation Fee is to establish a uniform, fair-share mitigation fee to be paid by new warehouse and logistics developments to mitigate the cumulative, indirect, regional impacts of the truck traffic generated by these future developments on overall traffic conditions on the freeway network in Riverside County. The fees, to be paid in-lieu of completing specific improvements associated with a particular development, will be utilized to help fund capacity improvements on freeways in Riverside County that are needed to maintain the target level of service in the face of the higher traffic volumes brought on by new growth in the county.

Specific to Regional Logistics Mitigation Fee for Riverside County, the completion of this study and the determination of a fair-share fee satisfies specific provisions of the July 29, 2016 Settlement Agreement between the County of Riverside, the Riverside County Transportation Commission, the City of Moreno Valley and Highland Fairview. This agreement established that each party would contribute toward the cost of "an RCTC-conducted regional transportation study to evaluate a logistics-related regional fee."

5.2.2. Use of Fee Revenues

Identify the use to which the fees will be put. If the use is financing facilities, the facilities shall be identified

The Mitigation Fee Act requires that the public facilities that are to be financed using the impact fee be identified. In the case of the Regional Logistics Mitigation Fee, the deficiency analysis described in **Section 2** identified those locations on the Riverside County freeway network that would be impacted by additional traffic growth associated with new development activity in Riverside County. This information was subsequently utilized in **Section 3** to define specific improvement projects and the associated costs to mitigate the deficiencies, as summarized in **Table 3-3**. Furthermore, the share of the cost of each individual improvement project to specifically address the mitigation of impacts associated with the growth of warehousing and logistics uses was determined and summarized in **Table 3-4** as the basis for calculating the logistics fee.

5.2.3. Use/Type-of-Development Relationship

Determine the reasonable relationship between the fees' use and the type of development project on which the fees are imposed

To determine the "use" relationship, the development being assessed an impact fee must be reasonably shown to derive some use or benefit from the facility being built using the fee. In the case of the Regional Logistics Mitigation Fee, the projects to be funded by the fee were identified by completing deficiency analysis to determine where the additional traffic generated by new development in Riverside County would impact the freeway network. Improvement project concepts were developed to mitigate these impacts, with at least part of the cost of these improvements being determined to be attributable to new logistics related development. The fact that the projects that will be funded in part by the Regional Logistics Mitigation Fee are to provide additional freeway capacity, and recognizing that freeways are the highest functional class of the roadway network and critically important on the regional roadway hierarchy, means that all residents and businesses in the county benefit in important ways from the maintenance of a reasonable level of service on these facilities. More specifically, most truck trips coming to or going from new warehouse and logistics uses can be expected to use area freeways for at least part of their trips, as demonstrated by the results of the deficiency analysis described in **Section 2**, and those that do not use freeways will nevertheless benefit because good traffic conditions on the area freeways will keep drivers from diverting to other roads and causing congestion in other parts of the county. Even residents or workers in the new developments who do not drive at all will benefit from access to goods and services made possible in part by the serviceability of the regional freeway network.

5.2.4. Need/Type-of-Development Relationship

Determine the reasonable relationship between the need for the public facilities and the types of development on which the fees are imposed

To determine the "need" relationship the facilities to be financed by the fee must be shown to be needed at least in part because of the new development. The primary intended purpose of the regional transportation study as required by the July 29, 2016 Settlement Agreement was to determine the extent to which additional truck trips associated with new warehouses and logistics uses would impact the freeways in Riverside County as the basis for determining the fair share amount of in-lieu fee payments to adequately mitigate the impacts. This was determined by analyzing the forecast traffic demand with the expected degree of new development and comparing that with the demand without new development. Projects were analyzed individually and the degree to which the need for the project was attributable to new warehouses and logistics developments varied widely from project to project. The findings of this analysis is summarized in **Table 3-4**, which indicates that new warehousing and logistics development activities are responsible for a share of the overall mitigation needed to address future freeway capacity deficiencies.

5.2.5. Proportionality Relationship

Determine how there is a reasonable relationship between the fees amount and the cost of the facilities or portion of the facilities attributable to the development on which the fee is imposed

The "proportionality" relationship requires that there be rough proportionality between the fee charged to each development and the cost of the facility being financed. In the case of the Regional Logistics Mitigation Fee, the share of truck traffic generated specifically by warehouses and logistics uses was estimated using the validated SCAG travel demand model as the basis to determine the rough proportion of the improvement cost to mitigate future deficiencies caused by these trucks on the Riverside County freeway network. Furthermore, the share of project costs was adjusted to account for those improvements already being completed by current funded capacity expansion projects, as well as the share of the cost of arterial interchange improvements necessary to accommodate freeway capacity expansion that are already being funded by the existing WRCOG TUMF program. The overall project cost share was also adjusted to account for existing capacity deficiencies that cannot be fully be attributed to new growth in Riverside County. **Table 2-5** summarizes the attribution of various project cost factors resulting in the determination of the fair-share of improvement costs that are roughly proportional to the specific impacts of new warehouse and logistics uses. Additionally, the detailed cost breakdowns in **Appendix B** include the adjustments for project cost elements already covered as part of the WRCOG TUMF program.

5.3. Conclusions

The findings of the RCTC Truck Study and Regional Logistics Mitigation Fee Study indicate that there is reasonable relationship between the cumulative regional freeway traffic impacts of new land development projects in Riverside County, including truck traffic impacts associated with new warehouse and logistics developments, and the need to mitigate these freeway traffic impacts, including using funds levied through a Regional Logistics Fee. The study evaluation results have established the proportional fair share of the freeway improvement cost attributable to truck trips generated by new warehouse and logistics development having adjusted for existing deficiencies, the impacts of other development type and the effects of pass through trips, and having accounted for improvements already being completed as part of an ongoing freeway project or funded by another impact fee. As presented in **Table 5-1**, the fair share fee to mitigate the cumulative indirect regional freeway traffic impacts of truck trips associated with new warehouse and logistics growth in Riverside County is $1.28 per square foot of gross floor area.

6. APPENDICES

Appendix A – Capacity Improvement Concept Plans

Appendix B – Conceptual Project Cost Estimate Tables

APPENDIX A – CAPACITY IMPROVEMENT CONCEPT PLANS

APPENDIX B – CONCEPTUAL PROJECT COST ESTIMATE TABLES

RCTC TRUCK STUDY AND REGIONAL LOGISTICS MITIGATION FEE

Technical Memorandum 1: Existing and Future Conditions

Warehouse-Related Land Use Data & Truck Travel Patterns

Prepared for :

Riverside County Transportation Commission

Prepared by:

WSP

In partnership with

FEHR & PEERS

October 2017

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1. INTRODUCTION

The RCTC Truck Study and Development and Implementation of Regional Logistics Mitigation Fee is intended to verify the anticipated rate of growth in warehousing and logistics-related development in Riverside County, and to quantify the associated level of traffic impacts on the Riverside County highway system as a result of the expected growth in warehousing and logistics activities. In quantifying impacts, the study is also intended to determine the amount that each new warehousing or logistics development should pay in lieu of completing actual freeway improvements to mitigate the cumulative regional traffic impacts specifically associated with truck trips generated by new warehousing and logistics developments. The findings of this study are intended to provide the basis for potentially implementing a program to collect impact fees that will contribute to mitigating the truck traffic impacts associated with new warehousing and logistics developments in Riverside County. Such a program can help to ensure that all new logistics-related development approved in Riverside County will bear a proportional fair share of the cost of building transportation infrastructure to address future transportation needs.

This technical memorandum represents the first in a series of documents that will verify the rate of new warehousing and logistics related developments in Riverside County, the associated truck trip generation rates and cumulative regional traffic impacts, the cost to mitigate these impacts, and the fair share basis for collecting a potential fee. In this document, the existing conditions of the warehousing industry and truck travel patterns in Riverside County were reviewed for five primary activities:

1) Creating an inventory of existing warehouse-related land uses
2) Developing a projection of future warehouse-related land use (2040)
3) Analyzing a range of potential trip generation rates to apply in calculating fees
4) Tabulating existing truck volumes on major roadways
5) Generating information regarding truck origins/destinations

This document also presents the results of existing and future baseline model runs to help quantify existing and future conditions on the Riverside County highway system.

The objective of this technical memorandum is to provide the reader with an understanding of the various warehousing-related trucking activities, the historic trends of these types of activities, and the anticipated future of this industry in Riverside County. With this information as a basis, subsequent study tasks will quantify specific truck-related

infrastructure needs associated with growth in warehousing-related uses, and the potential for an impact fee to address these needs. The inventory and verification of available data sources as presented in this technical memorandum is ultimately intended to demonstrate the adequacy of these data to support the technical evaluation efforts to be undertaken in subsequent tasks. In particular, the review of existing conditions data sources provides the ability to verify the following specific aspects of the data related to the needs of subsequent evaluation tasks:

- The available data provides appropriate levels of disaggregation for warehouse-related land uses to match the level of confidence in trip generation rates and forecasted growth in development
- Trip generation rates are available to be applied for the purpose of identifying the fair share of trips attributable to warehousing and logistics development activities
- The data provides the ability to define necessary adjustments in the forecasting model to match measured truck volumes and Origin-Destination (O-D) patterns

It should be noted that the contents of this document are technical and detailed in nature, and are presented with the primary purpose of providing a transparent assessment of available data sources to support the determination of a fee representing the fair share to mitigate the cumulative regional impacts of designated new developments. Unlike other types of transportation studies, where the assessment of underlying data sources and determination of assumptions might be conducted at a technical staff level, and only the methodology used and associated findings are presented in the study documentation, impact fee studies necessitate a more transparent approach to considering data sources and determining assumptions. For this reason, this technical memorandum effectively provides an additional level of background information presenting a more detailed consideration of the range of data sources available to support the evaluation to be conducted in subsequent tasks. In short, this technical memorandum is intended to describe what data sources are available and appropriate to support subsequent study tasks, with the specific assumptions and methodology to complete those tasks described in subsequent Technical Memoranda.

2. EXISTING LAND USE INVENTORY

Data from the County Business Patterns[1] (CBP), Southern California Association of Governments (SCAG), and Infogroup provide alternative means to identify land uses related to warehousing. These datasets use different systems to classify industries; the North American Industry Classification System (NAICS) and the Standard Industrial Classification (SIC). The U.S. Census Bureau uses the NAICS structure. Similarly, SCAG uses the NAICS structure as the basis for developing regional employment forecasts as part of its long range planning responsibilities. While the SIC has generally been replaced by NAICS, several data vendors are still using SIC-based data. The establishment data used for this study was purchased from Infogroup which uses SIC codes.

The NAICS applies a 6-digit hierarchical coding system to classify all economic activity into 20 industry sectors. Five sectors are mainly goods-producing sectors and 15 are entirely services-producing sectors. The SIC system is a 4-digit classification system. As would be expected, the 6-digit NAICS hierarchical structure allows greater coding flexibility than the 4-digit structure of the SIC system.

Each establishment has a primary NAICS/SIC code. This number indicates a company's primary line of business. What determines a company's primary SIC code is the code definition that generates the highest revenue for that company at a specific location in the past year. Warehousing is identified with a specific code in both the NAICS and SIC systems. However, many other classification codes, such as wholesaling and manufacturing, involve significant amount of warehousing activities. Therefore every establishment usually defines their activity with a secondary NAICS/SIC code as well. Infogroup verify the establishments' primary and secondary codes regularly through their survey. In this study, both the primary and the secondary warehousing uses were investigated to have a complete understanding of warehousing activities in Riverside County.

2.1. COUNTY BUSINESS PATTERNS (CBP)

Table 1 shows selected categories of NAICS, which are identified as primary or secondary warehousing uses. Although CBP data covers all establishments, it is only available at the county level.

[1] County Business Patterns is an annual series of reports by the U.S. Census Bureau that provides subnational economic data by industry. This series includes the number of establishments, employment during the week of March 12, first quarter payroll, and annual payroll.

Table 1. Description of Selected NAICS Categories

Industry Code	Brief Description
31-33 (Manufacturing)	Establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. Assembling of component parts of manufactured products is considered manufacturing, except in cases where the activity is appropriately classified as Construction. *(Example: Food Manufacturing, Textile Product Mills, Apparel Manufacturing, Wood Product Manufacturing, Chemical Manufacturing.)*
42 (Wholesale Trade)	Establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. Includes the outputs of agriculture, mining, manufacturing, and certain information industries, such as publishing. *(Example:, Furniture and Home Furnishing Merchant Wholesalers, Household Appliances and Electrical and Electronic Goods Merchant Wholesalers.)*
48-49 (Transportation & Warehousing)	Industries providing transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities related to modes of transportation. Establishments in these industries use transportation equipment or transportation related facilities as a productive asset. Modes of transportation include air, rail, water, road, and pipeline. *(Example: Freight Trucking Companies, Warehousing and Storage, Couriers and Delivery Services.)*

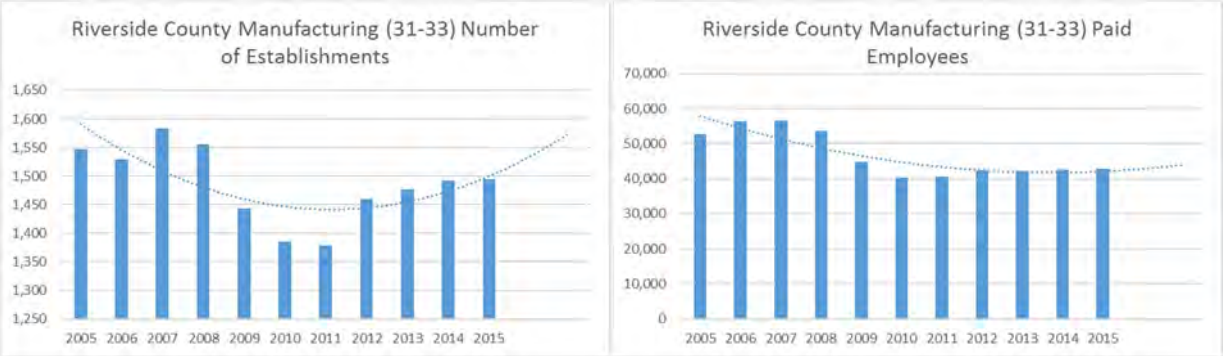
Source: North American Industry Classification System United States, Executive Office of the President Office of Management And Budget, 2017

There is no readily available information to separate the warehousing activity into establishments primarily registered as manufacturing or wholesale under the CBP database. Since this data is only available at the county level, it is not possible to make a detailed analysis. The historic comparison at the county level can only provide a high-level insight as a basis for comparison to support verification and validation of other data sources.

Figure 1 through 3 are a series of graphs detailing both the number of establishments and the number of employees for the uses identified in **Table 1** in Riverside County between 2005 and 2015 based on CBP data and categorized by NAICS sectors. The number of manufacturing establishments and employees declined in Riverside County during the 2008 to 2012 recession. Although they have rebounded somewhat, they have not yet returned to their pre-recession levels (see **Figure 1**). In contrast, Transportation & Warehousing employment rose more than 50% during the 2005 to 2015 period (see **Figure 2**). Wholesale Trade increased modestly over the same period (see **Figure 3**).

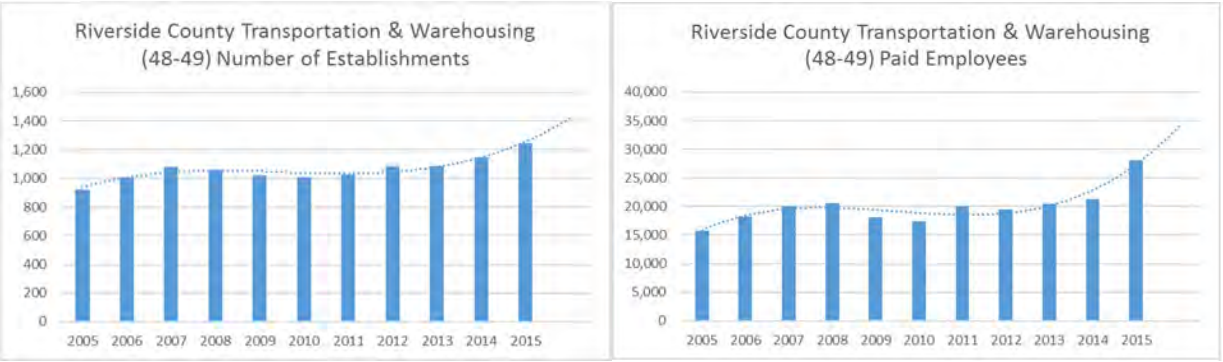
MANUFACTURING

Figure 1. Manufacturing Establishments and Employment in Riverside County, 2005-2015



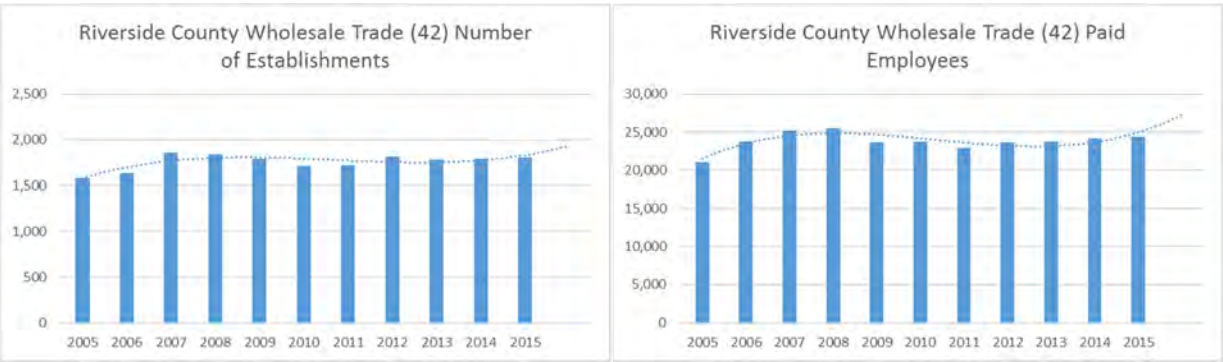
TRANSPORTATION & WAREHOUSING

Figure 2. Transportation & Warehousing Establishments and Employment in Riverside County, 2005-2015



WHOLESALE

Figure 3. Wholesaling Establishments and Employment in Riverside County, 2005-2015



Source: Census County Business Pattern data 2005-2015

As of 2015, the most recent year for which data are available, these three sectors continue to be dominated by small establishments, with at least 85% of establishments in each category having fewer than 20 employees. Countywide, there are only 17 establishments with 500 or more employees (five in manufacturing, eight in transportation and warehousing, and four in wholesale trade), and only five with 1,000 or more employees (one in manufacturing and four in transportation & warehousing).

Table 2: Distribution of Establishments by Industry Category, 2015

Employees	Manufacturing	Transportation and warehousing	Wholesale trade	Sum
1 to 4 employees	587	761	983	2,331
5 to 9 employees	265	204	335	804
10 to 19 employees	216	121	258	595
20 to 49 employees	207	78	143	428
50 to 99 employees	109	37	54	200
100 to 249 employees	87	23	20	130
250 to 499 employees	19	15	9	43
500 to 999 employees	4	4	4	12
1,000 employees or	1	4	0	5
All establishments	**1495**	**1247**	**1806**	**4,548**

Large manufacturing and wholesale establishments have significantly higher warehousing activities than smaller ones. Therefore, it is worthwhile to examine the pattern in growth of large establishments in Riverside County (**Figure 4** and **Table 3**). Although the overall number of establishments with 100 or more employees has decreased since 2008 in the manufacturing and wholesale trade sectors, it has increased in the transportation & warehousing sector. Additionally, the number of establishments with 1,000 or more employees in the transportation & warehousing sector grew from one to four during this period.

Figure 4 and **Table 3** demonstrate a general growth trend in each of these three market sectors following the effects of the Great Recession causing declines, particularly in the manufacturing sector. These data also demonstrate considerable diversity in the size of the businesses within this sector in terms of total employees, with a general trend toward more numerous small businesses compared to large businesses. The general trend for growth in these market sectors that directly and indirectly include warehousing and logistics related activities, as well as the diversity in business sizes, support inclusion of the full range of these activities in each sector be considered to assess the extent of associated transportation impacts and mitigation needs.

Figure 4. Change in number of establishments with 100+ employees in Riverside County, 2008-2015.

Although building area is very desirable for the purpose of this study, Census does not provide any information about the square footage of warehouses or other establishments. Census, and therefore by reference other regional socio-economic forecasts like those developed by SCAG, are based on employees.

Table 3. Growth in Establishments with 50+ Employees, 2008-2015

Manufacturing								
Employees	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
100-249	106	80	74	80	82	81	84	87
250-499	24	19	20	17	19	20	21	19
500-999	7	5	2	4	4	4	4	4
1000+	2	1	1	1	1	1	1	1
Total	139	105	97	102	106	106	110	111
Transportation and warehousing								
Employees	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
100-249	25	15	17	20	22	28	25	23
250-499	13	16	11	8	7	8	9	15
500-999	5	2	4	3	5	3	3	4
1000+	1	1	1	3	1	2	2	4
Total	44	34	33	34	35	41	39	46
Wholesale trade								
Employees	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
100-249	29	21	19	20	22	22	23	20
250-499	7	9	9	11	10	12	11	9
500-999	3	3	3	2	2	1	2	4
1000+	1	1	2	1	1	1	1	0
Total	40	34	33	34	35	36	37	33

2.2. INFOGROUP GEOCODED DATABASE (SIC CODE)

Infogroup's[2] database provides information about businesses' location, size, and industry classification code. Although the data does not provide a complete list of all establishments, it has sufficient quality and coverage that it can be used to gain an extensive understanding of land uses and concentration of activities in various parts of the county.

Commercial establishments are organized by SIC code. In addition, the data is further broken down by number of employees at each establishment. Using this data, it is possible to get an idea of both the scope and scale of various industries in Riverside County. For informational purposes, a short description of each of the SIC categories relevant to this analysis is provided below.

Table 4. Description of Selected SIC Categories

Industry Code	Brief Description
20-39 (Manufacturing)	Establishments engaged in the mechanical or chemical transformation of materials or substances into new products. Usually described as plants, factories, or mills and characteristically use power driven machines and materials handling equipment. Establishments engaged in assembling component parts of manufactured products are also considered manufacturing if the new product is neither a structure nor other fixed improvement. Also included is the blending of materials, such as lubricating oils, plastics resins, or liquors.
42 (Transportation & Warehousing)	Establishments furnishing local or long-distance trucking or transfer services, or those engaged in the storage of farm products, furniture and other household goods, or commercial goods of any nature. The operation of terminal facilities for handling freight, with or without maintenance facilities, is also included.
50-51 (Wholesale Trade)	Establishments primarily engaged in selling merchandise to retailers; to industrial, commercial, institutional, farm, construction contractors, or professional business users; or to other wholesalers; or acting as agents or brokers in buying merchandise for or selling merchandise to such persons or companies.

Source: U.S. Department of Labor, Occupational Safety & Health Administration

As shown on **Figure 5**, manufacturing establishments of all sizes (by primary or secondary SIC) are most heavily concentrated in Corona and Riverside along major freeway corridors, although the figure also demonstrates these activities are broadly distributed across the urbanized areas of Riverside County. Other areas with high concentrations include Mira Loma, Murrieta and Temecula. Corona, Riverside and Temecula are the only cities that contain manufacturing establishments with more than 500 employees.

[2] Infogroup is a private vendor of data on businesses.

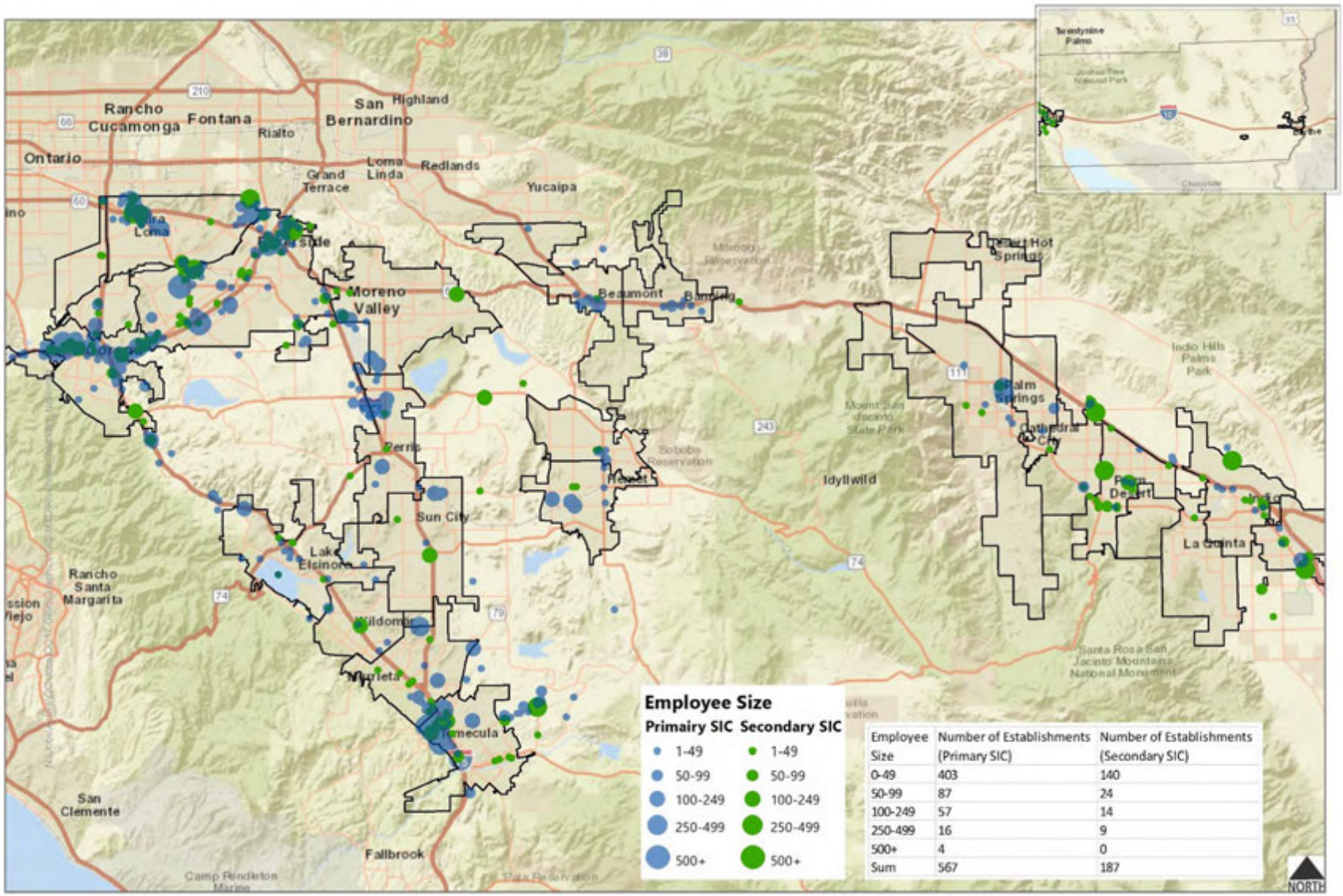
Represented on **Figure 6**, transportation & warehousing establishments with fewer than 50 employees are dispersed throughout the county, with the highest concentrations of establishments in Riverside, Corona and Temecula. Based on the primary SIC, only one establishment exceeds 50 employees and it is located in Mira Loma. Based on the secondary SIC, seven additional warehouse establishments have more than 50 employees; they are located in Corona, Mira Loma, Palm Desert and Riverside.

A total of 2,237 establishments countywide are characterized in wholesale trade as a primary function (**Figure 7**). This is several times larger than either manufacturing (567) or warehousing & transportation (483). Wholesale establishments of all sizes are similarly dispersed across the urbanized areas of the county, with some degree of concentration in Corona, Riverside and Temecula. There are six large wholesale establishments classified under primary code 50 and 51, with more than 500 employees in Coachella, Moreno Valley and Temecula. Based on the secondary SIC, there are also large wholesale establishments in Corona and Perris. In addition, there are 10 wholesale establishments with more than 500 employees in Perris.

It should be noted that there is no manufacturing, warehousing & transportation, or wholesale establishments of significance currently identified in the dataset within Blythe or the greater Palo Verde Valley. For this reason, the study effort will primarily focus on development activity in Western Riverside County and the Coachella Valley.

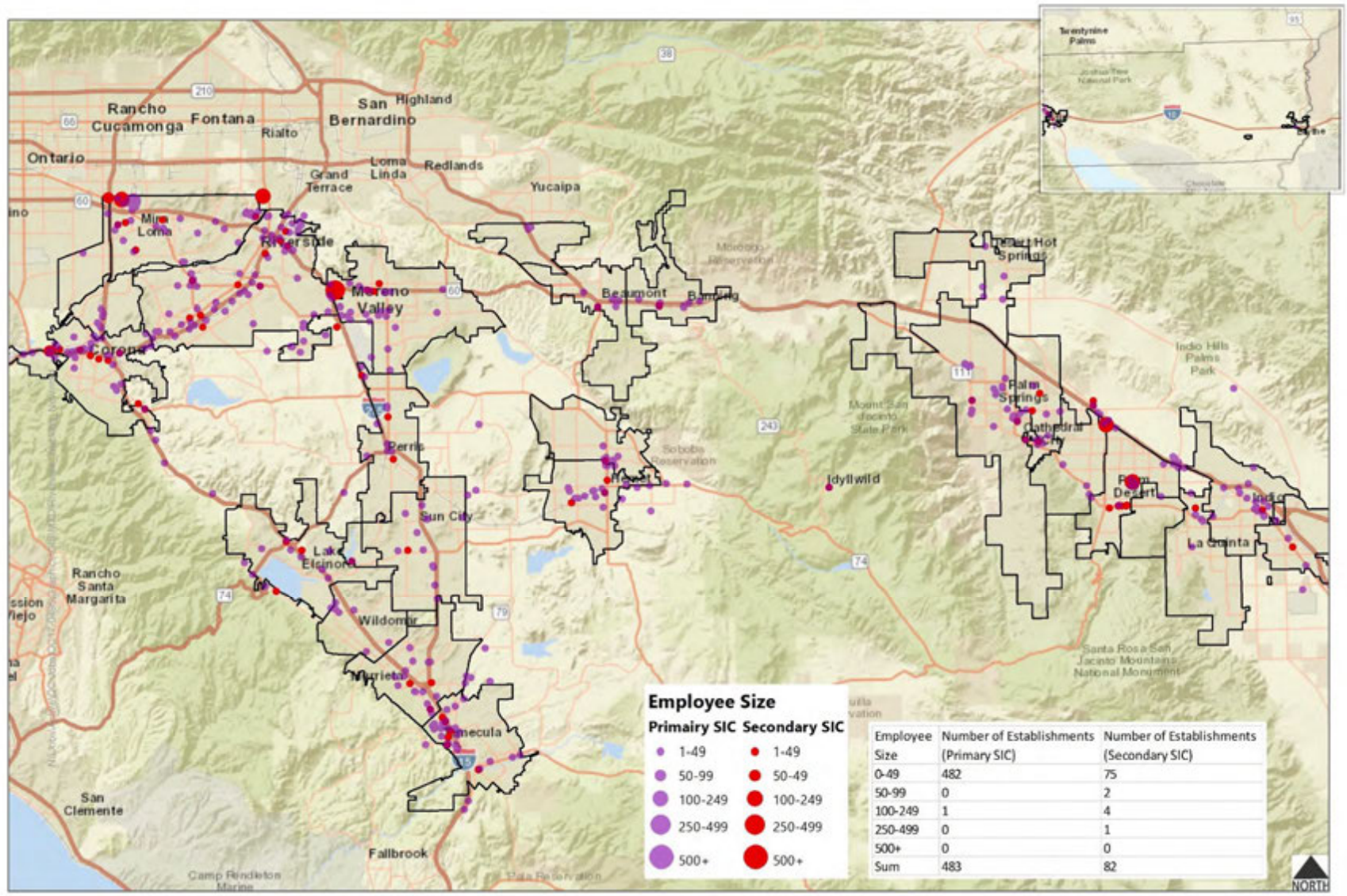
The overall number of establishments in each category is broadly consistent with the CBP numbers for Wholesale Trade, but not for Manufacturing and Transportation & Warehousing, where CBP shows a significantly larger number of establishments countywide. This is to be expected, given that CBP aims to be comprehensive, whereas Infogroup seeks to provide a sample and may take a more conservative approach in defining establishments. The Infogroup data is, however, useful in providing some idea of where establishments are or are not concentrated within the county. For each category, however, Infogroup appears to capture about a third of the establishments identified by CBP. Recognizing the limitations of the respective datasets, each provides useful information to validate and augment data derived from established regional sources, like SCAG, for the purposes of completing this study.

Figure 5. Distribution of Employment in Riverside County, Manufacturing



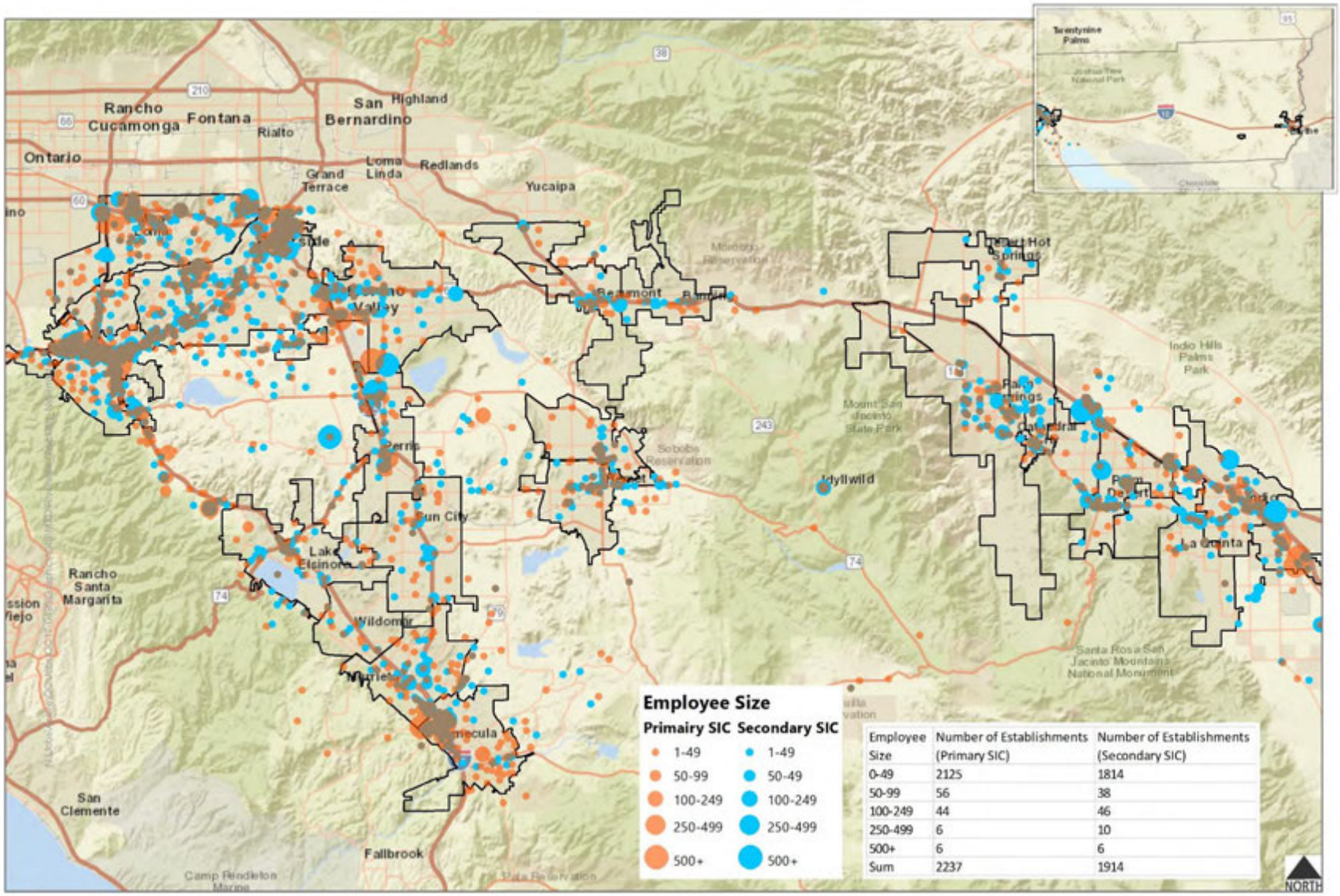
Employee Size	Number of Establishments (Primary SIC)	Number of Establishments (Secondary SIC)
0-49	403	140
50-99	87	24
100-249	57	14
250-499	16	9
500+	4	0
Sum	567	187

Figure 6. Distribution of Employment in Riverside County, Transportation & Warehousing



Employee Size	Number of Establishments (Primary SIC)	Number of Establishments (Secondary SIC)
0-49	482	75
50-99	0	2
100-249	1	4
250-499	0	1
500+	0	0
Sum	483	82

Figure 7. Distribution of Employment in Riverside County, Wholesale Trade



Employee Size	Number of Establishments (Primary SIC)	Number of Establishments (Secondary SIC)
0-49	2125	1814
50-99	56	38
100-249	44	46
250-499	6	10
500+	6	6
Sum	2237	1914

2.3. SCAG WAREHOUSE STUDY

SCAG's Industrial Warehouse Study provides estimates of existing and future warehouse square footage. Unfortunately at the time of preparing this report, this study was not officially released and therefore associated data were not able to be access for this study. The information presented here are based on land use data provided in the SCAG Heavy Duty Truck Model (HDT) developed for the 2016 RTP.

Warehouses are classified as High-Cube and Low-Cube in the SCAG HDT model. The high-cube warehouse is generally defined as a building with over 200,000 square feet of floor area and with a ceiling height of 24 feet or higher. The primary use of high-cube warehouses is storage, consolidation, and distribution of manufactured goods.

A high-cube warehouse is distinguished from a low-cube, or traditional, warehouse by several factors. Most prominent among these is a relative lack of automation in low-cube warehouses, leading to a larger number of human employees. High-cube warehouses, on the other hand, takes advantage of a very high degree of automation.

In addition, the two types are differentiated by economies of scale. Low-cube, traditional warehouses tend to be smaller on a square footage basis, with lower degree of automation, but higher employee per square feet ratio. High-cube warehouses process larger shipments with fewer employees relative to the warehouse's square footage. This means that, as compared to high-cube warehouses, low-cube warehouses generate fewer truck trips per employee (owing to the relatively larger number of employees proportional to size) but more truck trips per thousand square feet (because of smaller size of warehouse and smaller size of shipments).

By way of example, automation may mean that employees at a high-cube warehouse are able to handle higher shipment volumes than their counterparts at low-cube warehouses. Not only are total shipment volumes likely to be higher, but each individual shipment is likely to be larger. This means that truck trips are divided over a smaller number of employees. A low-cube warehouse will handle, on average, smaller shipments, and need a comparatively larger number of employees to handle them. This means that those truck trips handled at a low-cube warehouse will be spread over a larger number of employees.

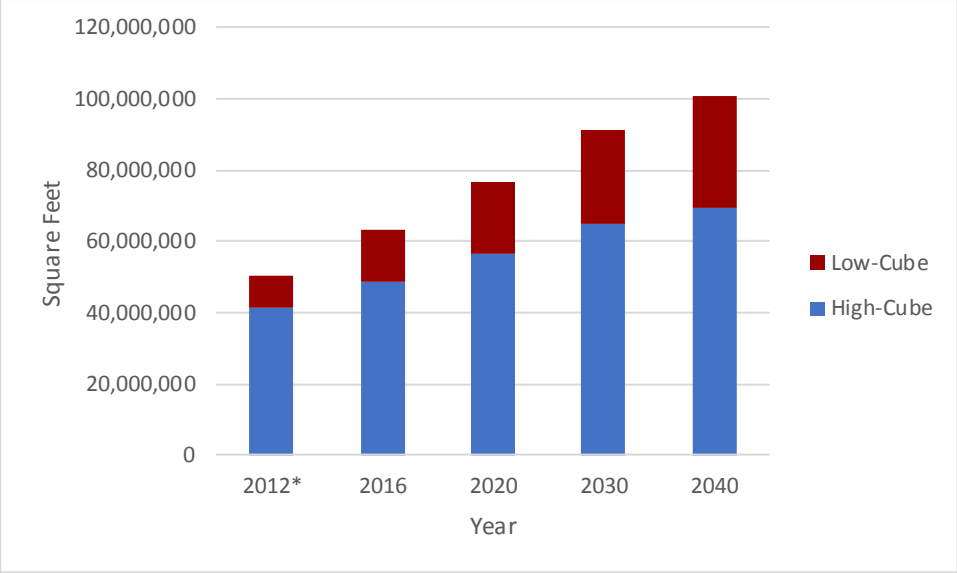
Based on information in 2016 SCAG HDT model, Riverside County is home to 76 million square feet of high-cube and low-cube warehouse space, and it is projected to grow through approximately 2030, before leveling off in expectation of market competition from other land uses. It is anticipated that in the long term, the attractiveness of other land uses and a lack of

easily developable land will exert downward pressure on the growth of warehouse square footage and employment in Riverside County. The changes predicted by this forecast are indicated in the figures below. By either measure (number of employment or square footage), the increase in warehouse capacity in Riverside County will be substantial during the 2012 to 2040 period, and constitutes both high-cube and low-cube warehouse growth. It is important to note that the comparison between 2012 and other years is not possible since the definition of "warehouse area" between 2012 baseline scenario and other scenarios are not consistent. The area shown in 2012 includes total available floor space, while the area shown in 2016 and years after includes only planned occupied floor space. Therefore the comparison analysis are only presented based on 2016 and 2040 scenarios for consistency.

As shown on **Figure 8** and **Figure 9**, although both high-cube and low-cube warehouse capacity are projected to increase substantially between 2016 and 2040, the increase for low-cube warehouse space is from 20,111 KSF to 31,232 KSF during this period (55%). This is significantly greater on a percentage basis (but lower in absolute terms) than the anticipated increase for high-cube warehouses space, from 56,393 KSF to 69,410 KSF (23%). As shown in detail on **Table 5**, and **Table 6**, this difference is somewhat less pronounced for employment, with low-cube warehouses increasing from 3,819 to 7,427 employees (94%), but with high-cube warehouses increasing from 3,256 employees to 6,185 by 2040 (90%).

It is important to remember that these forecasts are based on model data that must be considered in the context of modeling limitations. The addition or subtraction of just a few projects, particularly on the scale of high-cube warehouses, has the potential to make real-world conditions significantly different from the model's prediction. Despite the limitations in the model data, the anticipated growth in both high-cube and low-cube warehousing activity reiterates the appropriateness of considering all warehousing and logistics related uses as part of this study effort to assess the full transportation system impacts of this anticipated growth.

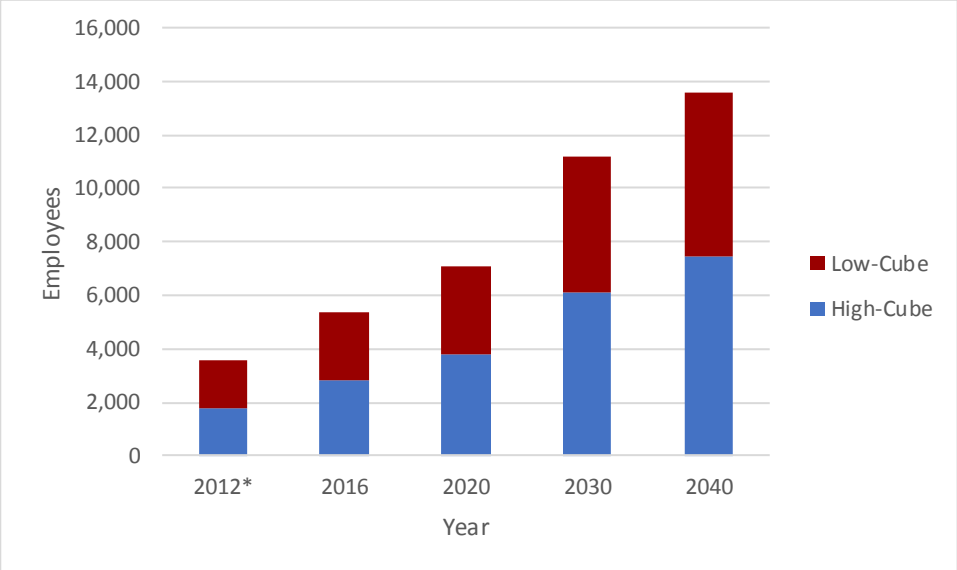
Figure 8. Warehouse Area Trend from 2012-2040 in Riverside County



* The area shown in 2012 includes total available floor space. The area shown in 2016 and years after includes planned occupied floor space.

Source: SCAG 2016 RTP

Figure 9. Warehouse Employment Trend from 2012 to 2040 in Riverside County



* The area shown in 2012 includes total available floor space. The area shown in 2016 and years after includes planned occupied floor space.

Source: SCAG 2016 RTP

Table 5 and **Table 6** show the employment ratio per 1000 square feet of each warehouse category. Based on SCAG information, the employee ratio for low-cube warehouse is at least twice higher than the ratio for high-cube warehouse. The tables also reflect a modest increase

over time in the ratio of employees per KSF for both high-cube and low-cube warehouses, although it not clear why this ratio is increasing in future year.

Table 5. High-Cube Warehouse Trends in Riverside County, 2012-2040

Year	Warehouse Area (square feet)	Employment	Employee/KSF
2012*	41,281,541	1,793	0.04
2016	48,837,363	2,810	0.06
2020	56,393,177	3,819	0.07
2030	64,664,947	6,120	0.09
2040	69,410,192	7,427	0.11

Table 6. Low-Cube Warehouse Trends in Riverside County, 2012-2040

Year	Warehouse Area (square feet)	Employment	Employee/KSF
2012*	8,833,418	1,804	0.20
2016	14,472,627	2,533	0.18
2020	20,111,826	3,256	0.16
2030	26,810,782	5,070	0.19
2040	31,231,977	6,185	0.20

* The area shown in 2012 includes total available floor space. The area shown in 2016 and years after includes planned occupied floor space.

Source: SCAG 2016 RTP

Table 7 shows the anticipated growth in high- and low-cube warehouse space in each Traffic Analysis Zone (TAZ) in Riverside County that has warehouse space. The rightmost column in the chart provides the sum in growth of both high- and low-cube warehouses during the period from 2016 to 2040.

SCAG's forecast anticipates that warehouse square footage growth will be highly concentrated. A single TAZ on the outskirts of Moreno Valley accounts for 56.3% of the expected growth between 2016 and 2040, and the 10 TAZs with the highest expected growth (on an absolute basis) will account for 90.3% of the county's overall warehouse growth in this period. Of the top 10, three are located in Moreno Valley, two are located in Coachella, and one each are located in Corona, Perris, Lake Elsinore, Jurupa Valley, and Hemet. The spatial distribution of this forecast reflects known warehousing and logistics development plans (like the World

Logistics Center in Moreno Valley) along with the influences of declining land availability in the region for warehouse and logistics related uses over time, especially high-cube uses that demand larger sites with transportation system accessibility. This influence of declining land availability is also reflected in the leveling off of the forecast rate of growth described previously, which accounts for the exhaustion of readily available land in later forecast years and the associated economics of locating highest and best value land uses making it less desirable to locate additional warehousing and logistics uses in Riverside County.

Table 7. Amount of Warehouse Space by TAZs in Riverside County (KSF)

TAZ_ID	High-cube 2016	Low-cube 2016	High-cube 2020	Low-cube 2020	High-cube 2030	Low-cube 2030	High-cube 2040	Low-cube 2040	Total Change from 2016-2040	Percent change from 2016 - 2040	Percent of total growth countywide
43344	5,417	2,323	10,834	4,646	16,778	7,201	20,136	8,628	21,024	271.63%	56.31%
43336	641	1,497	1,282	2,993	2,421	5,657	3,198	7,461	8,521	398.55%	22.82%
43338	101	231	202	462	297	696	355	822	845	254.52%	2.26%
43148	4,437	410	4,437	614	4,438	892	4,437	1,029	619	12.77%	1.66%
43571	-	-	-	-	382	-	594	-	594	0.00%	1.59%
43130	2,050	465	2,050	465	2,050	545	2,050	988	522	20.80%	1.40%
43364	-	182	-	182	221	232	331	293	442	242.86%	1.18%
43573	-	-	-	-	281	-	421	-	421	0.00%	1.13%
43302	655	-	1,072	-	1,072	-	1,072	-	417	63.66%	1.12%
43305	302	-	604	-	604	-	604	-	302	100.00%	0.81%
43264	-	-	-	-	200	-	300	-	300	0.00%	0.80%
43187	-	119	-	239	-	299	-	340	221	185.71%	0.59%
43575	156	37	311	75	311	75	311	75	193	100.00%	0.52%
43260	2,031	820	2,031	1,	2,032	1,002	2,031	1,002	180	6.38%	0.48%
43452	172	-	343	-	344	-	343	-	172	99.42%	0.46%
43345	-	-	-	-	-	109	-	163	163	0.00%	0.44%
43448	-	60	-	119	-	180	-	209	150	248.33%	0.40%
43286	-	-	-	-	-	87	-	149	149	0.00%	0.40%
43332	101	44	202	88	202	88	202	88	145	100.00%	0.39%
43249	3,197	1,716	3,197	1,860	3,198	1,864	3,197	1,860	144	2.93%	0.39%
43395	131	-	262	-	262	-	262	-	131	100.00%	0.35%
43415	2,992	244	2,992	244	2,993	328	2,992	369	124	3.86%	0.33%
43134	474	454	474	509	474	554	474	574	120	12.93%	0.32%
43454	119	-	237	-	237	-	237	-	119	99.16%	0.32%
43168	491	-	491	-	491	77	491	116	116	23.63%	0.31%

TAZ_ID	High-cube 2016	Low-cube 2016	High-cube 2020	Low-cube 2020	High-cube 2030	Low-cube 2030	High-cube 2040	Low-cube 2040	Total Change from 2016-2040	Percent change from 2016 - 2040	Percent of total growth countywide
43409	-	-	-	-	-	72	-	108	108	0.00%	0.29%
43366	-	-	-	-	-	59	-	89	89	0.00%	0.24%
43236	-	83	-	165	-	165	-	165	83	98.80%	0.22%
43399	-	81	-	162	-	163	-	162	81	100.00%	0.22%
43265	-	-	-	-	-	53	-	80	80	0.00%	0.21%
43488	-	78	-	155	-	156	-	155	78	98.72%	0.21%
43563	308	162	308	162	308	208	308	232	70	14.89%	0.19%
43246	328	487	328	547	328	548	328	547	61	7.36%	0.16%
43276	-	59	-	117	-	118	-	117	59	98.31%	0.16%
43429	-	57	-	115	-	115	-	115	57	101.75%	0.15%
43162	-	-	-	-	-	33	-	56	56	0.00%	0.15%
43181	821	61	821	61	822	95	821	112	51	5.78%	0.14%
43420	286	48	286	96	286	97	286	96	48	14.37%	0.13%
43261	-	120	-	163	-	163	-	163	43	35.83%	0.12%
43136	289	193	289	233	289	233	289	233	40	8.30%	0.11%
43310	-	40	-	80	-	80	-	80	40	100.00%	0.11%
43125	5,048	692	5,048	727	5,049	729	5,048	727	36	0.61%	0.10%
43474	-	32	-	65	-	65	-	65	32	103.13%	0.09%
43397	-	31	-	62	-	62	-	62	31	100.00%	0.08%
43188	380	145	380	175	380	175	380	175	30	5.71%	0.08%
43214	-	285	-	311	-	312	-	311	27	9.12%	0.07%
TOTAL	30,927	11,256	38,481	15,892	46,750	23,587	51,498	28,016	37,334	88.50%	100.00%

Source: SCAG Warehouse Study

Figure 10. High Cube Warehouse Area in Riverside County in 2016 by SCAG Tier I TAZ

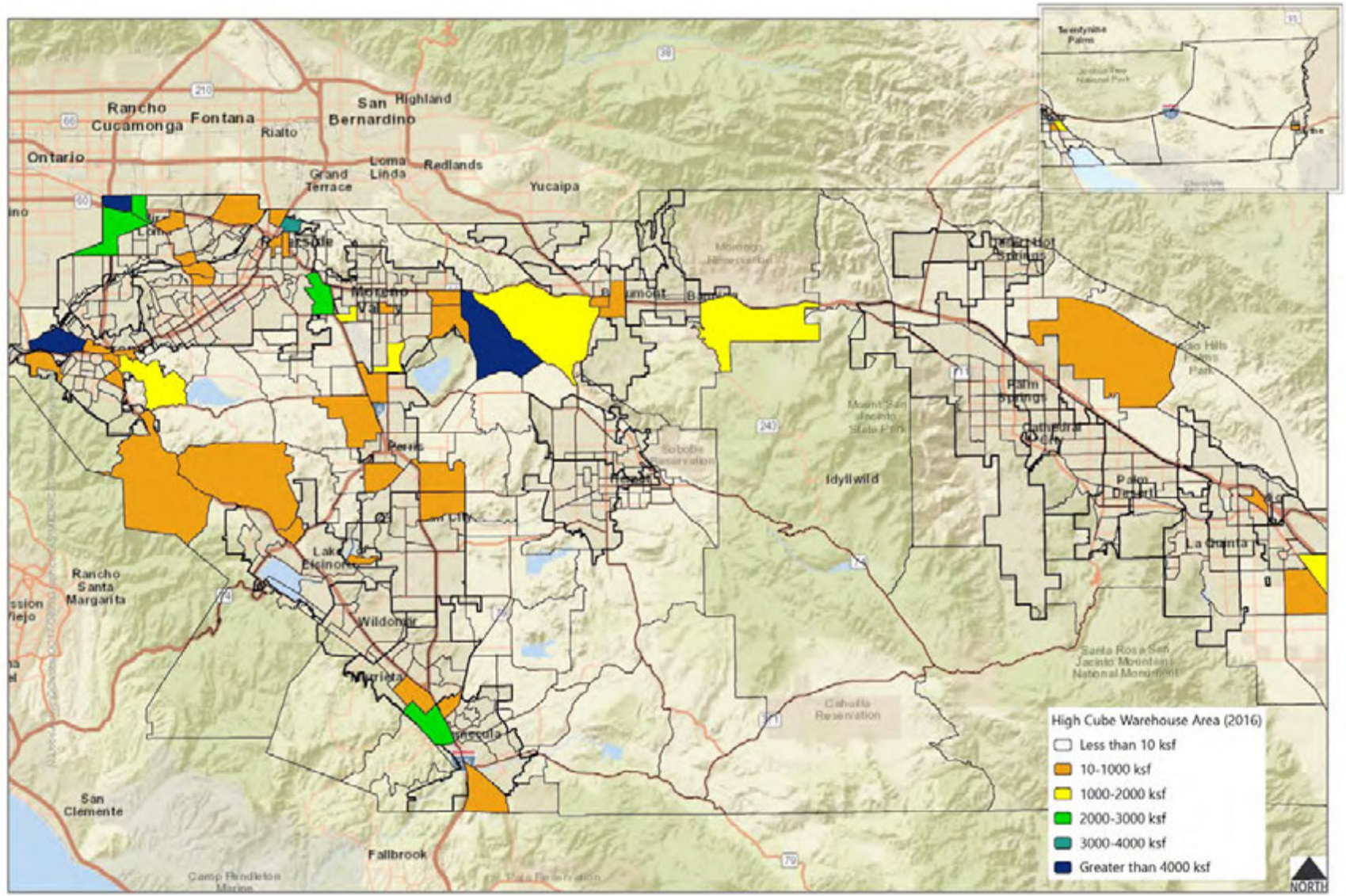


Figure 11. Low Cube Warehouse Area in Riverside County in 2016 by SCAG Tier I TAZ

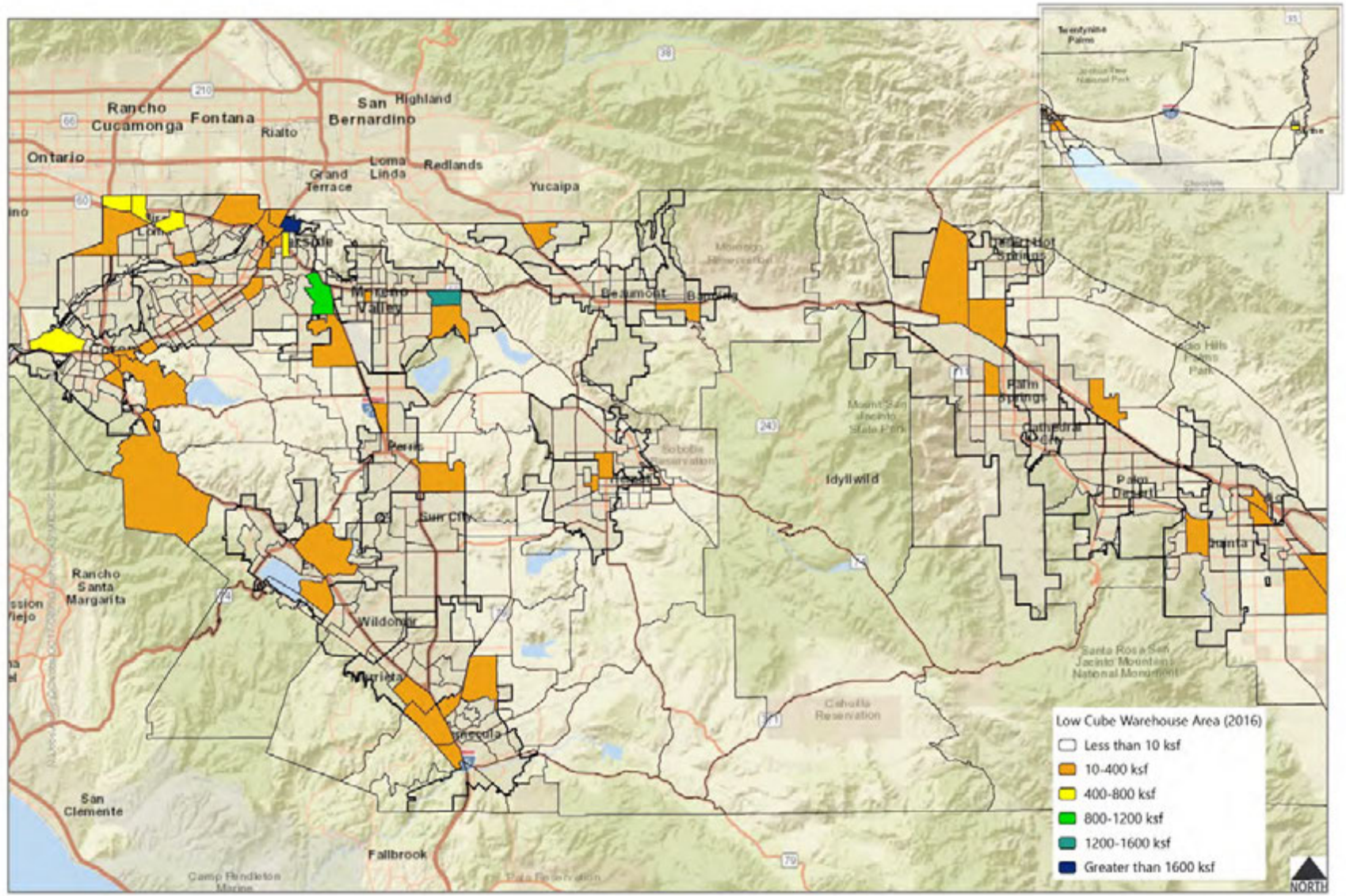


Figure 12. SCAG Expected High Cube Warehouse Area Growth in Riverside County 2016 to 2040 by SCAG Tier I TAZ

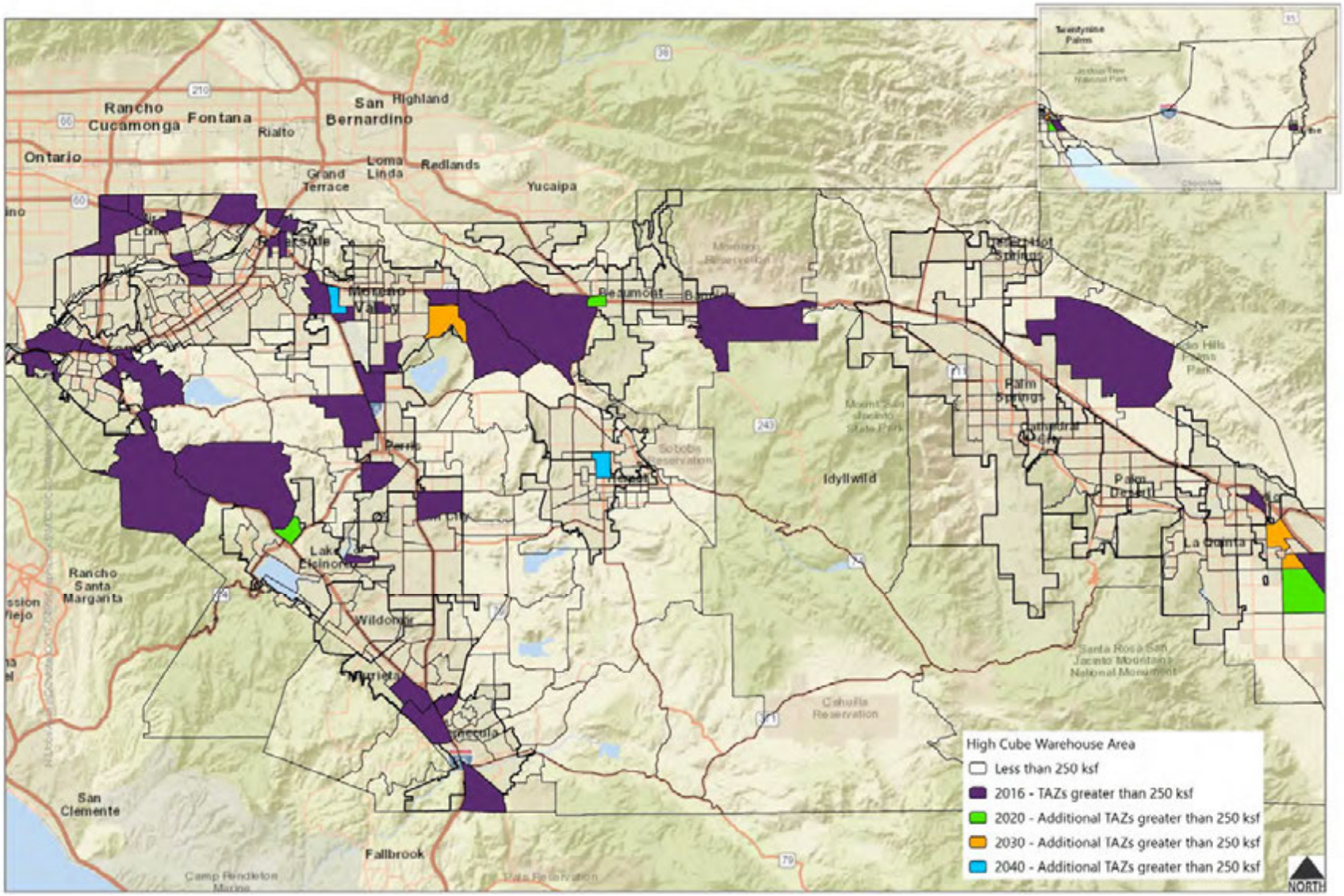
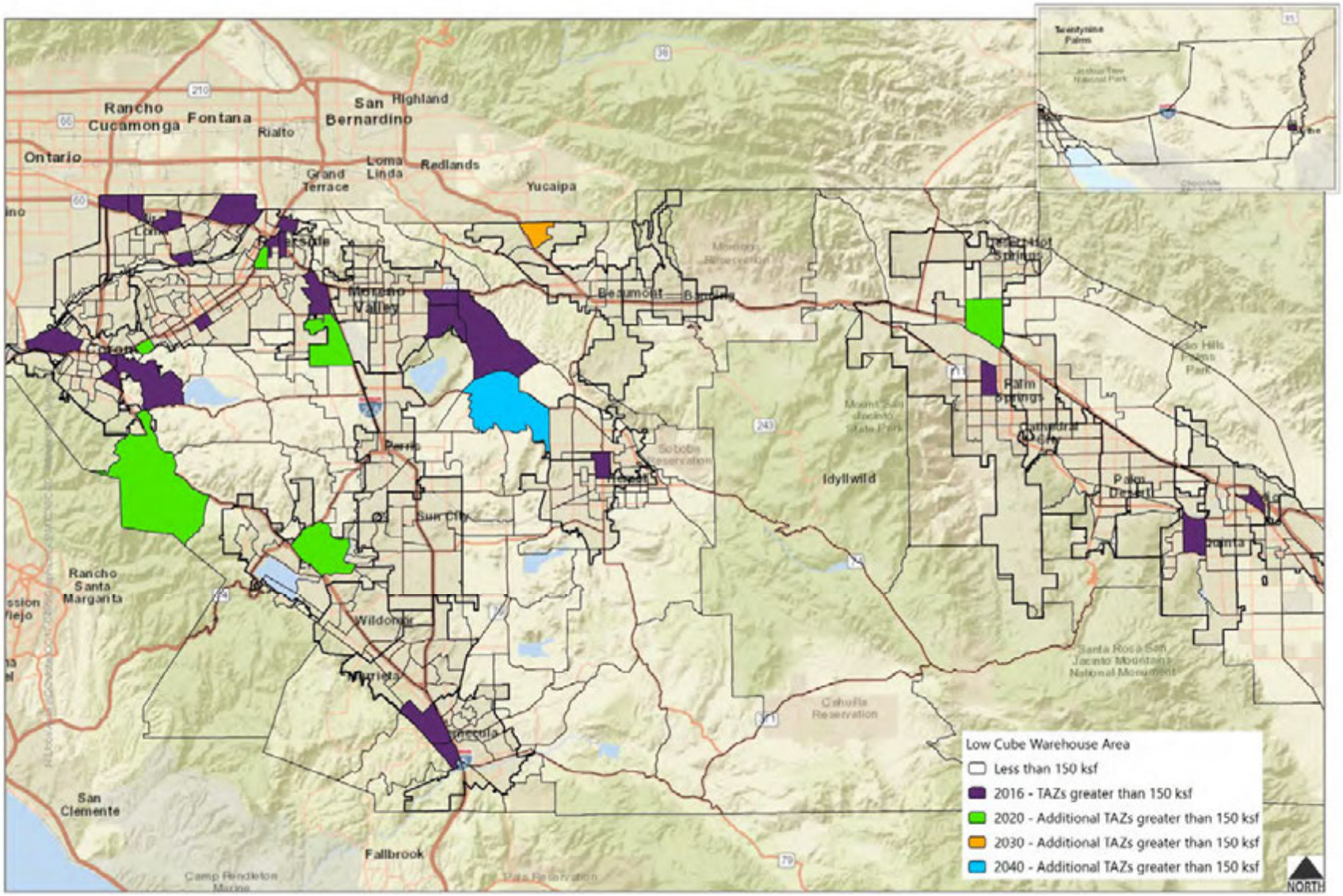


Figure 13. SCAG Expected Low Cube Warehouse Area Growth in Riverside County 2016 to 2040 by SCAG Tier I TAZ



3. TRUCK COUNTS

The SCAG RTP 2016 uses a comprehensive truck count database (2012-2013 counts) for HDT model calibration. This information helps to understand the magnitude of trucking activities on various segments of highway. This database has 74 locations on state and interstate facilities in Riverside County, as indicated in the following table. SCAG is currently conducting a project to update this database using 2016 counts. **Table 8** summarizes available truck counts on the state highway system in Riverside County. By comparing actual truck counts and GPS sample truck O-D information, it is possible to validate data derived from the SCAG regional model as well as estimate the share of truck traffic on each segment that is generated in Riverside County relative to the through traffic (trips with both origin and destination outside of the county)

Table 8. SCAG 2013 Truck Classification Count Locations within Riverside County

Facility TYPE	ON STREET	CROSS STREET	CROSS STREET 2
Interstate	I 10 (REDLANDS FWY) EB	Main St	SH 111
Interstate	I 10 (REDLANDS FWY) EB	Main St	SH 111
Interstate	I 10 (REDLANDS FWY) WB	Main St	SH 111
Interstate	I 10 (REDLANDS FWY) WB	Main St	SH 111
Interstate	I 10 EB	WEST OF	MESA DR
Interstate	I 10 EB	Dillon Rd	Aqueduct Rd Intchg
Interstate	I 10 EB	WEST OF	MESA DR
Interstate	I 10 EB	Dillon Rd	Aqueduct Rd Intchg
Interstate	I 10 EB (Sonny Bono Memorial Fwy)	N Gene Autry Trl	Date Palm Dr
Interstate	I 10 EB (Sonny Bono Memorial Fwy)	N Gene Autry Trl	Date Palm Dr
Interstate	I 10 WB	WEST OF	MESA DR
Interstate	I 10 WB	Dillon Rd	Aqueduct Rd Intchg
Interstate	I 10 WB	WEST OF	MESA DR
Interstate	I 10 WB	Dillon Rd	Aqueduct Rd Intchg
Interstate	I 10 WB (Sonny Bono Memorial Fwy)	N Gene Autry Trl	Date Palm Dr
Interstate	I 10 WB (Sonny Bono Memorial Fwy)	N Gene Autry Trl	Date Palm Dr
Interstate	I 15 (ONTARIO FWY) NB	68th St	Detroit St
Interstate	I 15 (ONTARIO FWY) NB	68th St	Detroit St
Interstate	I 15 (ONTARIO FWY) SB	68th St	Detroit St

Facility TYPE	ON STREET	CROSS STREET	CROSS STREET 2
Interstate	I 15 (ONTARIO FWY) SB	68th St	Detroit St
Interstate	I 15 (TEMECULA VALLEY FWY) NB	Temescal Canyon Rd	Lake St
Interstate	I 15 (TEMECULA VALLEY FWY) NB	Baxter Rd	Clinton Keith Rd
Interstate	I 15 (TEMECULA VALLEY FWY) NB	Temescal Canyon Rd	Lake St
Interstate	I 15 (TEMECULA VALLEY FWY) NB	Baxter Rd	Clinton Keith Rd
Interstate	I 15 (TEMECULA VALLEY FWY) SB	Temescal Canyon Rd	Lake St
Interstate	I 15 (TEMECULA VALLEY FWY) SB	Baxter Rd	Clinton Keith Rd
Interstate	I 15 (TEMECULA VALLEY FWY) SB	Temescal Canyon Rd	Lake St
Interstate	I 15 (TEMECULA VALLEY FWY) SB	Baxter Rd	Clinton Keith Rd
Interstate	I 215 (ESCONDIDO FWY) NB	W Nuevo Rd	North D St
Interstate	I 215 (ESCONDIDO FWY) NB	Keller Rd	Clinton Keith Rd
Interstate	I 215 (ESCONDIDO FWY) NB	W Nuevo Rd	North D St
Interstate	I 215 (ESCONDIDO FWY) NB	Keller Rd	Clinton Keith Rd
Interstate	I 215 (ESCONDIDO FWY) SB	W Nuevo Rd	North D St
Interstate	I 215 (ESCONDIDO FWY) SB	Keller Rd	Clinton Keith Rd
Interstate	I 215 (ESCONDIDO FWY) SB	W Nuevo Rd	North D St
Interstate	I 215 (ESCONDIDO FWY) SB	Keller Rd	Clinton Keith Rd
Interstate	I 215 (RIVERSIDE FWY) NB	Center St	Columbia Ave
Interstate	I 215 (RIVERSIDE FWY) NB	Center St	Columbia Ave
Interstate	I 215 (RIVERSIDE FWY) SB	Center St	Columbia Ave
Interstate	I 215 (RIVERSIDE FWY) SB	Center St	Columbia Ave
State Route-Full Access	E PALM CANYON DR	N Gene Autry Trl	Golf Club Dr
State Route-Full Access	E PALM CANYON DR	N Gene Autry Trl	Golf Club Dr
State Route-Full Access	Grapefruit Blvd	Ave 48	Ave 49
State Route-Full Access	Grapefruit Blvd	At	Imperial / Riverside County Line
State Route-Full Access	Grapefruit Blvd	Ave 48	Ave 49
State Route-Full Access	Grapefruit Blvd	At	Imperial / Riverside County Line
State Route-Full Access	PINACATE RD	Antelope Rd	Palomar Rd
State Route-Full Access	PINACATE RD	Antelope Rd	Palomar Rd
State Route-Full Access	S 71 (CORONA EXPY) NB	EUCLID AVE	S 91 (RIVERSIDE FWY)
State Route-Full Access	S 71 (CORONA EXPY) NB	EUCLID AVE	S 91 (RIVERSIDE FWY)
State Route-Full Access	S 71 (CORONA EXPY) SB	EUCLID AVE	S 91 (RIVERSIDE FWY)
State Route-Full Access	S 71 (CORONA EXPY) SB	EUCLID AVE	S 91 (RIVERSIDE FWY)
State Route-Full Access	S 74 (PINES TO PALMS HIGHWAY)	Santa Rosa Rd	PALM CANYON DR

Facility TYPE	ON STREET	CROSS STREET	CROSS STREET 2
State Route-Full Access	S 74 (PINES TO PALMS HIGHWAY)	Santa Rosa Rd	PALM CANYON DR
State Route-Full Access	State Highway 74 / Pines to Palms Hwy	South of	Portola Ave
State Route-Full Access	State Highway 74 / Pines to Palms Hwy	South of	Portola Ave
State Route-Full Access	WINCHESTER RD	Thompson Rd	Pourroy Rd
State Route-Full Access	WINCHESTER RD	Thompson Rd	Pourroy Rd
State Route-Full Access	WINCHESTER RD	Thompson Rd	Pourroy Rd
State Route-Limited Access	S 60 (Moreno Valley Fwy) EB	Moreno Beach Dr	Redlands Blvd
State Route-Limited Access	S 60 (Moreno Valley Fwy) EB	Moreno Beach Dr	Redlands Blvd
State Route-Limited Access	S 60 (Moreno Valley Fwy) WB	Moreno Beach Dr	Redlands Blvd
State Route-Limited Access	S 60 (Moreno Valley Fwy) WB	Moreno Beach Dr	Redlands Blvd
State Route-Limited Access	S 60 (POMONA FWY) EB	Hall Ave	Market St
State Route-Limited Access	S 60 (POMONA FWY) EB	Hall Ave	Market St
State Route-Limited Access	S 60 (POMONA FWY) WB	Hall Ave	Market St
State Route-Limited Access	S 60 (POMONA FWY) WB	Hall Ave	Market St
State Route-Limited Access	S 91 (Riverside Fwy) EB	Chino Valley Fwy (SH 71)	Serfas Club Dr/ Auto Center Dr
State Route-Limited Access	S 91 (Riverside Fwy) EB	Chino Valley Fwy (SH 71)	Serfas Club Dr/ Auto Center Dr
State Route-Limited Access	S 91 (Riverside Fwy) WB	Chino Valley Fwy (SH 71)	Serfas Club Dr/ Auto Center Dr
State Route-Limited Access	S 91 (Riverside Fwy) WB	Chino Valley Fwy (SH 71)	Serfas Club Dr/ Auto Center Dr
State Route-Limited Access	State Hwy 86 NB	Dillon Rd	50th Ave
State Route-Limited Access	State Hwy 86 NB	Dillon Rd	50th Ave
State Route-Limited Access	State Hwy 86 SB	Dillon Rd	50th Ave
State Route-Limited Access	State Hwy 86 SB	Dillon Rd	50th Ave

Caltrans regularly conducts vehicle classification counts on different segments of the highway network. The 2015 counts are presented in **Table 9**.

Table 9. CALTRANS Truck Counts Database

ID	Route	Post mile	Leg	Description and Approximate Location	Vehicle AADT Total	Truck AADT Total	Truck % Total Vehicle	Truck AADT Total by number of Axles				% Truck AADT by number of Axles			
								2	3	4	5	2	3	4	5
1	10	R58.89	A	Dillon Rd. (Coachella)	25,000	8,693	35	1,110	198	94	7,291	12.8	2.3	1.1	83.9
2	10	R105.087	B	Jct. Rte. 177 North (Desert Center)	24,600	8,693	35	1,110	198	94	7,291	12.8	2.3	1.1	83.9
3	10	R105.087	A	Jct. Rte. 177 North (Desert Center)	23,700	8,721	37	1,128	169	96	7,328	12.9	1.9	1.1	84.0
4	10	R149.15	B	Jct. Rte. 78 South (Blythe)	25,300	8,730	35	1,053	177	133	7,367	12.1	2.0	1.5	84.4
5	10	R149.15	A	Jct. Rte. 78 South (Blythe)	27,000	8,881	33	1,174	197	108	7,402	13.2	2.2	1.2	83.3
6	15	22.277	B	Jct. Rte. 74 (Lake Elsinore)	125,000	9,331	7	4,736	664	307	3,624	50.8	7.1	3.3	38.8

Source: Caltrans 2015 Truck counts.

4. TRUCK O-D AND ROUTING

A sample of mobile device and GPS truck trajectory data for weekdays in September 2016 was purchased from Streetlight® for this study. This data was used to identify truck origin-destination (O-D) patterns between zones in Riverside County, and between Riverside County and other regions, in part to validate similar information derived from the SCAG model. This data is also particularly helpful in identifying the share of through trips (trips with origin and destination outside of Riverside County, but passing through the county).

For the purposes of the O-D analysis, the TAZs in SCAG model were aggregated into 22 zones representing Riverside County and 11 zones representing the SCAG region outside Riverside County. **Figure 14** shows the boundaries of these zones.

This Streetlight data is classified by truck weights: heavy-duty trucks and medium-duty trucks. Heavy-duty trucks are those with minimum gross weight of 26,000 pounds. The medium-duty trucks are those with gross weight between 14,000 and 26,000 pounds.

Table 10 and **Table 11** show the O-D distribution for these two truck categories within the SCAG counties. Trips with at least one end external to the region are excluded from these tables. The GPS data was used to create a detailed O-D distribution between the 33 identified zones, which will be used by the team to fine-tune the model forecasts. In this analysis intermediate stops (less than 30 minutes), which are presumably for fuel or food, are eliminated so that long-distance trips are not mistaken for a series of short-distance trips. These tables show the share of each O-D pair in entire SCAG region. For example,15% of heavy duty truck trips in the SCAG region originate in Riverside County. Additionally, 7.3% of heavy duty truck trips and 10.4% of medium duty truck trips in the SCAG region start and end in Riverside County. This is reasonable because smaller trucks tends to travel shorter distances to perform multiple local deliveries.

Table 10. Heavy-Duty Truck O-D Distribution in SCAG Region

O \ D	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura	Total
Imperial	0.8%	0.0%	0.0%	0.2%	0.1%	0.0%	1%
Los Angeles	0.0%	25.8%	2.0%	2.3%	6.0%	0.6%	37%
Orange	0.0%	2.1%	3.0%	0.5%	1.1%	0.1%	7%
Riverside	0.1%	2.4%	0.5%	7.3%	5.0%	0.1%	15%
San Bernardino	0.1%	6.3%	1.2%	5.1%	25.1%	0.2%	38%
Ventura	0.0%	0.6%	0.0%	0.1%	0.2%	1.0%	2%
Total	1%	37%	7%	16%	37%	2%	100%

Table 11. Medium-Duty Truck O-D Distribution in SCAG Region

O \ D	Imperial	Los Angeles	Orange	Riverside	San Bernardino	Ventura	Total
Imperial	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1%
Los Angeles	0.0%	46.1%	2.2%	0.7%	1.6%	0.7%	51%
Orange	0.0%	2.2%	13.0%	0.5%	0.4%	0.0%	16%
Riverside	0.1%	0.7%	0.5%	10.4%	1.6%	0.0%	13%
San Bernardino	0.0%	1.6%	0.4%	1.6%	9.6%	0.0%	13%
Ventura	0.0%	0.7%	0.0%	0.0%	0.0%	3.9%	5%
Total	1%	51%	16%	13%	13%	5%	100%

Trips between zones for medium- and heavy-duty trucks are shown on **Table 12** and **Table 13**, respectively. For medium trucks, all 20 of the O-D pairs with the highest number of trips are the same zone (namely, short trips remaining within the same zone). The more frequent trip between two different zones is from Zone 14 to 21 (adjacent zones in the desert), which accounts for 31% of the traffic originating from Zone 14.

The situation is similar for heavy-duty trucks, where the 12 O-D pairs with the highest number of trips are the same zone. The most frequent trip between Zone 1 (northwestern Riverside County) and Zone 30 (southwestern San Bernardino County), accounting for 26% of trips from Zone 1. Beyond this, the most frequent trips are from Zone 17 to Zone 30 and from Zone 19 to Zone 31 (both 25% of trips originating from those respective links).

The distribution of trips on 29 selected segments of the highway network in Riverside County were also investigated. This analysis used a sample of GPS truck trip trajectories to understand the origin-destination of trips on a given facility. In this analysis, intermediate stops are included and counted as separate trips since these trips will contribute to congestion on local streets.

Table 14 shows the share of truck trips generated in Riverside County compared to the share of truck trips generated in SCAG area from the total truck traffic on each of the links. For heavy-duty trucks, Riverside County generated the most traffic on Links 17, 18, 19, 20, 21, and 23. Of these links, three are located on SR-60, two are located on I-215, and one is located on SR-91. Overall, Riverside is a comparatively bigger generator of medium-duty truck trips, although the busiest links are similar: Links 17, 18, 19, 21, 22, 23, and 24. Of these, three are on I-215, two are on SR-60, and two are on SR-91.

The patterns identified by these data are particularly useful for validating and refining other data sources as the basis for determining the fair share of trips generated by warehousing and logistics uses in Riverside County compared to those trips (or the portion of trips) generated by uses outside of the county.

Table 12. Distribution of Trips by Zone for Medium-Duty Trucks (% by Destination)

O \ D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	SUM
1	18	2	4	4			1				1						6	3	1	1			3	1		3	2		7	21	11	1		100
2	2	21	5	15		2	4		1	1	1	2						1	5	5			1			2	1		4	8	10	2		100
3	1		51	6	4					1	2						3							1		2	2		8	7	3	1		100
4	2	5	11	36	2	2	3		1	1	3						2	1	2	3						2	1		5	7	5			100
5			15	4	30	2			1	5	11						1							1		2	2		8	5	3			100
6		1	3	7	3	29	6		5	10	4									5				1		2	1		4	7	4	2		100
7		2	2	7		4	34	2	3	3	2	2							1	7				1		1	1		3	9	8	1		100
8	1	4	2	4		2	23	6	8	2	2	6	2						2	5			4			4	2	2	2	7	7			100
9			2	4		2	3		53	6	7	3	1							1									2	4	3			100
10			4	2	5	5	3		9	33	15	1							1	2						1			4	4	3	1		100
11			3	2	5	1			4	7	60																		3	3	2			100
12			1	2			1		3	1	1	45	7								4	2				2	1		1	7	11	1		100
13												3	61								24									1	1	3		100
14											2	6	7	25	2						31	12	1					2	2	3				100
15												3	6		50	10					14	3	1						1	2	2	4		100
16												1	2		9	76					2	2								1		2		100
17	8		13	5	1		1				1						22	1					1	2		3	2	2	6	20	5	1		100
18	10	5	5	11		1	2		1	1	1						3	11	3	2			2	1		2	2		5	14	11	1		100
19	2	6	4	9		1	4		1	2	2							2	13	3	1		2	2		3	2		4	10	19	3		100
20	2	4	4	10	1	5	12		2	3	2	1	1					1	3	17			1	1		2	1		4	8	9	1		100
21												2	25	2	1						60									1	1	2		100
22																					1	92						2						100
23																							50	9	9	5	12	3	6	2				100
24																							5	77	6	3	2		1	1			2	100
25																							9	11	62	1	10	1	2				2	100
26																							8	9	2	51	4	2	7	11	2			100
27																							9	3	7	2	61	8	7	1				100
28																							7	2	3	3	27	47	5	2				100
29			1																				3	1	1	2	5		80	2				100
30	2		2	1													1						3	3	1	8	2	1	5	51	10	3		100
31	1		2	2			1					2							1				1	2		2	1		2	17	53	4		100
32													1											2		1			1	5	4	78		100
33																								7	4								84	100

Values less than 1% are not shown in the table.

Table 13. Distribution of Trips by Zone for Heavy-Duty Trucks (% by Destination)

O \ D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	SUM
1	11					2	3										5	1		1			6	3		7	3	2	4	26	12	5		100
2	7	7	2	2		4	7	1				3	2			1	2	3	3	9	3	1	2	2		3	1		3	8	13	4		100
3	4	1	20	2	2	1					2						3			1			7	2		4	5	2	9	17	7	3		100
4	4	4	6	15		1	1					1					2	1	2	4	1		2	2		4	4	2	6	16	10	5		100
5	12		9		22	1	1				5						6						2	2		2	1	1	5	16	7	4		100
6	8	1				15	6					1	1			1	1	1	1	5	1		2	4		3	3	1	3	15	13	6		100
7	10	2				5	14					2	1			1	4	1	2	5	2		2	3		3	1		2	14	14	6		100
8	5	2		1	1	2	6	5		1		7	5						2	8	4	1	3	4	2	6	6	1	6	8	6	2		100
9	3	1	2			4	4		23	3	3	5	2				2	2	2	3			2	2		2			2	13	13	3		100
10	10	2	1		2	9	5	1	3	13	9	1						1	2	6				1			2		2	9	12	4		100
11	4		3		6	3				3	25	1					4		2	2			1	2		2	1		3	15	12	4		100
12	3											16	8		4	5	1			1	7	2	3	3		4	3	1	3	12	13	4		100
13	2											10	15		6	7				1	10	3	3	3		3	2	1	2	10	12	4		100
14	4											9	7	12							12	19		3		1				7	12	4		100
15	4											6	8		17	17				1	11		2	2		2	2	1	2	9	8	2		100
16	2											5	6		12	29					9	2	2	2		3	2		1	9	7	3		100
17	12	1	1				1										13	2	1	2			4	4		6	3	2	4	25	8	5		100
18	9	2					2										3	7	2	2			7	4		6	3	1	4	16	19	7		100
19	6	2	1			1	1					1					3	2	13	4			3	4		4	2		3	14	25	5	1	100
20	7	3	1	2		4	3				1	1	1				3	1	3	13			3	4		4	3	1	4	17	12	4	2	100
21	3						1					7	11		8	9					15	3	3	4		3	2	1	2	9	10	2		100
22	1											2	4	2							5	69		1					1	3	4	2		100
23	1																						38	8	2	9	11	5	5	10	3	3	1	100
24	1																						11	44	3	7	5	2	3	9	4	3	4	100
25																							17	14	30	3	14	4	3	4	2		6	100
26	3																1						11	6		29	5	3	6	20	5	4		100
27	1																						15	4	2	6	32	12	9	8	2	3		100
28																							8	2		5	14	51	4	7		3		100
29	2		1														1						8	3		6	9	4	45	10	3	3		100
30	5																2						5	4		7	3	3	4	41	11	6		100
31	4											2	1					1	2	1	1		3	3		4	2		3	18	36	10		100
32	1																						3	2		2	2	1	2	9	7	65		100
33																							5	15	3	3	3	1	2	4	2	2	54	100

Values less than 1% are not shown in the table.

Table 14. Share of Each Region from the Truck Traffic by Link

State Route No.	Link	Heavy-Duty Trucks		Medium-Duty Trucks	
		Riverside	SCAG	Riverside	SCAG
74	1	21%	93%	40%	99%
91	2	26%	94%	37%	98%
71	3	21%	84%	28%	93%
60	4	22%	93%	26%	95%
15	5	18%	90%	25%	92%
215	6	34%	83%	39%	94%
10	7	33%	74%	41%	85%
62	8	28%	93%	42%	98%
15	9	1%	1%	1%	1%
79	10	2%	6%	7%	15%
86	11	27%	80%	32%	85%
111	12	32%	83%	31%	88%
78	13	21%	43%	23%	47%
10	14	0%	0%	0%	0%
95	15	13%	32%	23%	40%
177	16	26%	53%	41%	61%
60	17	55%	78%	61%	88%
60	18	55%	80%	65%	91%
215	19	52%	83%	60%	92%
60	20	45%	93%	52%	96%
91	21	44%	91%	62%	98%
91	22	43%	91%	63%	97%
215	23	48%	73%	66%	86%
215	24	26%	36%	66%	79%
15	25	26%	37%	56%	74%
215	26	18%	26%	55%	61%
10	27	43%	72%	55%	84%
10	28	41%	62%	63%	80%
10	29	32%	41%	33%	39%

Figure 14. Zones Used in the O-D Analysis

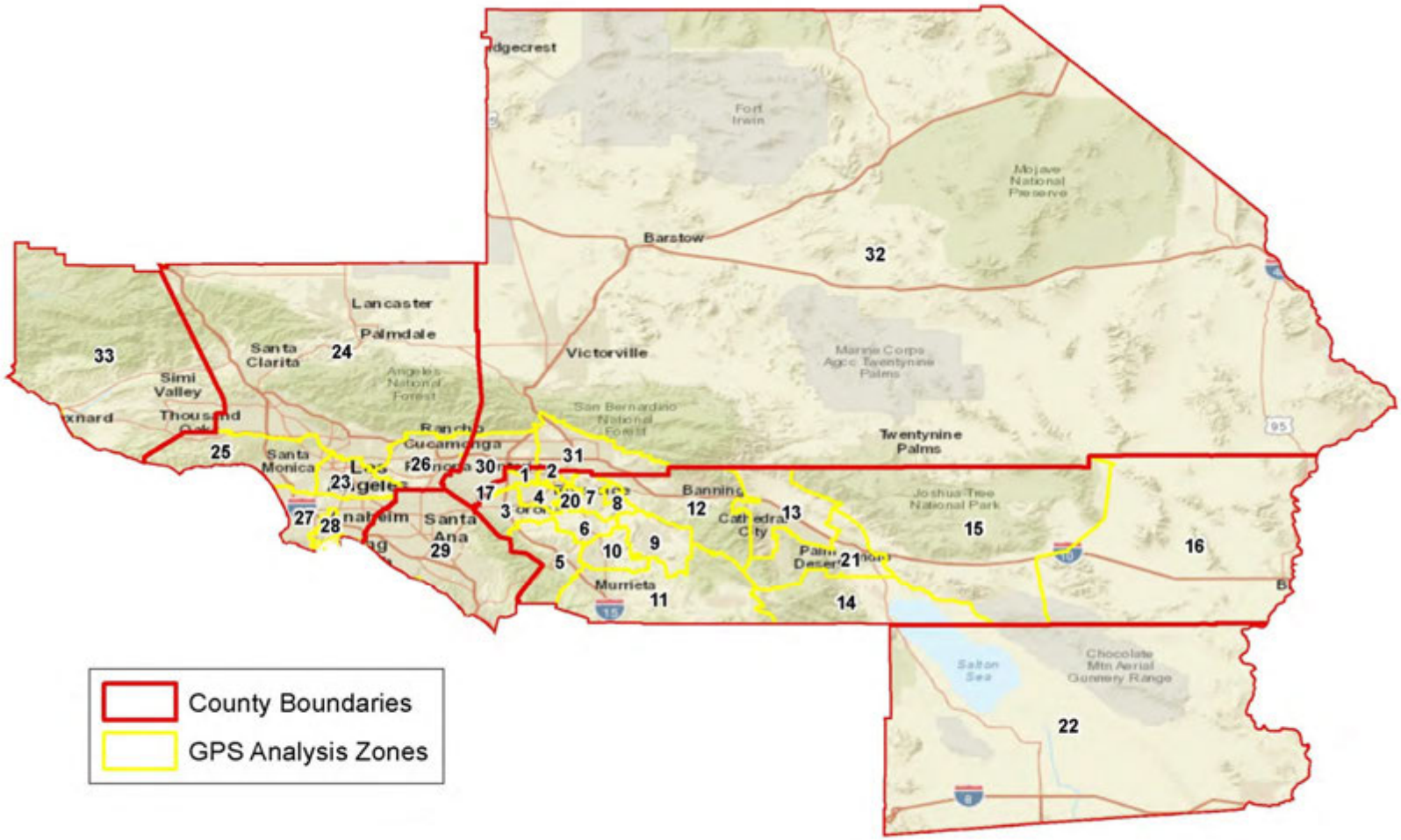


Figure 15. Selected Links for O-D Analysis

5. WAREHOUSE TRIP GENERATION METHODOLOGY

There are many possible approaches to estimate the number and length of trips generated by warehouse-related establishments in a given area. In this section, the most relevant and defensible of the currently available studies and methodologies are summarized. The recommendations follow the inventory of options.

5.1. CITY OF FONTANA TRUCK TRIP GENERATION STUDY

This study was completed in 2003 to evaluate the vehicle trip generation characteristics of several land use categories that typically generate significant volumes of truck traffic in the City of Fontana. This study identifies nine types of truck trip generating land uses, three of which are relevant to this study, namely: light warehouse, heavy warehouse, and industrial park. Below are the definitions for the three most relevant types of land use from the study, based on the Institute of Traffic Engineers (ITE) Trip Generation manual:

- Warehouse (ITE code 150) are primarily devoted to the storage materials; they may also include office and maintenance areas.
    - Light warehouses are 100,000 square feet gross floor area or less
    - Heavy warehouses are greater than 100,000 square feet gross floor area.
- Industrial park (ITE code 130) are areas containing a number of industrial or related facilities. They are characterized by a mix of manufacturing, service, and warehouse facilities with a wide variation in the proportion of each type of use. Many industrial parks contained highly diversified facilities, some with a large number of small businesses and others with one or two dominant industries.

Table 15 summarizes trip generation rates presented in the Fontana study for the above uses. The distribution of truck mix for each warehouse type is also presented. Based on this study, light warehousing generates more truck trips relative to heavy warehousing per employee (for example: 0.327*13%=0.065 >0.309* 13%=0.04 during AM period) however the share of 3+ axles trucks are significantly higher for heavy warehousing

Table 15. Trip Generation Rates by Warehouse Type (Fontana Study)

Warehouse Type	Period	Avg. trip rate per employee	Avg. trip per building KSF	Employee per building KSF	Truck %	Large Truck Mix %		
						2 Axles	3 Axles	4+ Axles
Light Warehouse	Daily	3.713	1.659	0.45	23%*	24.7	20.6	54.6
	AM Site	0.327	0.146		20%			
	PM Site	0.282	0.126		26%			
Heavy Warehouse	Daily	4.657	3.547	0.76	11%	16.95	22.71	60.34
	AM Site	0.309	0.235		13%			
	PM Site	0.417	0.318		10%			
Industrial Park	Daily	2.485	1.236	0.5	26%*	7.9	7.1	85
	AM Site	0.265	0.132		20%			
	PM Site	0.382	0.19		32%			

Source: Fontana Truck Trip Generation Study

* Daily truck percentages are derived by averaging the AM and PM peak hour truck percentage.

5.2. HIGH-CUBE WAREHOUSE VEHICLE TRIP GENERATION ANALYSIS

The South Coast Air Quality Management District (SCAQMD) and the National Association of Industrial and Office Properties (NAIOP) engaged ITE to conduct a high-cube warehouse vehicle trip generation analysis. The findings of this report are reflected in the most recent ITE Trip Generation Manual (10th Edition) published in September 2017.

This study defines high-cube warehouse (HCW) as a:

> building that typically has at least 200,000 gross square feet of floor area, has a ceiling height of 24 feet or more, and is used primarily for the storage and/or consolidation of manufactured goods (and to a lesser extent, raw materials) prior to their distribution to retail locations or other warehouses. A typical high-cube warehouse has a high level of on-site automation and logistics management. The automation and logistics enable highly-efficient processing of goods through the high-cube warehouse.

For the purpose of the analysis, high-cube warehouses are grouped into five types:

- Transload – usually pallet loads or larger handling products of manufacturers, wholesalers/distributors, or retailers with little or no storage durations
- Short-Term Storage – products held on-site for a short time

- Cold Storage – permanent cold storage in at least part of the building
- Fulfillment Center – storage and direct distribution of e-commerce product to end users
- Parcel Hub – Transload function for a parcel delivery company

This study describes the high-cube warehouse facilities in the context of existing ITE categories: "High-cube warehouses/distribution centers may be located in industrial parks or be free-standing. Intermodal truck terminal (Land Use 030), industrial park (Land Use 130), manufacturing (Land Use 140) and warehousing (Land Use 150) are related uses." A detailed description and comparison of each of the HCW categories regarding function, layout, building dimension, and level of automation is presented in the original report.

The vehicle trip generation for daily, AM and PM peak period and share of truck trip generation are estimated for the above categories of high-cube warehouse, and these data represent the most comprehensive effort to assess trip generation associated with high-cube warehouse to date thereby providing useful information to help validate other data sources. However, the study includes the following caveats related to the data and analyses contained within the report:

- Since the sample size for **fulfilment center** and parcel hub include only one establishment, the study recommends further data collection (a minimum of at least six sites) for these two categories to derive stable trip generation rates.

- The study produce statistically acceptable results based on limited data (nine sites) for **cold storage** category, which is generally higher than the rates developed previously based on an older data collection effort. The cold storage sites are classified subjectively based on the interpretation of the data submitter. It is recommended to confirm the applicability of the cold storage category based on the proportion of the HCW building space devoted to the cold storage. If some of the facilities are reclassified, the analysis needs to be re-evaluated. Further data collection might be needed, if a total of at least six sites are not identified under this category after reclassification.

- The study **combined the transload and short-term storage** categories for trip generation analysis. Although these categories are functionally different, their trip generation is not significantly different. Despite having relatively large sample size (95 sites) for this group, the study concluded that there is no meaningful statistic correlation between gross floor area and vehicle trip generation. It is recommended that an evaluation of further potential stratifications of the available data be undertaken and an appropriate set of data be selected for use as interim rates until further study is complete. For example, a set of 15 similar sites can be selected to

evaluate the consistency and correlation between the trip generation and one or more independent variables such as number of employment or floor area.

Recognizing the above-mentioned cautions about the results of this study, the summary of this study is presented in the following tables. **Table 16** shows the percentage of trucks from total vehicles by each high-cube warehouse category, and the findings reflect notable differences in the trip generation characteristics between certain use types.

At Short-Term Storage, Transload & Cold Storage facilities, trucks represent approximately 30% of daily vehicle traffic, with disproportionately less of that traffic coming during AM and PM peak hours. At Parcel Hubs, trucks represent almost half of the AM peak traffic, but only approximately 38% over the course of the day and just over 29% during the PM peak hour. Trucks account for only a small percentage of the total vehicle traffic at Fulfillment Centers.

Table 16 shows the daily weighted truck trip generation rates for each high-cube warehouse category. Per square foot, Parcel Hubs generate the highest number of truck trips, but the highest *proportion* of truck trips are generated by Cold Storage facilities. This is also the case when only 5+-axle trucks are considered.

Table 16. Trip Generation Rates by Warehouse Type (NAIOP Study)

Warehouse Type	Period	Avg trip rate per 1,000 GSF*	Truck %	Large Truck Mix %	
				2,3,4, Axles	5+ Axles
Short-Term Storage, Transload	Daily	1.432	32%	48.7	51.3
	AM Site	0.082	29%	37.5	62.5
	PM Site	0.108	21%	56.5	43.5
Cold Storage	Daily	2.115	40%	10.4	89.6
	AM Site	0.103	37%	28.9	71.1
	PM Site	0.129	33%	26.2	73.8
Fulfillment Center	Daily	8.178	9%	66.2	33.8
	AM Site	0.841	3%	60.9	39.1
	PM Site	1.979	2%	62.9	37.1
Parcel Hub	Daily	10.638	38%	75.5	24.5
	AM Site	0.851	50%	90.3	9.7
	PM Site	0.803	29%	96.2	3.8

Source: ACQMD, 2016, GSF: Gross Floor Area

5.3. INSTITUTE OF TRANSPORTATION ENGINEERS (ITE) TRIP GENERATION MANUAL

The 9th Edition ITE Trip Generation Manual provides trip generation rates for warehousing (150), mini-warehousing (151), high-cube warehousing (152), and wholesale market (860). Each land use code provides one or more methods for estimating the trips generated by a land use. For example, warehousing (150) provides two options:

1. Employee-based estimation for weekday
2. Area-based estimation for weekday

The results of ITE's analysis for various uses in Riverside County are presented in **Table 17**. The ITE Trip Generation Manual provides the ability to estimate daily, AM peak, M peak, and weekend vehicle trips based on land use types, using independent variables of: floor area, acreage, or number of employees.

10th ITE Trip Generation Manual was released in September 2017. Since the new edition might not be adopted by RCTC yet, the trip generation rates from the 9th Edition is compared with respective rates from the 10th edition.

The information contained in the High-Cube Warehouse Vehicle Trip Generation Analysis and the ITE Trip Generation Manuals will be particularly useful in determining the proportional impact and fair share fee for differing types of high cube warehousing uses not readily distinguishable in the data derived from other aggregated sources, like Census and the SCAG demographic forecasts.

Table 17. ITE Daily Trip Generation Rates for Industrial Land Use (Site Generators)

Code	Land Use	Unit	Daily Rate (9th Ed.)	AM/PM Peak (9th Ed.)	Daily Rate (10th Ed.)	AM/PM Peak (10th Ed.)	Truck % (9th Ed.)
110	General Light Industrial	Employees	3.02	0.48 / 0.51	3.05	0.67 / 0.68	N/A
		KSF Gross Floor Area	6.97	1.01 / 1.08	4.96	0.92 / 0.83	
120	General Heavy Industrial	Employees	0.82	0.40 / 0.40			N/A
		KSF Gross Floor Area	1.5	*PM:* 0.68			
130	Industrial Park	Employees	3.34	0.43 / 0.45	2.91	0.42 / 0.42	13%
		KSF Gross Floor Area	6.83	0.80 / 0.84	3.37	0.41 / 0.40	
140	Manufacturing	Employees	2.13	0.39 / 0.40	2.47	0.43 / 0.45	N/A
		KSF Gross Floor Area	3.82	0.79 / 0.75	3.93	0.81 / 0.79	
150	Warehousing	Employees	3.89	0.55 / 0.58	5.05	0.68 / 0.68	20%
		KSF Gross Floor Area	3.56	0.42 / 0.45	1.74	0.22 / 0.24	
151	Mini-Warehouse	KSF Gross Floor Area	2.5	0.28 / 0.29	1.51	0.20 / 0.20	2%-15%
		KSF Net Rentable Area	1.65	0.18 / 0.22	1.65	0.18 / 0.22	
		Storage Units	0.25	0.03 / 0.03	0.18*	0.23* / 0.24*	
		Occupied storage units	0.2	0.02 / 0.02	0.19*	0.02* / 0.02*	
152**	High-Cube Warehouse	KSF Gross Floor Area	1.68	0.14 / 0.16			38%
154	High-Cube Transload & Short-Term Storage Warehouse	KSF Gross Floor Area	-	-	1.40	0.12 / 0.16	N/A
155	High-Cube Fulfillment Center Warehouse	KSF Gross Floor Area	-	-	8.18	0.22 / 0.27	N/A
156	High-Cube Parcel Hub Warehouse	KSF Gross Floor Area	-	-	7.75	0.88 / 0.71	N/A
157	High-Cube Cold Storage Warehouse	KSF Gross Floor Area	-	-	2.12	N/A	N/A

Source: ITE Trip Generation, 9th Edition

** Figures given by 100s of units; divided by 100 for consistency with 9th Edition figures.*

*** In the 10th Edition, Land Use Code 152 is replaced by Codes 154-157, which provide additional specificity.*

5.4. SCAG HEAVY-DUTY TRUCK TRIP GENERATION (2016 RTP)

SCAG's heavy-duty truck (HDT) model is a sub-model within the SCAG 2016 Regional Transportation Plan (RTP) model. The model classifies trucks into three HDT weight classes by gross vehicle weight (GVW): light-heavy (8,500 to 14,000 lbs. GVW); medium-heavy (14,001 to 33,000 lbs. GVW); and heavy-heavy (>33,000 lbs. GVW).

The SCAG 2016 RTP HDT Model applies freight-related socioeconomic data to estimate trip generation using three submodules – external (to the region) trip generation, internal (to the region) trip generation, and special generator trip generation.

- **The external trip generation module** estimates the internal-external (IE), external-internal (EI), and external-external (EE) truck trip table for all interregional truck trips based on commodity flow patterns that link Southern California with the rest of the country. The EI/IE HDT trips are generated using a combination of commodity flow data at the county level and 2-digit NAICS employment data at a county level. External cordons are used to forecast future year external HDT trips from the base year trip flow matrices. This module uses a TRANSEARCH database obtained from IHS/Global Insight. These data are provided as annual flows in tons and are converted to daily weekday flow using an annulation factor of 306 (6 days per week for 51 weeks) for all commodities. The flows are converted from tons to trucks using the specified payload factors varying by commodity types. These payload factors were developed using data from the 2002 Vehicle Inventory and Use Survey (VIUS).

- **The internal trip generation module** is based on trip rates (number of trips per employee or household) for ten different land use/industry sectors at the trip ends. These land use/industry sectors are households, agriculture/mining/construction, retail, government, manufacturing, transportation/utility, general warehousing, high cube warehousing, wholesale, and other (service). The socioeconomic data used by the internal HDT model is consistent with those data used by broader regional travel demand model. The trip rates for every land use were updated based on recent data collection efforts – establishment surveys and third-party truck GPS data. **Table 15** shows the trip generation rates for truck trips internal to the region. All trip rates are per employee, except for the warehouse category, for which trip rates are presented both per employee and KSF of area

- **Special generators** include the ports and intermodal facilities. Not only major-purpose trips are included, but also secondary trips like cargo trips from intermediate handling locations to final destinations. Additionally, there are empty movements of trucks

associated with port truck trips, for purposes of truck repositioning. Ports are modeled based on detailed port area zone system and specialized trip generation rates for autos and trucks by type (bobtail, chassis, and containers). Intermodal truck trips are HDT movements generated at the six regional intermodal facilities in the SCAG region.

Table 18. Internal Truck Trip Generation Coefficient for Various Land Use Categories

Category	Truck Type			All Trucks
	Light HDT	Medium HDT	Heavy HDT	
Households	0.0147	0.0046	0.0072	0.0265
Agriculture/Mining/Construction	0.0804	0.0778	0.0715	0.2297
Retail	0.0663	0.0662	0.0703	0.2028
Government	0.0296	0.0150	0.0148	0.0594
Manufacturing	0.0613	0.0655	0.0924	0.2192
Transportation/Utility	0.1579	0.1815	0.3199	0.6593
Wholesale	0.0916	0.0968	0.1316	0.32
Other (Service)	0.0095	0.0111	0.0151	0.0357
General Warehouse per Employee	0.1610	0.1850	0.3720	0.718
General Warehouse per KSF of Area	0.2819	0.2434	0.5421	1.0674
High Cube Warehouse per Employee	0.184	0.211	0.372	0.767
High Cube Warehouse per KSF of Area	0.0948	0.1272	0.3380	0.56

Based on information in the SCAG HDT model, the ratio of employee per KSF for general warehouse and is presented in **Table 19.**

Table 19. Employee per KSF Ratio in SCAG HDT model

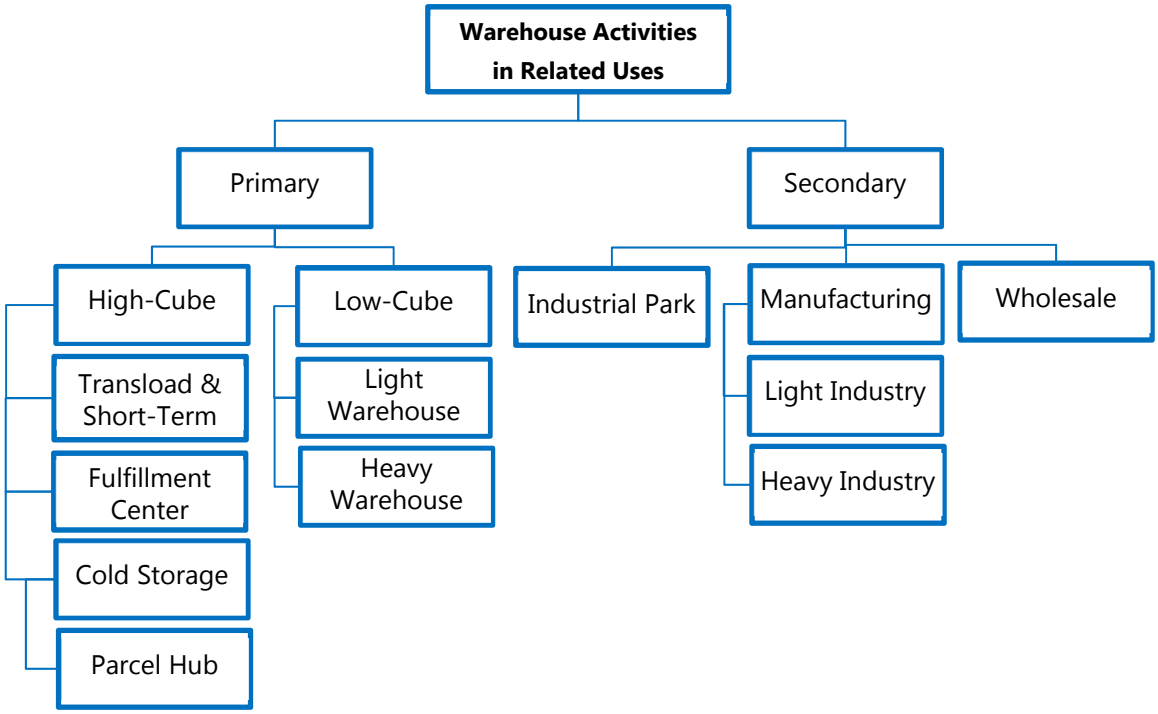
Employee per KSF Ratio	Light HDT Trip Rate	Medium HDT Trip Rate	Heavy HDT Trip Rate	Total Trucks
General Warehouse	1.75	1.32	1.46	4.52
High Cube Warehouse	1.94	1.66	1.10	4.70

The employee ratio in SCAG model seems very high compared to the ITE rates and the Fontana study. This issue was discussed with the SCAG modeling group who advised to only use the warehouse employee information from SCAG model since the 2016 RTP scenarios are based on employee variable and the warehouse square feet variable was not considered ready for use. For this reason, where necessary, employee per KSF conversion rates will be derived from the ITE Trip Generation Manual.

5.5. SUMMARY OF METHODOLOGICAL APPROACHES

Various approaches were reviewed in defining: 1) existing warehouse uses, 2) truck trip generation related to warehouse activities and 3) anticipated future warehouse growth in Riverside County. Although the equations used to estimate truck trips may differ significantly, a more important difference is the source of truck trips and the land use category that relates to each model. Unfortunately, these studies did not adopt a common definition of uses and with the rapid growth in automation in modern warehouses, the employee density may be declining while the related trucking activities may increase. However, in the absence of any other available information, the number of employee is still the primary variable to estimate trucking activities related to warehouse uses. For the purpose of this study effort, it is important to maintain the consistency between identified warehouse-related uses, their trip generation, and the future forecast of each use. **Figure 16** shows the taxonomy of various uses with major warehouse activities.

Figure 16. Taxonomy of Uses with Major Warehouse Activities



The studies that provide methods to estimate trip generation rates for various warehouse activities may aggregate some of these uses due to lack of information. Some methods are more conservative, choosing to include only heavy truck trip generators. Other methods take a more holistic approach, casting a broader net of trip types and weighting them for estimated

volume. No approach is inherently more correct than any other, but one may be more appropriate than others for a given purpose.

A desire for precision would suggest dis-aggregating land use types to the greatest degree possible. For example, distinguishing between high-cube and low-cube. However, this only useful if there is a valid forecast in the growth of these uses at the dis-aggregated level. Furthermore, in the context of impact fee programs, the concept of "rough proportionality" has been determined to be adequate as the basis for establishing a rational nexus and associated fair share fee. For these reasons, the use of more reliable, aggregated data is considered preferable for this study effort, with cross-reference to supplemental data sources to address specific study needs.

Table 20 is a summary of the trip generation data assessed in this report. These data represent the "universe" for trip generation for the purposes of this study effort, and elaborate the related land uses, available of data and applicability for study use.

Table 20. Summary of Uses Related to Warehouse Activities and Trip Generation Methodologies

Land use Category with Significant Warehouse Activity		Trip Generation Reference				SCAG Future Forecast (2040)
		Fontana Study	SCAG RTP (2012 Base Year)	SCAQMD	ITE	
Primary Warehouse Activity	High-cube transload / short-term warehouse			✓	✓	
	High-cube fulfillment center			✓	✓	✓
	High-cube cold storage			✓	✓	
	High-cube parcel hub			✓	✓	
	Light warehouse *	✓	✓		✓	✓
	Heavy warehouse **	✓	✓			
Secondary Warehouse Activity	Industrial park*	✓			✓	
	Light industry (manufacturing)	✓	✓		✓	✓
	Heavy industry (manufacturing)	✓				
	Wholesale		✓		✓	✓

✓ = available but not suitable for primary study use
✓ = available and suitable for supplemental reference
✓ = available and preferred for primary study use
*: Light warehouse also includes "low-cube" as defined by SCAG but not the Fontana Study
**: Heavy warehouse includes "high-cube" as defined by SCAG but not the Fontana Study

Table 21 summarize the trip generation rates presented in this study. It is important to use this table properly and understand the assumptions related to each reference, since there are fundamental differences.

Table 21. Summary Trip Generation Rates Related to Warehouse Activities

Land use Category with / Unit		Trip Generation Reference						
		Fontana Study		SCAG RTP [1]			SCAQMD	ITE (10TH ED)
		Per Employee	Per 1,000 GSF	Per Employee	Per 1000 SF	Per 1,000 GSF [2] (adjusted)	Per 1,000 GSF	Per 1,000 GSF*
Primary Warehouse Activity	High-cube transload /short-term warehouse	0.951	0.725	0.767	0.560	0.384	0.454	0.444
	High-cube fulfillment center						0.717	0.717
	High-cube cold storage						0.836	0.75
	High-cube parcel hub						4.007	2.918
	Light/General warehouse	0.732	0.327	0.673	1.065	0.897	-	0.348
Secondary Warehouse Activity	Industrial park	1.173	0.583	-	-	-	-	0.438
	Light industry/ manufacturing	1.722	2.513	0.219	-	-	-	0.992
	Heavy industry	1.469	2.926		-	-	-	-
	Wholesale	-	-	0.32	-	-	-	0.302

[1] Source: SCAG Internal HDT Truck Model Development Report, 2012

[2] Assuming 2000 square feet per employee in High cube warehouse and 750 square feet per employee in general warehouse

The SCAG HDT model is the only source that provides future forecast for warehousing uses. It provides aggregate level data for high-cube and low-cube warehouse uses, as well as data for secondary manufacturing and wholesale activities, and for consistency, it is the primary recommended data source for this study. Furthermore, the SCAG 2016 RTP model applies trip rates differentiated between general and high-cube warehouse and forecast truck trips from 10 land use types including general and high-cube warehouses. The rates presented in the Fontana study and most recent ITE manual (which incorporates findings from the SCAQMD study) provide supplemental information that can be used to modify the trip rates in the SCAG HDT model to provide further disaggregation of results, as needed.

6. DIAGNOSTIC TESTS OF SCAG MODEL

Best practice for traffic forecasting includes, among other things, checking the traffic model to make sure that it provides reasonable forecasts for the specific area(s) under study. The forecasting model that was selected for this study is the model developed by SCAG for the 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS)[3]. This model was selected because it incorporates the current adopted transportation and land use plan (the 2016 RTP/SCS)[4] and because it covers a sufficiently large geographic area to capture both ends of truck trips to and from logistics warehouses in Riverside County. The SCAG model was validated on a region-wide basis prior to its use for the RTP/SCS[5]. The diagnostic checks conducted for the current study pertained to the model's ability to accurate represent truck trips on freeways in Riverside County.

This first test was to see whether the model replicated the distribution of truck trips based on origin and destinations within the county and in neighboring counties. Utilizing the O-D data described previously, the model results were compared. **Table 22** shows that the model replicates the distribution of truck trips derived from the O-D data very closely.

Table 22: Check of County-Level Truck Origin-Destination Distribution

Trip Type	O-D Survey	2016 SCAG Model
Heavy Trucks		
Internal to Riverside County	47%	46%
One trip-end in Riverside County	53%	54%
Medium Trucks		
Internal to Riverside County	78%	80%
One trip-end in Riverside County	22%	20%

[3] SCAG Standard Disclaimer: "The following modeling analysis was performed by WSP based upon modeling information originally developed by the Southern California Association of Governments (SCAG). SCAG is not responsible for how the Model is applied or for any changes to the model scripts, model parameters, or model input data. The resulting modeling data does not necessarily reflect the official views or policies of SCAG. SCAG shall not be held responsible for the modeling results and the content of the documentation."

[4] Note that the current versions of the two other candidate models, namely RivTAM and the CVAG model, are both based on the (now superseded) 2012 RTP/SCS.

[5] See: *SCAG Regional Travel Demand Model and 2012 Model Validation*, SCAG, March 2016

The next check was to determine how well the model represented traffic flows on Riverside County freeways in the AM and PM peak hours. **Figure 17** and **Figure 18 c**ompare the model's 2016 traffic volumes to counts of actual traffic taken from the Caltrans' Performance Measurement System (PeMS). The figures also show a shaded area that represents the allowable deviation based on Caltrans guidelines[6]. A model is considered generally valid if 75% of the points fall within the allowable deviation. Based on this criterion, the SCAG model is generally valid for Riverside Counties in both the AM peak period (77% within allowable deviation) and the PM peak hour (81%). The figures also show that the model tends to slightly over-estimate traffic, which is a tendency that can be corrected by factoring down the forecasts during post-processing. However, the results indicate a particularly acute overestimation for the traffic on SR-91. Subsequent investigation has determined anomalies in the PeMS data for these locations causing the appearance in the charts that the model is overestimating when in reality, the results are more likely in the same realm as other sampled locations.

The next check was to see how well the SCAG model forecasts truck traffic on freeways in Riverside County, which is particularly relevant to determining the effectiveness of the model for use in this study effort. This test was performed by dividing the Riverside County freeway network into sections, as illustrated in **Figure 19**, and comparing the model's 2016 truck volumes on each section with Caltrans' truck volume data. **Table 23** shows that the model generally does a good job of forecasting truck traffic on the study freeways. The only notable exceptions are for the sections of SR-60/I-215 and SR-91 within the City of Riverside, where the model is over-forecasting truck trips by about a factor of 3. Since the model matches the counts with regards to the percentage of trucks (see the right-most column in **Table 23**, the over-estimate of trucks in the vicinity of Riverside appears to be mainly due to the general over-estimation of trucks in that area, and is consistent with the over estimation of traffic in this area as described previously and illustrated in **Figure 17** and **Figure 18**.

Correcting the general over-forecast of traffic in the vicinity of the City of Riverside central business district should reduce the tendency to over-forecast trucks on those sections of the freeway system. With resolution of this apparent anomaly in the SCAG model, the overall findings of the diagnostic tests of the SCAG model indicate that, with some minor post-processing, it can provide very reasonable forecasts of traffic, and specifically truck traffic, on freeways in Riverside County, and therefore is suitable for use to support the subsequent study evaluation efforts.

[6] *Travel Forecasting Guidelines,* Caltrans, November 1992

Figure 17: Comparison of Model to Actual Traffic in the AM Peak Hour

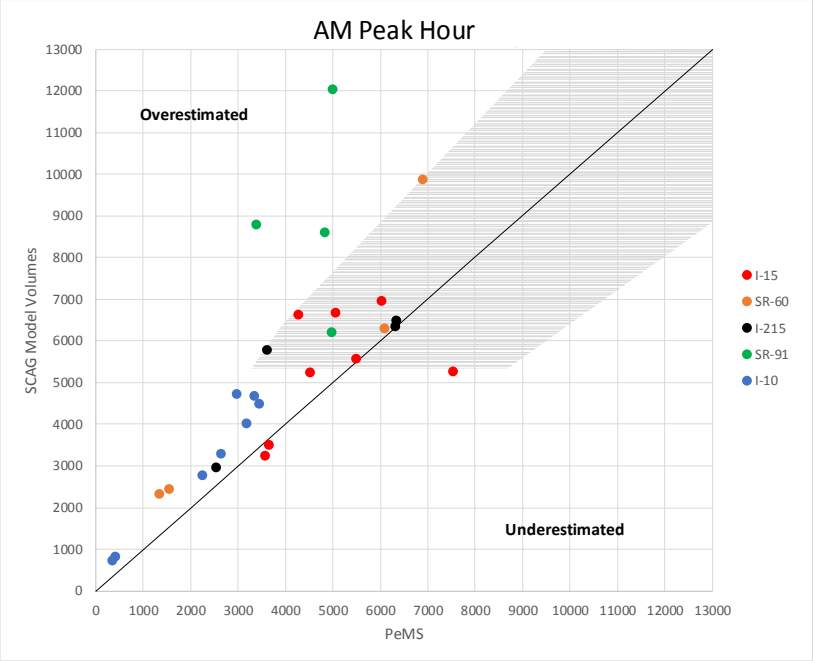


Figure 18: Comparison of Model to Actual Traffic in the PM Peak Hour

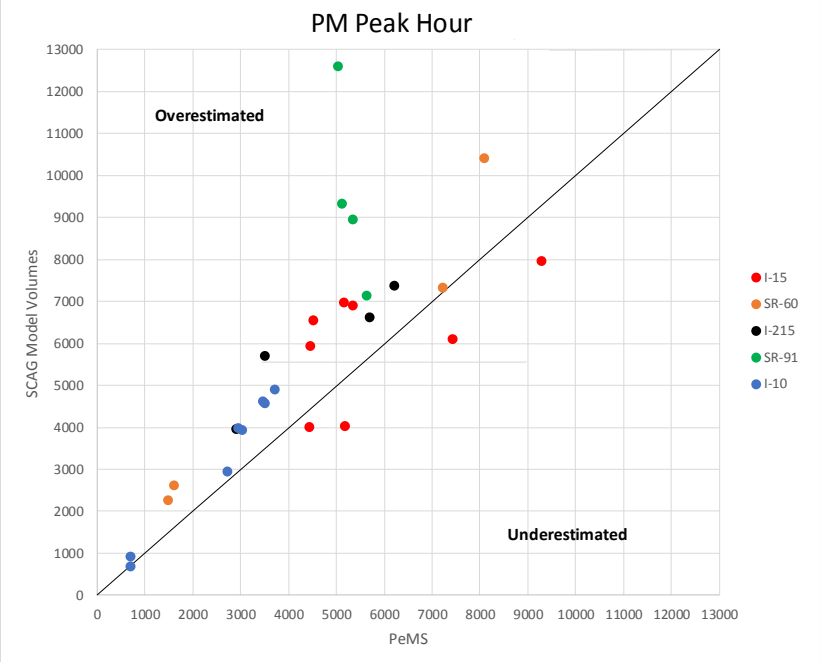


Figure 19: Freeway Sections Used to Check Truck Forecasts

Table 23: Comparison of Model's Truck Volumes to Counts of Actual Truck Traffic

ID	Route	SCAG 2016 Model Daily Volumes			AADT 2015 (Census)			Counts		Difference in Heavy Truck Percentage
		Total Vehicles	Heavy Trucks	Heavy Trucks %	AADT	4+ Axle AADT	Heavy Truck %	Difference Heavy Trucks	Ratio	
1&2	I-15	185,621	9,165	4.9%	151,000	9,082	6.0%	83	1.01	-1.1%
3&4	I-15	139,861	10,033	7.2%	117,000	5,762	4.9%	4,271	1.74	2.2%
7&8	I-15	197,698	9,092	4.6%	190,000	5,857	3.1%	3,235	1.55	1.5%
9&10	I-15	153,487	6,932	4.5%	159,000	6,226	3.9%	706	1.11	0.6%
13&14	SR-60/I-215	210,042	19,361	9.2%	170,000	5,367	3.2%	13,994	3.61	6.1%
15&16	SR 60	66,192	10,448	15.8%	61,000	6,929	11.4%	3,519	1.51	4.4%
17&18	I-215	189,324	7,187	3.8%	153,000	9,747	6.4%	-2,560	0.74	-2.6%
19&20	I-215	121,827	5,590	4.6%	120,000	6,120	5.1%	-530	0.91	-0.5%
23&24	SR-91	276,622	23,815	8.6%	247,000	8,040	3.3%	15,775	2.96	5.4%
25&26	SR-91	191,400	13,614	7.1%	209,000	8,036	3.8%	5,578	1.69	3.3%
27&28	I-10	109,361	9,708	8.9%	93,000	7,821	8.4%	1,887	1.24	0.5%
29&30	I-10	131,961	18,801	14.2%	118,000	16,844	14.3%	1,957	1.12	0.0%
31&32	I-10	96,719	16,418	17.0%	84,000	15,939	19.0%	479	1.03	-2.0%
33&34	I-10	30,654	10,415	34.0%	23,700	7,424	31.3%	2,991	1.40	2.6%

7. DATA ADEQUACY FINDINGS AND RECOMMENDATIONS

The objective of this technical memorandum is to present an overview of warehousing and logistics related development activity in Riverside County, and the availability of appropriate data to assess the impact of this development over time. This document is also intended to provide transparency in the study process by presenting background information regarding the range of data sources available to support the evaluation to be conducted in subsequent tasks.

The review of available data has revealed that Riverside County can expect to see continued development of warehousing and logistics uses in the future, and that growth in warehousing and logistics uses, although focused in specific zones, will occur in cities across Western Riverside County and the Coachella Valley, thereby likely generating impacts across the freeway system. Growth is expected to continue for both low-cube and high-cube warehousing and logistics uses supporting consideration of the impacts associated with the full range of associated development as part of this study, although it is anticipated that the rate of this type of development will decline over time as land availability is reduced for these uses.

SCAG demographic forecasts are provided based on number of employees, although impact fees are most readily applied based on total building (or site) area. The SCAG forecasts follow the NAICS structure which includes several categories associated with warehousing and logistics uses. The NAICS breakdown of employment categories utilized by SCAG supports extraction of warehousing and logistics employment from other uses as the basis to estimate growth in warehousing and logistics use over time. And while the SCAG Warehouse Study information that is expected to incorporate information relating to the growth in building area of warehousing is not considered suitable for use at this time, the availability of various employee to building area ratios will support conversion of the SCAG growth forecasts into growth in building area for the purposes of determining a fee. Furthermore, the availability of trip generation rates for a range of differing warehouse and logistics use types (based on employees and building area) will support the ability to determine a fair share fee amount to reflect the differing levels of impact associated with a variety of different types of warehousing and logistics uses.

A comparison of model outputs, O-D study results and actual traffic counts indicates that the SCAG model does a good job of replicating existing truck travel patterns and traffic conditions on the Riverside County freeway system. Furthermore, anomalies in the model results appear to be explicable and able to be resolved with limited post processing of results. This finding

supports the use of the SCAG model as the primary evaluation tool for study evaluation, with supporting information able to be derived from a variety of other sources for validation and post processing of results to accomplish study needs.

The assessment associated with this study task has determined that a range of adequate, suitable data is available to support the determination of impacts associated with warehousing and logistics uses in Riverside County, and more specifically, the cost associated with mitigating the cumulative regional impacts of new warehousing and logistics development on the freeway system in Riverside County. The specific methodology for applying the various data sources to the study evaluation will be described in subsequent Technical Memoranda. In addition, these subsequent documents will present the study findings and results providing the framework for consideration to establish a regional logistics impact fee program.

RCTC TRUCK STUDY AND REGIONAL LOGISTICS MITIGATION FEE

Supplemental Technical Memorandum 1: Existing and Future Conditions

Model Validation, Calibration and Forecasts

Prepared for :

RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Prepared by:

WSP

In partnership with

FEHR & PEERS

Revised: March 2018

Table of Contents

Table of Figures

1. INTRODUCTION

This supplemental technical memorandum documents the modeling steps used to prepare the forecasts of freeway impacts arising from new logistics development in Riverside County, and presents the results of the model runs.

The first section of this supplemental technical memorandum describes how the model was reviewed and calibrated to correct the problems reported in the earlier Technical Memorandum 1[1]. The second section describes the methodology used to forecast the growth in logistics in Riverside County. This is followed by a section describing the results of the model runs used to identify the impacts of truck traffic arising from new logistics warehouses. The final section of this memo discusses next steps in the analysis process.

2. ADJUSTING THE SCAG MODEL

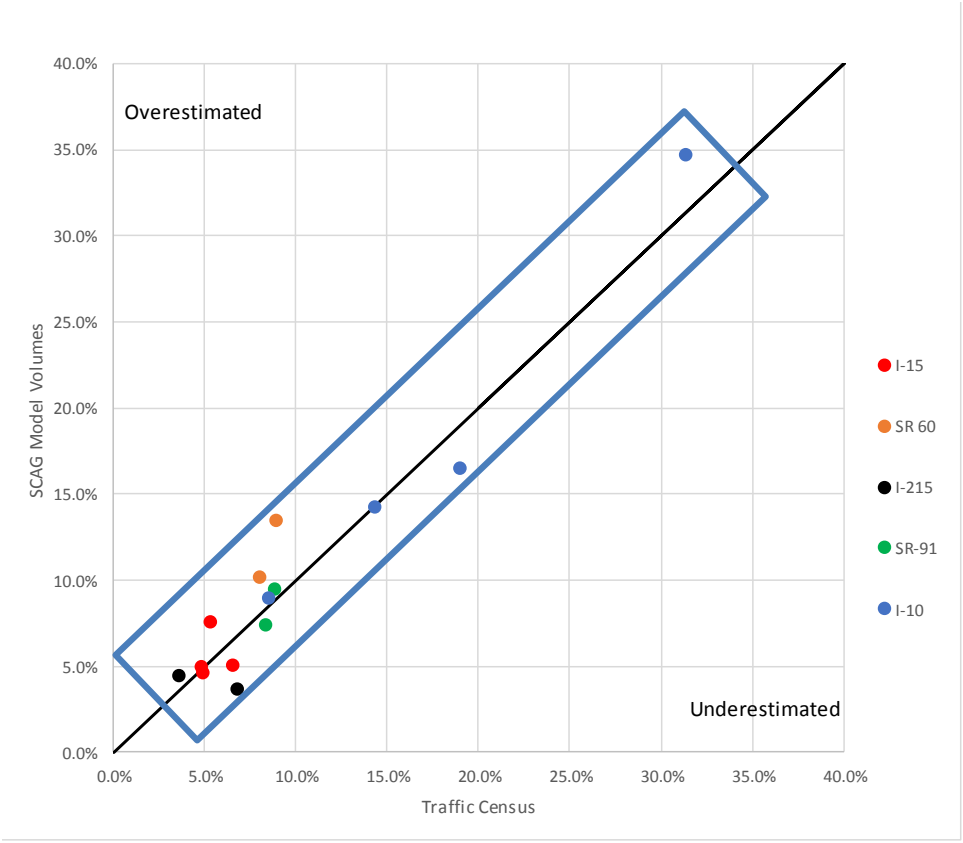
Best industry practice requires that a regional travel demand model be adjusted and re-validated prior to using it for sub-regional studies:

> *"Agencies that use MPO models for purposes other than regional planning should ensure that the model provides the appropriate scale and sensitivity for applications at a sub-regional level such as corridor, sub-area, or local planning studies. Below the regional level, model refinements are likely necessary to ensure the model meets the validation targets established in these guidelines and is appropriately sensitive to smaller scale changes associated with sub-regional studies."*
> *Source: California Regional Transportation Plan Guidelines, California Transportation Commission, 2010.*

Technical Memorandum 1 described a series of diagnostic tests that were performed on the SCAG model to test its validity for use to conduct technical evaluation as part of the RCTC Truck Study and Regional Logistics Mitigation Fee. The tests showed that the model represented truck traffic on Riverside County freeways well. For example, Exhibit 1 compares the percentage of trucks in the traffic on various freeways in the model versus the percentage in the Caltrans performance measurement system (PeMS) data, and Exhibit 2 shows a similar comparison for the truck volumes. The exhibits show a close correlation between the model and actual values, and no systemic tendency towards over- or under-estimating the truck percentage.

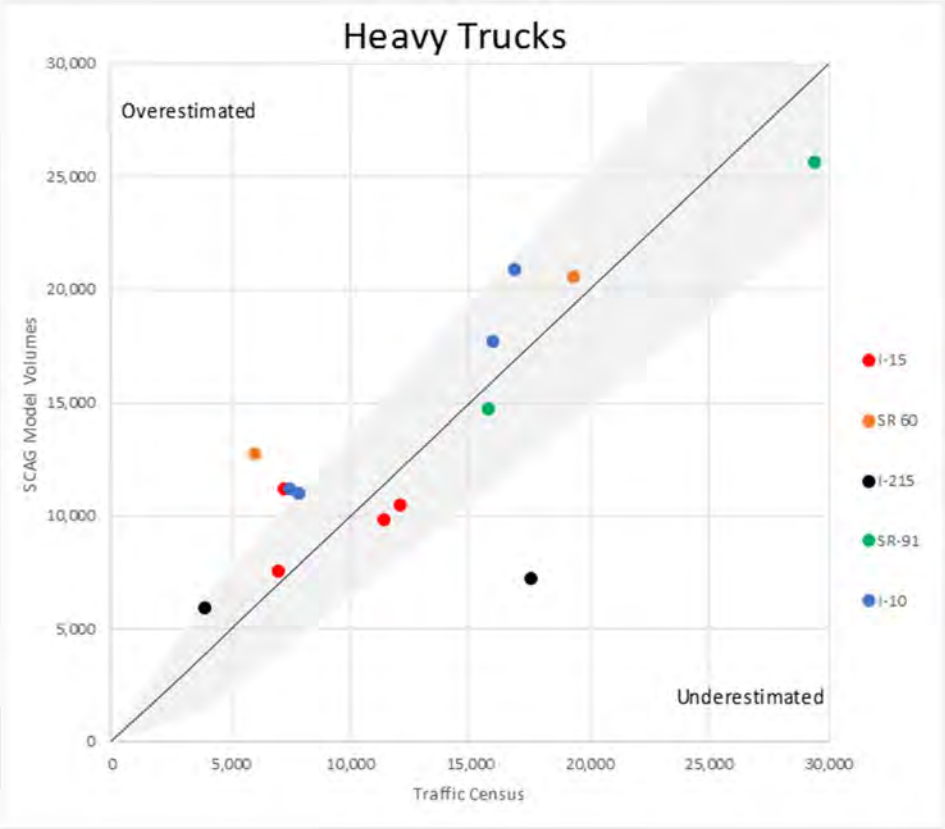
[1] See the discussion of diagnostic tests of the SCAG model in *Technical Memorandum 1: Existing and Future Conditions*, WSP, October 2017

Exhibit 1: Comparison of Modeled to Actual Truck Percentages on Riverside County Freeways



Data sources: SCAG 2016 RTP Travel Demand Model; Caltrans Freeway Performance Monitoring System (PeMS)

Exhibit 2: Comparison of Modeled to Actual Truck Volumes on Riverside County Freeways

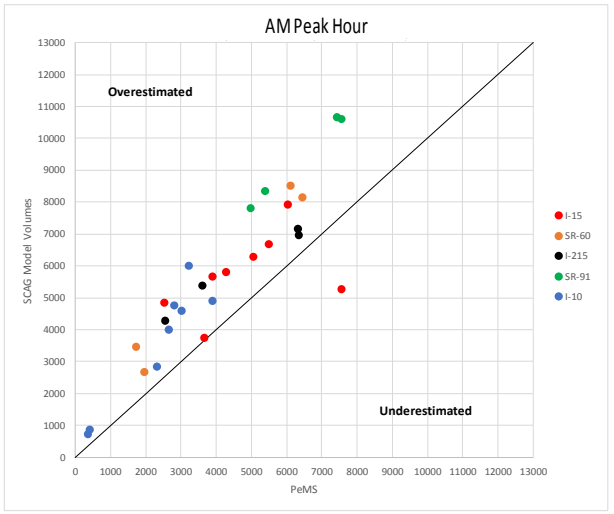


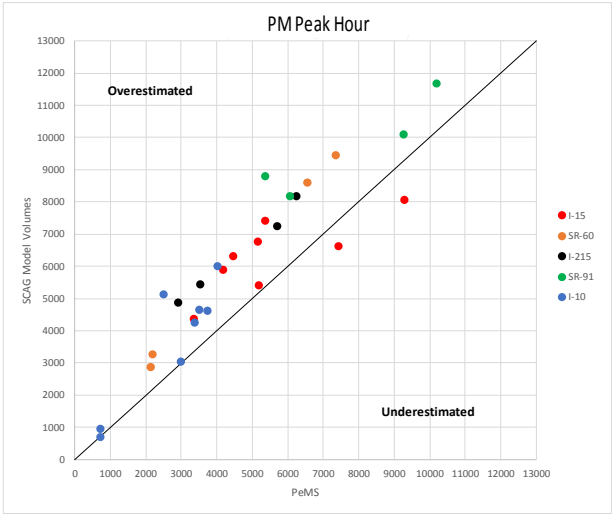
Data sources: SCAG 2016 RTP Travel Demand Model; Caltrans Freeway Performance Monitoring System (PeMS)

However, the tests also revealed that there was an issue warranting adjustment. Exhibit 3 shows link flows from a SCAG model run for 2016 compared to PeMS data for the same year. This data was evaluated two ways, namely:

- The shaded area in Exhibit 3 shows the allowable deviation based on Caltrans guidelines. The allowable deviation reflects the fact that the actual traffic volumes on roads fluctuate from day to day, so the "normal" traffic volume that a model should replicate is a range rather than a fixed value. A model is considered generally valid if 75% of the points fall within the allowable deviation. In this case 77% of the sites are within the allowable range in the AM peak hour and 81% in the PM peak hour, so the model passes this test of validity.
- The second test was to see whether there a general tendency for the model to over-estimate or under-estimate freeway volumes on freeways in Riverside County. The exhibit shows that the model failed this test demonstrating a tendency to over-estimate freeway traffic, as illustrated by the fact the points nearly all fall above the equilibrium line which crosses diagonally through the middle of the exhibits, with an average over-estimation of 26% in the AM peak hour and 20% in the PM peak hour.

Exhibit 3: AM and PM Peak Hour Comparison of Traffic Counts and SCAG Model Volumes





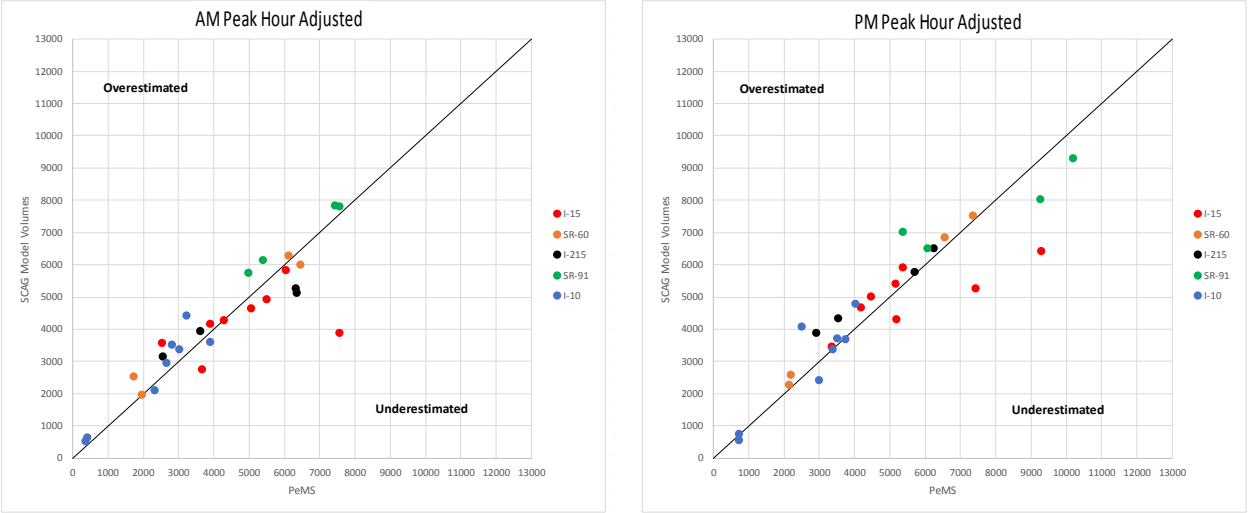
Data sources: SCAG 2016 RTP Travel Demand Model; Caltrans Freeway Performance Monitoring System (PeMS)

Both the AM and PM peak hour overestimates can be reduced by factoring down model volumes in a post-model adjustment. Note that only car volumes were factored down, not truck volumes, because Exhibit 2 showed that the truck volumes were not in error.

Exhibit 4 shows the results after applying the factors of 0.74 and 0.80 in the AM peak hour and PM peak hour. The accuracy of the forecasts was much improved by these adjustments, with the R-squared[2] value increasing from 0.15 to 0.79 in the AM peak hour and from 0.53 to 0.84 in the PM peak hour. The factoring down of the model forecasts to correct for the overestimation of car volumes by the model is important in the context of the study to ensure both existing and future deficiencies on the freeway network are not being overstated.

[2] R-squared is a measure of how well the forecast accounts for variations in the traffic counts. R-squared values can range from 0.00, indicating no relationship between the model values and the counts, to 1.00, indicating that the model accounts fully for variation in the count data set.

Exhibit 4: AM and PM Peak Hour Comparison of Traffic Counts and SCAG Model Adjusted Volumes



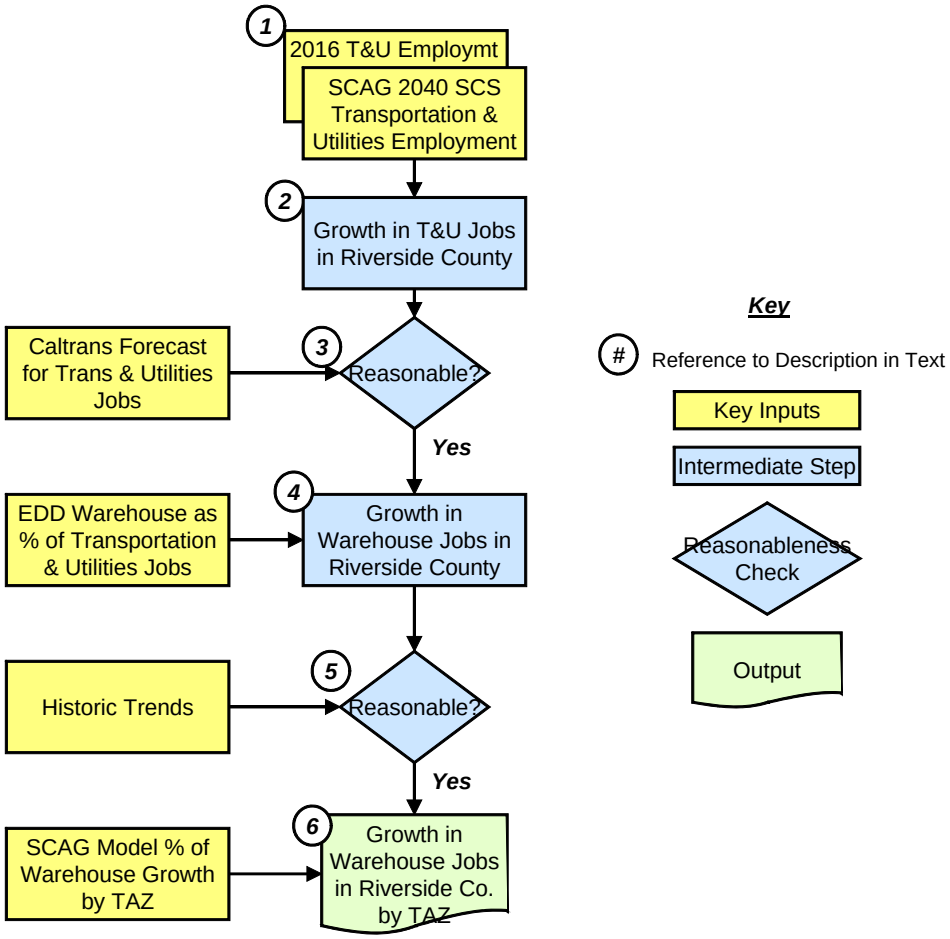
Data sources: SCAG 2016 RTP Travel Demand Model (adjusted volumes); Caltrans Freeway Performance Monitoring System (PeMS)

3. FORECASTING THE GROWTH IN LOGISTICS IN RIVERSIDE COUNTY

The steps used to forecast for the growth in logistics in Riverside County are illustrated in Exhibit 5. The steps in the process are described in the following section. The data sources recommended as the basis to accomplish these steps was previously described in Technical Memorandum 1.

1. The starting point for forecasting logistics growth in Riverside County was the adopted SCAG 2016 RTP/SCS. The SCS included a number of employment categories, of which the most relevant for this study is Transportation and Warehousing (corresponding to NAICS code 48-49). Warehousing employment (NAICS subcategory code 493) is included within this broad category, along with such things as air and rail transportation, trucking, transit, pipeline, and postal service jobs. The SCS data was obtained from SCAG in the form of socio-economic data (SED) inputs for the latest SCAG model (v6.3).
2. The growth in jobs in the Transportation and Warehousing category was derived as the difference in the employment figures for 2016 and 2040.

Exhibit 5: Steps Used to Forecast Logistics Growth



3. Caltrans' Transportation Economics Branch provides annual county-level projections of employment by 2-digit NAICS industry categories out to 2050[3]. Their forecast is shown in Exhibit 6. This was compared to the forecast from the adopted SCAG SCS as a reasonableness check. As can be seen in Exhibit 7, the two forecasts are reasonably consistent. The SCS forecast is a little lower in magnitude than the Caltrans' forecast, making it a more conservative basis for a fee program[4].
4. Next, the growth in employment in the warehouse sub-category needed to be separated out from the growth of the broader Transportation and Warehousing category. The best available data for accomplishing this comes from the California Employment Development Department (EDD). EDD collects data on employment by detailed NAICS industries, but only at the Metropolitan Statistical Area (MSA)

[3] http://www.dot.ca.gov/hq/tpp/offices/eab/socio_economic.html

[4] The Mitigation Fee Act prohibits agencies from over-charging a fee, but not under-charging (in most cases an agency is not required to charge any fee at all). For fee studies it is important not to *over*-state impacts. This is different from studies done pursuant to CEQA, where it is important not to *under*-state impacts.

geography. Moreover, EDD does not include long-term forecasts. Therefore, the EDD historical data for the Riverside-San Bernardino-Ontario MSA extrapolated into the future based on the continuation of historical trend.

The proportion of Transportation and Warehouse employment that is in the warehousing sub-category was computed (see Exhibit 8) to observe the historical trend. As seen in Exhibit 8, 2003 marks an inflection point where the rate of growth in warehousing increases relative to the growth of transportation employment as a whole. Therefore, the post-2003 trend was used to extrapolate from 2016 to 2040 for both for the warehousing sub-category and the rest of Transportation sub-categories.

Exhibit 6: Caltrans Economic Forecast for Riverside and San Bernardino Counties

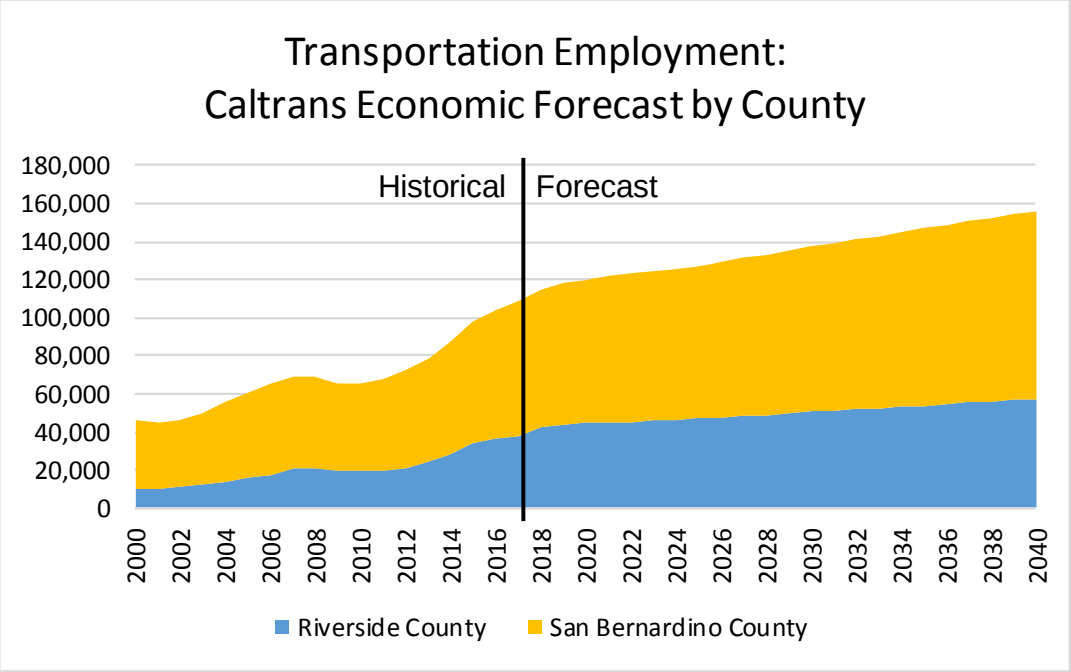


Exhibit 7: Caltrans Economic Forecast Transportation Employment Compared to the SCAG model's Transportation Employment Data for Riverside

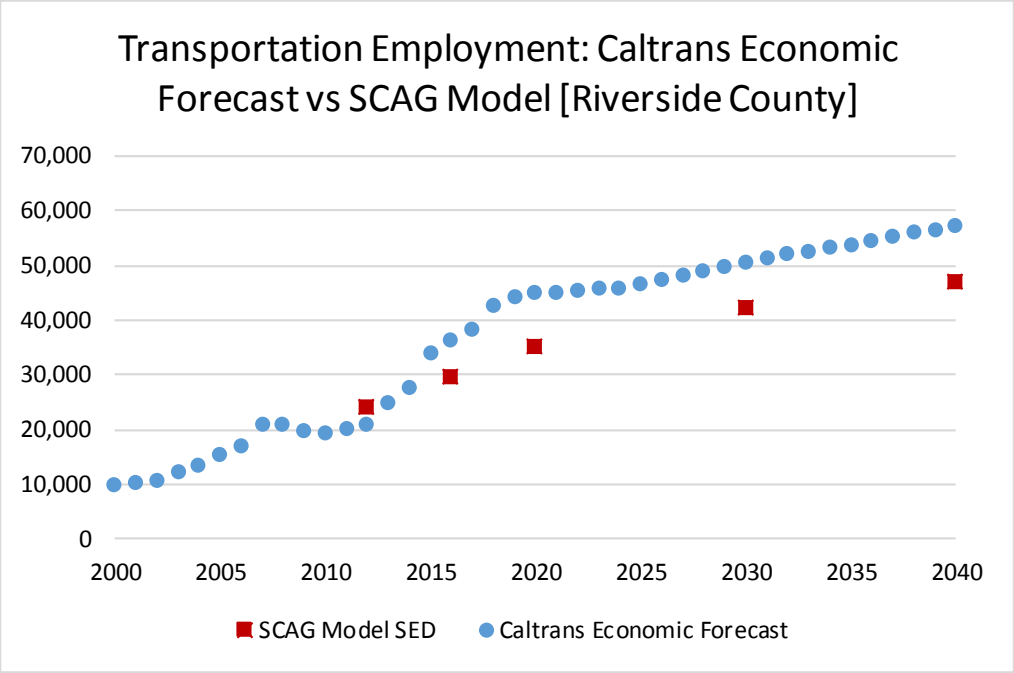
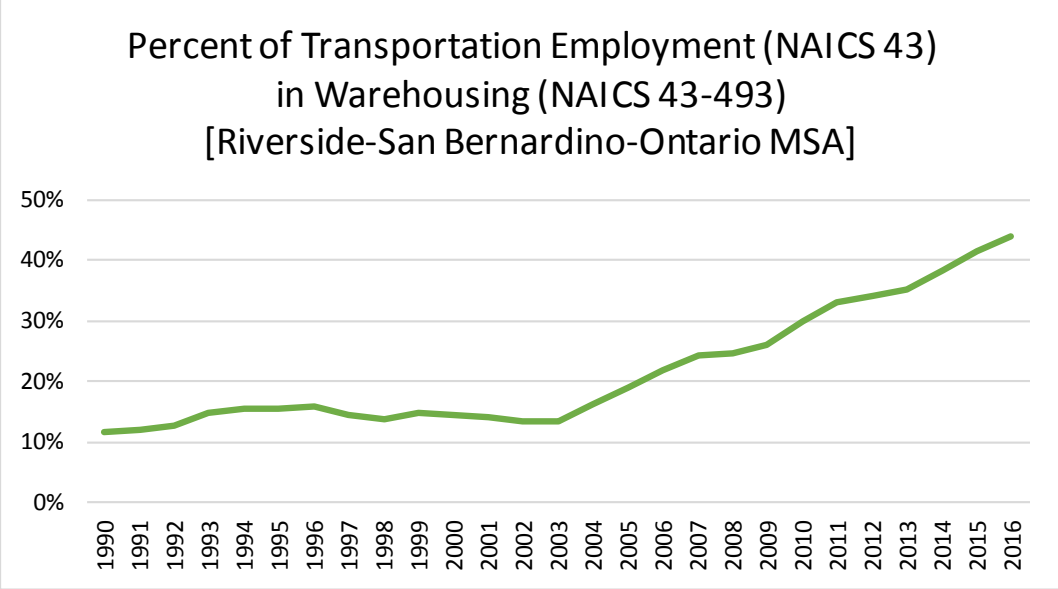


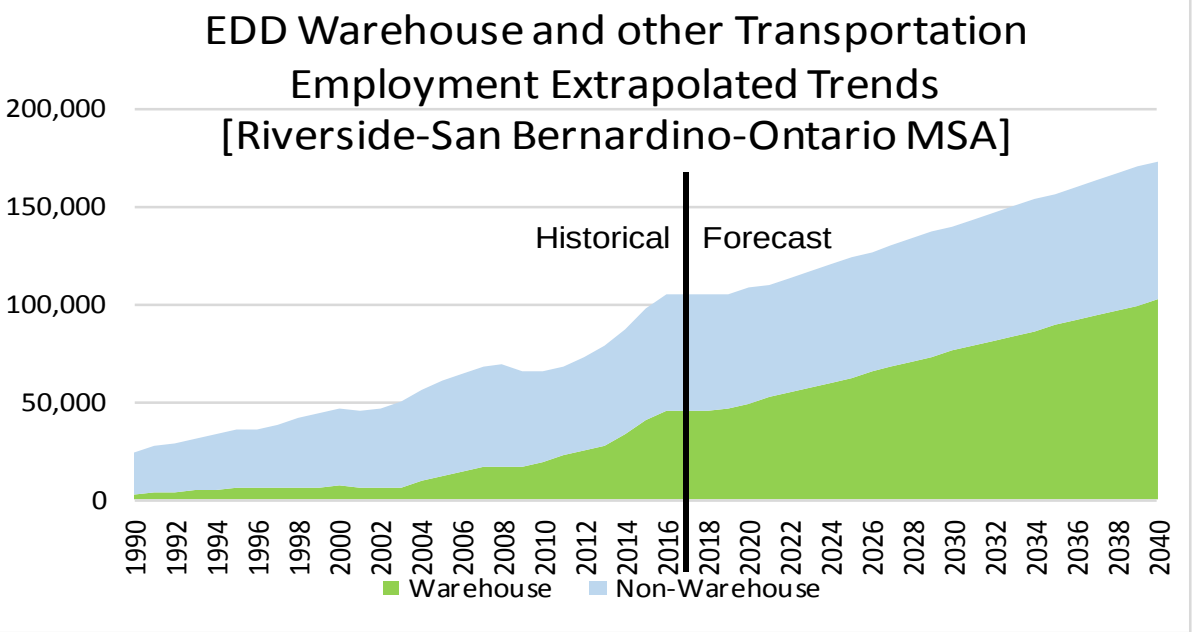
Exhibit 8: The Proportion of Warehousing to Transportation Employment from the Riverside-San Bernardino-Ontario MSA



5. As a reasonableness check, the growth in warehouse jobs and non-warehouse jobs in the Transportation and Warehouse category were compared to historic trends. As can be seen in

6. , the forecasts produced by steps 1 through 4 appear to be reasonable in light of the best available data, and generally reflect a continuation of recent historical trends.

Exhibit 9: Extrapolated EDD to 2040 using the 2003 to 2016 trend for warehousing and other transportation employment

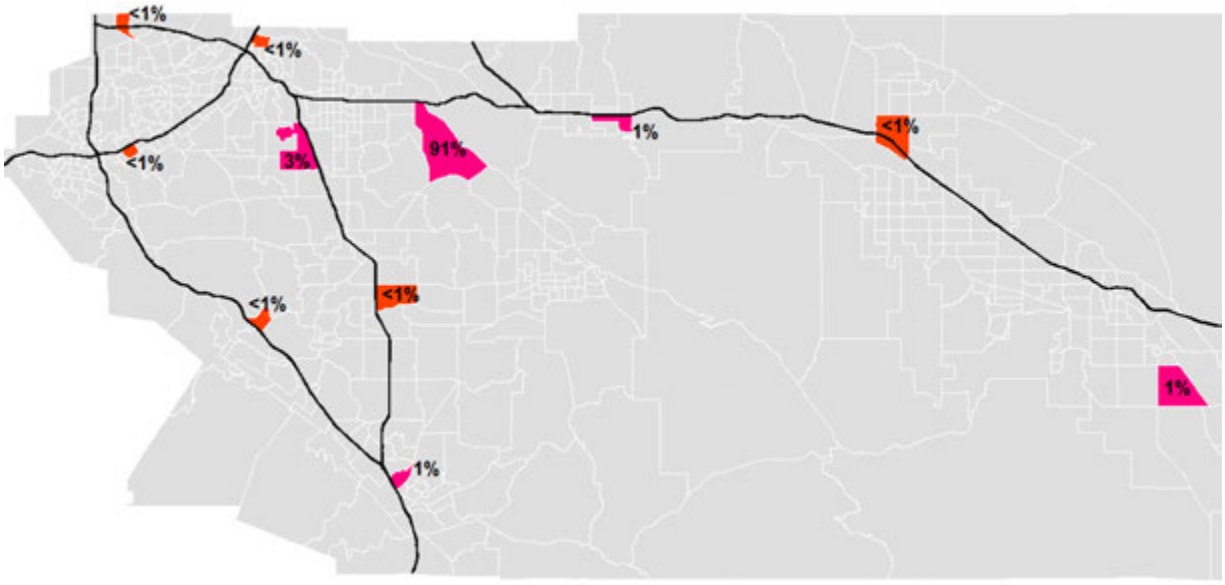


7. Steps 1 through 5 produced a control total for the growth in warehouse jobs in Riverside County, but contain no information about where in the county the jobs would be located. The best available data for the distribution of growth among the traffic analysis zones (TAZs) comes from a study currently underway by SCAG, some products of which are available for modeling purposes[5]. Exhibit 10 shows the TAZs with the highest warehousing growth in the SCAG model SED. The large majority of growth is associated with the World Logistics Center—this TAZ contains 91% of the growth shown for the county at the time the SED was developed. Another 3% of the projected growth is reflected in a TAZ encompassing the western portion of the March Joint Powers Authority (JPA) March Air Force Base Reuse Plan. Three additional TAZ's each show 1% of the forecast growth in warehousing, while six additional TAZs each show warehousing growth of less than 1%.

   The control total from Step 5 was multiplied by the percentage of growth for each TAZ to produce the forecast of the growth in warehouse employment by TAZ.

[5] The on-going SCAG study also produced some forecasts of warehouse jobs by TAZ, but the SCAG team stated that these were very preliminary and recommended that they not be used for the current nexus study.

Exhibit 10: TAZs with Largest Warehousing/Logistics Growth



4. RESULTS OF NEW MODEL RUNS

Once the model was prepared as described in the previous sections, new model runs were performed to forecast various traffic performance measures including the volume-to-capacity V/C ratio for each portion of the freeway network in Riverside County. The V/C ratio was computed using the passenger car equivalent (PCE) factors[6] embedded in the model. The Riverside County Congestion Management Plan (CMP) sets a target LOS of "E" (V/C ratio no greater than 0.99) for freeways, so any segment with a V/C ratio equal to or greater than 1.00 is considered deficient as defined by the CMP.

Exhibit 11 plots the existing freeway V/C ratios geographically. There are three current deficiencies as illustrated: I-15 in the Jurupa Valley, I-215 between downtown Riverside and Moreno Valley, and SR-91 through Corona. It should be noted that in many cases the extents of congestion drivers experience is exacerbated by queuing from downstream segments where deficiencies are observed (i.e. the bottlenecks identified by the model).

Exhibit 12 illustrates the impact of 2040 travel demands on the existing freeway network with no additional capacity improvements. The deficiencies shown in Exhibit 11 worsen and an additional three deficiencies are identified. Both plots only show Western Riverside County because no deficiencies were observed on freeways elsewhere in Riverside.

[6] PCE factors are used to account for the difference in size, speed, and maneuverability between different classes of vehicles, including the effect of slopes on the operating characteristics of trucks.

Exhibit 11: Existing Freeway Deficiencies in Western Riverside County

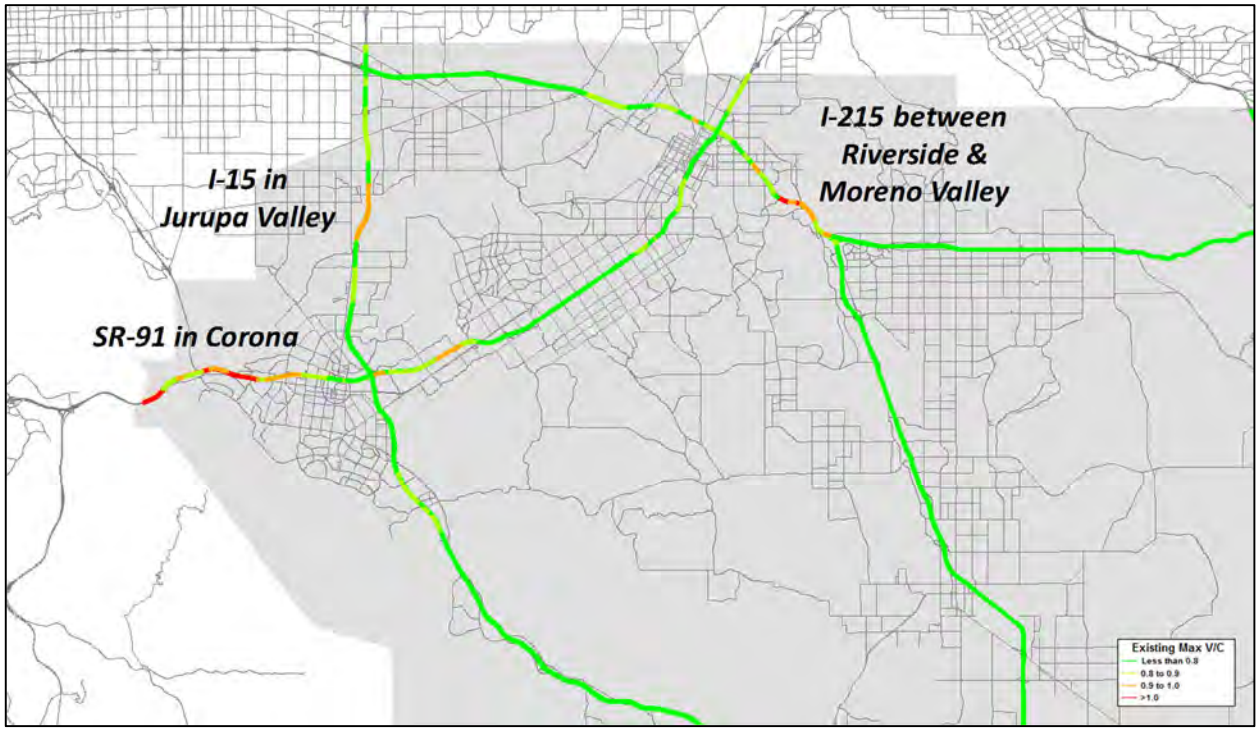


Exhibit 12: Future Freeway Deficiencies in Western Riverside County

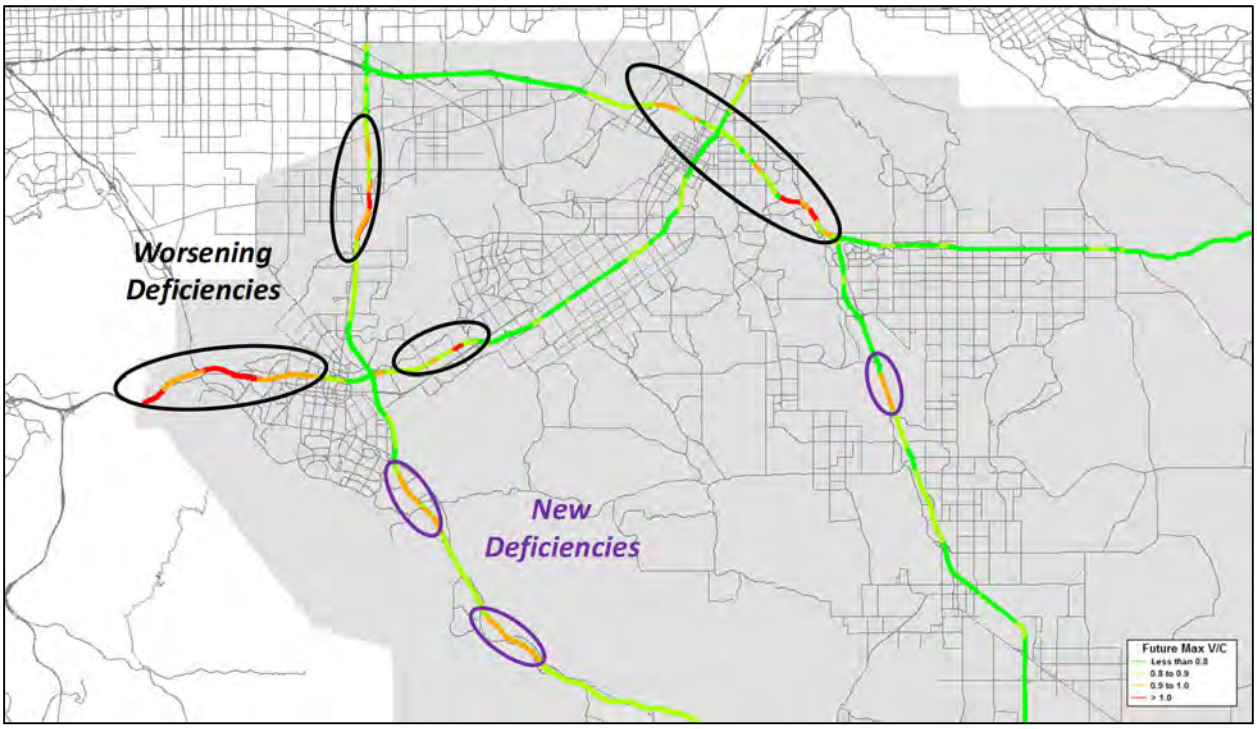
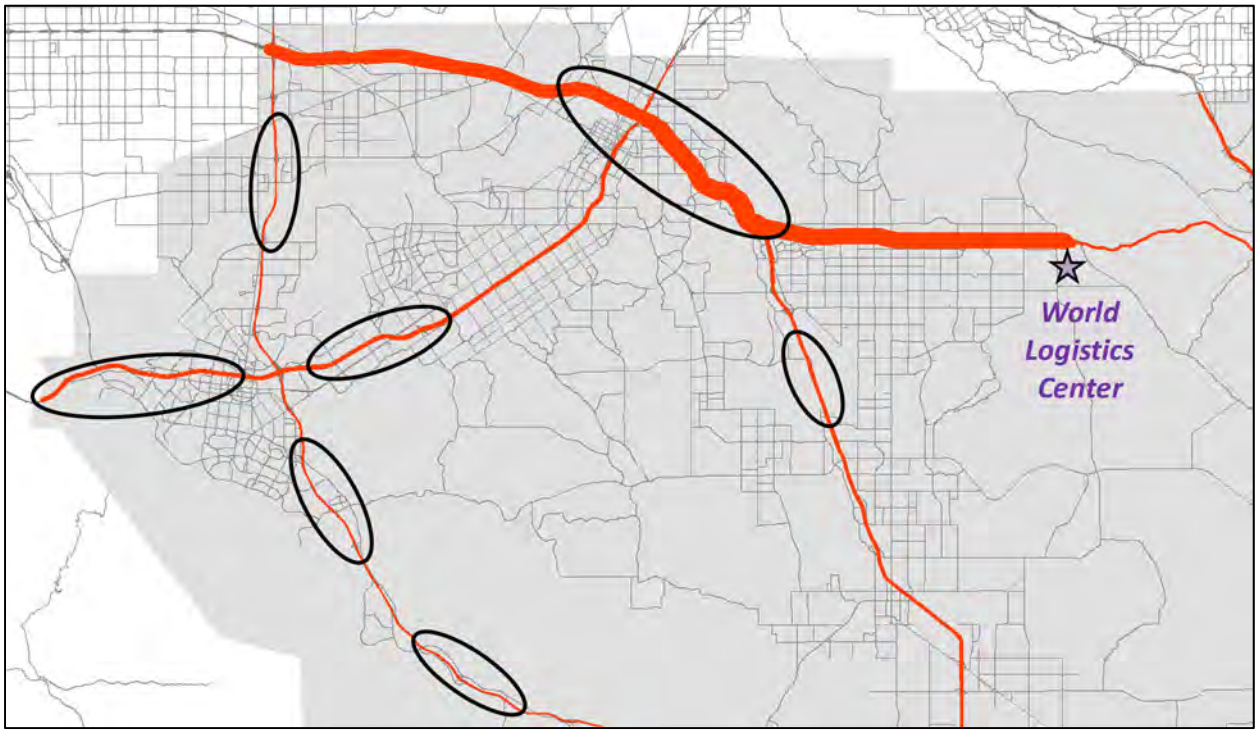


Exhibit 13 shows the relative growth in truck traffic due to new logistics, with the bandwidth being proportional to the increased volume. The largest flows of trucks are forecast to come from truck traffic to and from the proposed World Logistics Center. The largest increases in truck flows would occur on SR-60 and I-215 west of the World Logistics Center. However, truck traffic from new warehouses would contribute to worsening traffic conditions at all of the deficient freeway sections previously identified in Exhibit 11 and Exhibit 12, and as indicated by the black ellipses in Exhibit 13 .

Exhibit 13: New Logistics Trucks on Freeways in Western Riverside County



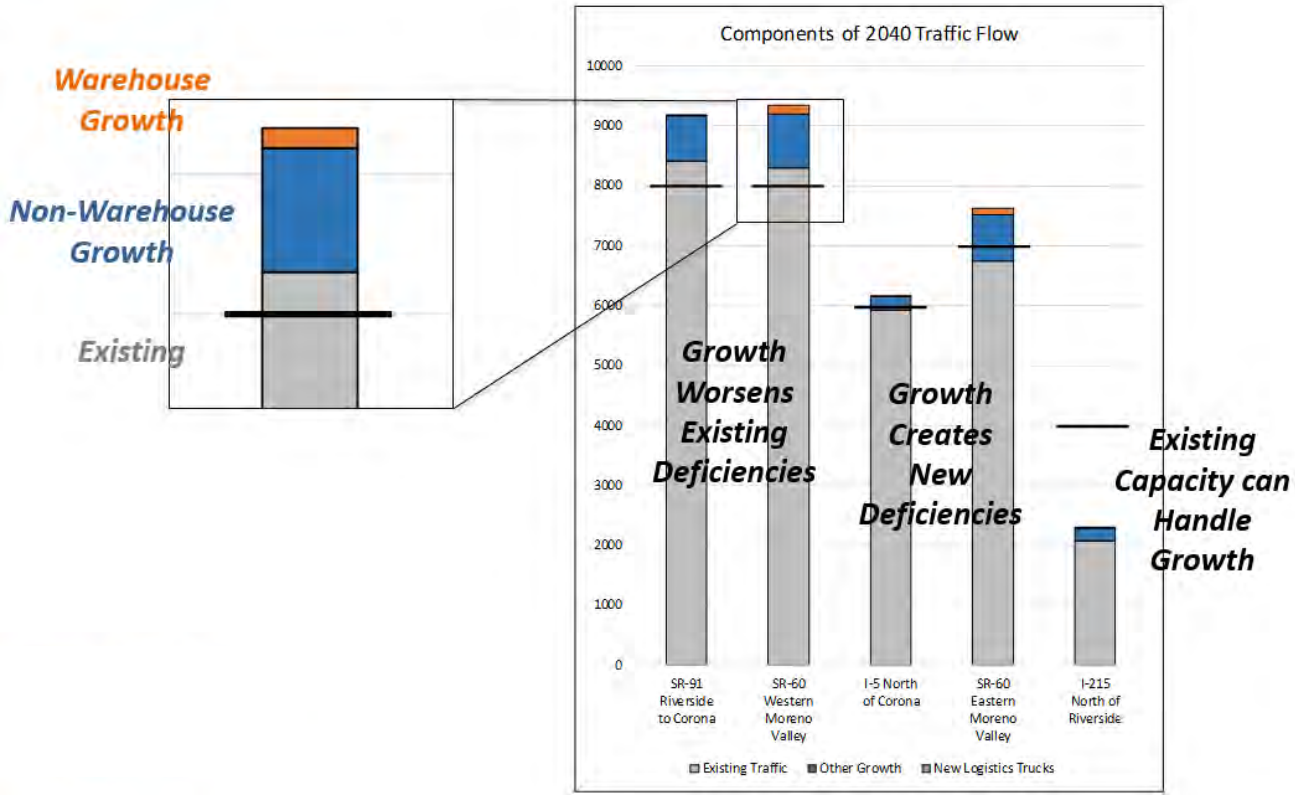
5. NEXT STEPS

Once the existing and future deficiencies were identified and the truck traffic arising from new logistics warehouses was forecast, the next step in the study process will be to determine how much of each future deficiency can be attributed to new truck trips from warehouses. Exhibit 14 shows that there are three possible situations in terms of the determining the relative share of future forecast traffic growth hat may be attributable to growth in warehousing in Riverside County:

- Some freeway segments have an existing deficiency that will be worsened with the addition of traffic from new growth. SR-91 between Riverside and Corona and SR-60 in western Moreno Valley appear to fall into this category. In these cases, the percent of the deficiency attributable to new growth is the portion of the excess traffic (excess being the traffic above the capacity of the road) that arises from new growth rather from existing traffic.
- The second case occurs when the existing traffic volumes are below the capacity of the freeway, but the addition of traffic from new growth creates a deficiency where none previously existed. I-15 north of Corona and SR-60 in eastern Moreno Valley are two examples of this. In such cases 100% of the deficiency can be attributed to new development.
- In the final situation, freeway volumes are below the capacity of the freeway, even when the traffic from new development is added in. In such cases there is no deficiency. No fee can be collected because no improvement is needed to mitigate the impacts of new growth.

It should be noted that in all three examples, the proportion of traffic impacts associated with new warehousing development in Riverside County (illustrated in orange in the exhibit) is relatively small compared to the traffic impacts associated with all other growth (illustrated in blue in the exhibit). As such, the share of the cost of mitigation attributable to growth in warehousing in Riverside County must be commensurate with the relative share of the impact resulting from these uses. Determination of mitigation needs, costs and the relative share attributable to new warehousing in Riverside County will be the subject of the next technical memorandum.

Exhibit 14: Examples of Attribution of 2040 Traffic Flow to Differing Sources



RCTC TRUCK STUDY AND REGIONAL LOGISTICS MITIGATION FEE

Technical Memorandum:
Task 2 – Funding and Cost Analysis

Prepared for :

RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Prepared by:

WSP

In partnership with

FEHR & PEERS

Revised: June 2018

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1. INTRODUCTION

The statutory requirements and legal precedents relating to the imposition of impact fees mandate developing a fully fundable program to ensure that the revenues collected are proportional, adequate and can be spent in a reasonable amount of time to effectively mitigate the resulting impacts. Accomplishing the funding and cost analysis task represents a series of critical steps in the nexus process to identify other available funding sources that will contribute to mitigating the impacts of logistics facilities and other development in the County. This includes quantifying the costs of addressing existing deficiencies in highway infrastructure, the costs to address impacts resulting from other development activities not attributable to the warehousing and logistics sector, and the cost to address the impacts of pass through trips, including goods movement. Additionally, this task will need to establish a program of projects that can be implemented to effectively mitigate the cumulative regional impacts of new logistics related developments and to satisfy requirements for timely revenue expenditure.

The various steps of the nexus development process that contribute to accomplishing this task are summarized as follows. This effort starts by using the traffic data outputs of the prior task to identify capacity deficiencies in the highway network, then determining the proportion of those deficiencies that are attributable to new warehousing and logistics related development. The resultant information can then be cross-referenced with project cost information to determine the overall cost of mitigating freight impacts as the basis for estimating a fee.

2. IDENTIFYING CAPACITY DEFICIENCIES

A primary step in the process of determining the basis for any impact fee program is identifying the extent of the impact that will result from new development activity. For the purposes of this study, the SCAG regional travel demand model was the primary tool used for identifying existing and future capacity deficiencies and determining attribution of deficiencies to new logistics trucking[1]. A modified SCAG model was run for existing (2016) and future with no improvement (2040) conditions. Model outputs were processed to identify deficiencies and percent attributable to new logistics trucking, as described in the following sections.

2.1. ADJUSTING THE SCAG MODEL

The SCAG Model's 2016 scenario year network was used for all model runs with the 2016 and 2040 socio-economic data providing the basis for the demand inputs. These model files were from the version of the SCAG model used to develop the 2016 RTP/SCS. In accordance with best industry practice, some adjustments were made to improve the accuracy of the model

[1] The following model analysis was performed by WSP based upon modeling information originally developed by the Southern California Association of Governments (SCAG). SCAG is not responsible for how the model is applied or for any changes to the model scripts, model parameters, or model input data. The resulting modelling data does not necessarily reflect the official views or policies of SCAG. SCAG shall not be held responsible for the modeling results and the content of the documentation.

with respect to freeways in Riverside County. These adjustments are described in an earlier technical memorandum[2].

2.1.1. Model Validation

Best industry practice requires that a regional model be adjusted and re-validated prior to using it for sub-regional studies:

> *"Agencies that use MPO models for purposes other than regional planning should ensure that the model provides the appropriate scale and sensitivity for applications at a sub-regional level such as corridor, sub-area, or local planning studies. Below the regional level, model refinements are likely necessary to ensure the model meets the validation targets established in these guidelines and is appropriately sensitive to smaller scale changes associated with sub-regional studies."* From *2010 California Regional Transportation Plan Guidelines*, California Transportation Commission.

The previous technical memorandum described a series of diagnostic tests that the study team performed on the SCAG model to test its validity for use in a freeway impact fee nexus study. The tests showed that the model represented truck traffic on Riverside County freeways well. For example, Figure 2-1 compares the percentage of trucks in the traffic on various freeways in the model versus the percentage in the Caltrans performance measurement system (PeMS) data, and Figure 2-2 shows a similar comparison for truck volumes. There is a close correlation between the model and actual values, and no systemic tendency towards over- or under-estimating the truck percentage.

[2] See the discussion of diagnostic tests of the SCAG model in *Technical Memorandum 1: Existing and Future Conditions*, WSP, July 2017

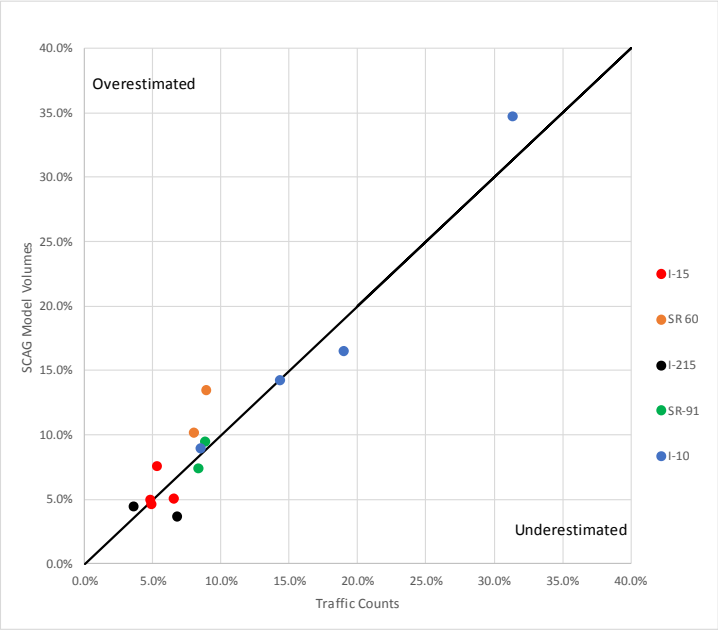


Figure 2-1: Comparison of Modeled to Actual Daily Truck Percentages on Riverside County Freeways

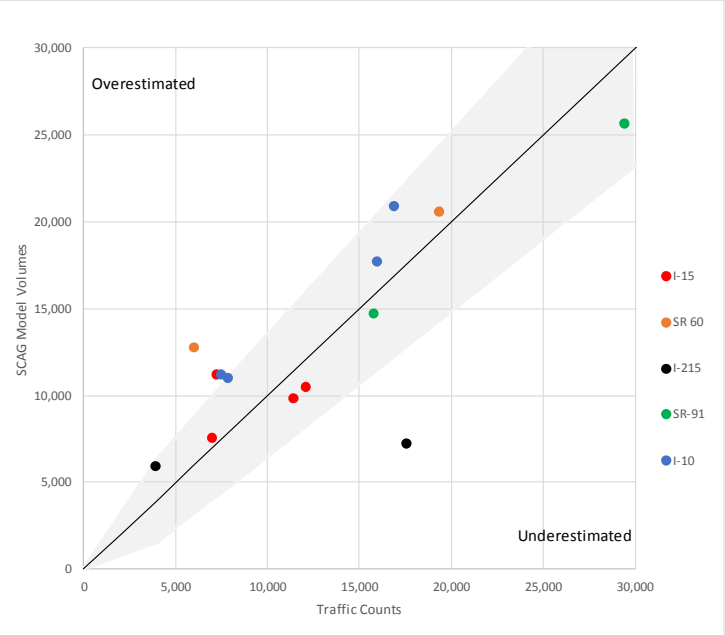


Figure 2-2: Comparison of Modeled to Actual Daily Truck Volumes on Riverside County Freeways

However, the tests also revealed that there was an issue warranting adjustment. Figure 2-3 shows link flows from a SCAG model run for 2016 compared to PeMS data for the same year. This data was evaluated two ways, namely:

- The shaded areas in Figure 2-2 and Figure 2-3 show the allowable deviation based on Caltrans guidelines. The allowable deviation reflects the fact that the actual traffic volumes on roads fluctuate from day to day, so the "normal" traffic volume that a model should replicate is a range rather than a fixed value. A model is considered generally valid if 75% of the points fall within the allowable deviation. In this case 77% of the sites are within the allowable range in the AM peak hour and 86% in the PM peak hour, so the model passes this test of validity.
- The second test was to see whether there was a general tendency for the model to over-estimate or under-estimate freeway volumes on freeways in Riverside County. Figure 2-3 shows that the model failed this test; over-estimating traffic on Riverside County freeways by an average of 26% in the AM peak hour and 20% in the PM peak hour.

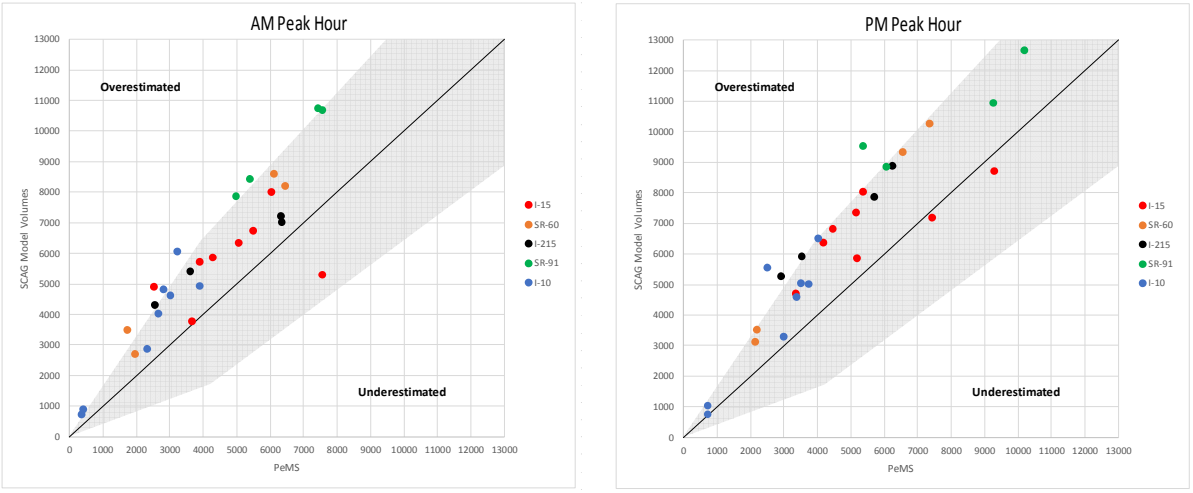


Figure 2-3: AM and PM Peak Hour Comparison of Traffic Counts and SCAG Model Volumes

The model overestimation can be reduced by factoring down model volumes in a post-model adjustment. Only car volumes were factored down, not truck volumes, because truck volumes did not show the same trend (see Figure 2-2).

Figure 2-4 shows the results after applying factors of 0.74 and 0.80 in the AM peak hour and PM peak hour, respectively. After adjustments, the R-squared[3] value increased from 0.11 to 0.79 in the AM peak hour and from 0.51 to 0.84 in the PM peak hour.

3 R-squared is a measure of how well the forecast accounts for variations in the traffic counts. R-squared values can range from 0.00, indicating no relationship between the model values and the counts, to 1.00, indicating that the model accounts for all variation in the count data set.

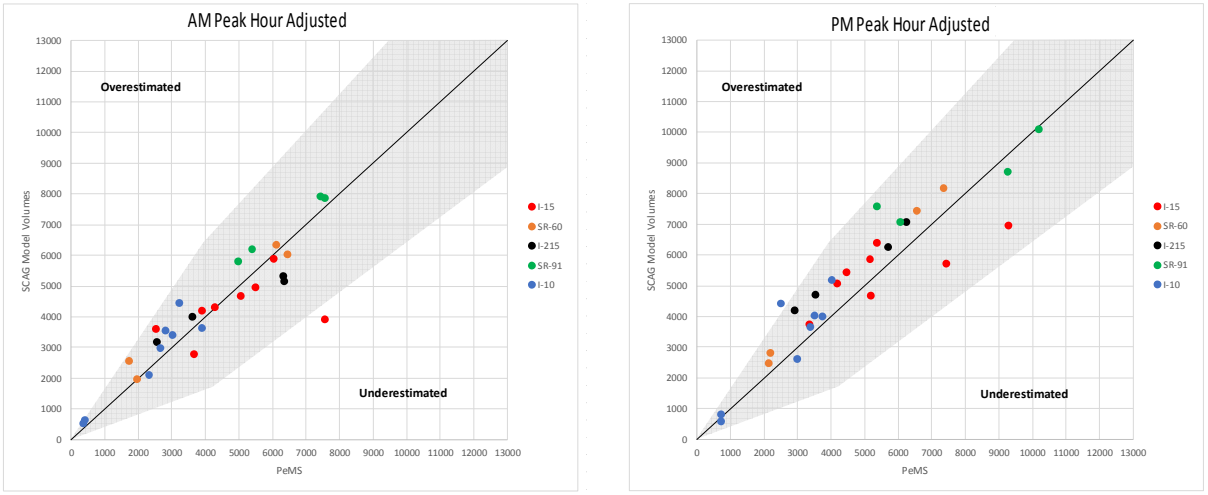


Figure 2-4: AM and PM Peak Hour Comparison of Traffic Counts and SCAG Model Adjusted Volumes

2.1.2. Forecasting the Growth in Logistics Employment in Riverside County

The steps used to forecast for the growth in logistics in Riverside County are outline in Figure 2-5 below.

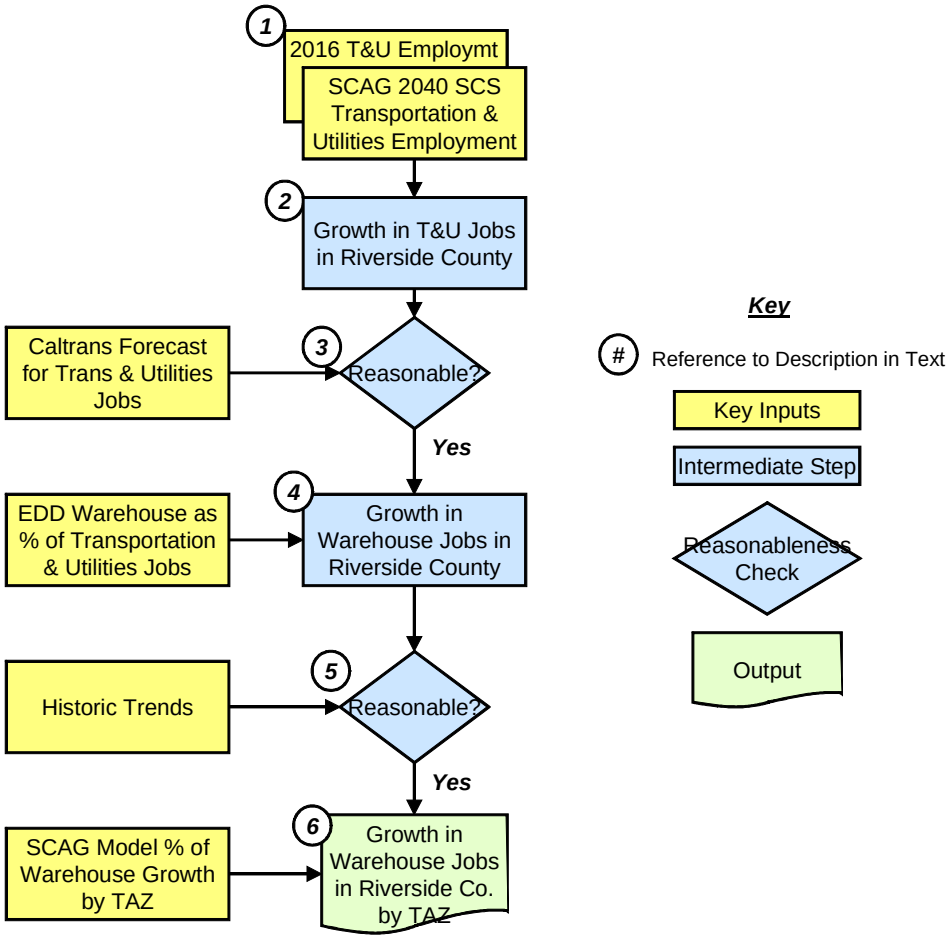


Figure 2-5: Steps Used to Forecast Logistics Growth

The steps in the process were:

1) The starting point for forecasting logistics growth in Riverside County was the adopted SCAG 2016 RTP/SCS. The SCS socio-economic data (SED) included several employment categories, of which the most relevant for this study is Transportation and Warehousing (corresponding to NAICS code 48-49). Warehousing employment (NAICS subcategory code 493) is included within this category, along with other types of employment such as air and rail transportation, trucking, transit, pipeline, and postal service. The SCS data was obtained from SCAG in the form of SED inputs for the latest SCAG model (v6.3).

2) The growth in jobs in the Transportation and Warehousing category was derived as the difference in the employment figures for 2016 and 2040.

3) Caltrans' Transportation Economics Branch provides annual county-level projections of employment by 2-digit NAICS industry categories out to 2050[4]. Their forecast is shown in Figure 2-6. This was compared to the forecast from the adopted SCS as a reasonableness check. As can be seen in Figure 2-7, the two forecasts are reasonably consistent. The SCS forecast is a little lower than the Caltrans' forecast, representing a more conservative forecast as the basis a fee program[5].

4) Next, the growth in employment in the warehouse sub-category needed to be separated out from the growth of the broader Transportation and Warehousing category. The best data available for doing this comes from the California Employment Development Department (EDD). EDD collects data on employment by detailed NAICS industries, but only at the Metropolitan Statistical Area (MSA) geography. Moreover, EDD does not include long-term forecasts. Therefore, the EDD historical data for the Riverside-San Bernardino-Ontario MSA had to be extrapolated into the future.

   First, the proportion of Transportation and Warehouse employment that is in the warehousing sub-category was computed (see Figure 2-8) to observe the historical trend. As seen in Figure 2-8, 2003 marks an inflection point where the rate of growth in warehousing increases relative to the growth of transportation/warehousing employment overall. Therefore, the post-2003 trend was used to extrapolate from 2016 to 2040 for both for the warehousing sub-category and the rest of Transportation sub-categories.

5) As a reasonableness check, the growth in warehouse jobs and non-warehouse jobs in the Transportation and Warehouse category were compared to historic trends. As can be seen in Figure 2-9, the forecasts produced by steps 1 through 4 appear to be reasonable considering the best available data.

6) Steps 1 through 5 produced a control total for the growth in warehouse jobs in Riverside County, but contain no information about where in the county the jobs would be located. Locational data is needed so that the growth will be properly represented in the forecast in terms of where they will affect the freeway system.

   The best available data for the distribution of growth among the traffic analysis zones (TAZs) comes from a study currently underway by SCAG, some products of which are available for modeling purposes[6]. Figure 2-10 shows the TAZs with the highest warehousing growth in the SCAG model SED. The large majority of growth is associated

[4] http://www.dot.ca.gov/hq/tpp/offices/eab/socio_economic.html

[5] Impact fee programs must demonstrate a rational nexus and rough proportionality between the nature of the development that would be subject to the fee, the magnitude of the impact being created, and the cost to mitigate the specific impact. For fee studies, it is important not to *over*-estimate impacts or thr required mitigation, which can be different from other types of traffic impact studies done pursuant to CEQA, where it is typically more important not to *under*-estimate impacts.

[6] The on-going SCAG study also produced some forecasts of warehouse jobs by TAZ, but the SCAG team stated that these were very preliminary and recommended that they not be used for the current nexus study.

with the World Logistics Center—this TAZ contains 91% of the growth for the county. After the five TAZ with the largest growth, there are six TAZs each with less than 1% of the warehousing employment in the county.

The control total from Step 5 was multiplied by the percentage of growth for each TAZ to produce the forecast of the growth in warehouse employment by TAZ.

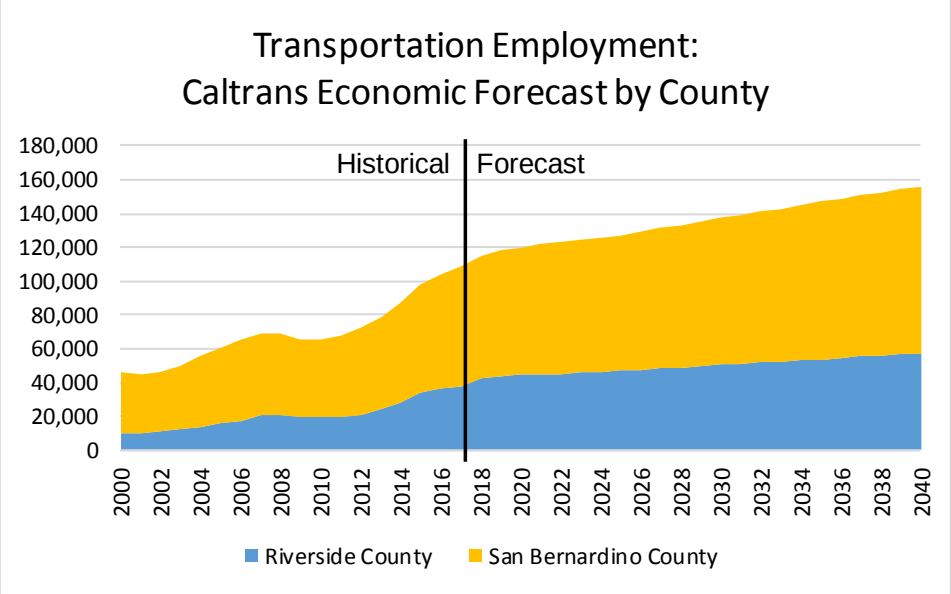


Figure 2-6: Caltrans Economic Forecast for Riverside and San Bernardino Counties

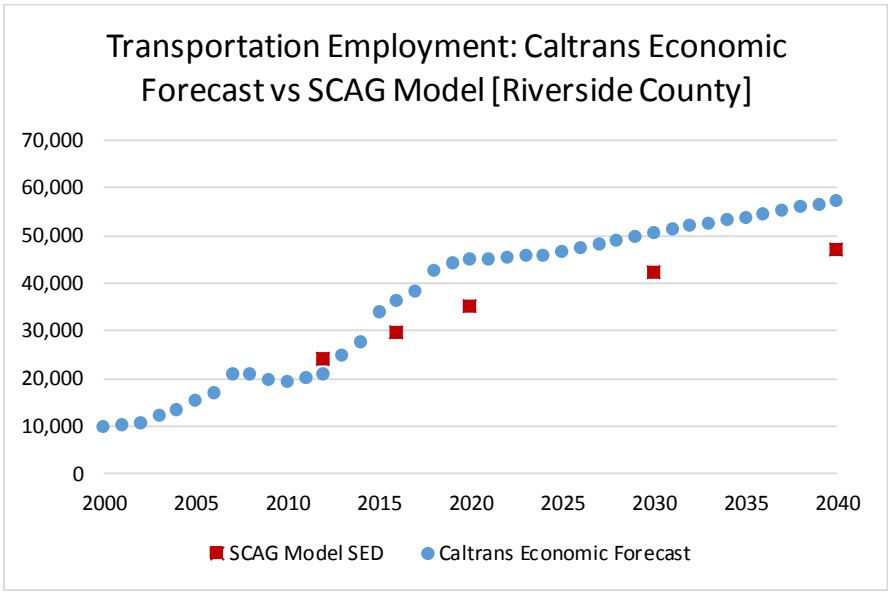


Figure 2-7: Caltrans Economic Forecast Transportation Employment Compared to the SCAG model's Transportation Employment Data for Riverside

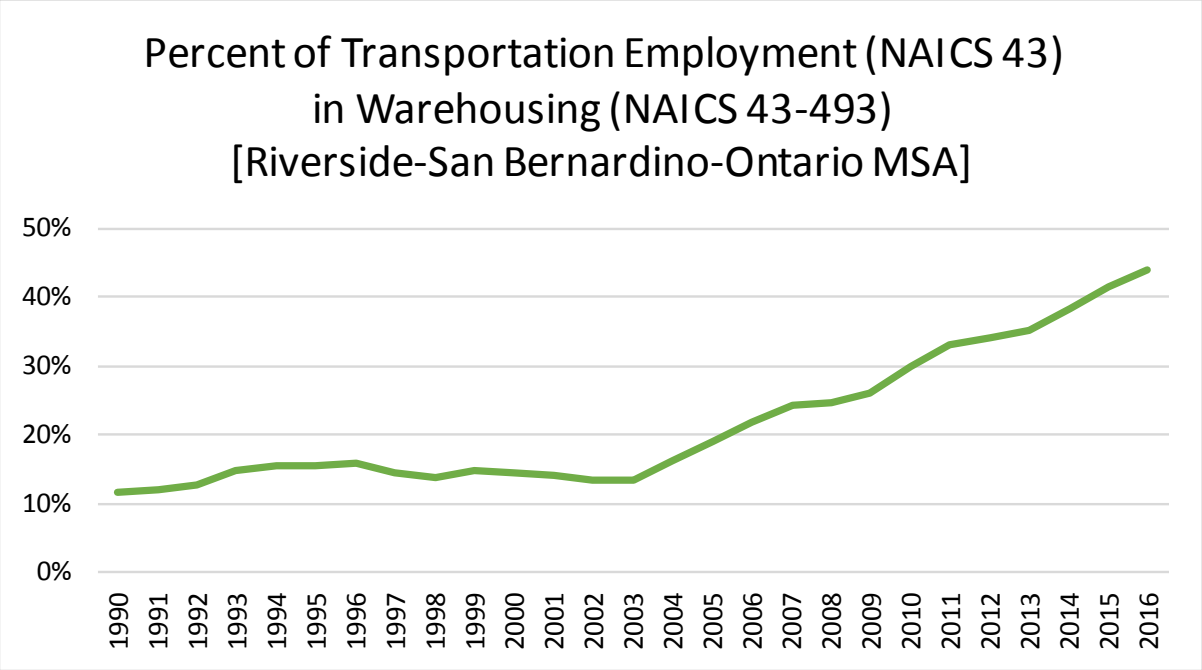


Figure 2-8: The Proportion of Warehousing to Transportation Employment from the Riverside-San Bernardino-Ontario MSA

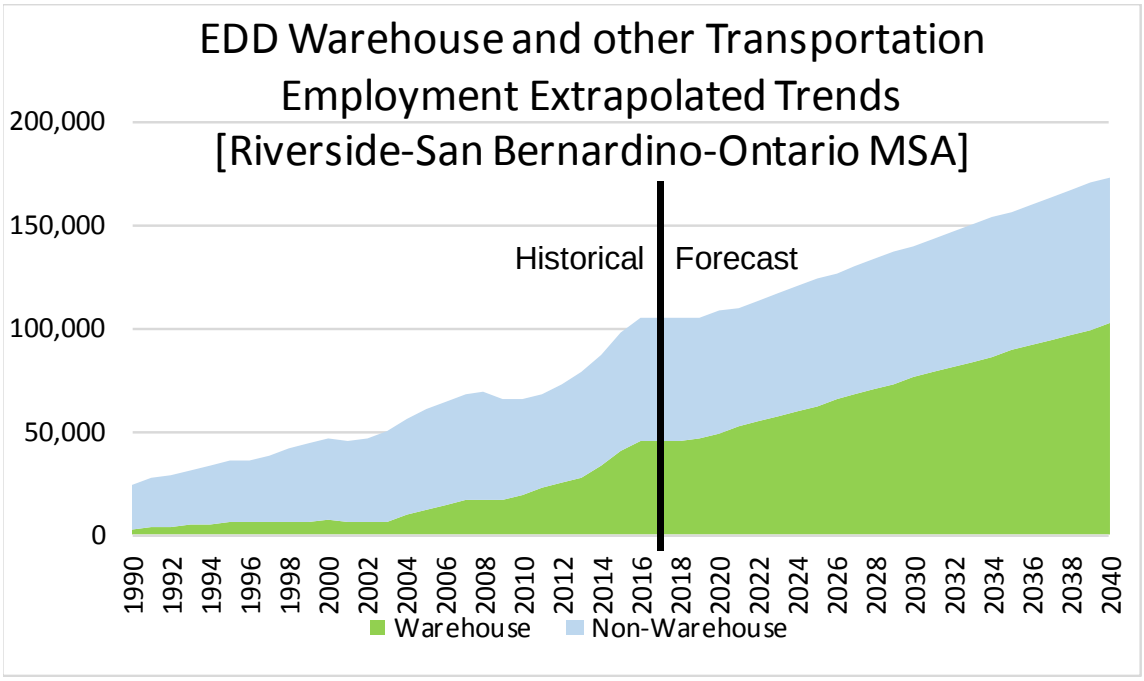


Figure 2-9: Extrapolated EDD to 2040 Using the 2003 to 2016 Trend for Warehousing and Other Transportation Employment

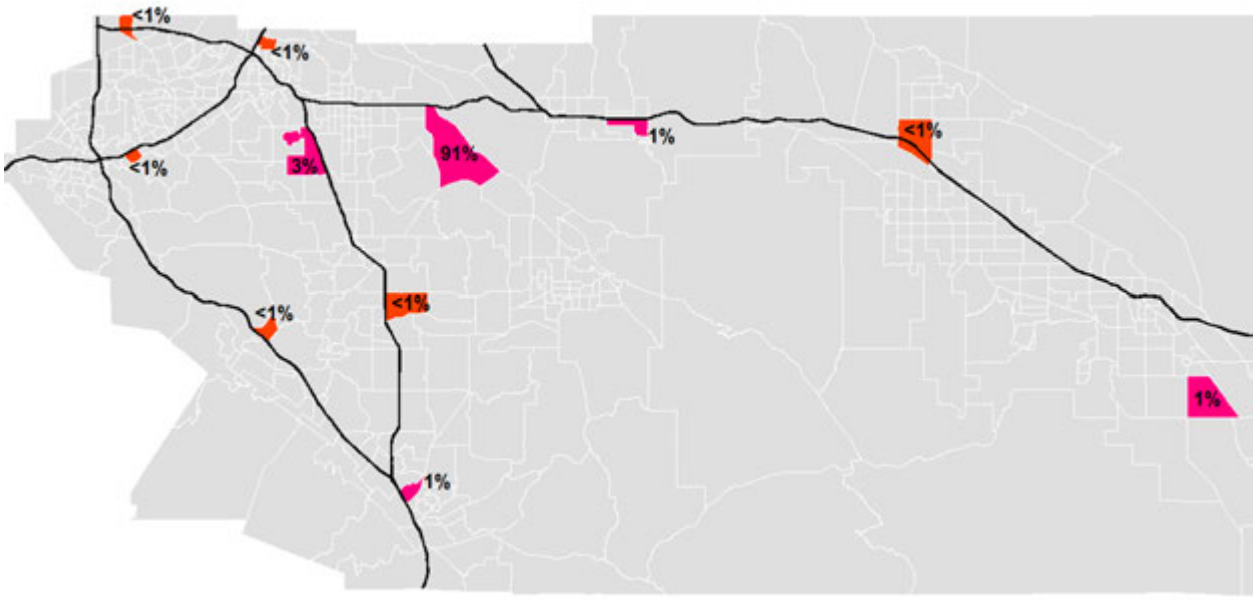


Figure 2-10: TAZs with Largest Warehousing/Logistics Growth in Riverside County

2.1.3. Model Post Processing

The model data was post-processed to calculate peak hour volume-to-capacity (V/C) ratios and identify deficiencies. Link data was processed for all freeway links in Riverside County. The SCAG model generates link flows for the AM peak (3-hour) and PM (4-hour) peak periods. Peak period flows for non-trucks were converted to hourly flows using conversion factors of 0.35 and 0.28 for AM and PM peak hours, respectively. These factors were taken from *San Bernardino County CMP Appendix H – Post Processed Traffic Volume Guidelines* and are widely used in model applications in Riverside and San Bernardino Counties. Trucks were assumed to have a flat demand for each hour within a peak period (i.e. factors of 0.33 and 0.25 for AM and PM). Then, the validation factors discussed in Section 2.1 (0.74 and 0.80 in the AM and PM peak hours, respectively) were applied to non-truck flows.

2.2. Identifying Deficiencies

The V/C ratio was computed for each link in the AM and PM peak hours using the capacities and passenger car equivalent (PCE) factors[7] embedded in the SCAG model which account for grade. Per the RCTC Congestion Management Program, the adopted minimum Level of Service (LOS) threshold for freeways in Riverside County is LOS "E" meaning that facilities with a V/C ratio of 1.0 or higher are considered deficient.

Figure 2-11 and Figure 2-13 show the existing V/C ratios for the AM peak hour and PM peak hour, respectively. There are three current deficiencies identified in Riverside County: SR-91 in Corona during the both the AM and PM peak hours, I-15 in the Jurupa Valley during the PM peak hour, and I-215 between Riverside and Moreno Valley during the PM peak hour. These congested sections may result in queuing in upstream sections whose V/C ratios would not in themselves be problematic, so drivers may perceive the problem sections to be longer than shown.

Figure 2-12 and Figure 2-14 shows 2040 traffic demand assigned to the existing network[8] with no capacity improvements for the AM and PM peak hours, respectively. The existing deficiencies would worsen and two additional deficiencies in the AM peak hour and five additional deficiencies in the PM peak hour would be created.

7 PCE factors are used to account for the difference in size, speed, and maneuverability between different classes of vehicles, including the effect of slopes on the operating characteristics of trucks.

8 The SCAG existing model network represents the current state of the transportation system in 2016 and does not reflect those projects completed since 2016. In Riverside County, the SR-91 Express Lanes Extension project that included various freeway improvements along SR-91 from the Orange County line to I-15 was completed after 2016. Projects completed after 2016 (as well as projects currently under construction) get reconciled during subsequent study steps, as described in Chapter 4 of this technical memorandum.

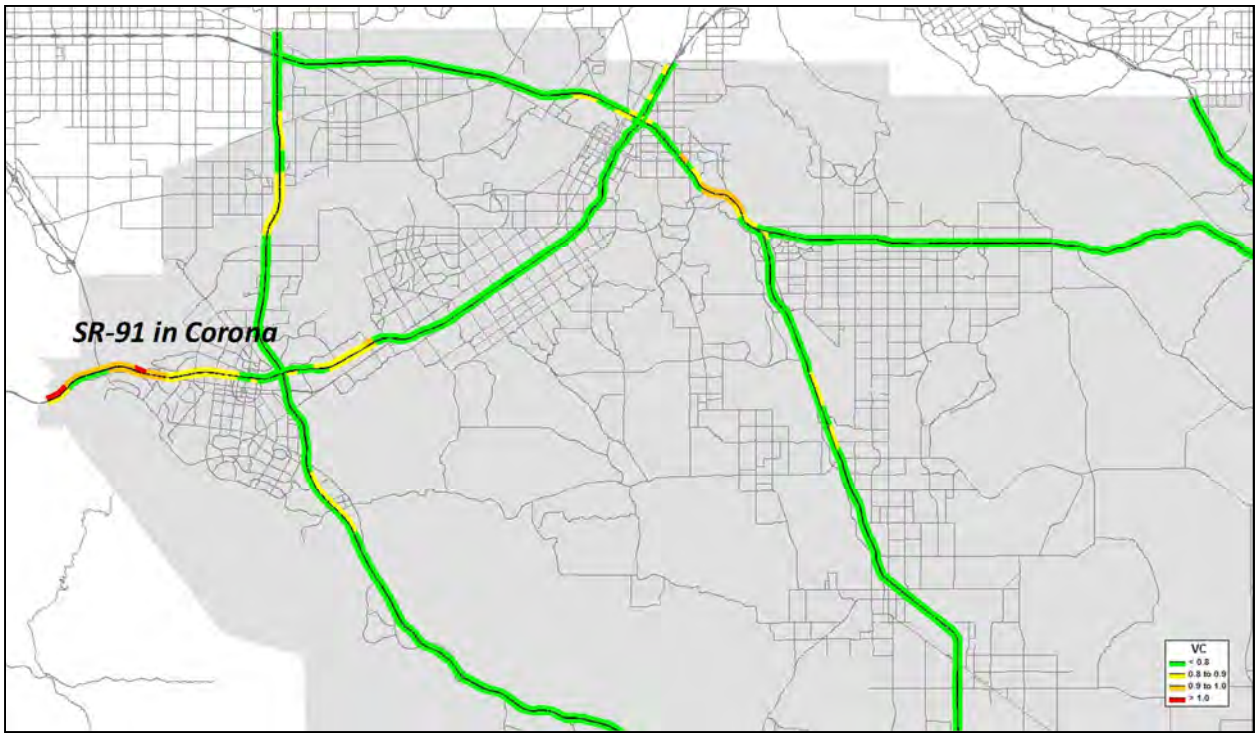


Figure 2-11: Existing Deficiencies in Riverside County during the AM Peak Hour

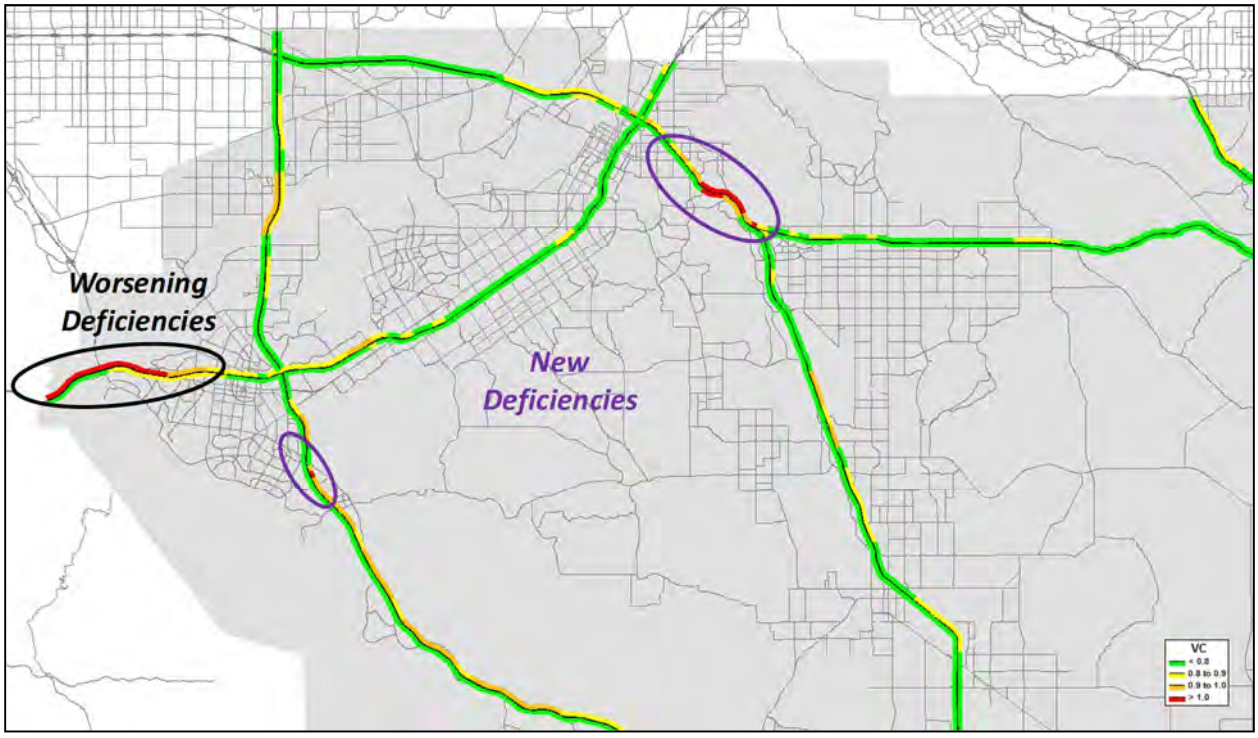


Figure 2-12: Future Deficiencies in Riverside County during the AM Peak Hour

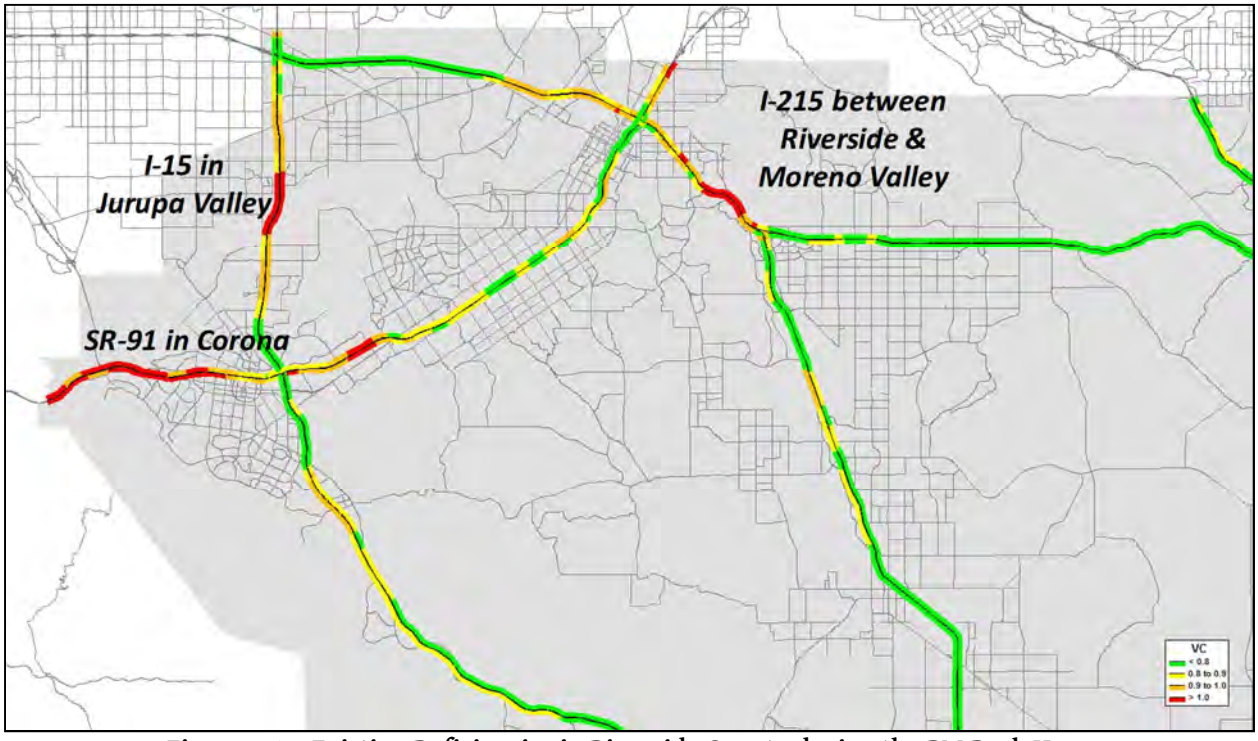


Figure 2-13: Existing Deficiencies in Riverside County during the PM Peak Hour

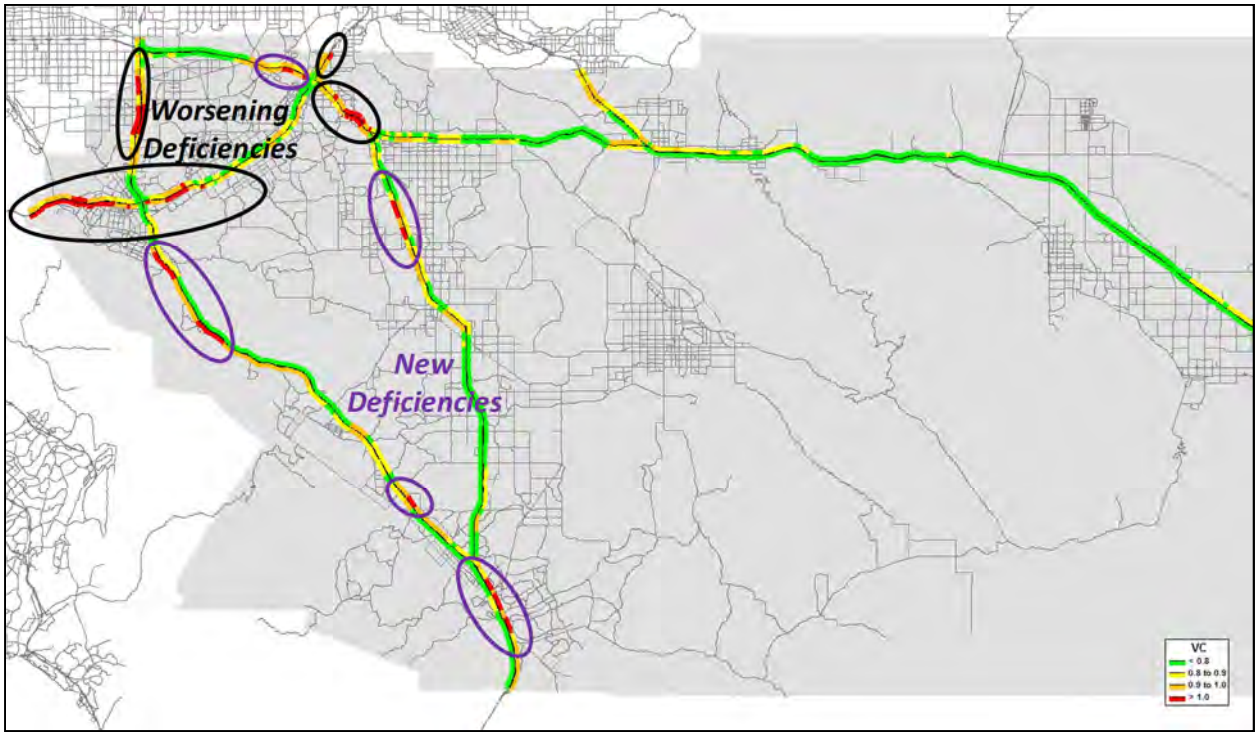


Figure 2-14: Future Deficiencies in Riverside County during the PM Peak Hour

3. ATTRIBUTING CAPACITY DEFICIENCIES TO NEW LOGISTICS DEVELOPMENT

3.1. Percent Attributable to Future Development

The Mitigation Fee Act limits impact fees to new development's "fair share" of the cost of needed improvements. For that reason, once the existing and future freeway deficiencies were identified, the next step was to determine how much of each future deficiency can be attributed to traffic from future development. There are three possible situations for each freeway link:

- Freeway volumes are below the capacity of the freeway, even when the traffic from new development is added in. In such cases there is no deficiency. No fee can be collected because no improvement is needed.
- Existing traffic volumes are below the capacity of the freeway, but the addition of traffic from new growth creates a deficiency where none previously existed. In such cases 100% of the deficiency can be attributed to new development.
- There is an existing deficiency that will worsen with the addition of traffic from new growth. In these cases, the percent of the deficiency attributable to new growth is the portion of the excess traffic (excess being the traffic above the capacity of the road) that arises from new growth rather than from existing traffic.

3.2. Percent Attributable to New Logistics Development

3.2.1. Tracking new logistics truck traffic in the SCAG model

In order compute the percent of each deficiency that is attributable to new logistics development, it was necessary to keep track of trips generated by new logistics uses during the model assignment. The socio-economic data (SED) input files were modified in such a way that only growth in warehousing employment were allocated to traffic analysis zones (TAZ), so all trips to or from these TAZ can be attributed to only new logistics activity. A select-zone query was generated during the assignment step so the new logistics trips were recorded for each link in the model. The SCAG model classifies vehicles by class including trucks, so trucks in the select-zone query represent all the truck traffic attributable to new logistics development.

Figure 3-1 shows the truck traffic due to new logistics, with bandwidth proportional to traffic flow. The largest flows are forecast to come from the proposed World Logistics Center, with the location of the World Logistics Center highlighted for easy reference. The largest increases in truck flows would occur on SR-60 and I-215 west of the World Logistics Center.

3.2.2. Percent Attributable to New Logistics Development

First, for each link, the growth in traffic volumes (measured as passenger car equivalents or PCE) from 2016 to 2040 was calculated. Then new logistics truck traffic was taken as a percent of that overall growth. This percent of growth attributable to new logistics trucks was

multiplied by the percent of deficiencies attributable to growth to find the percent of each deficiency specifically attributable to new logistics truck traffic. All these steps were done for both AM and PM peak hour traffic, then the peak hour with the higher percent attributable was selected to represent the link.

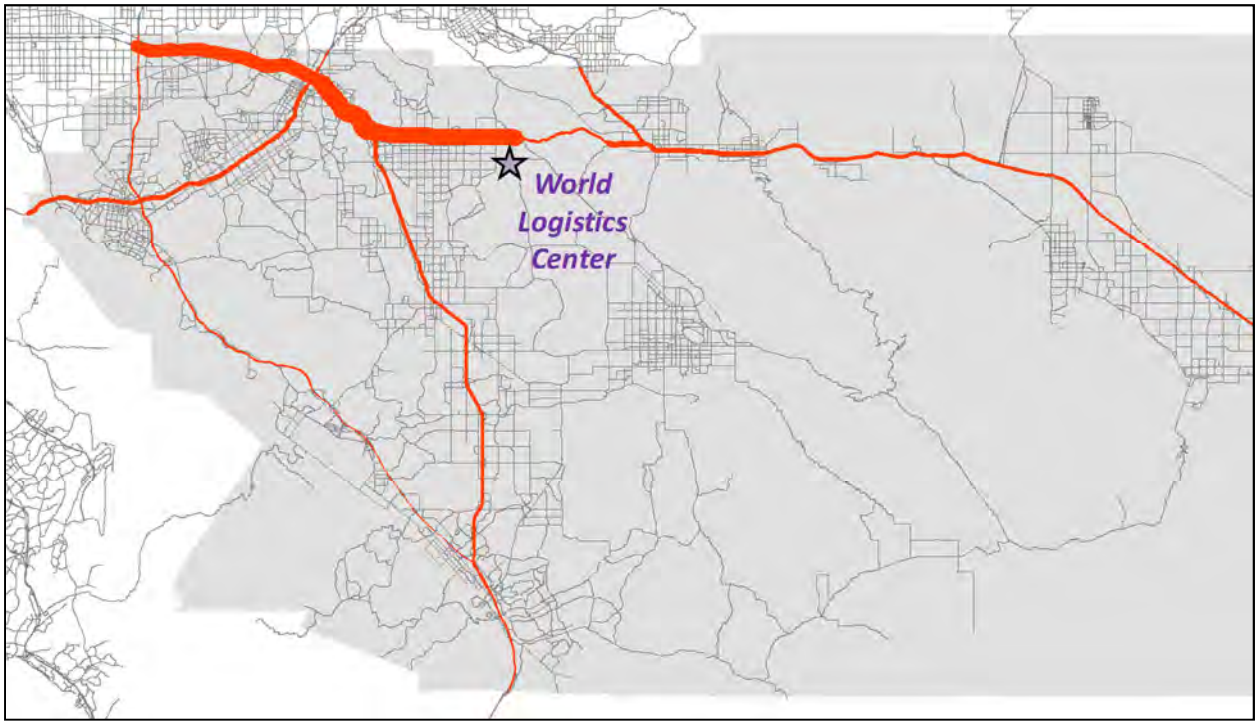


Figure 3-1: New Logistics Trucks in western Riverside County

3.3. IDENTIFYING PROJECTS

Links with new or increased deficiencies in either peak hour relative to existing conditions were identified as potential locations for improvement projects. Continuous sequences of model links were grouped into locations represented by a critical link for determining percent attributable to new logistics.

Table 3-1 shows the critical V/C ratios, deficiencies, and percent attributable for each project location. Figure 3-2 visually represents the components of traffic (existing, non-logistics growth, and logistics growth) relative to the capacity for each project location. For example, existing demand is less than capacity at project 4, so there is no existing deficiency. Therefore, the deficiency that is expected to appear by 2040 is entirely attributable to new development. At project 5, the existing demand exceeds capacity, and growth increases the deficiency. Figure 3-3 shows the project locations on a map.

Table 3-1: Deficient Segment Locations and Percent Attributable

Project ID	Route Name	Dir	Critical Segment		2016 GP Lanes on Critical Segment	Critical V/C ratio				Percent Deficiency Attributable to New Development		New Logistics Trucks as Percent of 2016 to 2040 Growth		Percent Deficiency Attributable to New Logistics Trucks by Peak Hour		Percent Deficiency Attributable to New Logistics Trucks
			Start	End		2016 AM V/C	2016 PM V/C	2040 AM V/C	2040 PM V/C	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	
						(A)		(B)		(C) = 100%, for (A) < 1.0 and (B) > 1.0 (C) = [(B)-(A)]/[(B)-1], for (A) > 1.0		(D)		(E) = (C) * (D)		(F) = Max (E)
1	I-15	NB	SR-79 S	Rancho California Rd	4	0.35	0.66	0.52	1.01	No Deficiency	100%	1.2%	0.7%	No Deficiency	0.7%	0.7%
			Rancho California Rd	Winchester Rd	4	0.45	0.74	0.60	1.01	No Deficiency	100%	1.4%	0.7%	No Deficiency	0.7%	0.7%
2	I-15	NB	Winchester Rd	Lane Add south of I-15/I-215 Split	4	0.46	0.79	0.58	1.02	No Deficiency	100%	2.3%	0.9%	No Deficiency	0.9%	0.9%
3	I-15	NB	Clinton Keith Rd	Baxter Rd	3	0.52	0.80	0.65	1.03	No Deficiency	100%	1.1%	0.3%	No Deficiency	0.3%	0.3%
4	I-15	NB	El Cerrito Rd	Ontario Ave	3	0.86	0.90	1.03	0.88	100%	No Deficiency	1.1%	100.0%	1.1%	No Deficiency	1.1%
5	I-15	NB	Norco Dr/6th Street	Limonite Ave	3	0.82	1.10	0.87	1.14	No Deficiency	29%	4.1%	2.5%	No Deficiency	0.7%	0.7%
6	I-15	SB	Cantu Galeano Ranch Rd	Limonite Ave	3	0.77	0.96	0.77	1.02	No Deficiency	100%	100.0%	4.3%	No Deficiency	4.3%	4.3%
			Limonite Ave	Norco Dr/6th Street	3	0.87	1.01	0.90	1.04	No Deficiency	88%	4.7%	5.9%	No Deficiency	5.2%	5.2%
7	I-15	SB	El Cerrito Rd	Dos Lagos Dr	3	0.65	0.92	0.61	1.03	No Deficiency	100%	100.0%	2.2%	No Deficiency	2.2%	2.2%
8	I-15	SB	Temescal Canyon Rd	Indian Truck Trail	3	0.61	0.83	0.56	1.01	No Deficiency	100%	100.0%	1.4%	No Deficiency	1.4%	1.4%
9	SR-60	EB	Rubidoux Blvd	Market St	3	0.84	0.95	0.81	1.03	No Deficiency	100%	100.0%	30.9%	No Deficiency	30.9%	30.9%
			Market St	Main St	3	0.87	1.00	0.82	1.06	No Deficiency	100%	100.0%	39.0%	No Deficiency	39.0%	39.0%
10	I-215	NB	Box Springs Rd	Central Ave	4	0.94	1.08	1.09	1.07	100%	0%	14.3%	100.0%	14.3%	0.0%	14.3%
			Watkins Dr	Martin Luther King Jr	4	0.94	1.05	1.12	1.16	100%	66%	24.8%	57.9%	24.8%	38.4%	38.4%
10c	I-215	NB	University Ave Off-Ramp	Upstream of Univ Ave On-ramp	3	0.90	1.04	0.98	1.04	No Deficiency	13%	26.9%	100.0%	No Deficiency	13.3%	13.3%
11	I-215	NB	Center St Off-Ramp	Riverside County Line/Iowa Ave	3	0.79	1.00	0.79	1.03	No Deficiency	97%	91.5%	12.2%	No Deficiency	11.8%	11.8%
12	I-215	SB	Martin Luther King Jr	Sycamore Canyon Rd	4	0.96	1.13	1.07	1.25	100%	50%	57.1%	55.2%	57.1%	27.7%	57.1%
13	I-215	SB	Van Buren Blvd	Harley Knox Blvd	3	0.67	0.95	0.64	1.06	No Deficiency	100%	100.0%	4.4%	No Deficiency	4.4%	4.4%
14	SR-91	NB	Riverside County Line	Green River Rd Off-Ramp	5	0.89	1.18	0.76	1.23	No Deficiency	23%	100.0%	6.1%	No Deficiency	1.4%	1.4%
			Green River Rd Off-Ramp	SR-71	5	0.79	1.01	0.72	1.02	No Deficiency	69%	100.0%	14.1%	No Deficiency	9.8%	9.8%
			SR-71	Serfas Club Dr Off-Ramp	4	0.92	1.17	0.85	1.27	No Deficiency	36%	100.0%	4.1%	No Deficiency	1.5%	1.5%
15	SR-91	NB	Serfas Club Dr Off-Ramp	Grand Blvd Off-Ramp	4	0.85	1.00	0.80	1.03	No Deficiency	100%	100.0%	8.9%	No Deficiency	8.9%	8.9%
16	SR-91	NB	On-Ramp from SB I-15	On-Ramp from NB I-15	3	0.81	1.03	0.76	1.07	No Deficiency	55%	100.0%	13.6%	No Deficiency	7.5%	7.5%
17	SR-91	NB	McKinley St Off-Ramp	Pierce St	3	0.81	0.98	0.76	1.02	No Deficiency	100%	100.0%	10.1%	No Deficiency	10.1%	10.1%
18	SR-91	NB	Magnolia Ave	La Sierra Ave	3	0.76	0.93	0.69	1.00	No Deficiency	100%	100.0%	8.3%	No Deficiency	8.3%	8.3%
19	SR-91	SB	Serfas Club Dr Off-Ramp	Lane Add at SR-71	4	0.97	1.08	1.05	1.01	100%	0%	2.8%	100.0%	2.8%	0.0%	2.8%
			Lane Add at SR-71	Riverside County Line	5	0.92	1.00	1.02	0.91	100%	No Deficiency	1.8%	100.0%	1.8%	No Deficiency	1.8%

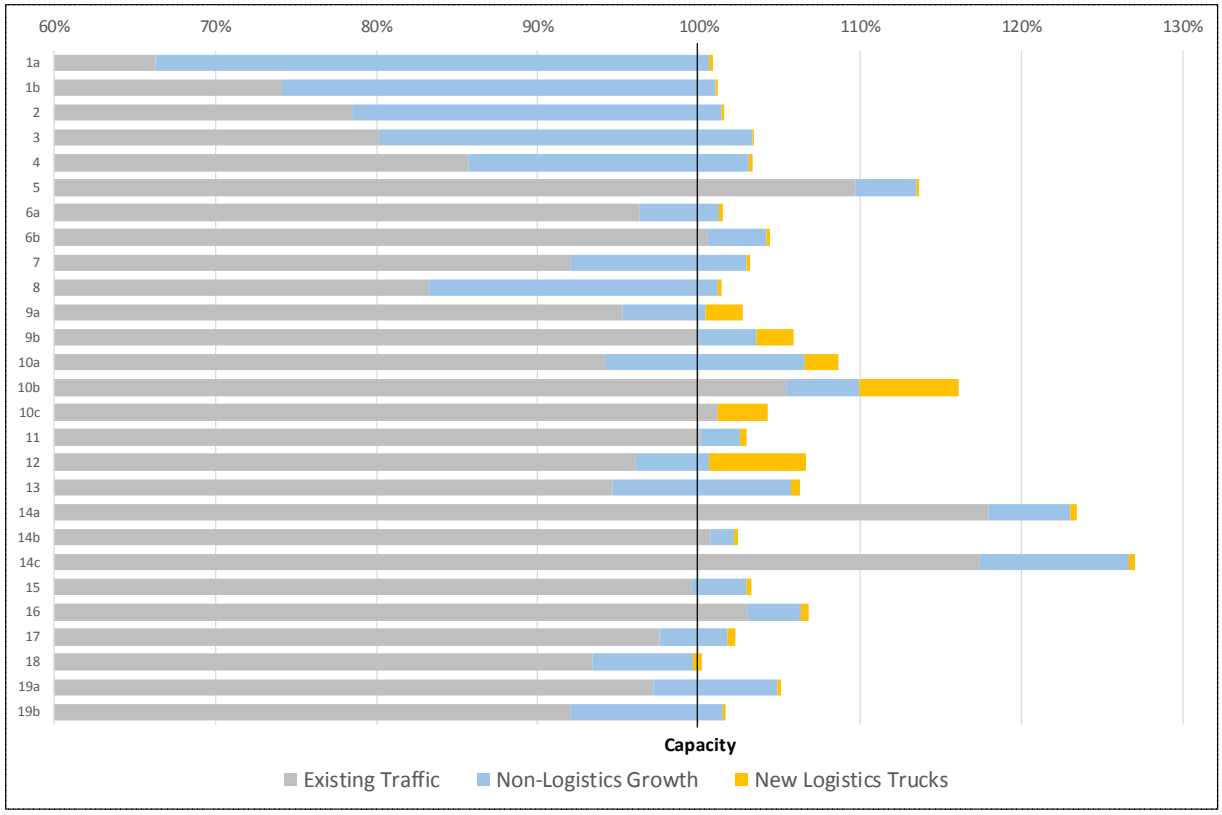


Figure 3-2: Components of 2040 Traffic Demand as a Percentage of Capacity

Figure 3-3: Deficient Segment Location Map

4. ESTIMATING FREEWAY PROJECT COSTS

4.1. ASSESSING PROJECT LIMITS

Section 2 of this memorandum described how future capacity deficiencies on the freeway network in Riverside County were identified. The findings of this effort were summarized as a list of directional freeway segments where the future demand exceeded capacity and resulted in a bottleneck in the system. Limiting capacity expansion to the specific identified segment would be expected mitigate the bottleneck in that segment, however it is likely that the bottleneck would be moved to the next adjacent segment without alleviating the capacity deficiency. Therefore, the list of deficient segments was reviewed in relation to the traffic data and the physical characteristics of the existing freeway facility to determine the extent of the improvement projects that would be necessary (i.e. to define the practical limits and logical termini for the associated improvement project) to address the actual operational problem, not just the specific upstream bottleneck location.

At each freeway segment identified as having a capacity deficiency, the traffic data was reviewed to determine the location (typically an off-ramp) where the demand along the corridor was reduced enough to no longer exceed the capacity of the freeway mainline. Other considerations were physical characteristics of the freeway that might also contribute to capacity reduction, such as uphill grades where truck lanes would benefit the operation of the freeway, and system interchanges where demand changed substantially and there were opportunities for lane drops at freeway-to-freeway connectors. The practical limits of each of the 19 projects required to mitigate the deficient segments are listed in Table 4-1.

Table 4-1: Practical Limits of Capacity Deficient Segment Improvement Projects

ID	Route Name	Dir	Beginning	End
1	I-15	NB	SR-79 S	Rancho California Rd
			Rancho California Rd	Winchester Rd
2			Winchester Rd	Lane Add south of I-15/I-215 Split
3			Clinton Keith Rd	Baxter Rd
4			El Cerrito Rd	Ontario Ave
5			Norco Dr/6th St	Limonite Ave
6		SB	Cantu Galeano Ranch Rd	Limonite Ave
			Limonite Ave	Norco Dr/6th
7			Cajalco Rd	Indian Truck Trail
8			El Cerrito Rd	Cajalco Rd
9	SR-60	EB	Rubidoux Blvd	Market St
			Market St	Main St
10	I-215	NB	Box Springs Rd	Central Ave/Watkins Dr

ID	Route Name	Dir	Beginning	End
			Central Ave/Watkins	Martin Luther King
10c			Martin Luther King Blvd	SR-91
11			Center St Off-Ramp	Riverside County Line/Iowa
12		SB	Martin Luther King Jr	Sycamore Canyon Rd
13			Van Buren Blvd	Case Rd
14	SR-91	EB	Riverside County Line	Green River Rd Off-Ramp
			Green River Rd Off-Ramp	SR-71
			SR-71	Serfas Club Dr Off-Ramp
15			Serfas Club Dr Off-Ramp	Grand Blvd Rd Off-Ramp
16			On-Ramp from SB-I-15	On Ramp from NB- I-15
17			McKinley St Off Ramp	Pierce St
18			Pierce St	Magnolia St
19		WB	Serfas Club Dr Off-Ramp	Lane Add at SR-71
			Lane Add at SR-71	Riverside County Line

The limits of one project, Number 13, were slightly ambiguous based on the review of traffic and physical features, as well in consideration of the proximity of future warehousing and logistics development activity. For these reasons, Project 13 was presented with two options – from Van Buren Boulevard to D Street and from Van Buren Boulevard to Case Road – and cost estimates were prepared for each option so that the Study Advisory Team could assess the value of each option separately and determine which option adequately addressed the capacity constraint. The Study Advisory Team, at the meeting held on February 22, 2018, recommended Option 2 be advanced for the purposes of the study.

4.2. Review of Currently Funded/Programmed Improvements

Once the practical limits of the improvements were defined, each project was compared to known, funded/programmed projects that were recently completed (and are not included in the SCAG 2016 Model existing network), are currently under construction, or are currently in development and are funded for construction. There are three projects that are within the study area that were identified as meeting these criteria:

- The I-15/French Valley Parkway Interchange Project, Phases 1 and 2
- The I-15 Express Lane Project
- The SR-91 Express Lane Extension Project

The French Valley Parkway Project includes the implementation of the I-15/French Valley Parkway Interchange as well as improvements to the Winchester Road Interchange and a

collector-distributor road system along I-15 between Winchester Road and the I-15/I-215 system interchange. This project adds as many as three lanes in each direction north of Winchester Road. Based on the Preferred Alternative Layout Plans included in the IS/EA (January 2010), the FVP Phasing Exhibit (December 2, 2015) and the Ultimate Project Exhibit (July 12, 2017), it was determined that the French Valley Parkway Project successfully eliminates the need to further mitigate deficient segment 2.

The I-15 Express Lane Project will implement one or two tolled managed lanes in each direction northbound and southbound between Cajalco Road and SR-60. This project also adds general purpose lanes and auxiliary lanes at specific locations. Based on a review of the I-15 Express Lane Project Tolling Concept Plans (June 21, 2017), the I-15 Express Lane Project successfully eliminates the need to further mitigate deficient segments 4, 5, and 6.

The SR-91 Express Lane Extension Project extends from west of the Orange County Line to east of I-15 both eastbound and westbound. In addition to the tolled express lanes, additional general purpose lanes were also constructed as part of this project. Based on a field review of the project as it has been constructed, the SR-91 Express Lane Extension Project successfully eliminates the need to further mitigate deficient segments 14, 15, 17, and 19.

Table 4-2 lists the remaining deficient segments and associated mitigation projects that would be included as the basis for the logistics fee program.

Table 4-2: Capacity Deficient Segment Improvement Projects to be Included in the Fee Program

ID	Route Name	Dir	Beginning	End
1	I-15	NB	SR-79 S	Rancho California Rd
			Rancho California Rd	Winchester Rd
3			Clinton Keith Rd	Baxter Rd
7		SB	Cajalco Rd	Indian Truck Trail
8			El Cerrito Rd	Cajalco Rd
9	SR-60	EB	Rubidoux Blvd	Market St
			Market St	Main St
10	I-215	NB	Box Springs Rd	Central Ave/Watkins Dr
			Central Ave/Watkins	Martin Luther King
10c			Martin Luther King Blvd	SR-91
11			Center St Off-Ramp	Riverside County Line/Iowa
12		SB	Martin Luther King Jr	Sycamore Canyon Rd
13			Van Buren Blvd	Case Rd
16	SR-91	EB	On-Ramp from SB-I-15	On Ramp from NB- I-15
18			Pierce St	Magnolia St

4.3. Development of Project Concepts

Using scalable, georeferenced aerial photography, project concept plans were developed that show the primary quantifiable cost items for each project, including:

- Right-of-Way Impact
- Retaining Walls
- Freeway Mainline Widening
- Structure Construction
- Ramp Realignment
- Roadway Excavation
- Street Improvements
- Signalization

The concept plans show colored lines and areas that can be measured and used to estimate quantities for the various categories of construction or property acquisition. These project concept drawings were reviewed by the Study Advisory Team to confirm that they reasonably represent the minimum improvements necessary to mitigate the identified deficiency.

The resultant improvement concept plans are included in Appendix A of this technical memorandum.

4.4. Project Cost Estimating

For the initial assessment and development of project concept plans, Google Earth was used to determine existing conditions for the corridors. The conditions recorded include number of lanes, width of pavement, HOV lanes, inside (left) shoulder width, outside (right) shoulder width, assumed right-of-way boundary, freeway structures, ramp locations, major drainage facilities, retaining walls, sounds walls, signage, and signals. All widths and lengths provided were obtained by doing desktop research on Google Earth and limited field reviews, and were based on sound engineering judgement.

The unit costs for the various construction components were taken from the Caltrans cost database and other recent project cost estimates for project of similar scale and scope within the Inland Empire. Right-of-way cost per residential unit and per square foot are based on current property valuations in Riverside County.

Roadway Item Costs

- Roadway costs include PCC pavement, tie-back walls, pavement markings and markers and replacement of signs. Unit costs were extrapolated from a similar freeway construction project.

- The quantity of each component was then multiplied by the unit cost to produce a cost item for the roadway component.

Drainage Item Costs
- Per our initial assessment, widening affects the existing drainage. Further analysis is needed as impacts to drainage can increase the costs.
- The costs associated with the potential impacts to drainage are 15% of the roadway items cost.

Specialty Item Costs
- Specialty item costs include retaining walls due to proposed widening, removal of existing retaining walls, sounds wall replacement, tie back walls and ramp adjustments.
- The quantity of each component was then multiplied by the unit cost to produce a cost item for the specialty item costs.

Minor Items Costs
- Minor items can include anything from ADA items to other minor items that are not considered high costs items. Typical Caltrans value is 5-10%.

Mobilization Costs
- Mobilization includes costs incurred due to mobilization of personnel and equipment as well as pre-construction expenses. Typical value of 10% can be adjusted when actual costs are available.

Roadway Additions
- Roadway addition items can include price index fluctuations, value analysis, maintaining traffic, removal of rock and debris, etc. These supplemental items cover work for items that cannot be quantified as contract bid item. All roadway supplemental items would be within the FHWA approved items list. At this stage it is appropriate to assume there will be supplemental items. Typical Caltrans value is 5-10%.

Contingency
- Contingency of 25% is within Caltrans recommended values. Pre-PSR 30%, PSR 25%, Draft PR 20%, PR 15%, after PR approval 10% and final PS&E is 5%. Caltrans contingencies allow for unforeseen increases. Due to the level of detail and engineering available, the contingency percentage is appropriate. As more information becomes available, costs would be refined and contingency would be decreased. This is typical per Caltrans.

Support Costs
- Support costs are 35% of the capital outlay costs. Support costs include design costs, construction management, Caltrans reimbursed costs and Metro internal costs. These

costs are functional overhead costs not administrative overhead. The support costs can be refined as more information becomes available.

The costs presented are based on a conceptual engineering assessment using Google desktop research. All costs and impacts are based on a visual analysis and it should be noted that no detailed engineering or surveying has been done to verify the assumptions.

The proposed improvement project conceptual cost estimates were compared to the Western Riverside Council of Governments (WRCOG) Transportation Uniform Mitigation Fee (TUMF) program, with a focus on identifying arterial-freeway interchange and bridge projects that are also included in TUMF. The TUMF program assesses all development types, including warehouse and logistics uses, impact fees to mitigate the cumulative regional transportation impacts of new development on the arterial highway system, including arterial-freeway interchanges and bridges. As such, new warehouse and logistics uses are already contributing toward the cost of these improvement projects to the extent they are included in the TUMF program. Where the conceptual improvement projects were determined to include project elements that were also identified in the TUMF program, the conceptual cost estimate for the project was reduced by an amount equal to the lesser of the estimated conceptual cost of the relevant project element (i.e. the conceptual cost of the arterial interchange and/or bridge improvements) or the maximum eligible amount prescribed in the 2016 TUMF Nexus Study. This reduction in the conceptual improvement costs as part of this study eliminates overlap with the TUMF program in terms of the cost for implementing arterial interchange and bridge improvements necessary to accommodate the proposed freeway capacity expansion necessary to mitigate the cumulative regional impacts of new development, including warehousing and logistics uses, on the freeway network.

The resultant conceptual project cost estimates are summarized it

Table 4-3. A more detailed breakout of the conceptual project cost estimates to mitigate the deficient segments is included in Appendix B of this technical memorandum.

Table 4-3: Capacity Deficient Segment Improvement Project Conceptual Cost Estimates

ID	Route Name	Dir	Beginning	End	Cost Estimate
1	I-15	NB	SR-79 S	Rancho California Rd	$36,237,000
			Rancho California Rd	Winchester Rd	
3			Clinton Keith Rd	Baxter Rd	$7,406,000
7		SB	Cajalco Rd	Indian Truck Trail	$37,825,000
8			El Cerrito Rd	Cajalco Rd	$10,408,000
9	SR-60	EB	Rubidoux Blvd	Market St	$40,234,000
			Market St	Main St	
10	I-215	NB	Box Springs Rd	Central Ave/Watkins Dr	$26,513,000
			Central Ave/Watkins	Martin Luther King	
10c			Martin Luther King Blvd	SR-91	$55,081,000
11			Center St Off-Ramp	Riverside County Line/Iowa	$42,212,000
12		SB	Martin Luther King Jr	Sycamore Canyon Rd	$13,403,000
13			Van Buren Blvd	Case Rd	$95,365,000
16	SR-91	EB	On-Ramp from SB-I-15	On Ramp from NB- I-15	$7,611,000
18			Pierce St	Magnolia St	$13,040,000
Total Project Cost Estimate				**$385,335,000**	

5. FUNDING SOURCES AND FUNDING GAP

This section of the memorandum reviews transportation funding projections in existing documents and describes recent or anticipated additional sources that might be available to complete freeway[9] capacity expansion projects identified as part of this study. This analysis starts with a recent, comprehensive analysis of potential funding - the Riverside County Strategic Assessment – which is described in the next section. It takes the results of this assessment and uses similar assumptions to add in more recent funding sources, such as those associate with California Senate Bill (SB) 1.

The various funding sources are then assessed for their potential to fulfill identified project needs and costs described in Chapters 2 to 4 of this memorandum. The potential revenues and anticipated needs are then compared to conclude a gap analysis in the following chapter.

5.1. RIVERSIDE COUNTY STRATEGIC ASSESSMENT

In 2015, the RCTC directed its staff to conduct an assessment to assist the Commission in examining the County's need for transportation investments. The objective was to produce findings and recommendation on actions the Commission could take to proactively prepare for the future. In early 2016, the RCTC approved the Riverside County Strategic Assessment[10]. It considered demographics, state local, federal transportation policies and revenues and a survey of public and stakeholder perspectives. The assessment includes recommendations regarding future planning, asset maximization, increasing funding and communication.

The Strategic Assessment includes a detailed review of federal, state and local revenues through 2040.[11] [12] It looked at 37 different funding sources covering all modes and categorized them into three levels (A, B and C), depending on their level of certainty. Category A represents existing revenues that can be reasonably expected to be available in the future, Category B includes existing and programmed revenues that Riverside County might realistically secure on a discretionary or competitive basis and those in Category C are considered strategy revenues. Category C revenues represent the highest risk as they are contingent upon implementation of future legislation or funding mechanisms.

The Strategic Assessment conducted an analysis for the 24-year period from 2016-2039. It assumed that most programs continued with increases at the rate of inflation throughout this period, with noted exceptions[13]. It found that, of the total $23 billion in projected need, categories A and B left a funding gap of $16 billion. New revenues from Category C were only expected to cover $6 million of the need, leaving a $10 billion gap.

In looking more closely at funding by project type, the Strategic Assessment reviewed the following funding sources for freeways and interchanges:

[9] Arterial funding sources are not addressed in this analysis as there are separate fee mechanisms already in place for arterial projects.
[10] HDR, January 2016, Riverside County Strategic Assessment: Executive Summary, RCTC.
[11] Since the document was prepared in 2015, it did not include several recent funding sources, which are discussed later in this memo.
[12] HDR, November 4, 2015, RCTC Strategic Assessment Technical Memorandum: Task 4 Funding Gap Analysis.
[13] Ibid. Details of programs and assumptions are contained the tables 8-12 in the appendix to the technical memo.

Federal

- Congestion Mitigation and Air Quality (CMAQ)
- Regional Surface Transportation Program (RSTP)

State

- Regional Improvement Program (RIP)
- Interregional Improvement Program (IIP)
- Mileage Based User-Fees (MBUF)

Local

- Measure A
- SR 91 toll revenues
- I-15 Express Lane toll revenues
- Mid County Parkway (MCP) toll revenues

CMAQ and RSTP funds can go to various modes. The Strategic Assessment assumed that, while historically much of the CMAQ funds have gone to toll lanes, over time transit projects will receive a greater portion of the funding. It assumed that 30% of the CMAQ and 50% of RSTP funds will go to freeway projects in the future.

The Regional Improvement Program (RIP) is the largest funding source over which RCTC has programming authority. The State Transportation Improvement Program (STIP) is developed and approved by the California Transportation Commission (CTC) by April of every even year. Each county transportation agency in the state is responsible for programming projects on or off the state highway system with Regional Improvement Program (RIP) funds, which represent 75% of the total STIP funds available for project programming. Eligible projects include capital improvement projects (e.g. interchange improvements, freeway and arterial widening, commuter rail stations, etc.) and planning and rideshare activities.

The Strategic Assessment includes federal Highway Safety Improvement Program (HSIP) funds under arterials rather than freeways, although funds can be devoted to any public road. The HSIP requires a data-driven, performance based approach to improving highway safety. It provides a maximum of $10 million in federal funds on projects that reduce traffic fatalities and serious injuries and can be designed and constructed expeditiously.

Another fund that has been used on freeways but was not included in the Strategic Assessment is the State Highway Operation and Protection Program (SHOPP). SHOPP is the State's "fix-it-first" program that funds the repair and preservation of the State Highway System (SHS), safety improvements, and some highway operational improvements. While the Strategic Assessment did not address preservation and maintenance, the SHOPP is worth noting as it

protects the enormous investment that has been made over many decades to create and manage the approximately 50,000 lane-mile SHS. All projects funded by the SHOPP are limited to capital improvements that do not add capacity (no new highway lanes) to the SHS, although auxiliary lanes (including truck climbing lanes) are eligible for SHOPP funding. Revenues for the SHOPP are generated by federal and state gas taxes and are fiscally constrained by the State Transportation Improvement Program Fund Estimate (Fund Estimate) that is produced by Caltrans based on established criteria and adopted by the California Transportation Commission.

According to the Strategic Assessment, the total costs of freeway and interchange projects between 2016 and 2039 were expected to be $8.724 billion and the revenues are $5.326 billion. So, only 61% of the freeway needs are funded, leaving an unfunded gap of $3.326 billion through 2039. Table 5-1 shows the breakdown of funding by program and risk.

Table 5-1: Freeway Funding Program, Amount (in millions) and Risk

Funding Program	Category A	Category B	Category C
Federal			
Congestion Mitigation and Air Quality (CMAQ)	$219.7		
Regional Surface Transportation Program (RSTP)	$315.2		
State			
Regional Improvement Program (RIP)	$441.9		
Interregional Improvement Program (IIP)		$58.8	
Mileage Based User-Fees (MBUF)			$2,233.5
Local			
Measure A*	$915.7		
SR 91 Net Toll Revenues*	$618.5		
I-15 Express Lane Toll Revenues*	$319.7		
Mid County Parkway (MCP) toll revenues			$153.5
Total (2016-2039)	$2,880	$59	$2,387

*Debt service and operations and maintenance costs have been deducted from these amounts.

The Strategic Assessment points out that funds for freeway and interchanges rely most heavily on the highest risk (Category C) funding sources. So, of the funding that was anticipated for

freeways and interchanges, fully 67% was from Category C. As shown in Table 5-1, a large portion of the Category C funds are from MBUF and tolled-based financing of the MCP.

The Assessment also noted that Measure A programs are further suballocated to additional geographies and programs. For example, while the majority appears to be allocated to freeways, there are specific suballocations to counties and, within those, to various modal programs. While the majority of the amount apportioned to freeways falls within the western part of the County, some is dedicated to Coachella Valley. We have not completed further disaggregation based on geography for this analysis.

Because the assessment was prepared in 2015 it did not include certain funding sources approved after that. New funding sources and their potential implications are described in the following sections.

5.2. Fixing America's Surface Transportation Act

On December 4, 2015 President Obama signed Fixing America's Surface Transportation Act (FAST) Act[14] into law. It was the first law enacted in over ten years that provides long-term funding certainty for surface transportation. The FAST Act allows states and local governments greater confidence in federal funding for transportation projects.

Overall, the FAST Act largely maintains program structures and funding shares between highways and transit. It was viewed as a down-payment for building a 21st century transportation system.

The law also makes changes and reforms to many Federal transportation programs, including streamlining the approval processes for new transportation projects, providing new safety tools, and establishing new programs to advance critical freight projects. The relevant funding programs are described below. The funding implications of all FAST Act funding programs on RCTC are discussed at the end of this section.

5.2.1. Nationally Significant Freight and Highway Projects

The Nationally Significant Freight and Highway Projects (NSFHP) program[15] provides financial assistance—competitive grants, known as INFRA grants, or credit assistance—to nationally and regionally significant freight and highway projects. Funding is $800 million to $1 billion annually over the program life. Both large (over $100 million) and small (more than $5 million) projects are eligible, but 90% of program funds are reserved for large projects.

Projects must support the national program goals to:

- improve the safety, efficiency, and reliability of the movement of freight and people;
- generate national or regional economic benefits and an increase in global economic competitiveness of the U.S.;
- reduce highway congestion and bottlenecks;
- improve connectivity between modes of freight transportation;

[14] Pub. L. No. 114-94
[15] FAST Act § 1105; 23 U.S.C. 117

- enhance the resiliency of critical highway infrastructure and help protect the environment;
- improve roadways vital to national energy security; and
- address the impact of population growth on the movement of people and freight.

Both highway and freight projects - including rail intermodal projects, grade crossings and rail and port projects – are eligible. Highway projects must be either on the NHS or the National Highway Freight network. Funding for non-highway freight projects is limited to $500 million over the life of the program.

Funding may go to any project phase including planning, construction, and operational improvements. However, the project must have completed preliminary engineering and be reasonably expected to begin construction within 18 months of obligation of funds.

States, MPOs, local governments, public authorities, political subdivision, tribal governments and groups of these entities may apply. The program encourages the use of nontraditional financing, innovative design and construction techniques, innovative technologies, and non-Federal contributions as well as geographic diversity among grant recipients. Non-federal funding commitments, however, must be backed by contingency and have additional stable and dependable sources of funding to construct operate and maintain and operate the project.

Projects must:

- generate national or regional economic, mobility, or safety benefits;
- be cost effective;
- contribute to the accomplishment of one or more of the national goals

5.2.2. Advanced Transportation and Congestion Management Technologies Deployment Program

The Advanced Transportation and Congestion Management Technologies Deployment Program[16] makes competitive grants for the development of model deployment sites for large scale installation and operation of advanced transportation technologies that improve safety, efficiency, system performance, and infrastructure return on investment.

Program funding totals $60 million annually. The federal share cannot exceed 50% of the cost of the project.

Eligible projects include deployment of advanced transportation and congestion management technologies, such as:

- advanced traveler information systems;
- advanced transportation management technologies;
- infrastructure maintenance, monitoring, and condition assessment;
- advanced public transportation systems;

[16] FAST Act § 6004; 23 U.S.C. 503(c)(4)

- transportation system performance data collection, analysis, and dissemination systems;
- advanced safety systems, including vehicle-to-vehicle and vehicle-to-infrastructure communications;
- technologies associated with autonomous vehicles, and other collision avoidance technologies, including systems using cellular technology;
- integration of intelligent transportation systems with the Smart Grid and other energy distribution and charging systems;
- electronic pricing and payment systems; or
- advanced mobility and access technologies, such as dynamic ridesharing and information systems to support human services for elderly and disabled individuals.[17]

5.2.3. Surface Transportation System Funding Alternatives Program

The Surface Transportation System Funding Alternatives Program[18] provides grants to States or groups of States to demonstrate user-based alternative revenue mechanisms that utilize a user fee structure to maintain the long-term solvency of the Highway Trust Fund.

The objectives of the program are:

- to test the design, acceptance, and implementation of two or more future user-based alternative mechanisms;
- to improve the functionality of the user-based alternative revenue mechanisms;
- to conduct outreach to increase public awareness regarding the need for alternative funding sources for surface transportation programs and to provide information on possible approaches;
- to provide recommendations regarding adoption and implementation of user-based alternative revenue mechanisms; and
- to minimize the administrative cost of any potential user-based alternative revenue mechanisms.

A total of $20 million is available annually. The Federal share of the cost of an activity carried out under the program may not exceed 50 percent. Geographic diversity will be considered in award of grants.

Program funds will test the design, acceptance, and implementation of a user-based alternative revenue mechanism, consistent with the program's objectives. Revenue collected through a user-based alternative revenue mechanism established with program funds may not be considered a toll under 23 U.S.C. 301. Because of the program's limitations and focus on testing, no estimates have been included among the funds available for freeway projects in this analysis.

[17] 23.U.S.C. 503(c)(4)(E)
[18] FAST Act § 6020

5.2.4. FAST Act Funding Implications for RCTC

As described in the previous section, the FAST Act provided two new grant programs – NSFHP and the Advanced Technology and Congestion program – that could reasonably be relied upon to provide funding for freeway and interchange projects in Riverside County. As stated previously, this analysis took similar assumptions as the Strategic Assessment. In the Assessment, RCTC assumed that it could win competitive grants commensurate with the proportion its population represents. For federal grants, Riverside County represented .74 percent of the national population[19]. Table 5-2 shows the new FAST funding amounts by program and risk category that could reasonably be expected to be available to RCTC each year based on this proportion of total program funding:

Table 5-2: Projected Annual RCTC Funding from FAST (in millions)

Funding Program	Category A	Category B	Category C
NSFHP (INFRA)		$6.66	
Advanced Technology and Congestion Management Deployment Program		$.444	
Total		$7.104	

5.3. Road Repair and Accountability Act of 2017 (Senate Bill 1)

In 2017 the California legislature passed and the governor signed into law a major transportation funding bill.[20] The Road Repair and Accountability Act of 2017 (referred to as SB1) provided additional funding to several existing programs, including the STIP, and established several new funding programs that are relevant to this project. The relevant SB1 programs and their implications for RCTC are described below.

5.3.1. Trade Corridor Enhancement Program

The objective of the Trade Corridor Enhancement Program is to fund infrastructure improvements on federally designated Trade Corridors of National and Regional Significance, on the Primary Freight Network, as identified in the California Freight Mobility Plan, and along other corridors that have a high volume of freight movement as determined by the Commission.[21] The Trade Corridor Enhancement Program is also intended to support the goals of the National Highway Freight Program, the California Freight Mobility Plan, and the guiding principles in the California Sustainable Freight Action Plan.

[19] https://www.census.gov/quickfacts/fact/table/riversidecountycalifornia,US/PST045216

[20] http://catc.ca.gov/
[21] http://catc.ca.gov/programs/sb1/tcep/

The Commission intends to allocate $1.3 Billion, in roughly equal annual installments, in the initial three-year program. Allocations are anticipated to continue after 2020, but the amounts aren't known. The initial program is funded by three years of Trade Corridor Enhancement Account funding ($794 million), five years of federal National Highway Freight Program funding ($535 million) and a one-time appropriation of $11 million the Budget Act of 2015. Caltrans is targeted to receive 40% for projects it applies for administers.

Funding is available for projects that significantly contribute to the freight system's economic activity or vitality; relieve congestion on the freight system; improve the safety, security, or resilience of the freight system; improve or preserve the freight system infrastructure; implement technology or innovation to improve the freight system or reduce or avoid its negative impacts; or reduce or avoid adverse community and/or environmental impacts of the freight system. Qualifying project costs include permits and environmental studies; plans, specifications and estimates; right-of-way; and construction.

The Commission has already identified the following corridors as eligible under this program: Bay Area, Central Valley, Central Coast, Lost Angeles/Inland Empire and San Diego/Border. Other regions are eligible to apply if they have a high volume of freight movement and otherwise meet the criteria for funding. The initial target for the Los Angeles/Inland Empire (which includes Los Angeles, Orange, Riverside, San Bernardino, and Ventura counties) is $467 million.

Eligible applicants include local, regional, and public agencies such as cities, counties, Metropolitan Planning Organizations, Regional Transportation Planning Agencies, port authorities, public construction authorities, and Caltrans. Project proposals from private entities must be submitted by a public agency.

Projects will first be screened to ensure they: meet the project eligibility requirements and program objectives, are in an adopted RTP that is consistent with regional greenhouse gas emissions reductions targets, demonstrate that negative environmental/community impacts will be mitigated and will stimulate economic activity and jobs. High scoring projects will be evaluated on freight system factors (throughput, velocity and reliability), transportation system factors (safety, congestion reduction, bottleneck relief, multi-modal strategy, interregional benefits, advanced technology) and community impact factors (air quality impact, community impact mitigation, economic/jobs growth).

5.3.2. Solutions for Congested Corridors Program

Solutions for Congested Corridors Program[22] (Congested Corridors Program) appropriates two hundred and fifty million dollars ($250,000,000) annually to projects designed to achieve a balanced set of transportation, environmental, and community access improvements within highly congested travel corridors throughout the state. The primary objective of the Congested Corridors Program is to fund projects that make specific improvements and are part of a comprehensive corridor plan designed to reduce congestion in highly traveled corridors by providing more transportation choices while preserving the character of the local community and creating opportunities for neighborhood enhancement projects.

[22] http://catc.ca.gov/programs/sb1/sccp/

Funds are allocated by the California Transportation Commission (Commission). Improvements may be on the state highway system, local streets and roads, public transit facilities, bicycle and pedestrian facilities or required mitigation or restoration or some combination thereof.

A regional transportation planning agency or county transportation commission or authority responsible for preparing a regional transportation improvement plan under Section 14527 of the Government Code or Caltrans may nominate projects for funding.

5.3.3. Local Partnership Program

The Local Partnership Program (LPP) appropriates two hundred million dollars ($200,000,000) annually to local or regional transportation agencies that have sought and received voter approval of taxes or that have imposed fees that are dedicated solely for transportation improvements. [23]

Funds are allocated by the California Transportation Commission (Commission) - half competitively and the balance by formula. Projects will require at least a one-to-one match of private, local, federal, or state funds except jurisdictions with a voter approved tax or fee which generates less than $100,000 annually need only provide a match equal to 50% of the requested funds.

Eligible projects include: (a) improvements to the state highway system; (b) improvements to transit facilities; (c) acquisition, retrofit, or rehabilitation of rolling stock, buses, or other transit equipment; (d) improvements to the local road system; (e) improvements to bicycle or pedestrian safety or mobility; (f) improvements to mitigate the environmental impact of new transportation infrastructure on a locality's or region's air quality or water quality; (g) a separate phase or stage of construction for an eligible project may include mitigation of the project's environmental impacts; (h) sound walls for certain freeways; (i) road maintenance and rehabilitation; and (j) other transportation improvement projects.

Eligible applicants are the taxing authorities that have sought and received voter approval of taxes, tolls, or fees, or that have imposed fees, including uniform developer fees as defined by subdivision (b) of Section 8879.67 of the Government Code, which are dedicated solely to transportation improvements.

The Commission will give higher priority to projects that (a) are more cost-effective; (b) can commence construction or implementation earlier; (c) can leverage more committed funds per program dollar; (d) can demonstrate quantifiable air quality improvements, including a significant reduction in vehicle-miles traveled; (e) can demonstrate regional and community project support; and (f) within a Metropolitan Planning Organization, projects that further the implementation of the sustainable communities strategy.

5.3.4. SB1 Funding Implications for RCTC

Most of the SB1 funds that could go to freeways and interchanges are via competitive grant programs. In 2016, Riverside County represented about six percent of the population in the

[23] http://catc.ca.gov/programs/sb1/lpp/

state.[24] Assuming, on average, transportation projects are awarded approximately proportionate to county population, Table 5-3 shows the projected annual allocation projects in Riverside County could reasonably be expected to obtain.

Table 5-3: Projected Annual SB1 Funding for RCTC (in millions)

Funding Program	Category A	Category B	Category C
LPP (county allocation)	$6.786		
TCEP		$25.997	
SCCP		$15	
LPP (competitive grant)		$6.786	
	$6.786	$47.783	

5.4. Summary of Available Funding from All Sources

To quantify the total funds that might be available to freeway and interchange projects in Riverside County through 2040, sources identified in the Strategic Assessment were combined those from FAST and SB1 programs. Taking the approach used in the Strategic Assessment, unless otherwise specific, program funding levels were assumed to continue at the rate of inflation throughout the study period. Table 5-4 summarizes newly identified funding sources, while Table 5-5 combines new funding sources with those identified previously as part of the Strategic Assessment to establish a total of anticipated freeway project funding through 2040 from all sources by risk category.

[24] https://www.census.gov/quickfacts/fact/table/riversidecountycalifornia,US/PST045216

Table 5-4: Freeway Project Funding from New Sources 2017-2040 (in millions)

Funding Program	Category A	Category B	Category C
Federal			
NSFHP (INFRA)		$159.8	
Advanced Technology and Congestion Management Deployment Program		$10.7	
State			
LPP (County Allocation)	$162.9		
TCEP		$623.9	
SCCP		$360	
LPP (competitive grants)		$162.9	
Grand Total New Sources	$162.9	$1,317.3	

Table 5-5: RCTC Projected Freeway Project Funding 2017-2040 - All Sources (in millions)

Funding Source	Category A	Category B	Category C
Total Strategic Assessment Sources	$2,948.6	$61	$2,465.8
Total New Sources	$162.9	$1,317.3	
Grand Total Old and New Sources	$3111.5	$1,378.3	$2,465.8

As can be seen in Table 5-4 and Table 5-5, the infusion of SB1 funds, which are considered risk category B, creates better balance across the risk categories than that found in the Strategic Assessment, which was heavily reliance on high-risk, category C funds. However, although the SB1 program has been legislated there is also an on-going repeal effort, hence they have been identified as risk category B rather than category A.

A sensitivity analysis was completed to assess the impact of a potential repeal on future transportation funding in the County. Table 5-6 shows the projected funds for freeway and interchange projects from all sources without SB1 funds.

Table 5-6: Projected RCTC Projected Freeway Project Funds without SB1, 2017-2040 (millions)

Funding Source	**Category A**	**Category B**	**Category C**
Total Strategic Assessment Sources	$2,948.6	$61	$2,465.8
Total New Sources	$162.9	$170.5	
Grand Total Old and New Sources	$3111.5	$231.5	$2,465.8

Table 5-7 shows the total funding that is expected to be available for freeway and related interchange projects in Riverside County over the next 24 years. As can be seen, the total projected funding that might reasonably be expected to be available for freeway and interchange projects in Riverside County through 2040 is expected to be nearly $6 billion, with approximately half of this funding expected to be made available through low risk category A funding sources, even without SB1 funding. This amount substantially exceeds the estimated cost to complete the various mitigation projects previously identified in Chapter 4 and summarized in

Table 4-3 of this report making the various improvement projects viable to be completed, even following the adjustment of funds to be generated through a potential logistics fee program to account for the portion of impact attributable to logistics uses.

Table 5-7: Projected RCTC Funding with and without SB1, 2017-2040 (in millions)

Scenario	Total Funding
With SB1	$6,955.6
Without SB1	$5,808.8

6. FUNDING GAP ANALYSIS

As described in Chapters 3, the fair share of costs to mitigate future freeway deficiencies that are attributable to new warehousing and logistics uses varies by segment, but is a relatively small proportion of the total cost to complete the necessary improvements. Furthermore, although the project concepts associated cost estimates have identified a minimum level of improvement necessary to reasonably mitigate the identified impact, it is likely the scale and scope of any proposed improvement project would be greater to account for the accomplishment of other transportation goals and/or freeway operational needs, including rehabilitation and roadway maintenance, resolution of existing needs, or anticipation of addition future demands beyond the horizon year of the fee program. Since the resolution of these items cannot be fairly attributed to the mitigation of new development impacts, it is necessary to ensure that sufficient alternative funding sources are expected to be available to complete the necessary improvements.

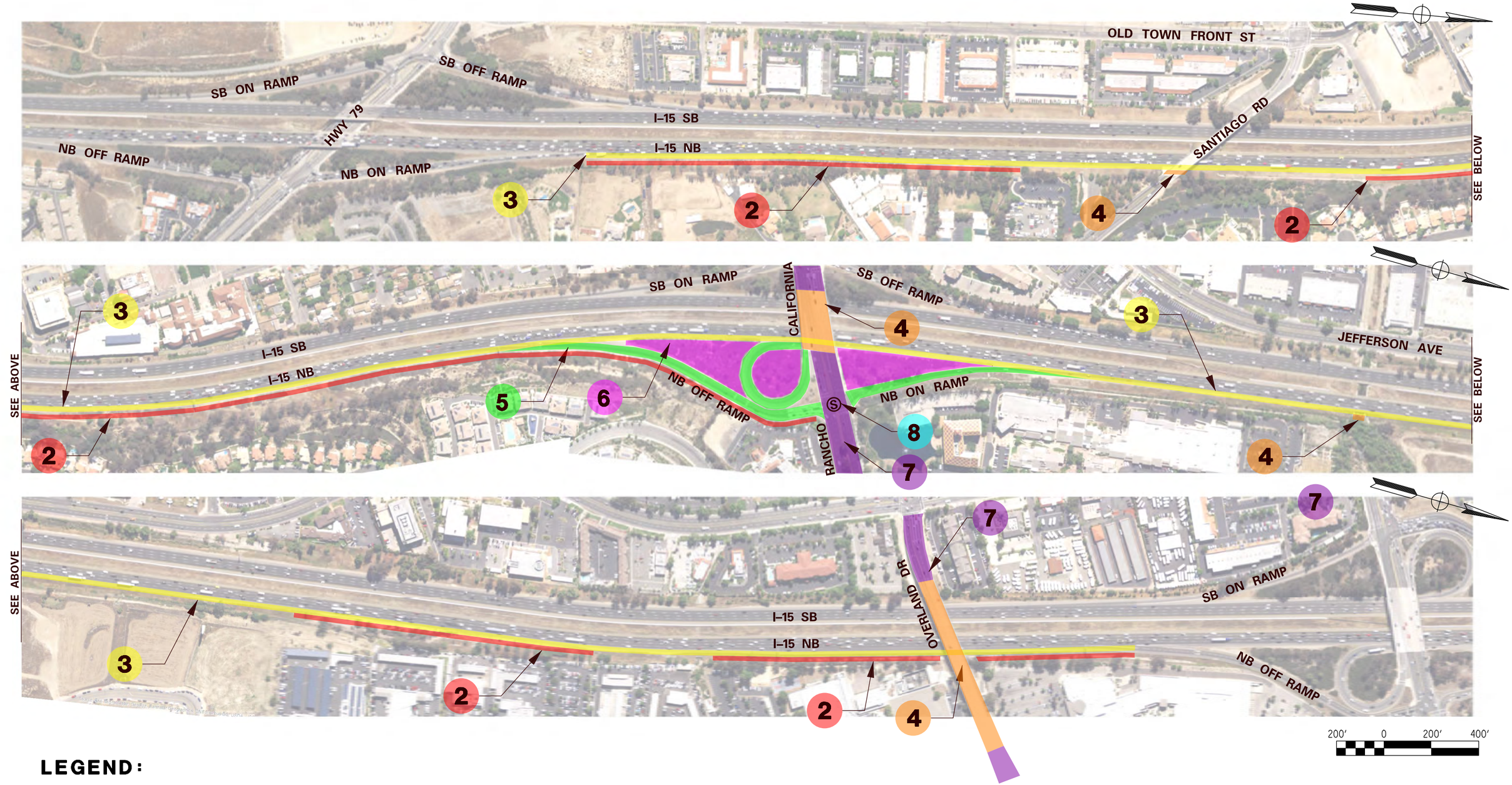
The total estimated conceptual cost to complete the reasonable mitigation of deficient segments identified as part of this study is $385,335,000. Although a relatively small proportion of this cost can be attributed to new warehousing and logistics developments, and therefore this fair share of the mitigation cost could be derived from a logistics impact fee, the estimates of alternative funding sources described in Chapter 5 clearly indicate that the remaining costs to complete these improvement projects could reasonably be expected to be obtained from existing and proposed funding sources. Furthermore, the projected availability of future funding for freeway and interchange improvement projects is over ten times the amount of the conceptual cost estimates to mitigate the impacts of new development on the freeway system indicating that sufficient funding might reasonably be expected to account for the expansion of scale and scope of associated freeway projects to address other project needs not directly attributable to the impacts of new development.

7. APPENDICES

Appendix A – Capacity Improvement Concept Plans

Appendix B – Conceptual Project Cost Estimate Tables

APPENDIX A – CAPACITY IMPROVEMENT CONCEPT PLANS



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3 WIDENING	6 ROADWAY EXCAVATION	

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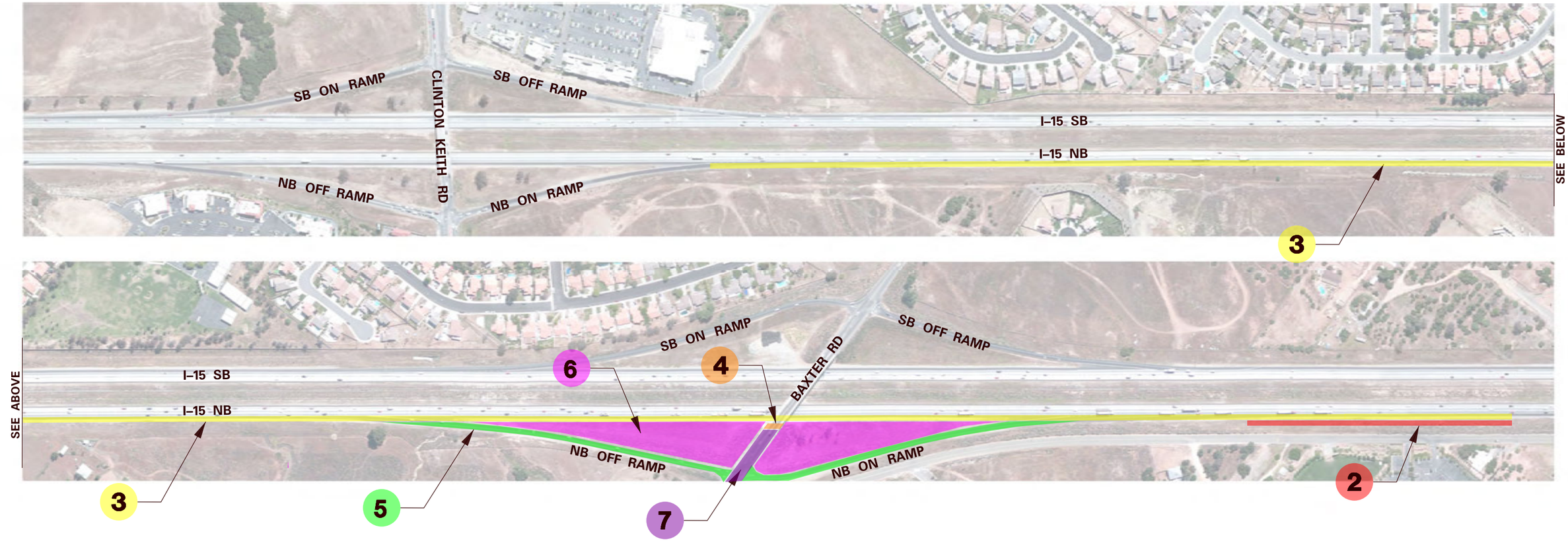

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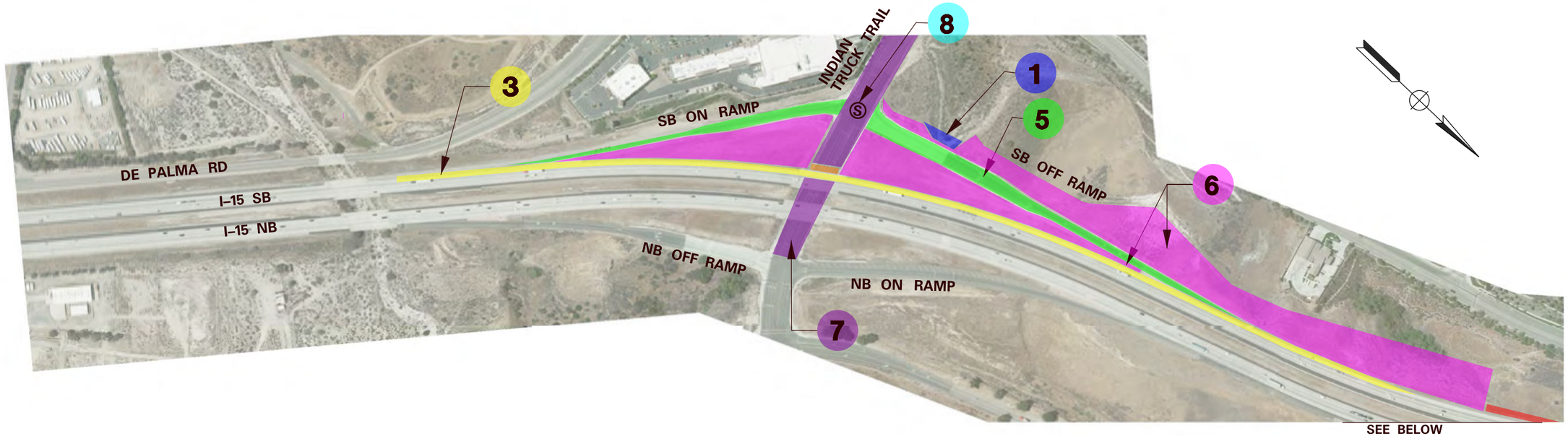

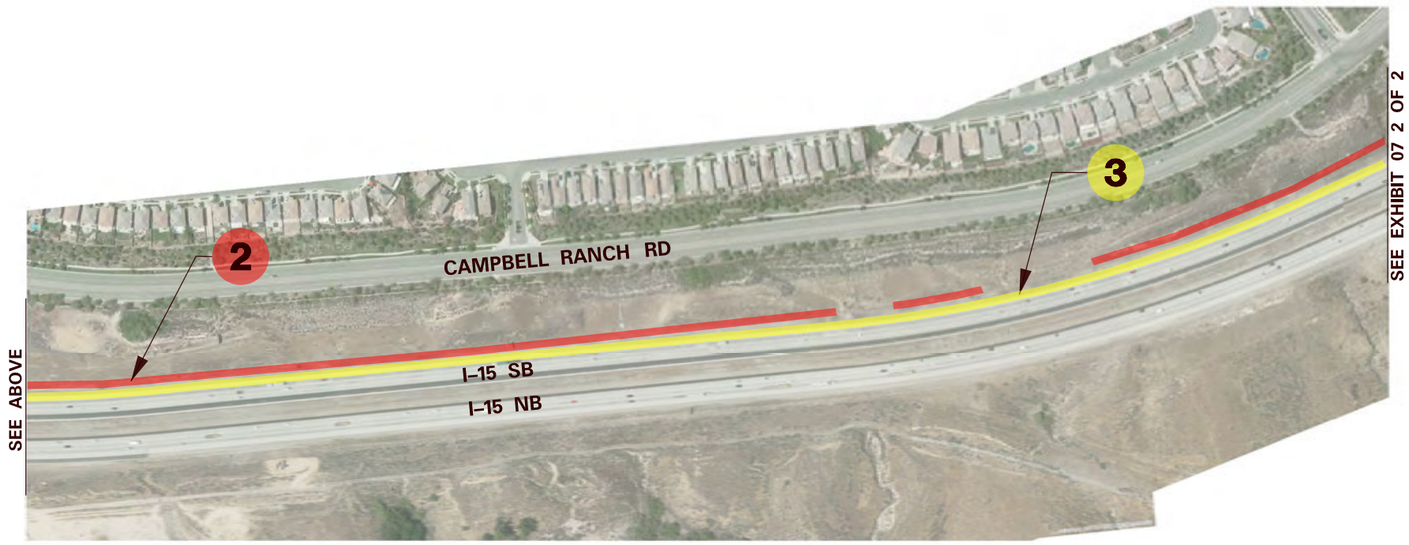

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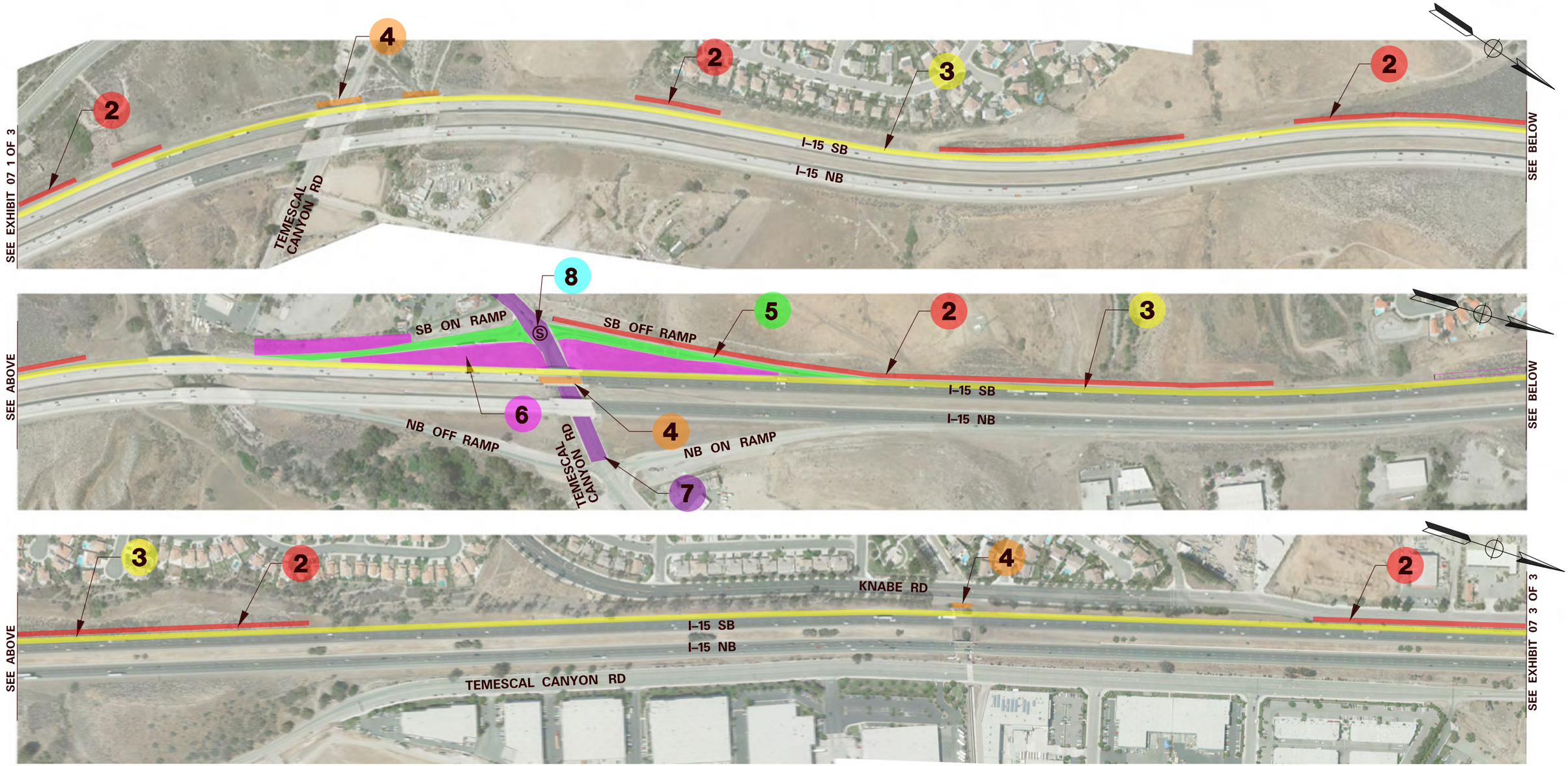

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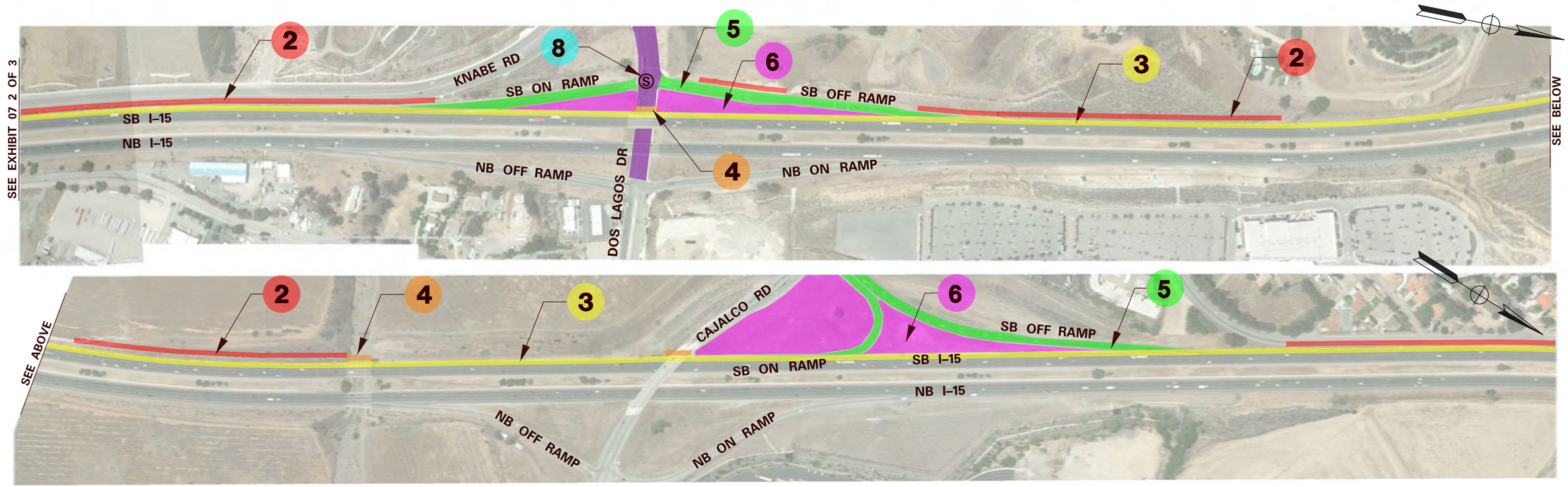

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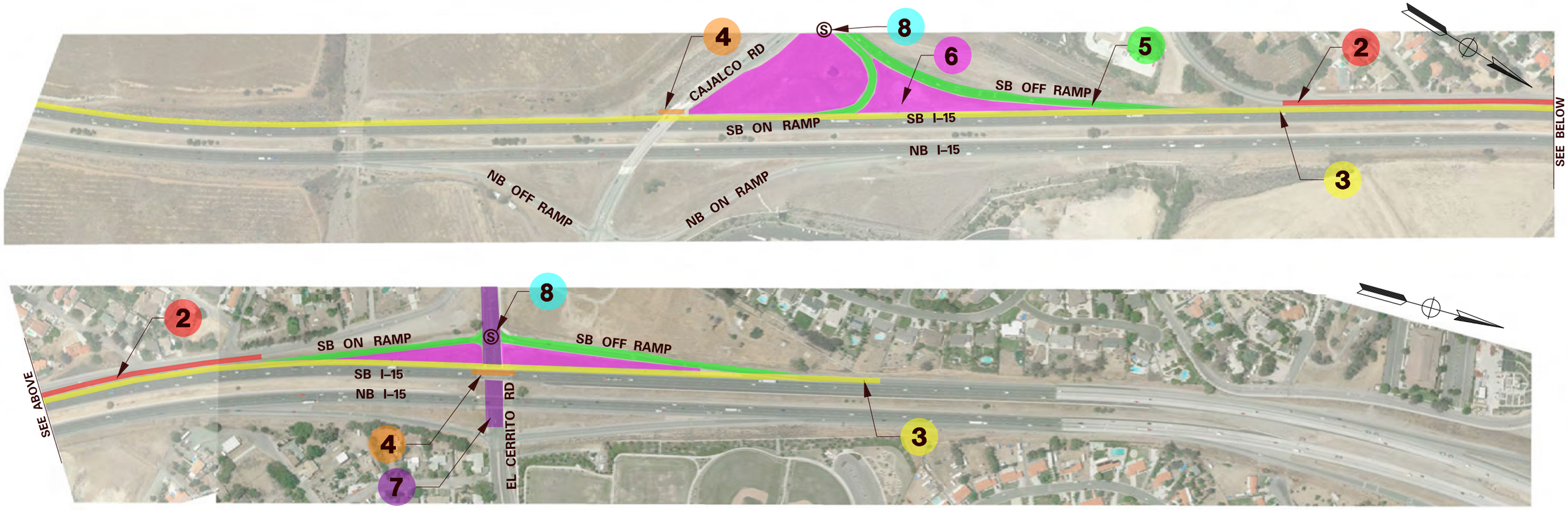

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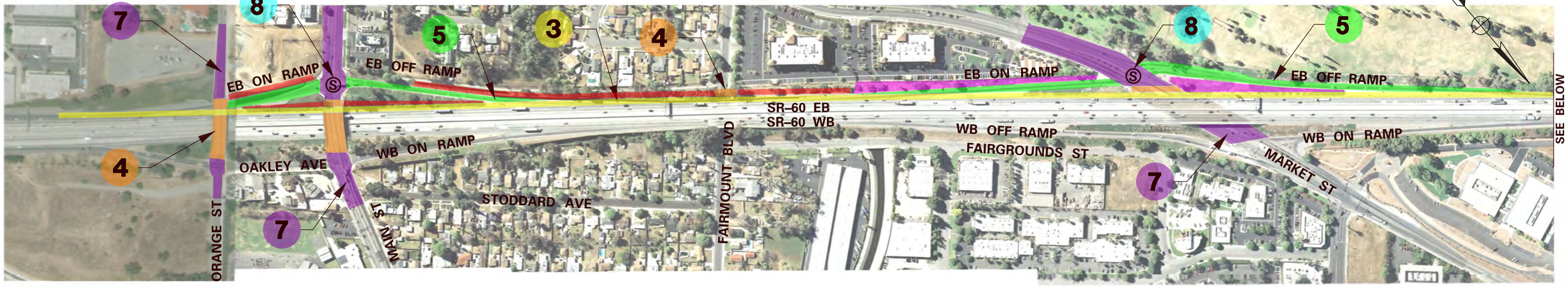

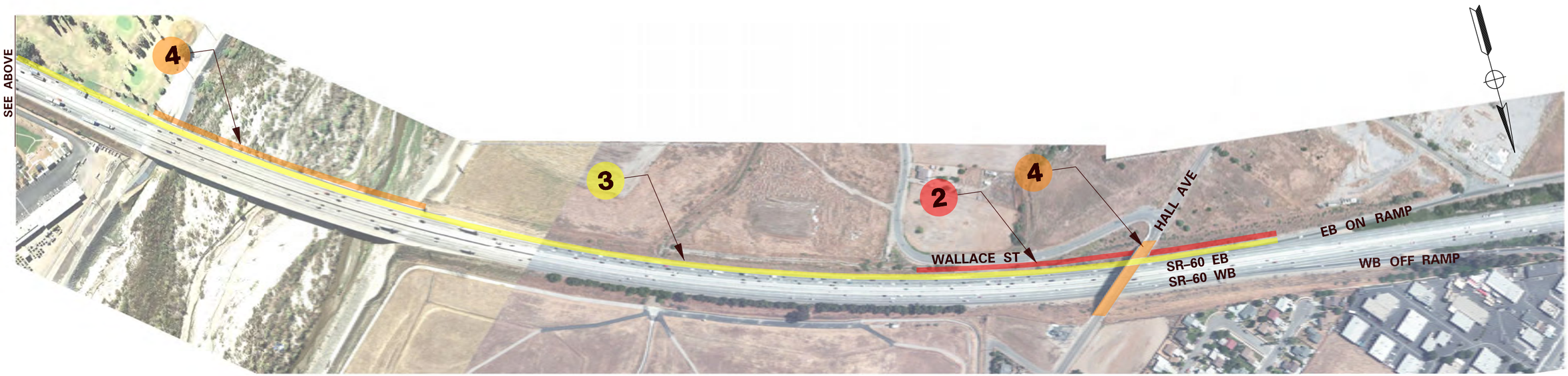

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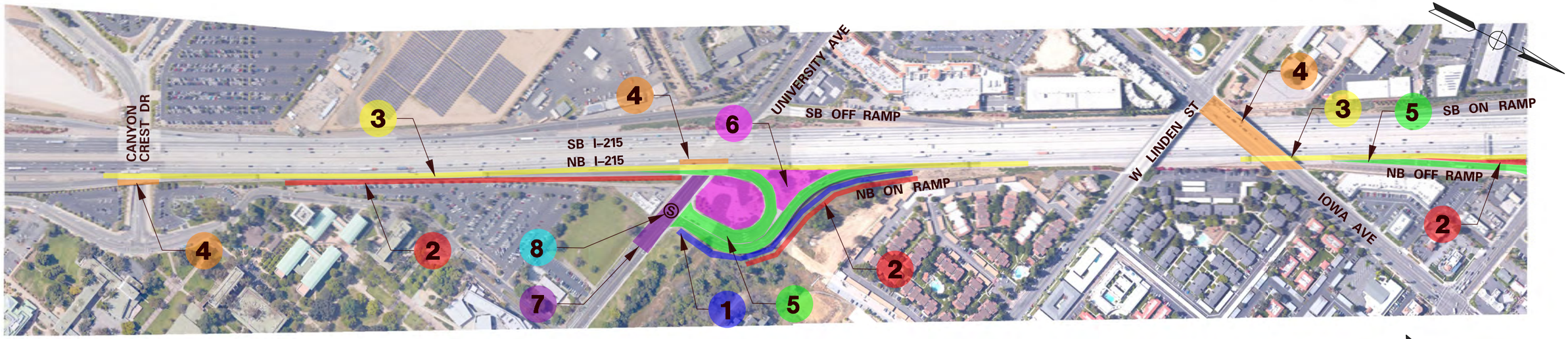

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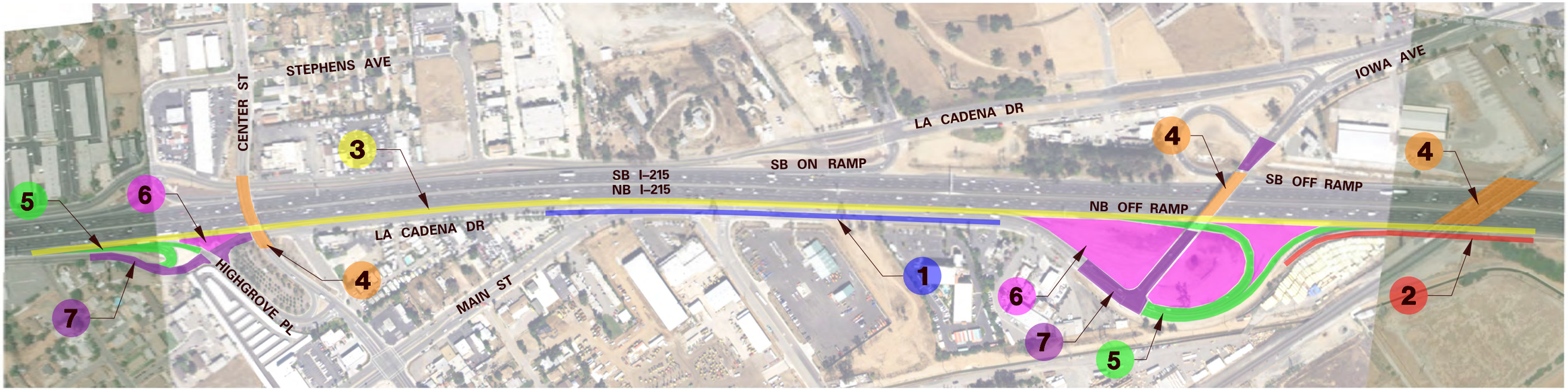

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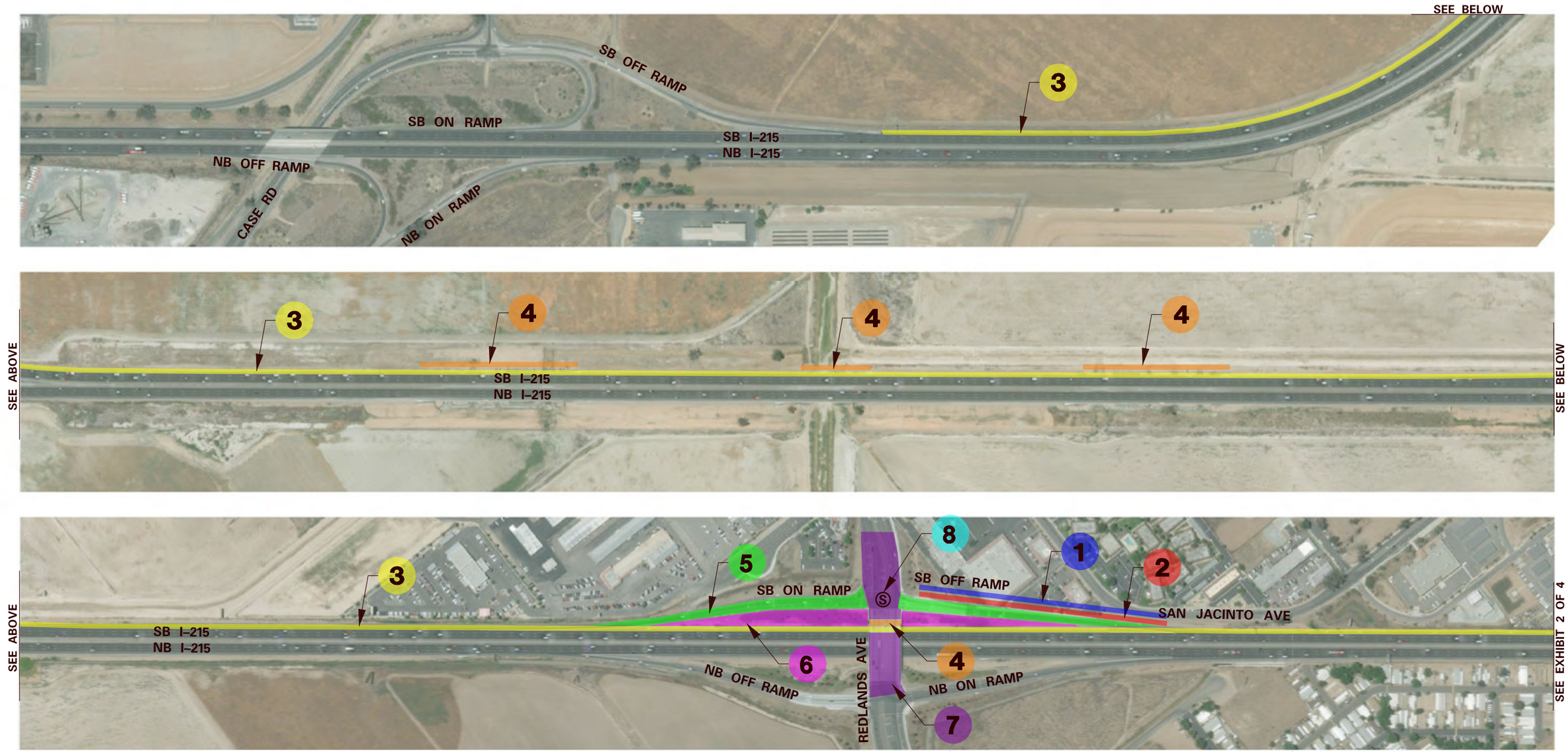

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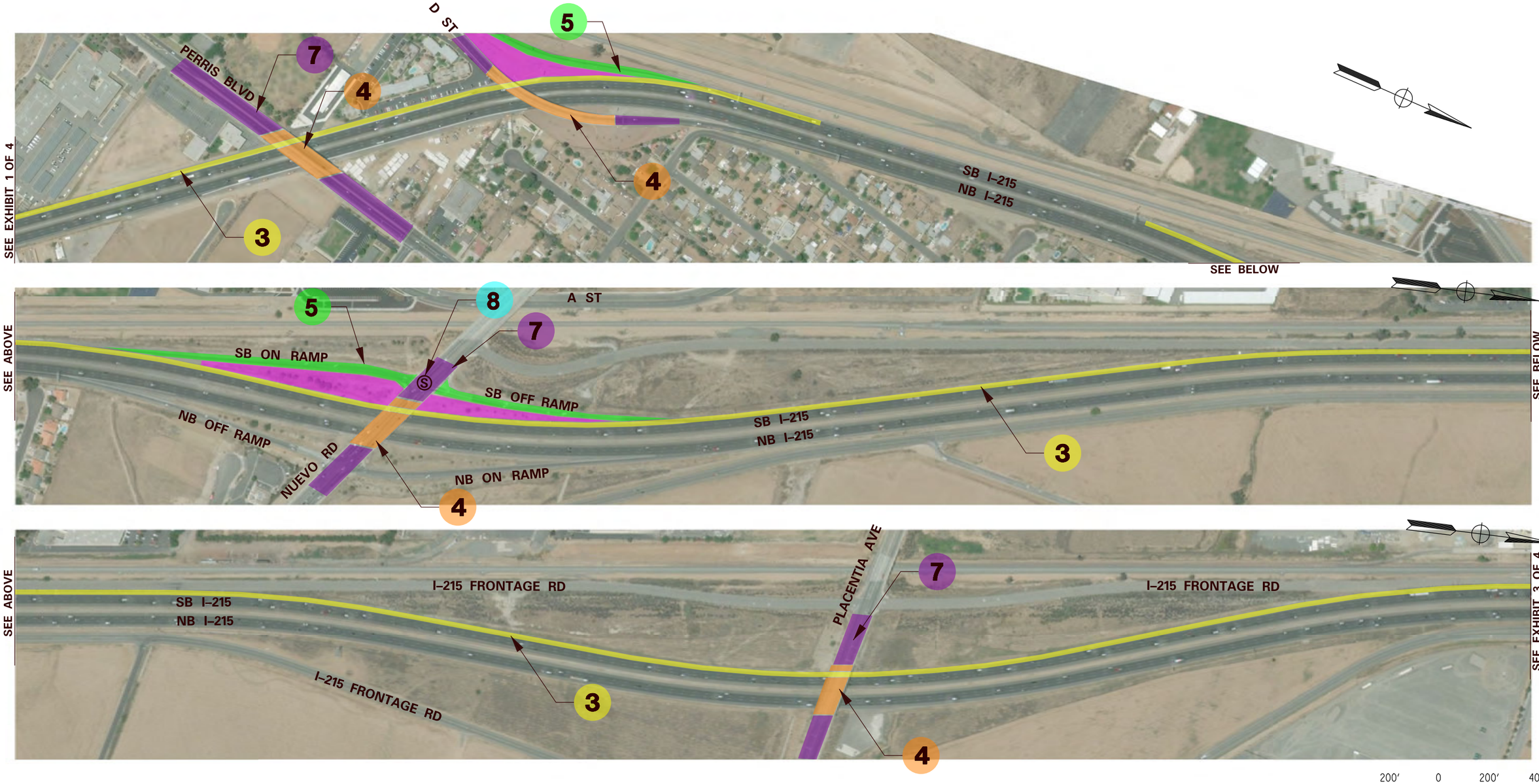

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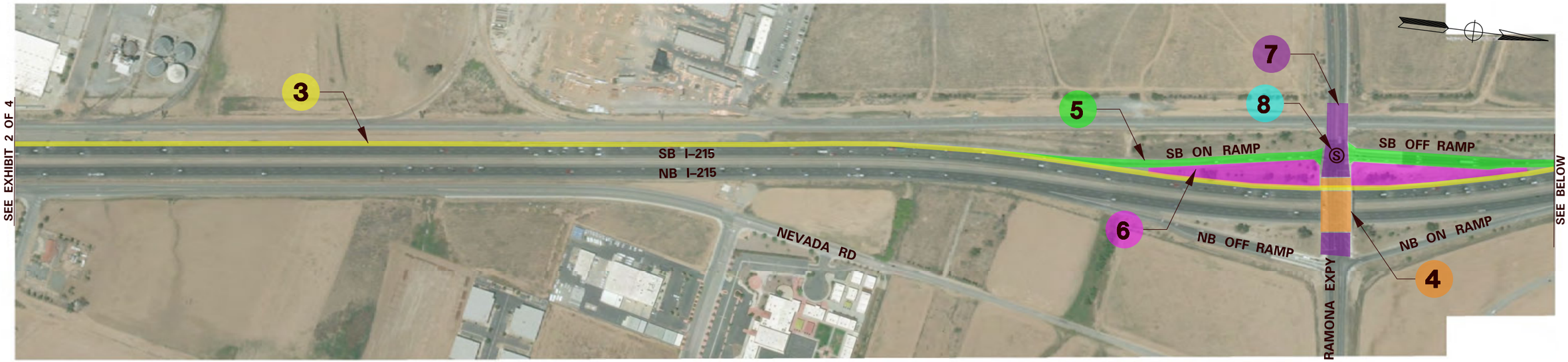

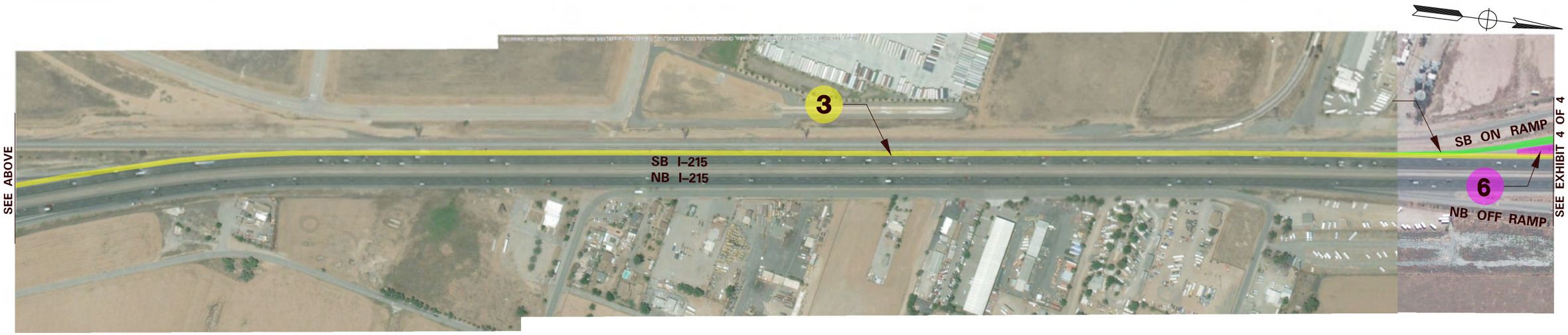

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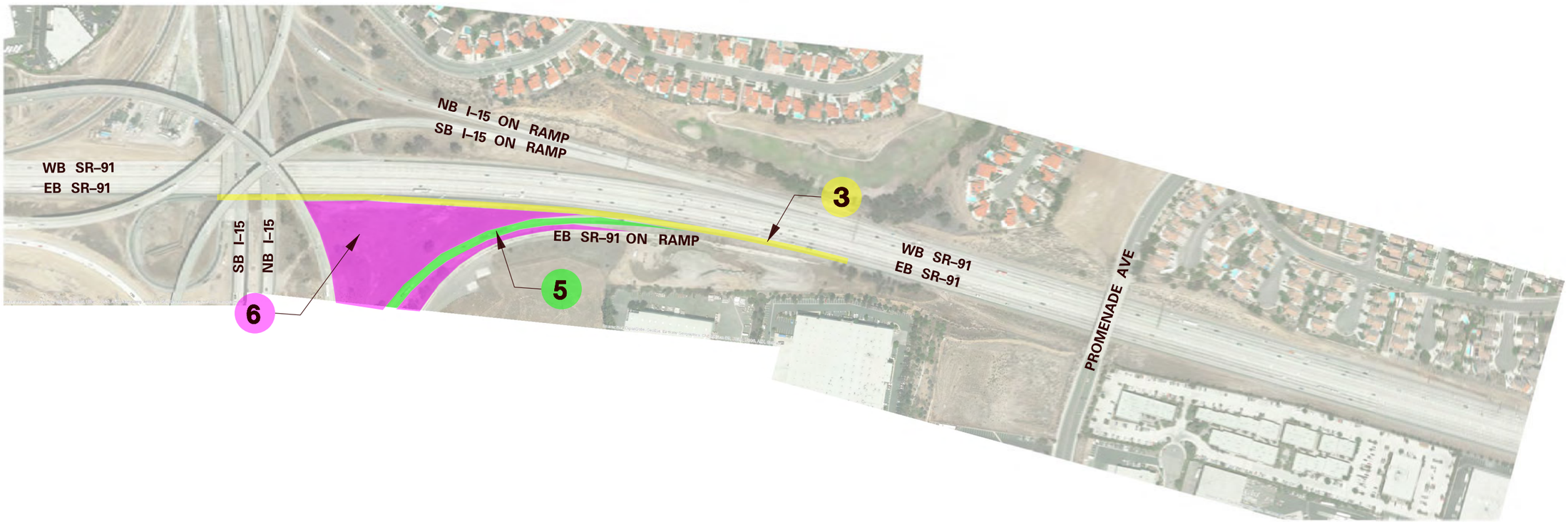

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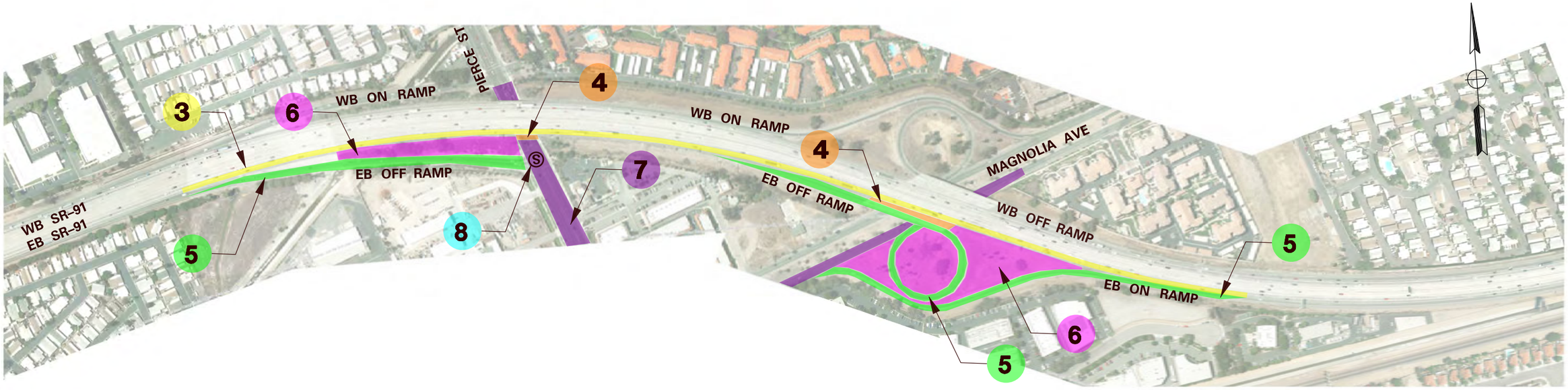

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APPENDIX B – CONCEPTUAL PROJECT COST ESTIMATE TABLES

Project #1: I-15 NB, from SR-79 S On-Ramp to Winchester Rd Off-Ramp		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$665,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$6,173,000***	
SECTION 3: DRAINAGE	***$1,205,850***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 4: Speciallty Items	***$96,000***	
SECTION 6: TRAFFIC ITEMS	***$1,105,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$462,243***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$924,485***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$462,243***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$4,437,528***	
II. STRUCTURE ITEMS		
BRIDGES	***$20,207,000***	
TOTAL CAPITAL OUTLAY COSTS	***$35,738,348***	
SUPPORT COSTS	***$12,508,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$48,246,000***	

Summary of Quantities

Project #1: I-15 NB, from SR-79 S On-Ramp to Winchester Rd Off-Ramp

	Item Description	Distance (ft)	Width (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary								
	Earthwork							
	Roadway Excavation (NB Off Ramp Rancho California)	0.-560	20-235	7831.70	CY	$15.00	$117,475.56	
	Roadway Excavation (NB Loop On Ramp Rancho California)	0-202	0-200	13690.93	CY	$15.00	$205,363.89	
	Roadway Excavation (NB On Ramp Rancho California)	655	0-185	22810.22	CY	$15.00	$342,153.33	
	Pavment Structural Section							
	Remove Concrete Pavement (Mainline)	14605.00	10.00	16227.78	SQYD	$36.38	$590,366.56	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	14605.00	22.00	8330.26	CY	$72.10	$600,611.69	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	14605.00	22.00	5823.74	TON	$85.00	$495,018.22	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (Mainline)	14605.00	22.00	10710.33	CY	$270.00	$2,891,790.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB Off Ramp Rancho California Rd)	1415.00	8.00	1257.78	SQYD	$36.38	$45,757.96	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB Off Ramp Rancho California Rd)	1415.00	38.00	1394.04	CY	$72.10	$100,510.07	Lane plus shoulder at 38' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB Off Ramp Rancho California Rd)	1415.00	38.00	974.58	TON	$85.00	$82,839.41	Lane plus shoulder at 38' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (NB Off Ramp Rancho California Rd)	1415.00	38.00	1792.33	CY	$270.00	$483,930.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB Loop On Ramp Rancho California Rd)	800.00	8.00	711.11	SQYD	$36.38	$25,870.22	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB Loop On Ramp Rancho California Rd)	800.00	46.00	954.07	CY	$72.10	$68,788.74	Lane plus shoulder at 46' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB Loop On Ramp Rancho California Rd)	800.00	46.00	667.00	TON	$85.00	$56,695.00	Lane plus shoulder at 46' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (NB Loop On Ramp Rancho California Rd)	800.00	46.00	1226.67	CY	$270.00	$331,200.00	Lane plus shoulder at 46' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB On Ramp Rancho Califnornia)	835.00	8.00	742.22	SQYD	$36.38	$27,002.04	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB On Ramp Rancho Califnornia)	835.00	36.00	779.33	CY	$72.10	$56,189.93	Lane plus shoulder at 36' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB On Ramp Rancho Califnornia)	835.00	36.00	544.84	TON	$85.00	$46,311.19	Lane plus shoulder at 36' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (NB On Ramp Rancho Califnornia)	835.00	36.00	1002.00	CY	$270.00	$270,540.00	Lane plus shoulder at 36' with a CRCP depth of 0.90'
	Specialty Items							
	Structural Concrete (Retaining Wall)	8625.00		1597.41	SQFT	$60.00	$95,844.44	Retaing wall height 5'
	Traffic Items							
	Traffic Electrical							
	Intersection Signalization			4.00	PER CORNER	$50,000.00	$200,000.00	
	Traffic Signing and Stripping							
	Removal of Existing Striping (Mainline)	14605.00		14605.00	LF	$0.65	$9,493.25	
	Thermoplastic Striping (Mainline)	29210.00		29210.00	LF	$2.41	$70,396.10	
	Removal of Existing Striping (NB Off Ramp Rancho California Rd)	4252.00		4252.00	LF	$0.65	$2,763.80	
	Thermoplastic Striping (NB Off Ramp Rancho California Rd)	4252.00		4252.00	LF	$2.41	$10,247.32	
	Removal of Existing Striping (NB Loop On Ramp Rancho California Rd)	2027.00		2027.00	LF	$0.65	$1,317.55	
	Thermoplastic Striping (NB Loop On Ramp Rancho California Rd)	2027.00		2027.00	LF	$2.41	$4,885.07	
	Removal of Existing Striping (NB On Ramp Rancho Califnornia)	1870.00		1870.00	LF	$0.65	$1,215.50	
	Thermoplastic Striping (NB On Ramp Rancho Califnornia)	1870.00		1870.00	LF	$2.41	$4,506.70	
	Reconstruct Sign Structure			4.00	EA	$200,000.00	$800,000.00	
II. Structure Items								
	Santiago Rd Bridge-Tie-back	70.00	22.00	1540.00	SQ FT	$375.00	$577,500.00	
	Rancho Califnoria Rd Bridge Replacement	122.00	262.00	31964.00	SQ FT	$250.00	$7,991,000.00	
	Drainge Underpass Widening	58.00	22.00	1276.00	SQ FT	$375.00	$478,500.00	
	Overland Rd Bridge Replacement	62.00	720.00	44640.00	SQ FT	$250.00	$11,160,000.00	
III. Right of Way								

I.	***Roadway Items***	$8,039,000.00
	Earthwork	$665,000.00
	Pavment Structural Section	$6,173,000.00
	Speciallty Items	$96,000.00
	Traffic Items	$1,105,000.00
II.	***Structural Items***	$20,207,000.00
III.	***Right of Way***	$0.00

Project #1: I-15 NB at Rancho California Subtotal		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$665,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$1,596,000***	
SECTION 3: DRAINAGE	***$375,300***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Speciallty Items	***$16,000***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$225,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$143,865***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$287,730***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$143,865***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$1,381,104***	
II. STRUCTURE ITEMS		
BRIDGES	***$7,991,000***	
TOTAL CAPITAL OUTLAY COSTS	***$12,824,864***	
SUPPORT COSTS	***$4,489,000***	Support costs are 35% of capital outlay costs
SUBTOTAL PROJECT COSTS	***$17,314,000***	

Amount included in 2016 TUMF Nexus Study	***$12,009,000.00***
Amount to be reduced from Total Project Costs	***$12,009,000.00***

Summary of Quantities

Project #1: I-15 NB at Rancho California Subtotal

Item Description	Distance (ft)	Width (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary							
Earthwork							
Roadway Excavation (NB Off Ramp Rancho California)	0.-560	20-235	7831.70	CY	$15.00	$117,475.56	
Roadway Excavation (NB Loop On Ramp Rancho California)	0-202	0-200	13690.93	CY	$15.00	$205,363.89	
Roadway Excavation (NB On Ramp Rancho California)	655	0-185	22810.22	CY	$15.00	$342,153.33	
Pavment Structural Section							
Remove Concrete Pavement (Mainline)						$0.00	Existing shoulders at 10'
Class 2 Aggregate Subbase (Mainline)						$0.00	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (Mainline)						$0.00	Lane plus shoulder at 22' with a HMA depth of 0.25'
Continously Reinforced Concrete Pavement (Mainline)						$0.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
Remove Concrete Pavement (NB Off Ramp Rancho California Rd)	1415.00	8.00	1257.78	SQYD	$36.38	$45,757.96	Existing shoulders at 8'
Class 2 Aggregate Subbase (NB Off Ramp Rancho California Rd)	1415.00	38.00	1394.04	CY	$72.10	$100,510.07	Lane plus shoulder at 38' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (NB Off Ramp Rancho California Rd)	1415.00	38.00	974.58	TON	$85.00	$82,839.41	Lane plus shoulder at 38' with a HMA depth of 0.25'
Continously Reinforced Concrete Pavement (NB Off Ramp Rancho California Rd)	1415.00	38.00	1792.33	CY	$270.00	$483,930.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
Remove Concrete Pavement (NB Loop On Ramp Rancho California Rd)	800.00	8.00	711.11	SQYD	$36.38	$25,870.22	Existing shoulders at 8'
Class 2 Aggregate Subbase (NB Loop On Ramp Rancho California Rd)	800.00	46.00	954.07	CY	$72.10	$68,788.74	Lane plus shoulder at 46' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (NB Loop On Ramp Rancho California Rd)	800.00	46.00	667.00	TON	$85.00	$56,695.00	Lane plus shoulder at 46' with a HMA depth of 0.25'
Continously Reinforced Concrete Pavement (NB Loop On Ramp Rancho California Rd)	800.00	46.00	1226.67	CY	$270.00	$331,200.00	Lane plus shoulder at 46' with a CRCP depth of 0.90'
Remove Concrete Pavement (NB On Ramp Rancho Califnornia)	835.00	8.00	742.22	SQYD	$36.38	$27,002.04	Existing shoulders at 8'
Class 2 Aggregate Subbase (NB On Ramp Rancho Califnornia)	835.00	36.00	779.33	CY	$72.10	$56,189.93	Lane plus shoulder at 36' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (NB On Ramp Rancho Califnornia)	835.00	36.00	544.84	TON	$85.00	$46,311.19	Lane plus shoulder at 36' with a HMA depth of 0.25'
Continously Reinforced Concrete Pavement (NB On Ramp Rancho Califnornia)	835.00	36.00	1002.00	CY	$270.00	$270,540.00	Lane plus shoulder at 36' with a CRCP depth of 0.90'
Specialty Items							
Structural Concrete (Retaining Wall)	*1400.00*		259.26	SQFT	$60.00	$15,555.56	Retaing wall height 5'
Traffic Items							
Traffic Electrical							
Intersection Signalization			4.00	PER CORNER	$50,000.00	$200,000.00	
Traffic Signing and Stripping							
Removal of Existing Striping (Mainline)						$0.00	
Thermoplastic Striping (Mainline)						$0.00	
Removal of Existing Striping (NB Off Ramp Rancho California Rd)	4252.00		4252.00	LF	$0.65	$2,763.80	
Thermoplastic Striping (NB Off Ramp Rancho California Rd)	4252.00		4252.00	LF	$2.41	$10,247.32	
Removal of Existing Striping (NB Loop On Ramp Rancho California Rd)	2027.00		2027.00	LF	$0.65	$1,317.55	
Thermoplastic Striping (NB Loop On Ramp Rancho California Rd)	2027.00		2027.00	LF	$2.41	$4,885.07	
Removal of Existing Striping (NB On Ramp Rancho Califnornia)	1870.00		1870.00	LF	$0.65	$1,215.50	
Thermoplastic Striping (NB On Ramp Rancho Califnornia)	1870.00		1870.00	LF	$2.41	$4,506.70	
Reconstruct Sign Structure						$0.00	
II. Structure Items							
Santiago Rd Bridge-Tie-back						$0.00	
Rancho Califnoria Rd Bridge Replacement	122.00	262.00	31964.00	SQ FT	$250.00	$7,991,000.00	
Drainge Underpass Widening						$0.00	
Overland Rd Bridge Replacement						$0.00	
III. Right of Way							

I.	***Roadway Items***	$2,502,000.00
	Earthwork	$665,000.00
	Pavment Structural Section	$1,596,000.00
	Speciallty Items	$16,000.00
	Traffic Items	$225,000.00
II.	***Structural Items***	$7,991,000.00
III.	***Right of Way***	$0.00

Project #3: I-15 NB, from Clinton Keith Rd. On-ramp to Baxter Rd. Off-Ramp		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$2,239,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$2,328,000***	
SECTION 3: DRAINAGE	***$809,700***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 4: Specialty Items	***$35,000***	
SECTION 6: TRAFFIC ITEMS	***$796,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$310,385***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$620,770***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$310,385***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$2,979,696***	
II. STRUCTURE ITEMS		
BRIDGES	***$360,000***	
TOTAL CAPITAL OUTLAY COSTS	***$10,788,936***	
SUPPORT COSTS	***$3,776,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$14,565,000***	

Summary of Quantities

Project #3: I-15 NB, from Clinton Keith Rd. On-ramp to Baxter Rd. Off-Ramp

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (NB Off Ramp Baxter Rd)	1175.00	0-185	14.00	50359.04	CY	$15.00	$755,385.56	
	Roadway Excavation (NB On Ramp Baxter Rd)	860.00	0-200	28.00	98907.41	CY	$15.00	$1,483,611.11	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)	4840.00	10.00		5377.78	SQYD	$36.38	$195,643.56	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	4840.00	22.00		2760.59	CY	$72.10	$199,038.73	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	4840.00	22.00		1929.95	TON	$85.00	$164,045.75	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)	4840.00	22.00		3549.33	CY	$270.00	$958,320.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB Off Ramp Baxter)	1220.00	8.00		1084.44	SQYD	$36.38	$39,452.09	Existing shoulders at 8'
	Class 2 Aggregate Subbase(NB Off Ramp Baxter)	1220.00	24.00		759.11	CY	$72.10	$54,731.91	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB Off Ramp Baxter)	1220.00	24.00		530.70	TON	$85.00	$45,109.50	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB Off Ramp Baxter)	1220.00	24.00		976.00	CY	$270.00	$263,520.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB On Ramp Baxter)	1235.00	8.00		1097.78	SQYD	$36.38	$39,937.16	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB On Ramp Baxter)	1235.00	24.00		768.44	CY	$72.10	$55,404.84	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB On Ramp Baxter)	1235.00	24.00		537.23	TON	$85.00	$45,664.13	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB On Ramp Baxter)	1235.00	24.00		988.00	CY	$270.00	$266,760.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Specialty Items						$0.00		
	Structural Concrete (Retaining Wall)	1055.00			586.11	SQFT	$60.00	$35,166.67	Retaining wall height 5'
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				7.00	PER CORNER	$50,000.00	$350,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	4840.00			4840.00	LF	$0.65	$3,146.00	
	Thermoplastic Striping (Mainline)	9680.00			9680.00	LF	$2.41	$23,328.80	
	Removal of Existing Striping (NB Off Ramp Baxter)	1475.00			1475.00	LF	$0.65	$958.75	
	Thermoplastic Striping (NB Off Ramp Baxter)	1475.00			1475.00	LF	$2.41	$3,554.75	
	Removal of Existing Striping (NB On Ramp Baxter)	1235.00			1235.00	LF	$0.65	$802.75	
	Thermoplastic Striping (NB On Ramp Baxter)	1235.00			1235.00	LF	$2.41	$2,976.35	
	Reconstruct Sign Structure				2.00	EA	$200,000.00	$400,000.00	
II. Structure Items									
	Baxter Rd Bridge-Tie-back	60.00	16.00		960.00	SQFT	$375.00	$360,000.00	
III. Right of Way									

I.	***Roadway Items***	$5,398,000.00
	Earthwork	$2,239,000.00
	Pavement Structural Section	$2,328,000.00
	Specialty Items	$35,000.00
	Traffic Items	$796,000.00
II.	***Structural Items***	$360,000.00
III.	***Right of Way***	$0.00

Project #3: I-15 NB at Baxter Subtotal		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$2,239,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$811,000***	
SECTION 3: DRAINAGE	***$573,000***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Specialty Items	***$0***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$770,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$219,650***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$439,300***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$219,650***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$2,108,640***	
II. STRUCTURE ITEMS		
BRIDGES	***$360,000***	
TOTAL CAPITAL OUTLAY COSTS	***$7,740,240***	
SUPPORT COSTS	***$2,709,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$10,449,000***	

Amount included in 2016 TUMF Nexus Study	***$7,159,000.00***
Amount to be reduced from Total Project Costs	***$7,159,000.00***

Summary of Quantities

Project #3: I-15 NB at Baxter Subtotal

	Item Description	*Distance (ft)*	*Width (ft)*	*Depth (ft)*	*Quantity*	*Unit*	*Cost Assumptions*	*Total Cost*	*Engineering Assumptions*
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (NB Off Ramp Baxter Rd)	1175.00	0-185	14.00	50359.04	CY	$15.00	$755,385.56	
	Roadway Excavation (NB On Ramp Baxter Rd)	860.00	0-200	28.00	98907.41	CY	$15.00	$1,483,611.11	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)							$0.00	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)							$0.00	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)							$0.00	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)							$0.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB Off Ramp Baxter)	1220.00	8.00		1084.44	SQYD	$36.38	$39,452.09	Existing shoulders at 8'
	Class 2 Aggregate Subbase(NB Off Ramp Baxter)	1220.00	24.00		759.11	CY	$72.10	$54,731.91	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB Off Ramp Baxter)	1220.00	24.00		530.70	TON	$85.00	$45,109.50	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB Off Ramp Baxter)	1220.00	24.00		976.00	CY	$270.00	$263,520.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB On Ramp Baxter)	1235.00	8.00		1097.78	SQYD	$36.38	$39,937.16	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB On Ramp Baxter)	1235.00	24.00		768.44	CY	$72.10	$55,404.84	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB On Ramp Baxter)	1235.00	24.00		537.23	TON	$85.00	$45,664.13	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB On Ramp Baxter)	1235.00	24.00		988.00	CY	$270.00	$266,760.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Specialty Items						$0.00		
	Structural Concrete (Retaining Wall)							$0.00	Retaining wall height 5'
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				7.00	PER CORNER	$50,000.00	$350,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)							$0.00	
	Thermoplastic Striping (Mainline)							$0.00	
	Removal of Existing Striping (NB Off Ramp Baxter)	1475.00			1475.00	LF	$0.65	$958.75	
	Thermoplastic Striping (NB Off Ramp Baxter)	1475.00			1475.00	LF	$2.41	$3,554.75	
	Removal of Existing Striping (NB On Ramp Baxter)	1235.00			1235.00	LF	$0.65	$802.75	
	Thermoplastic Striping (NB On Ramp Baxter)	1235.00			1235.00	LF	$2.41	$2,976.35	
	Reconstruct Sign Structure				2.00	EA	$200,000.00	$400,000.00	
II. Structure Items									
	Baxter Rd Bridge-Tie-back	60.00	16.00		960.00	SQFT	$375.00	$360,000.00	
III. Right of Way									

I.	***Roadway Items***	$3,820,000.00
	Earthwork	$2,239,000.00
	Pavement Structural Section	$811,000.00
	Specialty Items	$0.00
	Traffic Items	$770,000.00
II.	***Structural Items***	$360,000.00
III.	***Right of Way***	$0.00

Project #7, I-15 SB, from Cajalco Rd On-Ramp to Indian Truck Trail On-Ramp		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$1,510,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$11,919,000***	
SECTION 3: DRAINAGE	***$2,251,950***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Specialty Items	***$304,000***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$1,280,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$863,248***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$1,726,495***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$863,248***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$8,287,176***	
II. STRUCTURE ITEMS		
BRIDGES	***$4,310,000***	
II. STRUCTURE ITEMS		
Right of Way Acquisition	***$375,000***	
TOTAL CAPITAL OUTLAY COSTS	***$33,690,116***	
SUPPORT COSTS	***$11,792,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$45,482,000***	

Summary of Quantities

Project #7, I-15 SB, from Cajalco Rd On-Ramp to Indian Truck Trail On-Ramp

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (SB On Ramp Indian Truck Trail)	840.00	0-186	0-12	36720.00	CY	$15.00	$550,800.00	
	Roadway Excavation (SB Off Ramp Indian Truck Trail)	1100.00	11-167	0-11	36410.00	CY	$15.00	$546,150.00	
	Roadway Excavation (West of SB Off Ramp Indian Truck Trail)	1735	0-162	0-7	10460.52	CY	$15.00	$156,907.78	
	Roadway Excavation (West of SB on Ramp Temescal Canyon)	640.00	36-70	0-2	2587.11	CY	$15.00	$38,806.67	
	Roadway Excavation (SB on Ramp Temescal Canyon)	830.00	14-102	0-3	5971.00	CY	$15.00	$89,565.00	
	Roadway Excavation (SB off Ramp Temescal Canyon)	860.00	12-125	0-2	4170.44	CY	$15.00	$62,556.67	
	Roadway Excavation (SB on Ramp Dos Lagos)	520.00	0-85	0-2	1586.07	CY	$15.00	$23,791.11	
	Roadway Excavation (SB off Ramp Dos Lagos)	950.00	0-90	0-2	2776.52	CY	$15.00	$41,647.78	
	Pavement Structural Section								
	Remove Concrete Pavement (Mainline)	29203.00	10.00		32447.78	SQYD	$36.38	$1,180,450.16	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	29203.00	22.00		16656.53	CY	$72.10	$1,200,935.52	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	29203.00	22.00		11644.70	TON	$85.00	$989,799.18	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)	29203.00	22.00		21415.53	CY	$270.00	$5,782,194.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Indian Truck Trail)	215.00	8.00		191.11	SQYD	$36.38	$6,952.62	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Indian Truck Trail)	215.00	26.00		144.93	CY	$72.10	$10,449.16	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Indian Truck Trail)	215.00	26.00		101.32	TON	$85.00	$8,612.09	Lane plus shoulder at 26' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Indian Truck Trail)	215.00	26.00		186.33	CY	$270.00	$50,310.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB Off Ramp Indian Truck Trail)	1220.00	8.00		1084.44	SQYD	$36.38	$39,452.09	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB Off Ramp Indian Truck Trail)	1220.00	52.00		1644.74	CY	$72.10	$118,585.81	Lane plus shoulder at 52' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB Off Ramp Indian Truck Trail)	1220.00	52.00		1149.85	TON	$85.00	$97,737.25	Lane plus shoulder at 52' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB Off Ramp Indian Truck Trail)	1220.00	52.00		2114.67	CY	$270.00	$570,960.00	Lane plus shoulder at 52' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Temescal Canyon)	955.00	8.00		848.89	SQYD	$36.38	$30,882.58	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Temescal Canyon)	955.00	36.00		891.33	CY	$72.10	$64,265.13	Lane plus shoulder at 36' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Temescal Canyon)	955.00	36.00		623.14	TON	$85.00	$52,966.69	Lane plus shoulder at 36' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Temescal Canyon)	955.00	36.00		1146.00	CY	$270.00	$309,420.00	Lane plus shoulder at 36' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Temescal Canyon)	1165.00	8.00		1035.56	SQYD	$36.38	$37,673.51	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Temescal Canyon)	1165.00	34.00		1026.93	CY	$72.10	$74,041.36	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Temescal Canyon)	1165.00	34.00		717.93	TON	$85.00	$61,024.16	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Temescal Canyon)	1165.00	34.00		1320.33	CY	$270.00	$356,490.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Dos Lagos)	740.00	8.00		657.78	SQYD	$36.38	$23,929.96	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Dos Lagos)	740.00	38.00		729.04	CY	$72.10	$52,563.57	Lane plus shoulder at 38 with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Dos Lagos)	740.00	38.00		509.68	TON	$85.00	$43,322.38	Lane plus shoulder at 38' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Dos Lagos)	740.00	38.00		937.33	CY	$270.00	$253,080.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Dos Lagos)	1050.00	8.00		933.33	SQYD	$36.38	$33,954.67	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Dos Lagos)	1050.00	36.00		980.00	CY	$72.10	$70,658.00	Lane plus shoulder at 36' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Dos Lagos)	1050.00	36.00		685.13	TON	$85.00	$58,235.63	Lane plus shoulder at 36' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Dos Lagos)	1050.00	36.00		1260.00	CY	$270.00	$340,200.00	Lane plus shoulder at 36' with a CRCP depth of 0.90'
	Specialty Items								
	Remove Retaining Wall	1095.00			1095.00	LF	$15.00	$16,425.00	
	Structural Concrete (Retaining Wall)	14010.00			4792.22	SQFT	$60.00	$287,533.33	Retaining wall height 5'
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				12.00	PER CORNER	$50,000.00	$600,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	29203.00			29203.00	LF	$0.65	$18,981.95	
	Thermoplastic Striping (Mainline)	58406.00			58406.00	LF	$2.41	$140,758.46	
	Removal of Existing Striping (SB on Ramp Indian Truck Trail)	2386.00			2386.00	LF	$0.65	$1,550.90	
	Thermoplastic Striping (SB on Ramp Indian Truck Trail)	2386.00			2386.00	LF	$2.41	$5,750.26	
	Removal of Existing Striping (SB Off Ramp Indian Truck Trail)	3870.00			3870.00	LF	$0.65	$2,515.50	
	Thermoplastic Striping (SB Off Ramp Indian Truck Trail)	3870.00			3870.00	LF	$2.41	$9,326.70	
	Removal of Existing Striping (SB on Ramp Temescal Canyon)	2035.00			2035.00	LF	$0.65	$1,322.75	
	Thermoplastic Striping (SB on Ramp Temescal Canyon)	2035.00			2035.00	LF	$2.41	$4,904.35	
	Removal of Existing Striping (SB off Ramp Temescal Canyon)	26170.00			26170.00	LF	$0.65	$17,010.50	
	Thermoplastic Striping (SB off Ramp Temescal Canyon)	26170.00			26170.00	LF	$2.41	$63,069.70	
	Removal of Existing Striping (SB on Ramp Dos Lagos)	1491.00			1491.00	LF	$0.65	$969.15	
	Thermoplastic Striping (SB on Ramp Dos Lagos)	1491.00			1491.00	LF	$2.41	$3,593.31	
	Removal of Existing Striping (SB off Ramp Dos Lagos)	3290.00			3290.00	LF	$0.65	$2,138.50	
	Thermoplastic Striping (SB off Ramp Dos Lagos)	3290.00			3290.00	LF	$2.41	$7,928.90	
	Reconstruct Sign Structure				2.00	LF	$200,000.00	$400,000.00	
II. Structure Items									
	Indian Truck Trail Bridge Widening	136.00	14.00		1904.00	SQFT	$375.00	$714,000.00	
	Temescal Canyon OC Widening PM 31.90	160.00	14.00		2240.00	SQFT	$375.00	$840,000.00	
	Mayhew Wash Bridge Widening PM 31.97	145.00	14.00		2030.00	SQFT	$375.00	$761,250.00	
	Temescal Canyon Road UC Widening PM 33.25	62.00	14.00		868.00	SQFT	$375.00	$325,500.00	
	Brown Canyon Wash Bridge Widening PM 34.72	78.00	14.00		1092.00	SQ FT	$375.00	$409,500.00	
	Dos Lagos Bridge Widening	140.00	14.00		1960.00	SQ FT	$375.00	$735,000.00	
	Bedford Wash Bridge Widening	100.00	14.00		1400.00	SQFT	$375.00	$525,000.00	
III. Right of Way									
	Right of Way Acquisition	150.00	50.00		7500.00	SQFT	$50.00	$375,000.00	

I.	***Roadway Items***	$15,013,000.00
	Earthwork	$1,510,000.00
	Pavement Structural Section	$11,919,000.00
	Specialty Items	$304,000.00
	Traffic Items	$1,280,000.00
II.	***Structural Items***	$4,310,000.00
III.	***Right of Way***	$375,000.00

Project #7, I-15 SB at Temescal Canyon Subtotal		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$191,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$987,000***	
SECTION 3: DRAINAGE	***$375,150***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Specialty Items	***$43,000***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$1,280,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$143,808***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$287,615***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$143,808***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$1,380,552***	
II. STRUCTURE ITEMS		
BRIDGES	***$840,000***	
II. STRUCTURE ITEMS		
Right of Way Acquisition	***$0***	
TOTAL CAPITAL OUTLAY COSTS	***$5,671,932***	
SUPPORT COSTS	***$1,985,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$7,657,000***	

Amount included in 2016 TUMF Nexus Study	***$17,897,000.00***
Amount to be reduced from Total Project Costs	***$7,657,000.00***

Summary of Quantities

Project #7, I-15 SB at Temescal Canyon Subtotal

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (SB On Ramp Indian Truck Trail)							$0.00	
	Roadway Excavation (SB Off Ramp Indian Truck Trail)							$0.00	
	Roadway Excavation (West of SB Off Ramp Indian Truck Trail)							$0.00	
	Roadway Excavation (West of SB on Ramp Temescal Canyon)	640.00	36-70	0-2	2587.11	CY	$15.00	$38,806.67	
	Roadway Excavation (SB on Ramp Temescal Canyon)	830.00	14-102	0-3	5971.00	CY	$15.00	$89,565.00	
	Roadway Excavation (SB off Ramp Temescal Canyon)	860.00	12-125	0-2	4170.44	CY	$15.00	$62,556.67	
	Roadway Excavation (SB on Ramp Dos Lagos)							$0.00	
	Roadway Excavation (SB off Ramp Dos Lagos)							$0.00	
	Pavement Structural Section								
	Remove Concrete Pavement (Mainline)							$0.00	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)							$0.00	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)							$0.00	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)							$0.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Indian Truck Trail)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Indian Truck Trail)							$0.00	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Indian Truck Trail)							$0.00	Lane plus shoulder at 26' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Indian Truck Trail)							$0.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB Off Ramp Indian Truck Trail)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB Off Ramp Indian Truck Trail)							$0.00	Lane plus shoulder at 52' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB Off Ramp Indian Truck Trail)							$0.00	Lane plus shoulder at 52' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB Off Ramp Indian Truck Trail)							$0.00	Lane plus shoulder at 52' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Temescal Canyon)	955.00	8.00		848.89	SQYD	$36.38	$30,882.58	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Temescal Canyon)	955.00	36.00		891.33	CY	$72.10	$64,265.13	Lane plus shoulder at 36' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Temescal Canyon)	955.00	36.00		623.14	TON	$85.00	$52,966.69	Lane plus shoulder at 36' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Temescal Canyon)	955.00	36.00		1146.00	CY	$270.00	$309,420.00	Lane plus shoulder at 36' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Temescal Canyon)	1165.00	8.00		1035.56	SQYD	$36.38	$37,673.51	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Temescal Canyon)	1165.00	34.00		1026.93	CY	$72.10	$74,041.36	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Temescal Canyon)	1165.00	34.00		717.93	TON	$85.00	$61,024.16	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Temescal Canyon)	1165.00	34.00		1320.33	CY	$270.00	$356,490.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Dos Lagos)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Dos Lagos)							$0.00	Lane plus shoulder at 38 with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Dos Lagos)							$0.00	Lane plus shoulder at 38' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Dos Lagos)							$0.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Dos Lagos)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Dos Lagos)							$0.00	Lane plus shoulder at 36' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Dos Lagos)							$0.00	Lane plus shoulder at 36' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Dos Lagos)							$0.00	Lane plus shoulder at 36' with a CRCP depth of 0.90'
	Specialty Items								
	Remove Retaining Wall							$0.00	
	Structural Concrete (Retaining Wall)	*1300.00*			722.22	SQFT	$60.00	$43,333.33	Retaining wall height 5'
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				*4.00*	PER CORNER	$50,000.00	$200,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)							$0.00	
	Thermoplastic Striping (Mainline)							$0.00	
	Removal of Existing Striping (SB on Ramp Indian Truck Trail)							$0.00	
	Thermoplastic Striping (SB on Ramp Indian Truck Trail)							$0.00	
	Removal of Existing Striping (SB Off Ramp Indian Truck Trail)							$0.00	
	Thermoplastic Striping (SB Off Ramp Indian Truck Trail)							$0.00	
	Removal of Existing Striping (SB on Ramp Temescal Canyon)	2035.00			2035.00	LF	$0.65	$1,322.75	
	Thermoplastic Striping (SB on Ramp Temescal Canyon)	2035.00			2035.00	LF	$2.41	$4,904.35	
	Removal of Existing Striping (SB off Ramp Temescal Canyon)	26170.00			26170.00	LF	$0.65	$17,010.50	
	Thermoplastic Striping (SB off Ramp Temescal Canyon)	26170.00			26170.00	LF	$2.41	$63,069.70	
	Removal of Existing Striping (SB on Ramp Dos Lagos)							$0.00	
	Thermoplastic Striping (SB on Ramp Dos Lagos)							$0.00	
	Removal of Existing Striping (SB off Ramp Dos Lagos)							$0.00	
	Thermoplastic Striping (SB off Ramp Dos Lagos)							$0.00	
	Reconstruct Sign Structure							$0.00	
II. Structure Items									
	Indian Truck Trail Bridge Widening							$0.00	
	Temescal Canyon OC Widening PM 31.90	160.00	14.00		2240.00	SQFT	$375.00	$840,000.00	
	Mayhew Wash Bridge Widening PM 31.97							$0.00	
	Temescal Canyon Road UC Widening PM 33.25							$0.00	
	Brown Canyon Wash Bridge Widening PM 34.72							$0.00	
	Dos Lagos Bridge Widening							$0.00	
	Bedford Wash Bridge Widening							$0.00	
III. Right of Way									
	Right of Way Acquisition							$0.00	

I.	***Roadway Items***	$1,507,000.00
	Earthwork	$191,000.00
	Pavement Structural Section	$987,000.00
	Specialty Items	$43,000.00
	Traffic Items	$286,000.00
II.	***Structural Items***	$840,000.00
III.	***Right of Way***	$0.00

Project #8, I-15 SB, from El Cerrito Rd Off-Ramp to Cajalco Rd Off-Ramp		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$1,153,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$3,814,000***	
SECTION 3: DRAINAGE	***$857,700***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 4: Speciallty Items	***$288,000***	
SECTION 6: TRAFFIC ITEMS	***$463,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$328,785***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$657,570***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$328,785***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$3,156,336***	
II. STRUCTURE ITEMS		
BRIDGES	***$975,000***	
TOTAL CAPITAL OUTLAY COSTS	***$12,022,176***	
SUPPORT COSTS	***$4,208,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$16,230,000***	

Summary of Quantities

Project #8, I-15 SB, from El Cerrito Rd Off-Ramp to Cajalco Rd Off-Ramp

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (SB on Ramp Cajalco)	700.00	0-320	0-12	61799.11	CY	$15.00	$926,986.67	
	Roadway Excavation (SB off Ramp Cajalco)	1000.00	0-175	0-5	10822.78	CY	$15.00	$162,341.67	
	Roadway Excavation (SB on Ramp El Cerrito)	595.00	0-78	0-2	1750.96	CY	$15.00	$26,264.44	
	Roadway Excavation (SB off Ramp El Cerrito)	780.00	8-84	0-2	2461.04	CY	$15.00	$36,915.56	
	Pavment Structural Section								
	Remove Concrete Pavement (Mainline)	6907.00	14.00		10744.22	SQYD	$36.38	$390,874.80	Existing shoulders at 14'
	Class 2 Aggregate Subbase (Mainline)	6907.00	22.00		3939.55	CY	$72.10	$284,041.42	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	6907.00	22.00		2754.17	TON	$85.00	$234,104.13	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (Mainline)	6907.00	22.00		5065.13	CY	$270.00	$1,367,586.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Cajalco)	468.00	10.00		520.00	SQYD	$36.38	$18,917.60	Existing shoulders at 10'
	Class 2 Aggregate Subbase (SB on Ramp Cajalco)	468.00	24.00		291.20	CY	$72.10	$20,995.52	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Cajalco)	468.00	24.00		203.58	TON	$85.00	$17,304.30	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (SB on Ramp Cajalco)	468.00	24.00		374.40	CY	$270.00	$101,088.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Cajalco)	1225.00	8.00		1088.89	SQYD	$36.38	$39,613.78	
	Class 2 Aggregate Subbase (SB off Ramp Cajalco)	1225.00	40.00		1270.37	CY	$72.10	$91,593.70	
	Hot Mix Asphalt (Type A) (SB off Ramp Cajalco)	1225.00	40.00		888.13	TON	$85.00	$75,490.63	
	Continously Reinforced Concrete Pavement (SB off Ramp Cajalco)	1225.00	40.00		1633.33	CY	$270.00	$441,000.00	
	Remove Concrete Pavement (SB on Ramp El Cerrito)	820.00	8.00		728.89	SQYD	$36.38	$26,516.98	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp El Cerrito)	820.00	34.00		722.81	CY	$72.10	$52,114.95	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp El Cerrito)	820.00	34.00		505.33	TON	$85.00	$42,952.63	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (SB on Ramp El Cerrito)	820.00	34.00		929.33	CY	$270.00	$250,920.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp El Cerrito)	1060.00	10.00		1177.78	CY	$36.38	$42,847.56	Existing shoulders at 10'
	Class 2 Aggregate Subbase (SB off Ramp El Cerrito)	1060.00	24.00		659.56	TON	$72.10	$47,553.96	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp El Cerrito)	1060.00	24.00		461.10	LF	$85.00	$39,193.50	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (SB off Ramp El Cerrito)	1060.00	24.00		848.00	LF	$270.00	$228,960.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Speciallty Items								
	Structural Concrete (Retaining Wall)	16665.00			4792.22	SQFT	$60.00	$287,533.33	Retaing wall height 5'
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				8.00	PER CORNER	$50,000.00	$400,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	6907.00			6907.00	LF	$0.65	$4,489.55	
	Thermoplastic Striping (Mainline)	13814.00			13814.00	LF	$2.41	$33,291.74	
	Removal of Existing Striping (SB on Ramp Cajalco)	936.00			936.00	LF	$0.65	$608.40	
	Thermoplastic Striping (SB on Ramp Cajalco)	936.00			936.00	LF	$2.41	$2,255.76	
	Removal of Existing Striping (SB off Ramp Cajalco)	3215.00			3215.00	LF	$0.65	$2,089.75	
	Thermoplastic Striping (SB off Ramp Cajalco)	3215.00			3215.00	LF	$2.41	$7,748.15	
	Removal of Existing Striping (SB on Ramp El Cerrito)	1440.00			1440.00	LF	$0.65	$936.00	
	Thermoplastic Striping (SB on Ramp El Cerrito)	1440.00			1440.00	LF	$2.41	$3,470.40	
	Removal of Existing Striping (SB off Ramp El Cerrito)	2640.00			2640.00	LF	$0.65	$1,716.00	
	Thermoplastic Striping (SB off Ramp El Cerrito)	2640.00			2640.00	LF	$2.41	$6,362.40	
	Reconstruct Sign Structure				0.00	LF	$200,000.00	$0.00	
II. Structure Items									
	Cajalco Road OC Tie Back	40.00	16.00		640.00	SQFT	$375.00	$240,000.00	
	El Cerrito UC Widening	140.00	14.00		1960.00	SQFT	$375.00	$735,000.00	
III. Right of Way									

I.	***Roadway Items***	$5,718,000.00
	Earthwork	$1,153,000.00
	Pavment Structural Section	$3,814,000.00
	Speciallty Items	$288,000.00
	Traffic Items	$463,000.00
II.	***Structural Items***	$975,000.00
III.	***Right of Way***	$0.00

Project #8, I-15 SB at Cajalco Subtotal		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$1,089,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$806,000***	
SECTION 3: DRAINAGE	***$316,200***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Speciallty Items	***$0***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$213,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$121,210***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$242,420***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$121,210***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$1,163,616***	
II. STRUCTURE ITEMS		
BRIDGES	***$240,000***	
TOTAL CAPITAL OUTLAY COSTS	***$4,312,656***	
SUPPORT COSTS	***$1,509,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$5,822,000***	
Amount included in 2016 TUMF Nexus Study	***$44,257,000.00***	
Amount to be reduced from Total Project Costs	***$5,822,000.00***	

Summary of Quantities

Project #8, I-15 SB at Cajalco Subtotal

Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary								
Earthwork								
Roadway Excavation (SB on Ramp Cajalco)	700.00	0-320	0-12	61799.11	CY	$15.00	$926,986.67	
Roadway Excavation (SB off Ramp Cajalco)	1000.00	0-175	0-5	10822.78	CY	$15.00	$162,341.67	
Roadway Excavation (SB on Ramp El Cerrito)							$0.00	
Roadway Excavation (SB off Ramp El Cerrito)							$0.00	
Pavment Structural Section								
Remove Concrete Pavement (Mainline)							$0.00	Existing shoulders at 14'
Class 2 Aggregate Subbase (Mainline)							$0.00	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (Mainline)							$0.00	Lane plus shoulder at 22' with a HMA depth of 0.25'
Continously Reinforced Concrete Pavement (Mainline)							$0.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB on Ramp Cajalco)	468.00	10.00		520.00	SQYD	$36.38	$18,917.60	Existing shoulders at 10'
Class 2 Aggregate Subbase (SB on Ramp Cajalco)	468.00	24.00		291.20	CY	$72.10	$20,995.52	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB on Ramp Cajalco)	468.00	24.00		203.58	TON	$85.00	$17,304.30	Lane plus shoulder at 24' with a HMA depth of 0.25'
Continously Reinforced Concrete Pavement (SB on Ramp Cajalco)	468.00	24.00		374.40	CY	$270.00	$101,088.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp Cajalco)	1225.00	8.00		1088.89	SQYD	$36.38	$39,613.78	
Class 2 Aggregate Subbase (SB off Ramp Cajalco)	1225.00	40.00		1270.37	CY	$72.10	$91,593.70	
Hot Mix Asphalt (Type A) (SB off Ramp Cajalco)	1225.00	40.00		888.13	TON	$85.00	$75,490.63	
Continously Reinforced Concrete Pavement (SB off Ramp Cajalco)	1225.00	40.00		1633.33	CY	$270.00	$441,000.00	
Remove Concrete Pavement (SB on Ramp El Cerrito)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB on Ramp El Cerrito)							$0.00	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB on Ramp El Cerrito)							$0.00	Lane plus shoulder at 34' with a HMA depth of 0.25'
Continously Reinforced Concrete Pavement (SB on Ramp El Cerrito)							$0.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp El Cerrito)							$0.00	Existing shoulders at 10'
Class 2 Aggregate Subbase (SB off Ramp El Cerrito)							$0.00	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp El Cerrito)							$0.00	Lane plus shoulder at 24' with a HMA depth of 0.25'
Continously Reinforced Concrete Pavement (SB off Ramp El Cerrito)							$0.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
Speciallty Items								
Structural Concrete (Retaining Wall)							$0.00	Retaing wall height 5'
Traffic Items								
Traffic Electrical								
Intersection Signalization				*4.00*	PER CORNER	$50,000.00	$200,000.00	
Traffic Signing and Stripping						$0.00		
Removal of Existing Striping (Mainline)							$0.00	
Thermoplastic Striping (Mainline)							$0.00	
Removal of Existing Striping (SB on Ramp Cajalco)	936.00			936.00	LF	$0.65	$608.40	
Thermoplastic Striping (SB on Ramp Cajalco)	936.00			936.00	LF	$2.41	$2,255.76	
Removal of Existing Striping (SB off Ramp Cajalco)	3215.00			3215.00	LF	$0.65	$2,089.75	
Thermoplastic Striping (SB off Ramp Cajalco)	3215.00			3215.00	LF	$2.41	$7,748.15	
Removal of Existing Striping (SB on Ramp El Cerrito)							$0.00	
Thermoplastic Striping (SB on Ramp El Cerrito)							$0.00	
Removal of Existing Striping (SB off Ramp El Cerrito)							$0.00	
Thermoplastic Striping (SB off Ramp El Cerrito)							$0.00	
Reconstruct Sign Structure				0.00	LF	$200,000.00	$0.00	
II. Structure Items								
Cajalco Road OC Tie Back	40.00	16.00		640.00	SQFT	$375.00	$240,000.00	
El Cerrito UC Widening							$0.00	
III. Right of Way								

I.	***Roadway Items***	$2,108,000.00
	Earthwork	$1,089,000.00
	Pavment Structural Section	$806,000.00
	Speciallty Items	$0.00
	Traffic Items	$213,000.00
II.	***Structural Items***	$240,000.00
III.	***Right of Way***	$0.00

Project #9, SR-60 EB, from Rubidoux Blvd. On-Ramp to Main St Off-Ramp		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$311,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$4,621,000***	
SECTION 3: DRAINAGE	***$935,550***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 4: Speciallty Items	***$227,000***	
SECTION 6: TRAFFIC ITEMS	***$1,078,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$358,628***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$717,255***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$358,628***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$3,442,824***	
II. STRUCTURE ITEMS		
BRIDGES	***$17,753,000***	
TOTAL CAPITAL OUTLAY COSTS	***$29,802,884***	
SUPPORT COSTS	***$10,431,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$40,234,000***	

Summary of Quantities

Project #9, SR-60 EB, from Rubidoux Blvd. On-Ramp to Main St Off-Ramp

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (EB on Ramp Market St)	955.00	17-48	0-10	10247.78	CY	$15.00	$153,716.67	
	Roadway Excavation (EB off Ramp Market St)	620.00	7-65	0-15	10493.89	CY	$15.00	$157,408.33	
	Pavment Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)	11025.00	10.00		12250.00	SQYD	$36.38	$445,655.00	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	11025.00	22.00		6288.33	CY	$72.10	$453,388.83	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	11025.00	22.00		4396.22	TON	$85.00	$373,678.59	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (Mainline)	11025.00	22.00		8085.00	CY	$270.00	$2,182,950.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (EB On Ramp Main St)	535.00	8.00		475.56	SQYD	$36.38	$17,300.71	Existing shoulders at 8'
	Class 2 Aggregate Subbase (EB On Ramp Main St)	535.00	32.00		443.85	CY	$72.10	$32,001.72	Lane plus shoulder at 32' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (EB On Ramp Main St)	535.00	32.00		310.30	TON	$85.00	$26,375.50	Lane plus shoulder at 32' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (EB On Ramp Main St)	535.00	32.00		570.67	CY	$270.00	$154,080.00	Lane plus shoulder at 32' with a CRCP depth of 0.90'
	Remove Concrete Pavement (EB Off Ramp Main St)	700.00	8.00		622.22	SQYD	$36.38	$22,636.44	Existing shoulders at 8'
	Class 2 Aggregate Subbase (EB Off Ramp Main St)	700.00	20.00		362.96	CY	$72.10	$26,169.63	Lane plus shoulder at 20' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (EB Off Ramp Main St)	700.00	20.00		253.75	TON	$85.00	$21,568.75	Lane plus shoulder at 20' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement t (EB Off Ramp Main St)	700.00	20.00		466.67	CY	$270.00	$126,000.00	Lane plus shoulder at 20' with a CRCP depth of 0.90'
	Remove Concrete Pavement (EB on Ramp Market St)	900.00	8.00		800.00	SQYD	$36.38	$29,104.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (EB on Ramp Market St)	900.00	24.00		560.00	CY	$72.10	$40,376.00	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (EB on Ramp Market St)	900.00	24.00		391.50	TON	$85.00	$33,277.50	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (EB on Ramp Market St)	900.00	24.00		720.00	CY	$270.00	$194,400.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Remove Concrete Pavement (EB off Ramp Market St)	1340.00	8.00		1191.11	SQYD	$36.38	$43,332.62	Existing shoulders at 8'
	Class 2 Aggregate Subbase (EB off Ramp Market St)	1340.00	24.00		833.78	CY	$72.10	$60,115.38	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (EB off Ramp Market St)	1340.00	24.00		582.90	TON	$85.00	$49,546.50	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continously Reinforced Concrete Pavement (EB off Ramp Market St)	1340.00	24.00		1072.00	CY	$270.00	$289,440.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Speciallty Items						$0.00		
	Remove Sound Wall	1920.00			1920.00	LF	$27.00	$51,840.00	
	Sound Wall	1920.00			1920.00	SQFT	$23.98	$46,041.60	6' High sound wall
	Structural Concrete (Retaining Wall)	3885.00			2158.33	SQFT	$60.00	$129,500.00	Retaining wall height 5'
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				8.00	PER CORNER	$50,000.00	$400,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	11025.00			11025.00	LF	$0.65	$7,166.25	
	Thermoplastic Striping (Mainline)	22050.00			22050.00	LF	$2.41	$53,140.50	
	Removal of Existing Striping (EB On Ramp Main St)	865.00			865.00	LF	$0.65	$562.25	
	Thermoplastic Striping (EB On Ramp Main St)	865.00			865.00	LF	$2.41	$2,084.65	
	Removal of Existing Striping (EB Off Ramp Main St)	1400.00			1400.00	LF	$0.65	$910.00	
	Thermoplastic Striping (EB Off Ramp Main St)	1400.00			1400.00	LF	$2.41	$3,374.00	
	Removal of Existing Striping (EB on Ramp Market St)	1640.00			1640.00	LF	$0.65	$1,066.00	
	Thermoplastic Striping (EB on Ramp Market St)	1640.00			1640.00	LF	$2.41	$3,952.40	
	Removal of Existing Striping (EB off Ramp Market St)	1850.00			1850.00	LF	$0.65	$1,202.50	
	Thermoplastic Striping (EB off Ramp Market St)	1850.00			1850.00	LF	$2.41	$4,458.50	
	Reconstruct Sign Structure				3.00	EA	$200,000.00	$600,000.00	
II. Structure Items									
	Orange St Bridge Replacement	56.00	220.00		12320.00	SQFT	$250.00	$3,080,000.00	
	Main St Bridfge Replacement	72.00	210.00		15120.00	SQFT	$250.00	$3,780,000.00	
	Fairmount Blvd Bridge Widening	115.00	14.00		1610.00	SQFT	$375.00	$603,750.00	
	Market St Bridge Widening	278.00	14.00		3892.00	SQFT	$375.00	$1,459,500.00	
	Santa Ana River Bridge Widening	1120.00	14.00		15680.00	SQ FT	$375.00	$5,880,000.00	
	Hall Ave Bridge Replacement	40.00	295.00		11800.00	SQ FT	$250.00	$2,950,000.00	
III. Right of Way									

I.	***Roadway Items***	$6,237,000.00
	Earthwork	$311,000.00
	Pavment Structural Section	$4,621,000.00
	Speciallty Items	$227,000.00
	Traffic Items	$1,078,000.00
II.	***Structural Items***	$17,753,000.00
III.	***Right of Way***	$0.00

Project #10, I-215 NB, from Box Springs Rd. On-Ramp to Martin Luther King Jr. On-Ramp		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$1,077,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$4,546,000***	
SECTION 3: DRAINAGE	***$1,244,400***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Specialty Items	***$1,369,000***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$1,304,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$477,020***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$954,040***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$477,020***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$4,579,392***	
II. STRUCTURE ITEMS		
BRIDGES	***$2,546,000***	
III. RIGHT OF WAY		
Right of Way Acquisition	***$1,065,000***	
TOTAL CAPITAL OUTLAY COSTS	***$19,638,872***	
SUPPORT COSTS	***$6,874,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$26,513,000***	

Summary of Quantities

Project #10, I-215 NB, from Box Springs Rd. On-Ramp to Martin Luther King Jr. On-Ramp

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (New Road)	1891.00	20.00	0-5	7016.11	CY	$15.00	$105,241.67	
	Roadway Excavation (NB off Ramp Central)	790.00	0-85	0-19	30291.63	CY	$15.00	$454,374.44	
	Roadway Excavation (NB on Ramp Central)	647	0-100	0-20	34520.00	CY	$15.00	$517,800.00	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)	7570.00	10.00		8411.11	SQYD	$36.38	$305,996.22	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	7570.00	22.00		4317.70	CY	$72.10	$311,306.44	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	7570.00	22.00		3018.54	TON	$85.00	$256,575.69	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)	7570.00	22.00		5551.33	CY	$270.00	$1,498,860.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB off Ramp Central)	1350.00	8.00		1200.00	SQYD	$36.38	$43,656.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB off Ramp Central)	1350.00	38.00		1330.00	CY	$72.10	$95,893.00	Lane plus shoulder at 38' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB off Ramp Central)	1350.00	38.00		929.81	TON	$85.00	$79,034.06	Lane plus shoulder at 38' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB off Ramp Central)	1350.00	38.00		1710.00	CY	$270.00	$461,700.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB on Ramp Central)	755.00	8.00		671.11	SQYD	$36.38	$24,415.02	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB on Ramp Central)	755.00	30.00		587.22	CY	$72.10	$42,338.72	Lane plus shoulder at 30' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB on Ramp Central)	755.00	30.00		410.53	TON	$85.00	$34,895.16	Lane plus shoulder at 30' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB on Ramp Central)	755.00	30.00		755.00	CY	$270.00	$203,850.00	Lane plus shoulder at 30' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB off Ramp Martin Luther King)	1335.00	8.00		1186.67	SQYD	$36.38	$43,170.93	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB off Ramp Martin Luther King)	1335.00	38.00		1315.22	CY	$72.10	$94,827.52	Lane plus shoulder at 38' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB off Ramp Martin Luther King)	1335.00	38.00		919.48	TON	$85.00	$78,155.91	Lane plus shoulder at 38' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB off Ramp Martin Luther King)	1335.00	38.00		1691.00	CY	$270.00	$456,570.00	Lane plus shoulder at 38"with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB on Ramp Martin Luther King)	930.00	8.00		826.67	SQYD	$36.38	$30,074.13	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB on Ramp Martin Luther King)	930.00	42.00		1012.67	CY	$72.10	$73,013.27	Lane plus shoulder at 42' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB on Ramp Martin Luther King)	930.00	42.00		707.96	TON	$85.00	$60,176.81	Lane plus shoulder at 42' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB on Ramp Martin Luther King)	930.00	42.00		1302.00	CY	$270.00	$351,540.00	Lane plus shoulder at 42' with a CRCP depth of 0.90'
	Specialty Items						$0.00		
	Remove Sound Wall	1000.00			1000.00	LF	$27.00	$27,000.00	
	Sound Wall	1000.00			1000.00	SQFT	$23.98	$23,980.00	6' High sound wall
	Remove Retaining Wall	7430.00			7430.00	LF	$15.00	$111,450.00	
	Structural Concrete (Retaining Wall)	410.00			501.11	SQFT	$80.00	$40,088.89	Retaining wall height 11'
	Structural Concrete (Retaining Wall)	4100.00			6833.33	SQFT	$90.00	$615,000.00	Retaining wall height 15'
	Structural Concrete (Retaining Wall)	2920.00			5515.56	SQFT	$100.00	$551,555.56	Retaining wall height 17'
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				4.00	PER CORNER	$50,000.00	$200,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	13560.00			13560.00	LF	$0.65	$8,814.00	
	Thermoplastic Striping (Mainline)	27120.00			27120.00	LF	$2.41	$65,359.20	
	Removal of Existing Striping (NB off Ramp Central)	2438.00			2438.00	LF	$0.65	$1,584.70	
	Thermoplastic Striping (NB off Ramp Central)	2438.00			2438.00	LF	$2.41	$5,875.58	
	Removal of Existing Striping (NB on Ramp Central)	1345.00			1345.00	LF	$0.65	$874.25	
	Thermoplastic Striping (NB on Ramp Central)	1345.00			1345.00	LF	$2.41	$3,241.45	
	Removal of Existing Striping (NB off Ramp Martin Luther King)	3425.00			3425.00	LF	$0.65	$2,226.25	
	Thermoplastic Striping (NB off Ramp Martin Luther King)	3425.00			3425.00	LF	$2.41	$8,254.25	
	Removal of Existing Striping (NB on Ramp Martin Luther King)	2461.00			2461.00	LF	$0.65	$1,599.65	
	Thermoplastic Striping (NB on Ramp Martin Luther King)	2461.00			2461.00	LF	$2.41	$5,931.01	
	Reconstruct Sign Structure				5.00	EA	$200,000.00	$1,000,000.00	
II. Structure Items									
	Central Bridge Widening	150.00	14.00		2100.00	SQFT	$375.00	$787,500.00	
	Martin Luther King Widening	175.00	14.00		2450.00	SQFT	$375.00	$918,750.00	
	Canyon Crest Widening	160.00	14.00		2240.00	SQFT	$375.00	$840,000.00	
III. Right of Way									
	Right of Way Acquisition #1	1950.00	10.00		19500.00	SQFT	$50.00	$975,000.00	
	Right of Way Acquisition #2	360.00	5.00		1800.00	SQFT	$50.00	$90,000.00	

I.	***Roadway Items***	$8,296,000.00
	Earthwork	$1,077,000.00
	Pavement Structural Section	$4,546,000.00
	Specialty Items	$1,369,000.00
	Traffic Items	$1,304,000.00
II.	***Structural Items***	$2,546,000.00
III.	***Right of Way***	$1,065,000.00

Project #10C, I-215 NB, Martin Luther King Off Ramp to SR-91		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$1,434,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$3,172,000***	
SECTION 3: DRAINAGE	***$1,193,850***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Specialty Items	***$1,888,000***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$1,465,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$457,643***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$915,285***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$457,643***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$4,393,368***	
II. STRUCTURE ITEMS		
BRIDGES	***$21,655,000***	
III. RIGHT OF WAY		
Right of Way Acquisition	***$3,768,750***	
TOTAL CAPITAL OUTLAY COSTS	***$40,800,538***	
SUPPORT COSTS	***$14,280,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$55,081,000***	

Summary of Quantities

Project #10C, I-215 NB, Martin Luther King Off Ramp to SR-91

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (NB off Ramp University)	276.00	168	0-18	28446.67	CY	$15.00	$426,700.00	
	Roadway Excavation (NB on Ramp University)	0-410	6-170	0-5	4946.67	CY	$15.00	$74,200.00	
	Roadway Excavation (NB Off Ramp 3rd St)	600	6-34	0-6	5928.89	CY	$15.00	$88,933.33	
	Roadway Excavation (NB On Ramp 3rd St)	436.00	6-38	0-15	4478.89	CY	$15.00	$67,183.33	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)	5867.00	10.00		6518.89	SQYD	$36.38	$237,157.18	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	5867.00	22.00		3346.36	CY	$72.10	$241,272.77	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	5867.00	22.00		2339.47	TON	$85.00	$198,854.63	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)	5867.00	22.00		4302.47	CY	$270.00	$1,161,666.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB off Ramp University)	610.00	8.00		542.22	SQYD	$36.38	$19,726.04	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB off Ramp University)	610.00	42.00		664.22	CY	$72.10	$47,890.42	Lane plus shoulder at 42' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB off Ramp University)	610.00	42.00		464.36	TON	$85.00	$39,470.81	Lane plus shoulder at 42' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB off Ramp University)	610.00	42.00		854.00	CY	$270.00	$230,580.00	Lane plus shoulder at 42' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB on Ramp University)	936.00	8.00		832.00	SQYD	$36.38	$30,268.16	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB on Ramp University)	936.00	26.00		630.93	CY	$72.10	$45,490.29	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB on Ramp University)	936.00	26.00		441.09	TON	$85.00	$37,492.65	Lane plus shoulder at 26' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB on Ramp Central)	936.00	26.00		811.20	CY	$270.00	$219,024.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB Off Ramp 3rd St)	850.00	8.00		755.56	SQYD	$36.38	$27,487.11	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB Off Ramp 3rd St)	850.00	34.00		749.26	CY	$72.10	$54,021.59	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB Off Ramp 3rd St)	850.00	34.00		523.81	TON	$85.00	$44,524.06	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB Off Ramp 3rd St)	850.00	34.00		963.33	CY	$270.00	$260,100.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB On Ramp 3rd St)	610.00	8.00		542.22	SQYD	$36.38	$19,726.04	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB On Ramp 3rd St)	610.00	34.00		537.70	CY	$72.10	$38,768.44	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB On Ramp 3rd St)	610.00	34.00		375.91	TON	$85.00	$31,952.56	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB On Ramp 3rd St)	610.00	34.00		691.33	CY	$270.00	$186,660.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Specialty Items						$0.00		
	Remove Sound Wall	2633.00			2633.00	LF	$27.00	$71,091.00	
	Sound Wall	2633.00			2633.00	SQFT	$23.98	$63,139.34	6' High sound wall
	Remove Retaining Wall	3444.00			3444.00	LF	$27.00	$92,988.00	
	Structural Concrete (Retaining Wall)	34336.00			19075.56	SQFT	$60.00	$1,144,533.33	Retaining wall height 5'
	Structural Concrete (Retaining Wall)	3444.00			5740.00	SQFT	$90.00	$516,600.00	Retaining wall height 15'
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				8.00	PER CORNER	$50,000.00	$400,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	11735.00			11735.00	LF	$0.65	$7,627.75	
	Thermoplastic Striping (Mainline)	11735.00			11735.00	LF	$2.41	$28,281.35	
	Removal of Existing Striping (NB off Ramp University)	2110.00			2110.00	LF	$0.65	$1,371.50	
	Thermoplastic Striping (NB off Ramp University)	2110.00			2110.00	LF	$2.41	$5,085.10	
	Removal of Existing Striping (NB on Ramp University)	2810.00			2810.00	LF	$0.65	$1,826.50	
	Thermoplastic Striping (NB on Ramp University)	2810.00			2810.00	LF	$2.41	$6,772.10	
	Removal of Existing Striping (NB Off Ramp 3rd St)	2660.00			2660.00	LF	$0.65	$1,729.00	
	Thermoplastic Striping (NB Off Ramp 3rd St)	2660.00			2660.00	LF	$2.41	$6,410.60	
	Removal of Existing Striping (NB On Ramp 3rd St)	1830.00			1830.00	LF	$0.65	$1,189.50	
	Thermoplastic Striping (NB On Ramp 3rd St)	1830.00			1830.00	LF	$2.41	$4,410.30	
	Reconstruct Sign Structure				5.00	EA	$200,000.00	$1,000,000.00	
II. Structure Items									
	University Ave Bridge Widening	108.00	14.00		1512.00	SQFT	$375.00	$567,000.00	
	Iowa Ave Bridge Replacement	400.00	120.00		48000.00	SQFT	$250.00	$12,000,000.00	
	3rd St Bridge Replacement	256.00	142.00		36352.00	SQFT	$250.00	$9,088,000.00	
III. Right of Way									
	Right of Way Acquisition #1	1075.00	5.00		5375.00	SQFT	$50.00	$268,750.00	
	Right of Way Acquisition #2	500.00			10.00	PER HOUSE	$350,000.00	$3,500,000.00	$350,000 per property

I.	***Roadway Items***	$7,959,000.00
	Earthwork	$1,434,000.00
	Pavement Structural Section	$3,172,000.00
	Specialty Items	$1,888,000.00
	Traffic Items	$1,465,000.00
II.	***Structural Items***	$21,655,000.00
III.	***Right of Way***	$3,768,750.00

Project #11, I-215 NB, from Center St. off-Ramp to County Line/Iowa Ave.		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$1,388,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$2,919,000***	
SECTION 3: DRAINAGE	***$836,700***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 4: Specialty Items	***$422,000***	
SECTION 6: TRAFFIC ITEMS	***$849,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$320,735***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$641,470***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$320,735***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$3,079,056***	
II. STRUCTURE ITEMS		
BRIDGES	***$25,566,000***	
III. RIGHT OF WAY		
Right of Way Acquisition	***$400,000***	
TOTAL CAPITAL OUTLAY COSTS	***$36,742,696***	
SUPPORT COSTS	***$12,860,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$49,603,000***	

Summary of Quantities

Project #11, I-215 NB, from Center St. off-Ramp to County Line/Iowa Ave.

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (NB off Ramp Highgrove)	0-236	0+56	0-6	1596.67	CY	$15.00	$23,950.00	
	Roadway Excavation (NB off Ramp La Cadena)	646.00	0-260	0-12	37572.44	CY	$15.00	$563,586.67	
	Roadway Excavation (NB loop off Ramp La Cadena)	260	285.00	0-18	48333.33	CY	$15.00	$725,000.00	
	Roadway Excavation (NB on Ramp La Cadena)	0-430'	0-240	0-5	5037.41	CY	$15.00	$75,561.11	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)	5915.00	10.00		6572.22	SQYD	$36.38	$239,097.44	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	5915.00	22.00		3373.74	CY	$72.10	$243,246.71	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	5915.00	22.00		2358.61	TON	$85.00	$200,481.53	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)	5915.00	22.00		4337.67	CY	$270.00	$1,171,170.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB off Ramp Highgrove)	477.00	8.00		424.00	SQYD	$36.38	$15,425.12	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB off Ramp Highgrove)	477.00	48.00		593.60	CY	$72.10	$42,798.56	Lane plus shoulder at 48' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB off Ramp Highgrove)	477.00	48.00		414.99	TON	$85.00	$35,274.15	Lane plus shoulder at 48' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB off Ramp Highgrove)	477.00	48.00		763.20	CY	$270.00	$206,064.00	Lane plus shoulder at 48' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB off Ramp La Cadena)	1170.00	8.00		1040.00	SQYD	$36.38	$37,835.20	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB off Ramp La Cadena)	1170.00	30.00		910.00	CY	$72.10	$65,611.00	Lane plus shoulder at 30' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB off Ramp La Cadena)	1170.00	30.00		636.19	TON	$85.00	$54,075.94	Lane plus shoulder at 30' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB off Ramp La Cadena)	1170.00	30.00		1170.00	CY	$270.00	$315,900.00	Lane plus shoulder at 30' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB on Ramp La Cadena)	885.00	8.00		786.67	SQYD	$36.38	$28,618.93	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB on Ramp La Cadena)	885.00	24.00		550.67	CY	$72.10	$39,703.07	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB on Ramp La Cadena)	885.00	24.00		384.98	TON	$85.00	$32,722.88	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB on Ramp La Cadena)	885.00	24.00		708.00	CY	$270.00	$191,160.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Specialty Items								
	Remove Retaining Wall	1020.00			1020.00	LF	$15.00	$15,300.00	
	Structural Concrete (Retaining Wall)	1020.00			1133.33	SQFT	$80.00	$90,666.67	Retaining wall height 10'
	Concrete Barrier (Type 60)	3545.00			3545.00	LF	$82.40	$292,108.00	
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				8.00	PER CORNER	$50,000.00	$400,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	5915.00			5915.00	LF	$0.65	$3,844.75	
	Thermoplastic Striping (Mainline)	11830.00			11830.00	LF	$2.41	$28,510.30	
	Removal of Existing Striping (NB off Ramp Highgrove)	1170.00			1170.00	LF	$0.65	$760.50	
	Thermoplastic Striping (NB off Ramp Highgrove)	1170.00			1170.00	LF	$2.41	$2,819.70	
	Removal of Existing Striping (NB off Ramp La Cadena)	2340.00			2340.00	LF	$0.65	$1,521.00	
	Thermoplastic Striping (NB off Ramp La Cadena)	2340.00			2340.00	LF	$2.41	$5,639.40	
	Removal of Existing Striping (NB on Ramp La Cadena)	1770.00			1770.00	LF	$0.65	$1,150.50	
	Thermoplastic Striping (NB on Ramp La Cadena)	1770.00			1770.00	LF	$2.41	$4,265.70	
	Reconstruct Sign Structure				2.00	EA	$200,000.00	$400,000.00	
II. Structure Items									
	Center St Bridge Replacement	303.00	48.00		14544.00	SQFT	$250.00	$3,636,000.00	
	Iowa St Bridge Replacement	232.00	60.00		13920.00	SQFT	$250.00	$3,480,000.00	
	Railroad Bridge Replacement	410.00	120.00		49200.00	SQFT	$375.00	$18,450,000.00	Steel Truss Bridge- 4 track railroad
III. Right of Way									
	Right of Way Acquisition #1	1600.00	5.00		8000.00	SQFT	$50.00	$400,000.00	

I.	***Roadway Items***	$5,578,000.00
	Earthwork	$1,388,000.00
	Pavement Structural Section	$2,919,000.00
	Specialty Items	$422,000.00
	Traffic Items	$849,000.00
II.	***Structural Items***	$25,566,000.00
III.	***Right of Way***	$400,000.00

Project #11, I-215 NB at Highgrove/Center Subtotal		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$24,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$300,000***	
SECTION 3: DRAINAGE	***$142,800***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Specialty Items	***$24,000***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$604,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$54,740***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$109,480***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$54,740***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$525,504***	
II. STRUCTURE ITEMS		
BRIDGES	***$3,636,000***	
III. RIGHT OF WAY		
Right of Way Acquisition	***$0***	
TOTAL CAPITAL OUTLAY COSTS	***$5,475,264***	
SUPPORT COSTS	***$1,916,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$7,391,000***	

Amount included in 2016 TUMF Nexus Study	***$17,897,000.00***
Amount to be reduced from Total Project Costs	***$7,391,000.00***

Summary of Quantities

Project #11, I-215 NB at Highgrove/Center St Subtotal.

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (NB off Ramp Highgrove)	0-236	0+56	0-6	1596.67	CY	$15.00	$23,950.00	
	Roadway Excavation (NB off Ramp La Cadena)							$0.00	
	Roadway Excavation (NB loop off Ramp La Cadena)							$0.00	
	Roadway Excavation (NB on Ramp La Cadena)							$0.00	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)							$0.00	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)							$0.00	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)							$0.00	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)							$0.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB off Ramp Highgrove)	477.00	8.00		424.00	SQYD	$36.38	$15,425.12	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB off Ramp Highgrove)	477.00	48.00		593.60	CY	$72.10	$42,798.56	Lane plus shoulder at 48' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB off Ramp Highgrove)	477.00	48.00		414.99	TON	$85.00	$35,274.15	Lane plus shoulder at 48' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB off Ramp Highgrove)	477.00	48.00		763.20	CY	$270.00	$206,064.00	Lane plus shoulder at 48' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB off Ramp La Cadena)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB off Ramp La Cadena)							$0.00	Lane plus shoulder at 30' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB off Ramp La Cadena)							$0.00	Lane plus shoulder at 30' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB off Ramp La Cadena)							$0.00	Lane plus shoulder at 30' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB on Ramp La Cadena)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB on Ramp La Cadena)							$0.00	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB on Ramp La Cadena)							$0.00	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB on Ramp La Cadena)							$0.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Specialty Items								
	Remove Retaining Wall							$0.00	
	Structural Concrete (Retaining Wall)							$0.00	Retaining wall height 10'
	Concrete Barrier (Type 60)							$0.00	
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				*4.00*	PER CORNER	$50,000.00	$200,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)							$0.00	
	Thermoplastic Striping (Mainline)							$0.00	
	Removal of Existing Striping (NB off Ramp Highgrove)	1170.00			1170.00	LF	$0.65	$760.50	
	Thermoplastic Striping (NB off Ramp Highgrove)	1170.00			1170.00	LF	$2.41	$2,819.70	
	Removal of Existing Striping (NB off Ramp La Cadena)							$0.00	
	Thermoplastic Striping (NB off Ramp La Cadena)							$0.00	
	Removal of Existing Striping (NB on Ramp La Cadena)							$0.00	
	Thermoplastic Striping (NB on Ramp La Cadena)							$0.00	
	Reconstruct Sign Structure				2.00	EA	$200,000.00	$400,000.00	
II. Structure Items									
	Center St Bridge Replacement	303.00	48.00		14544.00	SQFT	$250.00	$3,636,000.00	
	Iowa St Bridge Replacement							$0.00	
	Railroad Bridge Replacement							$0.00	Steel Truss Bridge- 4 track railroad
III. Right of Way									
	Right of Way Acquisition #1							$0.00	

I.	***Roadway Items***	$952,000.00
	Earthwork	$24,000.00
	Pavement Structural Section	$300,000.00
	Specialty Items	$24,000.00
	Traffic Items	$604,000.00
II.	***Structural Items***	$3,636,000.00
III.	***Right of Way***	$0.00

Project #12, I-215 SB, from Martin Luther King Blvd On-Ramp to Sycamore Canyon Rd Off-Ramp		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$119,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$2,740,000***	
SECTION 3: DRAINAGE	***$674,400***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 4: Specialty Items	***$193,000***	
SECTION 6: TRAFFIC ITEMS	***$1,444,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$258,520***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$517,040***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$258,520***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$2,481,792***	
II. STRUCTURE ITEMS		
BRIDGES	***$814,000***	
III. RIGHT OF WAY		
Right of Way Acquisition	***$427,500***	
TOTAL CAPITAL OUTLAY COSTS	***$9,927,772***	
SUPPORT COSTS	***$3,475,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$13,403,000***	

Summary of Quantities

Project #12, I-215 SB, from Martin Luther King Blvd Jr. On-Ramp to Sycamore Canyon Rd Off-Ramp

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (SB on Ramp Watkins)	400.00	22.00	0-13	3955.85	CY	$15.00	$59,337.78	
	Roadway Excavation (SB off Ramp Watkins)	450.00	0-32	0-13	3952.96	CY	$15.00	$59,294.44	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)	6370.00	10.00		7077.78	SQYD	$36.38	$257,489.56	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	6370.00	22.00		3633.26	CY	$72.10	$261,957.99	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	6370.00	22.00		2540.04	TON	$85.00	$215,903.19	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)	6370.00	22.00		4671.33	CY	$270.00	$1,261,260.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Watkins)	530.00	8.00		471.11	SQYD	$36.38	$17,139.02	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Watkins)	530.00	40.00		549.63	CY	$72.10	$39,628.30	Lane plus shoulder at 48' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Watkins)	530.00	40.00		384.25	TON	$85.00	$32,661.25	Lane plus shoulder at 48' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Watkins)	530.00	40.00		706.67	CY	$270.00	$190,800.00	Lane plus shoulder at 48' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Watkins)	710.00	8.00		631.11	SQYD	$36.38	$22,959.82	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Watkins)	710.00	50.00		920.37	CY	$72.10	$66,358.70	Lane plus shoulder at 30' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Watkins)	710.00	50.00		643.44	TON	$85.00	$54,692.19	Lane plus shoulder at 30' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Watkins)	710.00	50.00		1183.33	CY	$270.00	$319,500.00	Lane plus shoulder at 30' with a CRCP depth of 0.90'
	Sec 3. Drainage								
	Specialty Items						$0.00		
	Remove Retaining Wall	2065.00			2065.00	LF	$15.00	$30,975.00	
	Structural Concrete (Retaining Wall)	2065.00			1835.56	SQFT	$75.00	$137,666.67	Retaining wall height 8'
	Sec 5. Environmental								
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				4.00	PER CORNER	$50,000.00	$200,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	6370.00			6370.00	LF	$0.65	$4,140.50	
	Thermoplastic Striping (Mainline)	12740.00			12740.00	LF	$2.41	$30,703.40	
	Removal of Existing Striping (SB on Ramp Watkins)	1319.00			1319.00	LF	$0.65	$857.35	
	Thermoplastic Striping (SB on Ramp Watkins)	1319.00			1319.00	LF	$2.41	$3,178.79	
	Removal of Existing Striping (SB off Ramp Watkins)	1705.00			1705.00	LF	$0.65	$1,108.25	
	Thermoplastic Striping (SB off Ramp Watkins)	1705.00			1705.00	LF	$2.41	$4,109.05	
	Reconstruct Sign Structure				6.00	EA	$200,000.00	$1,200,000.00	
II. Structure Items									
	Watkins Dr Bridge Widening	155.00	14.00		2170.00	SQFT	$375.00	$813,750.00	
III. Right of Way									
	Right of Way Acquisition #1	570.00	15.00		8550.00	SQFT	$50.00	$427,500.00	

I.	***Roadway Items***	$4,496,000.00
	Earthwork	$119,000.00
	Pavement Structural Section	$2,740,000.00
	Specialty Items	$193,000.00
	Traffic Items	$1,444,000.00
II.	***Structural Items***	$814,000.00
III.	***Right of Way***	$427,500.00

Project #13 I-215 SB, from Van Buren On Ramp to Case Rd Off Ramp		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$2,578,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$20,307,000***	
SECTION 3: DRAINAGE	***$4,037,100***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 4: Specialty Items	***$446,000***	
SECTION 6: TRAFFIC ITEMS	***$3,583,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$1,547,555***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$3,095,110***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$1,547,555***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$14,856,528***	
II. STRUCTURE ITEMS		
BRIDGES	***$42,690,000***	
III. RIGHT OF WAY		
Right of Way Acquisition	***$360,000***	
TOTAL CAPITAL OUTLAY COSTS	***$95,047,848***	
SUPPORT COSTS	***$33,267,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$128,315,000***	

Summary of Quantities

Project #13, I-215 SB, from Van Buren On Ramp to Case Rd Off Ramp

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (SB off Ramp Harley Knox)	845.00	26-85	0-15	24160.00	CY	$15.00	$362,400.00	
	Roadway Excavation (SB on Ramp Harley Knox)	480.00	21-76	0-15	14576.11	CY	$15.00	$218,641.67	
	Roadway Excavation (SB off Ramp Ramona)	700.00	18-100	0-11	14719.22	CY	$15.00	$220,788.33	
	Roadway Excavation (SB off Ramp Nuevo)	588.00	26-95	0-15	16787.22	CY	$15.00	$251,808.33	
	Roadway Excavation (SB on Ramp Nuevo)	790.00	25-102	0-15	32457.22	CY	$15.00	$486,858.33	
	Roadway Excavation (SB off Ramp D st)	775.00	0-21	0-18	29114.00	CY	$15.00	$436,710.00	
	Roadway Excavation (SB off Ramp Redlands)	695.00	19-80	0-15	22228.33	CY	$15.00	$333,425.00	
	Roadway Excavation (SB on Ramp Redlands)	778.00	20-80	0-15	17835.56	CY	$15.00	$267,533.33	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)	52230.00	10.00		58033.33	SQYD	$36.38	$2,111,252.67	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	52230.00	22.00		29790.44	CY	$72.10	$2,147,891.04	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	52230.00	22.00		20826.71	TON	$85.00	$1,770,270.56	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)	52230.00	22.00		38302.00	CY	$270.00	$10,341,540.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Harley Knox)	1450.00	8.00		1288.89	SQYD	$36.38	$46,889.78	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Harley Knox)	1450.00	34.00		1278.15	CY	$72.10	$92,154.48	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Harley Knox)	1450.00	34.00		893.56	TON	$85.00	$75,952.81	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Harley Knox)	1450.00	34.00		1643.33	CY	$270.00	$443,700.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Harley Knox)	860.00	8.00		764.44	SQYD	$36.38	$27,810.49	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Harley Knox)	860.00	32.00		713.48	CY	$72.10	$51,442.01	Lane plus shoulder at 32' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Harley Knox)	860.00	32.00		498.80	TON	$85.00	$42,398.00	Lane plus shoulder at 32' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Harley Knox)	860.00	32.00		917.33	CY	$270.00	$247,680.00	Lane plus shoulder at 32' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Ramona)	720.00	8.00		640.00	SQYD	$36.38	$23,283.20	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Ramona)	720.00	48.00		896.00	CY	$72.10	$64,601.60	Lane plus shoulder at 48' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Ramona)	720.00	48.00		626.40	TON	$85.00	$53,244.00	Lane plus shoulder at 48' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Ramona)	720.00	48.00		1152.00	CY	$270.00	$311,040.00	Lane plus shoulder at 48' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Nuevo)	1040.00	8.00		924.44	SQYD	$36.38	$33,631.29	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Nuevo)	1040.00	26.00		701.04	CY	$72.10	$50,544.77	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Nuevo)	1040.00	26.00		490.10	TON	$85.00	$41,658.50	Lane plus shoulder at 26' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Nuevo)	1040.00	26.00		901.33	CY	$270.00	$243,360.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Nuevo)	1420.00	8.00		1262.22	SQYD	$36.38	$45,919.64	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Nuevo)	1420.00	24.00		883.56	CY	$72.10	$63,704.36	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Nuevo)	1420.00	24.00		617.70	TON	$85.00	$52,504.50	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Nuevo)	1420.00	24.00		1136.00	CY	$270.00	$306,720.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp D st)	1280.00	8.00		1137.78	SQYD	$36.38	$41,392.36	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp D st)	1280.00	38.00		1261.04	CY	$72.10	$90,920.77	Lane plus shoulder at 38' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp D st)	1280.00	38.00		881.60	TON	$85.00	$74,936.00	Lane plus shoulder at 38' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp D st)	1280.00	38.00		1621.33	CY	$270.00	$437,760.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Redlands)	1075.00	8.00		955.56	SQYD	$36.38	$34,763.11	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Redlands)	1075.00	34.00		34.00	CY	$72.10	$2,451.40	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Redlands)	1075.00	34.00		662.47	TON	$85.00	$56,309.84	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Redlands)	1075.00	34.00		1218.33	CY	$270.00	$328,950.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Redlands)	1040.00	8.00		924.44	SQYD	$36.38	$33,631.29	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Redlands)	1040.00	40.00		1078.52	CY	$72.10	$77,761.19	Lane plus shoulder at 40' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Redlands)	1040.00	40.00		754.00	TON	$85.00	$64,090.00	Lane plus shoulder at 40' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Redlands)	1040.00	40.00		1386.67	CY	$270.00	$374,400.00	Lane plus shoulder at 40' with a CRCP depth of 0.90'
	Sec 3. Drainage								
	Specialty Items						$0.00		
	Remove Sound Wall	1020.00			1020.00	LF	$27.00	$27,540.00	
	Sound Wall	1020.00			1020.00	SQFT	$23.98	$24,459.60	
	Remove Retaining Wall	1020.00			1020.00	LF	$15.00	$15,300.00	
	Structural Concrete (Retaining Wall)	1020.00			1020.00	SQFT	$75.00	$76,500.00	Retaining wall height 9'
	Concrete Barrier (Type 60)	3665.00			3665.00	LF	$82.40	$301,996.00	
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				16.00	PER CORNER	$50,000.00	$800,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	60115.00			60115.00	LF	$0.65	$39,074.75	
	Thermoplastic Striping (Mainline)	120230.00			120230.00	LF	$2.41	$289,754.30	
	Removal of Existing Striping (SB off Ramp Harley Knox)	2900.00			2900.00	LF	$0.65	$1,885.00	
	Thermoplastic Striping (SB off Ramp Harley Knox)	2900.00			2900.00	LF	$2.41	$6,989.00	
	Removal of Existing Striping (SB on Ramp Harley Knox)	1720.00			1720.00	LF	$0.65	$1,118.00	
	Thermoplastic Striping (SB on Ramp Harley Knox)	1720.00			1720.00	LF	$2.41	$4,145.20	
	Removal of Existing Striping (SB off Ramp Ramona)	2320.00			2320.00	LF	$0.65	$1,508.00	
	Thermoplastic Striping (SB off Ramp Ramona)	2320.00			2320.00	LF	$2.41	$5,591.20	
	Removal of Existing Striping (SB off Ramp Nuevo)	2080.00			2080.00	LF	$0.65	$1,352.00	
	Thermoplastic Striping (SB off Ramp Nuevo)	2080.00			2080.00	LF	$2.41	$5,012.80	
	Removal of Existing Striping (SB on Ramp Nuevo)	2840.00			2840.00	LF	$0.65	$1,846.00	
	Thermoplastic Striping (SB on Ramp Nuevo)	2840.00			2840.00	LF	$2.41	$6,844.40	
	Removal of Existing Striping (SB off Ramp Redlands)	2150.00			2150.00	LF	$0.65	$1,397.50	
	Thermoplastic Striping (SB off Ramp Redlands)	2560.00			2560.00	LF	$2.41	$6,169.60	
	Removal of Existing Striping (SB on Ramp Redlands)	3380.00			3380.00	LF	$0.65	$2,197.00	
	Thermoplastic Striping (SB on Ramp Redlands)	3380.00			3380.00	LF	$2.41	$8,145.80	
	Reconstruct Sign Structure				12.00	EA	$200,000.00	$2,400,000.00	
II. Structure Items									
	Ramona Bridge Replacement	220.00	125.00		27500.00	0.00	$250.00	$6,875,000.00	
	Harley Knox Bridge Replacement	220.00	82.00		18040.00	SQFT	$250.00	$4,510,000.00	
	Placentia Bridge Replacement	215.00	72.00		15480.00	SQFT	$250.00	$3,870,000.00	
	Nuevo Rd Bridge Replacement	260.00	106.00		27560.00	SQFT	$250.00	$6,890,000.00	
	D St Bridge Tieback	260.00	16.00		4160.00	SQFT	$250.00	$1,040,000.00	
	Perris Blvd Bridge Replacement	560.00	90.00		50400.00	SQ FT	$250.00	$12,600,000.00	
	Redlands Bridge Tieback	125.00	16.00		2000.00	SQ FT	$250.00	$500,000.00	
	Bridge Structure 1	490.00	14.00		6860.00	SQFT	$375.00	$2,572,500.00	
	Bridge Structure 2	230.00	14.00		3220.00	SQFT	$375.00	$1,207,500.00	
	Bridge Structure 3	500.00	14.00		7000.00	SQFT	$375.00	$2,625,000.00	
III. Right of Way									
	Right of Way Acquisition #1	480.00	15.00		7200.00	SQFT	$50.00	$360,000.00	

I.	***Roadway Items***	$26,914,000.00
	Earthwork	$2,578,000.00
	Pavement Structural Section	$20,307,000.00
	Specialty Items	$446,000.00
	Traffic Items	$3,583,000.00
II.	***Structural Items***	$42,690,000.00
III.	***Right of Way***	$360,000.00

Project #13 I-215 SB at Perris Overcrossing Subtotal		
ITEMS	***TOTAL COST***	***ENGINEERING ASSUMPTIONS***
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$0***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$0***	
SECTION 3: DRAINAGE	***$0***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Specialty Items	***$0***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$0***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$0***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$0***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$0***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$0***	
II. STRUCTURE ITEMS		
BRIDGES	***$500,000***	
III. RIGHT OF WAY		
Right of Way Acquisition	***$0***	
TOTAL CAPITAL OUTLAY COSTS	***$500,000***	
SUPPORT COSTS	***$175,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$675,000***	

Amount included in 2016 TUMF Nexus Study	***$1,356,000.00***
Amount to be reduced from Total Project Costs	***$675,000.00***

Summary of Quantities

Project #13, I-215 SB at Perris Overcrossing Subtotal

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (SB off Ramp Harley Knox)							$0.00	
	Roadway Excavation (SB on Ramp Harley Knox)							$0.00	
	Roadway Excavation (SB off Ramp Ramona)							$0.00	
	Roadway Excavation (SB off Ramp Nuevo)							$0.00	
	Roadway Excavation (SB on Ramp Nuevo)							$0.00	
	Roadway Excavation (SB off Ramp D st)							$0.00	
	Roadway Excavation (SB off Ramp Redlands)							$0.00	
	Roadway Excavation (SB on Ramp Redlands)							$0.00	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)							$0.00	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)							$0.00	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)							$0.00	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)							$0.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Harley Knox)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Harley Knox)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Ramona)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Nuevo)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Nuevo)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp D st)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Redlands)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Redlands)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with a CRCP depth of 0.90'
	Sec 3. Drainage								
	Specialty Items						$0.00		
	Remove Sound Wall							$0.00	
	Sound Wall							$0.00	
	Remove Retaining Wall							$0.00	
	Structural Concrete (Retaining Wall)							$0.00	Retaining wall height 9'
	Concrete Barrier (Type 60)							$0.00	
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization							$0.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)							$0.00	
	Thermoplastic Striping (Mainline)							$0.00	
	Removal of Existing Striping (SB off Ramp Harley Knox)							$0.00	
	Thermoplastic Striping (SB off Ramp Harley Knox)							$0.00	
	Removal of Existing Striping (SB on Ramp Harley Knox)							$0.00	
	Thermoplastic Striping (SB on Ramp Harley Knox)							$0.00	
	Removal of Existing Striping (SB off Ramp Ramona)							$0.00	
	Thermoplastic Striping (SB off Ramp Ramona)							$0.00	
	Removal of Existing Striping (SB off Ramp Nuevo)							$0.00	
	Thermoplastic Striping (SB off Ramp Nuevo)							$0.00	
	Removal of Existing Striping (SB on Ramp Nuevo)							$0.00	
	Thermoplastic Striping (SB on Ramp Nuevo)							$0.00	
	Removal of Existing Striping (SB off Ramp Redlands)							$0.00	
	Thermoplastic Striping (SB off Ramp Redlands)							$0.00	
	Removal of Existing Striping (SB on Ramp Redlands)							$0.00	
	Thermoplastic Striping (SB on Ramp Redlands)							$0.00	
	Reconstruct Sign Structure							$0.00	
II. Structure Items									
	Ramona Bridge Replacement							$0.00	
	Harley Knox Bridge Replacement							$0.00	
	Placentia Bridge Replacement							$0.00	
	Nuevo Rd Bridge Replacement							$0.00	
	D St Bridge Tieback							$0.00	
	Perris Blvd Bridge Replacement							$0.00	
	Redlands Bridge Tieback	125.00	16.00		2000.00	SQ FT	$250.00	$500,000.00	
	Bridge Structure 1							$0.00	
	Bridge Structure 2							$0.00	
	Bridge Structure 3							$0.00	
III. Right of Way									
	Right of Way Acquisition #1							$0.00	

I.	***Roadway Items***	$0.00
	Earthwork	$0.00
	Pavement Structural Section	$0.00
	Specialty Items	$0.00
	Traffic Items	$0.00
II.	***Structural Items***	$500,000.00
III.	***Right of Way***	$0.00

Project #13 I-215 SB at Nuevo Subtotal

ITEMS	*TOTAL COST*	*ENGINEERING ASSUMPTIONS*
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$739,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$838,000***	
SECTION 3: DRAINAGE	***$268,800***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Specialty Items	***$0***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$215,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$103,040***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$206,080***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$103,040***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$989,184***	
II. STRUCTURE ITEMS		
BRIDGES	***$6,890,000***	
III. RIGHT OF WAY		
Right of Way Acquisition	***$0***	
TOTAL CAPITAL OUTLAY COSTS	***$10,352,144***	
SUPPORT COSTS	***$3,623,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$13,975,000***	

Amount included in 2016 TUMF Nexus Study	***$17,897,000.00***
Amount to be reduced from Total Project Costs	***$13,975,000.00***

Summary of Quantities

Project #13, I-215 SB at Nuevo Subtotal

Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary								
Earthwork								
Roadway Excavation (SB off Ramp Harley Knox)							$0.00	
Roadway Excavation (SB on Ramp Harley Knox)							$0.00	
Roadway Excavation (SB off Ramp Ramona)							$0.00	
Roadway Excavation (SB off Ramp Nuevo)	588.00	26-95	0-15	16787.22	CY	$15.00	$251,808.33	
Roadway Excavation (SB on Ramp Nuevo)	790.00	25-102	0-15	32457.22	CY	$15.00	$486,858.33	
Roadway Excavation (SB off Ramp D st)							$0.00	
Roadway Excavation (SB off Ramp Redlands)							$0.00	
Roadway Excavation (SB on Ramp Redlands)							$0.00	
Pavement Structural Section						$0.00		
Remove Concrete Pavement (Mainline)							$0.00	Existing shoulders at 10'
Class 2 Aggregate Subbase (Mainline)							$0.00	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (Mainline)							$0.00	Lane plus shoulder at 22' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (Mainline)							$0.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp Harley Knox)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB on Ramp Harley Knox)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp Ramona)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp Nuevo)	1040.00	8.00		924.44	SQYD	$36.38	$33,631.29	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB off Ramp Nuevo)	1040.00	26.00		701.04	CY	$72.10	$50,544.77	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp Nuevo)	1040.00	26.00		490.10	TON	$85.00	$41,658.50	Lane plus shoulder at 26' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB off Ramp Nuevo)	1040.00	26.00		901.33	CY	$270.00	$243,360.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB on Ramp Nuevo)	1420.00	8.00		1262.22	SQYD	$36.38	$45,919.64	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB on Ramp Nuevo)	1420.00	24.00		883.56	CY	$72.10	$63,704.36	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB on Ramp Nuevo)	1420.00	24.00		617.70	TON	$85.00	$52,504.50	Lane plus shoulder at 24' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB on Ramp Nuevo)	1420.00	24.00		1136.00	CY	$270.00	$306,720.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp D st)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp Redlands)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB on Ramp Redlands)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with a CRCP depth of 0.90'
Sec 3. Drainage								
Specialty Items						$0.00		
Remove Sound Wall							$0.00	
Sound Wall							$0.00	
Remove Retaining Wall							$0.00	
Structural Concrete (Retaining Wall)							$0.00	Retaining wall height 9'
Concrete Barrier (Type 60)							$0.00	
Traffic Items								
Traffic Electrical								
Intersection Signalization				*4.00*	PER CORNER	$50,000.00	$200,000.00	
Traffic Signing and Stripping						$0.00		
Removal of Existing Striping (Mainline)							$0.00	
Thermoplastic Striping (Mainline)							$0.00	
Removal of Existing Striping (SB off Ramp Harley Knox)							$0.00	
Thermoplastic Striping (SB off Ramp Harley Knox)							$0.00	
Removal of Existing Striping (SB on Ramp Harley Knox)							$0.00	
Thermoplastic Striping (SB on Ramp Harley Knox)							$0.00	
Removal of Existing Striping (SB off Ramp Ramona)							$0.00	
Thermoplastic Striping (SB off Ramp Ramona)							$0.00	
Removal of Existing Striping (SB off Ramp Nuevo)	2080.00			2080.00	LF	$0.65	$1,352.00	
Thermoplastic Striping (SB off Ramp Nuevo)	2080.00			2080.00	LF	$2.41	$5,012.80	
Removal of Existing Striping (SB on Ramp Nuevo)	2840.00			2840.00	LF	$0.65	$1,846.00	
Thermoplastic Striping (SB on Ramp Nuevo)	2840.00			2840.00	LF	$2.41	$6,844.40	
Removal of Existing Striping (SB off Ramp Redlands)							$0.00	
Thermoplastic Striping (SB off Ramp Redlands)							$0.00	
Removal of Existing Striping (SB on Ramp Redlands)							$0.00	
Thermoplastic Striping (SB on Ramp Redlands)							$0.00	
Reconstruct Sign Structure							$0.00	
II. Structure Items								
Ramona Bridge Replacement							$0.00	
Harley Knox Bridge Replacement							$0.00	
Placentia Bridge Replacement							$0.00	
Nuevo Rd Bridge Replacement	260.00	106.00		27560.00	SQFT	$250.00	$6,890,000.00	
D St Bridge Tieback							$0.00	
Perris Blvd Bridge Replacement							$0.00	
Redlands Bridge Tieback							$0.00	
Bridge Structure 1							$0.00	
Bridge Structure 2							$0.00	
Bridge Structure 3							$0.00	
III. Right of Way								
Right of Way Acquisition #1							$0.00	

I.	***Roadway Items***	$1,792,000.00
	Earthwork	$739,000.00
	Pavement Structural Section	$838,000.00
	Specialty Items	$0.00
	Traffic Items	$215,000.00
II.	***Structural Items***	$6,890,000.00
III.	***Right of Way***	$0.00

Project #13 I-215 SB at Placentia Overcrossing Subtotal		
ITEMS	***TOTAL COST***	***ENGINEERING ASSUMPTIONS***
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$0***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$0***	
SECTION 3: DRAINAGE	***$0***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Specialty Items	***$0***	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	***$0***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$0***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$0***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$0***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$0***	
II. STRUCTURE ITEMS		
BRIDGES	***$3,870,000***	
III. RIGHT OF WAY		
Right of Way Acquisition	***$0***	
TOTAL CAPITAL OUTLAY COSTS	***$3,870,000***	
SUPPORT COSTS	***$1,355,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$5,225,000***	
Amount included in 2016 TUMF Nexus Study	***$12,354,000.00***	as Mid-County Parkway Interchange
Amount to be reduced from Total Project Costs	***$5,225,000.00***	

Summary of Quantities

Project #13, I-215 SB at Placentia Overcrossing Subtotal

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (SB off Ramp Harley Knox)							$0.00	
	Roadway Excavation (SB on Ramp Harley Knox)							$0.00	
	Roadway Excavation (SB off Ramp Ramona)							$0.00	
	Roadway Excavation (SB off Ramp Nuevo)							$0.00	
	Roadway Excavation (SB on Ramp Nuevo)							$0.00	
	Roadway Excavation (SB off Ramp D st)							$0.00	
	Roadway Excavation (SB off Ramp Redlands)							$0.00	
	Roadway Excavation (SB on Ramp Redlands)							$0.00	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)							$0.00	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)							$0.00	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)							$0.00	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)							$0.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Harley Knox)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Harley Knox)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Ramona)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Nuevo)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Nuevo)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp D st)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Redlands)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Redlands)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with a CRCP depth of 0.90'
	Sec 3. Drainage								
	Specialty Items						$0.00		
	Remove Sound Wall							$0.00	
	Sound Wall							$0.00	
	Remove Retaining Wall							$0.00	
	Structural Concrete (Retaining Wall)							$0.00	Retaining wall height 9'
	Concrete Barrier (Type 60)							$0.00	
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization							$0.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)							$0.00	
	Thermoplastic Striping (Mainline)							$0.00	
	Removal of Existing Striping (SB off Ramp Harley Knox)							$0.00	
	Thermoplastic Striping (SB off Ramp Harley Knox)							$0.00	
	Removal of Existing Striping (SB on Ramp Harley Knox)							$0.00	
	Thermoplastic Striping (SB on Ramp Harley Knox)							$0.00	
	Removal of Existing Striping (SB off Ramp Ramona)							$0.00	
	Thermoplastic Striping (SB off Ramp Ramona)							$0.00	
	Removal of Existing Striping (SB off Ramp Nuevo)							$0.00	
	Thermoplastic Striping (SB off Ramp Nuevo)							$0.00	
	Removal of Existing Striping (SB on Ramp Nuevo)							$0.00	
	Thermoplastic Striping (SB on Ramp Nuevo)							$0.00	
	Removal of Existing Striping (SB off Ramp Redlands)							$0.00	
	Thermoplastic Striping (SB off Ramp Redlands)							$0.00	
	Removal of Existing Striping (SB on Ramp Redlands)							$0.00	
	Thermoplastic Striping (SB on Ramp Redlands)							$0.00	
	Reconstruct Sign Structure							$0.00	
II. Structure Items									
	Ramona Bridge Replacement							$0.00	
	Harley Knox Bridge Replacement							$0.00	
	Placentia Bridge Replacement	215.00	72.00		15480.00	SQFT	$250.00	$3,870,000.00	
	Nuevo Rd Bridge Replacement							$0.00	
	D St Bridge Tieback							$0.00	
	Perris Blvd Bridge Replacement							$0.00	
	Redlands Bridge Tieback							$0.00	
	Bridge Structure 1							$0.00	
	Bridge Structure 2							$0.00	
	Bridge Structure 3							$0.00	
III. Right of Way									
	Right of Way Acquisition #1							$0.00	

I.	***Roadway Items***	$0.00
	Earthwork	$0.00
	Pavement Structural Section	$0.00
	Specialty Items	$0.00
	Traffic Items	$0.00
II.	***Structural Items***	$3,870,000.00
III.	***Right of Way***	$0.00

Project #13 I-215 SB at Ramona Subtotal		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$221,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$452,000***	
SECTION 3: DRAINAGE	***$132,000***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 4: Specialty Items	***$0***	
SECTION 6: TRAFFIC ITEMS	***$207,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$50,600***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$101,200***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$50,600***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$485,760***	
II. STRUCTURE ITEMS		
BRIDGES	***$6,875,000***	
III. RIGHT OF WAY		
Right of Way Acquisition	***$0***	
TOTAL CAPITAL OUTLAY COSTS	***$8,575,160***	
SUPPORT COSTS	***$3,001,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$11,576,000***	
Amount included in 2016 TUMF Nexus Study	***$5,965,000.00***	
Amount to be reduced from Total Project Costs	***$5,965,000.00***	

Summary of Quantities

Project #13, I-215 SB at Ramona Subtotal

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (SB off Ramp Harley Knox)							$0.00	
	Roadway Excavation (SB on Ramp Harley Knox)							$0.00	
	Roadway Excavation (SB off Ramp Ramona)	700.00	18-100	0-11	14719.22	CY	$15.00	$220,788.33	
	Roadway Excavation (SB off Ramp Nuevo)							$0.00	
	Roadway Excavation (SB on Ramp Nuevo)							$0.00	
	Roadway Excavation (SB off Ramp D st)							$0.00	
	Roadway Excavation (SB off Ramp Redlands)							$0.00	
	Roadway Excavation (SB on Ramp Redlands)							$0.00	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)							$0.00	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)							$0.00	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)							$0.00	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)							$0.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Harley Knox)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Harley Knox)							$0.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Harley Knox)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Harley Knox)							$0.00	Lane plus shoulder at 32' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Ramona)	720.00	8.00		640.00	SQYD	$36.38	$23,283.20	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Ramona)	720.00	48.00		896.00	CY	$72.10	$64,601.60	Lane plus shoulder at 48' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Ramona)	720.00	48.00		626.40	TON	$85.00	$53,244.00	Lane plus shoulder at 48' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Ramona)	720.00	48.00		1152.00	CY	$270.00	$311,040.00	Lane plus shoulder at 48' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Nuevo)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Nuevo)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp D st)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB off Ramp Redlands)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
	Remove Concrete Pavement (SB on Ramp Redlands)							$0.00	Existing shoulders at 8'
	Class 2 Aggregate Subbase (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with a CRCP depth of 0.90'
	Sec 3. Drainage								
	Specialty Items						$0.00		
	Remove Sound Wall							$0.00	
	Sound Wall							$0.00	
	Remove Retaining Wall							$0.00	
	Structural Concrete (Retaining Wall)							$0.00	Retaining wall height 9'
	Concrete Barrier (Type 60)							$0.00	
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				*4.00*	PER CORNER	$50,000.00	$200,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)							$0.00	
	Thermoplastic Striping (Mainline)							$0.00	
	Removal of Existing Striping (SB off Ramp Harley Knox)							$0.00	
	Thermoplastic Striping (SB off Ramp Harley Knox)							$0.00	
	Removal of Existing Striping (SB on Ramp Harley Knox)							$0.00	
	Thermoplastic Striping (SB on Ramp Harley Knox)							$0.00	
	Removal of Existing Striping (SB off Ramp Ramona)	2320.00			2320.00	LF	$0.65	$1,508.00	
	Thermoplastic Striping (SB off Ramp Ramona)	2320.00			2320.00	LF	$2.41	$5,591.20	
	Removal of Existing Striping (SB off Ramp Nuevo)							$0.00	
	Thermoplastic Striping (SB off Ramp Nuevo)							$0.00	
	Removal of Existing Striping (SB on Ramp Nuevo)							$0.00	
	Thermoplastic Striping (SB on Ramp Nuevo)							$0.00	
	Removal of Existing Striping (SB off Ramp Redlands)							$0.00	
	Thermoplastic Striping (SB off Ramp Redlands)							$0.00	
	Removal of Existing Striping (SB on Ramp Redlands)							$0.00	
	Thermoplastic Striping (SB on Ramp Redlands)							$0.00	
	Reconstruct Sign Structure							$0.00	
II. Structure Items									
	Ramona Bridge Replacement	220.00	125.00		27500.00	SQFT	$250.00	$6,875,000.00	
	Harley Knox Bridge Replacement							$0.00	
	Placentia Bridge Replacement							$0.00	
	Nuevo Rd Bridge Replacement							$0.00	
	D St Bridge Tieback							$0.00	
	Perris Blvd Bridge Replacement							$0.00	
	Redlands Bridge Tieback							$0.00	
	Bridge Structure 1							$0.00	
	Bridge Structure 2							$0.00	
	Bridge Structure 3							$0.00	
III. Right of Way									
	Right of Way Acquisition #1							$0.00	

I.	***Roadway Items***	$880,000.00
	Earthwork	$221,000.00
	Pavement Structural Section	$452,000.00
	Specialty Items	$0.00
	Traffic Items	$207,000.00
II.	***Structural Items***	$6,875,000.00
III.	***Right of Way***	$0.00

Project #13 I-215 SB at Harley Knox Subtotal		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	$581,000	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	$1,028,000	
SECTION 3: DRAINAGE	$273,450	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all
SECTION 4: Specialty Items	$0	Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 6: TRAFFIC ITEMS	$214,000	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	$104,823	
SECTION 9: MOBILIZATION 10% of Sections 1-6	$209,645	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	$104,823	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	$1,006,296	
II. STRUCTURE ITEMS		
BRIDGES	$4,510,000	
III. RIGHT OF WAY		
Right of Way Acquisition	$0	
TOTAL CAPITAL OUTLAY COSTS	$8,032,036	
SUPPORT COSTS	$2,811,000	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$10,843,000***	
Amount included in 2016 TUMF Nexus Study	$7,110,000.00	
Amount to be reduced from Total Project Costs	$7,110,000.00	

Summary of Quantities

Project #13, I-215 SB at Harley Knox Subtotal

Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary								
Earthwork								
Roadway Excavation (SB off Ramp Harley Knox)	845.00	26-85	0-15	24160.00	CY	$15.00	$362,400.00	
Roadway Excavation (SB on Ramp Harley Knox)	480.00	21-76	0-15	14576.11	CY	$15.00	$218,641.67	
Roadway Excavation (SB off Ramp Ramona)							$0.00	
Roadway Excavation (SB off Ramp Nuevo)							$0.00	
Roadway Excavation (SB on Ramp Nuevo)							$0.00	
Roadway Excavation (SB off Ramp D st)							$0.00	
Roadway Excavation (SB off Ramp Redlands)							$0.00	
Roadway Excavation (SB on Ramp Redlands)							$0.00	
Pavement Structural Section						$0.00		
Remove Concrete Pavement (Mainline)							$0.00	Existing shoulders at 10'
Class 2 Aggregate Subbase (Mainline)							$0.00	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (Mainline)							$0.00	Lane plus shoulder at 22' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (Mainline)							$0.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp Harley Knox)	1450.00	8.00		1288.89	SQYD	$36.38	$46,889.78	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB off Ramp Harley Knox)	1450.00	34.00		1278.15	CY	$72.10	$92,154.48	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp Harley Knox)	1450.00	34.00		893.56	TON	$85.00	$75,952.81	Lane plus shoulder at 34' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB off Ramp Harley Knox)	1450.00	34.00		1643.33	CY	$270.00	$443,700.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB on Ramp Harley Knox)	860.00	8.00		764.44	SQYD	$36.38	$27,810.49	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB on Ramp Harley Knox)	860.00	32.00		713.48	CY	$72.10	$51,442.01	Lane plus shoulder at 32' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB on Ramp Harley Knox)	860.00	32.00		498.80	TON	$85.00	$42,398.00	Lane plus shoulder at 32' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB on Ramp Harley Knox)	860.00	32.00		917.33	CY	$270.00	$247,680.00	Lane plus shoulder at 32' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp Ramona)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB off Ramp Ramona)							$0.00	Lane plus shoulder at 48' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp Nuevo)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB off Ramp Nuevo)							$0.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB on Ramp Nuevo)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB on Ramp Nuevo)							$0.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp D st)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB off Ramp D st)							$0.00	Lane plus shoulder at 38' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB off Ramp Redlands)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB off Ramp Redlands)							$0.00	Lane plus shoulder at 34' with a CRCP depth of 0.90'
Remove Concrete Pavement (SB on Ramp Redlands)							$0.00	Existing shoulders at 8'
Class 2 Aggregate Subbase (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with Class 2 Aggregate depth of 0.70'
Hot Mix Asphalt (Type A) (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with a HMA depth of 0.25'
Continuously Reinforced Concrete Pavement (SB on Ramp Redlands)							$0.00	Lane plus shoulder at 40' with a CRCP depth of 0.90'
Sec 3. Drainage								
Specialty Items						$0.00		
Remove Sound Wall							$0.00	
Sound Wall							$0.00	
Remove Retaining Wall							$0.00	
Structural Concrete (Retaining Wall)							$0.00	Retaining wall height 9'
Concrete Barrier (Type 60)							$0.00	
Traffic Items								
Traffic Electrical								
Intersection Signalization				*4.00*	PER CORNER	$50,000.00	$200,000.00	
Traffic Signing and Stripping						$0.00		
Removal of Existing Striping (Mainline)							$0.00	
Thermoplastic Striping (Mainline)							$0.00	
Removal of Existing Striping (SB off Ramp Harley Knox)	2900.00			2900.00	LF	$0.65	$1,885.00	
Thermoplastic Striping (SB off Ramp Harley Knox)	2900.00			2900.00	LF	$2.41	$6,989.00	
Removal of Existing Striping (SB on Ramp Harley Knox)	1720.00			1720.00	LF	$0.65	$1,118.00	
Thermoplastic Striping (SB on Ramp Harley Knox)	1720.00			1720.00	LF	$2.41	$4,145.20	
Removal of Existing Striping (SB off Ramp Ramona)							$0.00	
Thermoplastic Striping (SB off Ramp Ramona)							$0.00	
Removal of Existing Striping (SB off Ramp Nuevo)							$0.00	
Thermoplastic Striping (SB off Ramp Nuevo)							$0.00	
Removal of Existing Striping (SB on Ramp Nuevo)							$0.00	
Thermoplastic Striping (SB on Ramp Nuevo)							$0.00	
Removal of Existing Striping (SB off Ramp Redlands)							$0.00	
Thermoplastic Striping (SB off Ramp Redlands)							$0.00	
Removal of Existing Striping (SB on Ramp Redlands)							$0.00	
Thermoplastic Striping (SB on Ramp Redlands)							$0.00	
Reconstruct Sign Structure							$0.00	
II. Structure Items								
Ramona Bridge Replacement						$250.00	$0.00	
Harley Knox Bridge Replacement	220.00	82.00		18040.00	SQFT	$250.00	$4,510,000.00	
Placentia Bridge Replacement							$0.00	
Nuevo Rd Bridge Replacement							$0.00	
D St Bridge Tieback							$0.00	
Perris Blvd Bridge Replacement							$0.00	
Redlands Bridge Tieback							$0.00	
Bridge Structure 1							$0.00	
Bridge Structure 2							$0.00	
Bridge Structure 3							$0.00	
III. Right of Way								
Right of Way Acquisition #1							$0.00	

I.	***Roadway Items***	$1,823,000.00
	Earthwork	$581,000.00
	Pavement Structural Section	$1,028,000.00
	Specialty Items	$0.00
	Traffic Items	$214,000.00
II.	***Structural Items***	$4,510,000.00
III.	***Right of Way***	$0.00

Project #16, EB SR-91, I-15 SB On Ramp to I-15 NB On Ramp		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$1,454,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$1,439,000***	
SECTION 3: DRAINAGE	***$437,700***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 4: Specialty Items	***$0***	
SECTION 6: TRAFFIC ITEMS	***$25,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$167,785***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$335,570***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$167,785***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$1,610,736***	
II. STRUCTURE ITEMS		
BRIDGES	***$0***	
TOTAL CAPITAL OUTLAY COSTS	***$5,637,576***	
SUPPORT COSTS	***$1,973,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$7,611,000***	

Summary of Quantities

Project #16, EB SR-91, I-15 SB On Ramp to I-15 NB On Ramp

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (North of 15 ramp to EB 91)	1250.00	0-60	0-5	12215.36	CY	$15.00	$183,230.42	
	Roadway Excavation (South of 15 ramp to EB 91)	870.00	0-105	0-7	31370.93	CY	$15.00	$470,563.89	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)	2366.00	10.00		2628.89	SQYD	$36.38	$95,638.98	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	2366.00	22.00		1349.50	CY	$72.10	$97,298.68	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	2366.00	22.00		943.44	TON	$85.00	$80,192.61	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)	2366.00	22.00		1735.07	CY	$270.00	$468,468.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (NB 15 ramp to EB 91)	1965.00	8.00		1746.67	SQYD	$36.38	$63,543.73	Existing shoulders at 8'
	Class 2 Aggregate Subbase (NB 15 ramp to EB 91)	1965.00	26.00		1324.56	CY	$72.10	$95,500.46	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (NB 15 ramp to EB 91)	1965.00	26.00		926.01	TON	$85.00	$78,710.53	Lane plus shoulder at 26' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (NB 15 ramp to EB 91)	1965.00	26.00		1703.00	CY	$270.00	$459,810.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	2366.00			2366.00	LF	$0.65	$1,537.90	
	Thermoplastic Striping (Mainline)	4732.00			4732.00	LF	$2.41	$11,404.12	
	Removal of Existing Striping (NB 15 ramp to EB 91)	3930.00			3930.00	LF	$0.65	$2,554.50	
	Thermoplastic Striping (NB 15 ramp to EB 91)	3930.00			3930.00	LF	$2.41	$9,471.30	
II. Structure Items									
III. Right of Way									

I.	***Roadway Items***	$2,918,000.00
	Earthwork	$1,454,000.00
	Pavement Structural Section	$1,439,000.00
	Specialty Items	$0.00
	Traffic Items	$25,000.00
II.	***Structural Items***	$0.00
III.	***Right of Way***	$0.00

Project #18, SR-91 EB, Pierce St Off Ramp to Magnolia On Ramp		
ITEMS	**TOTAL COST**	**ENGINEERING ASSUMPTIONS**
I. Roadway Items Summary		
SECTION 1: EARTHWORK COST	***$939,000***	Roadway Cost are all based on a preliminary Google Earth review.
SECTION 2: PAVEMENT STRUCTRUAL SECTION	***$2,094,000***	
SECTION 3: DRAINAGE	***$573,000***	Drainage is taken at 15% of Roadway Items due to the lack of detail at this stage. During this review, we do not show that any pumps will be affected. Further analysis should look at all Retaining walls, sound walls, tie back walls and ramp reconfigurations are based on the widening needed. These are all based on a preliminary Google Earth review.
SECTION 4: Specialty Items	***$0***	
SECTION 6: TRAFFIC ITEMS	***$787,000***	
SECTION 8: MINOR ITEMS 5% of Sections 1-6	***$219,650***	
SECTION 9: MOBILIZATION 10% of Sections 1-6	***$439,300***	
SECTION 10: ROADWAY ADDITIONS 5% of Sections 1-6	***$219,650***	
SECTION 13: CONTINGENCIES 40% of Sections 1-10	***$2,108,640***	
II. STRUCTURE ITEMS		
BRIDGES	***$2,279,000***	
TOTAL CAPITAL OUTLAY COSTS	***$9,659,240***	
SUPPORT COSTS	***$3,381,000***	Support costs are 35% of capital outlay costs
TOTAL PROJECT COSTS	***$13,040,000***	

Summary of Quantities

Project #18, SR-91 EB, Pierce St Off Ramp to Magnolia On Ramp

	Item Description	Distance (ft)	Width (ft)	Depth (ft)	Quantity	Unit	Cost Assumptions	Total Cost	Engineering Assumptions
I. Roadway Items Summary									
	Earthwork								
	Roadway Excavation (EB Magnolia off Ramp)	260.00	260.00	0-15	26576.11	CY	$15.00	$398,641.67	
	Roadway Excavation (EB Magnolia on Ramp)	330.00	220	0-8	13303.70	CY	$15.00	$199,555.56	
	Roadway Excavation (EB Pierce off Ramp)	715	32-78	0-15	22695.00	CY	$15.00	$340,425.00	
	Pavement Structural Section						$0.00		
	Remove Concrete Pavement (Mainline)	4115.00	10.00		4572.22	SQYD	$36.38	$166,337.44	Existing shoulders at 10'
	Class 2 Aggregate Subbase (Mainline)	4115.00	22.00		2347.07	CY	$72.10	$169,224.04	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (Mainline)	4115.00	22.00		1640.86	TON	$85.00	$139,472.78	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (Mainline)	4115.00	22.00		3017.67	CY	$270.00	$814,770.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (EB Magnolia off Ramp)	1345.00	8.00		1195.56	SQYD	$36.38	$43,494.31	Existing shoulders at 8'
	Class 2 Aggregate Subbase (EB Magnolia off Ramp)	1345.00	26.00		906.63	CY	$72.10	$65,368.00	Lane plus shoulder at 26' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (EB Magnolia off Ramp)	1345.00	26.00		633.83	TON	$85.00	$53,875.66	Lane plus shoulder at 26' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (EB Magnolia off Ramp)	1345.00	26.00		1165.67	CY	$270.00	$314,730.00	Lane plus shoulder at 26' with a CRCP depth of 0.90'
	Remove Concrete Pavement (EB Magnolia on Ramp)	745.00	8.00		662.22	SQYD	$36.38	$24,091.64	Existing shoulders at 8'
	Class 2 Aggregate Subbase (EB Magnolia on Ramp)	745.00	22.00		424.93	CY	$72.10	$30,637.16	Lane plus shoulder at 22' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (EB Magnolia on Ramp)	745.00	22.00		297.07	TON	$85.00	$25,250.84	Lane plus shoulder at 22' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (EB Magnolia on Ramp)	745.00	22.00		546.33	CY	$270.00	$147,510.00	Lane plus shoulder at 22' with a CRCP depth of 0.90'
	Remove Concrete Pavement (EB Pierce off Ramp)	300.00	8.00		266.67	SQYD	$36.38	$9,701.33	Existing shoulders at 8'
	Class 2 Aggregate Subbase (EB Pierce off Ramp)	300.00	24.00		186.67	CY	$72.10	$13,458.67	Lane plus shoulder at 24' with Class 2 Aggregate depth of 0.70'
	Hot Mix Asphalt (Type A) (EB Pierce off Ramp)	300.00	24.00		130.50	TON	$85.00	$11,092.50	Lane plus shoulder at 24' with a HMA depth of 0.25'
	Continuously Reinforced Concrete Pavement (EB Pierce off Ramp)	300.00	24.00		240.00	CY	$270.00	$64,800.00	Lane plus shoulder at 24' with a CRCP depth of 0.90'
	Traffic Items								
	Traffic Electrical								
	Intersection Signalization				3.00	PER CORNER	$50,000.00	$150,000.00	
	Traffic Signing and Stripping						$0.00		
	Removal of Existing Striping (Mainline)	4112.00			4112.00	LF	$0.65	$2,672.80	
	Thermoplastic Striping (Mainline)	8224.00			8224.00	LF	$2.41	$19,819.84	
	Removal of Existing Striping (EB Magnolia off Ramp)	2690.00			2690.00	LF	$0.65	$1,748.50	
	Thermoplastic Striping (EB Magnolia off Ramp)	2690.00			2690.00	LF	$2.41	$6,482.90	
	Removal of Existing Striping (EB Magnolia on Ramp)	1490.00			1490.00	LF	$0.65	$968.50	
	Thermoplastic Striping (EB Magnolia on Ramp)	1490.00			1490.00	LF	$2.41	$3,590.90	
	Removal of Existing Striping (EB Pierce off Ramp)	600.00			600.00	LF	$0.65	$390.00	
	Thermoplastic Striping (EB Pierce off Ramp)	600.00			600.00	LF	$2.41	$1,446.00	
	Reconstruct Sign Structure				3.00	EA	$200,000.00	$600,000.00	
II. Structure Items									
	Magnolia Bridge Widening	340.00	14.00		4760.00	SQFT	$375.00	$1,785,000.00	
	Pierce Bridge Widening	94.00	14.00		1316.00	SQFT	$375.00	$493,500.00	
III. Right of Way									

I.	***Roadway Items***	$3,820,000.00
	Earthwork	$939,000.00
	Pavement Structural Section	$2,094,000.00
	Specialty Items	$0.00
	Traffic Items	$787,000.00
II.	***Structural Items***	$2,279,000.00
III.	***Right of Way***	$0.00

RCTC TRUCK STUDY AND REGIONAL LOGISTICS MITIGATION FEE

Draft Technical Memorandum: Task 4 – Fee Allocation Structure and Implementing Mechanisms

Potential Locational Effects of a Riverside County Logistics Mitigation Fee

Prepared for:

RIVERSIDE COUNTY TRANSPORTATION COMMISSION

Prepared by:

WSP

In partnership with:

FEHR & PEERS

April 23, 2019

Contents

Exhibits

1. Introduction

A potential logistics mitigation fee of $1.28 per square foot of gross floor area of new warehouse construction in Riverside County would provide funding for highway projects that are needed to mitigate the impacts of increased truck traffic resulting from new development. The *RCTC Truck Study and Regional Logistics Mitigation* Fee *Technical Memorandum: Task 3 – Nexus Study* describes the needs for this fee and how the proposed amount of the fee was determined.

The objective of this document is to assess the potential impacts of this fee on warehouse development within Riverside County. Such development affects many other aspects of the county's economy, including direct employment, induced employment in businesses supporting warehousing, transportation volumes, demand for other county services, and local and state tax revenues. Major factors addressed include the following:

- The market for logistics and warehouse development in Southern California. How likely will the proposed fee affect the pace of development given the overall supply and demand for warehouse space in Southern California?
- The extent to which locational decisions within the Southern California market could be affected by the proposed fee:
  - How does the proposed fee compare to total development costs (including land and construction costs)?
  - How does the proposed fee compare to similar fees elsewhere in the market?
  - Will the fee substantially influence developers to locate in areas outside Riverside County?
- The possibility that other changes in regional development fees or development costs might affect the potential impacts of the proposed Riverside mitigation fee. Mitigation fees have been applied across multiple building types and for multiple purposes as shown in Appendix 1, and such fees are likely to evolve over time.

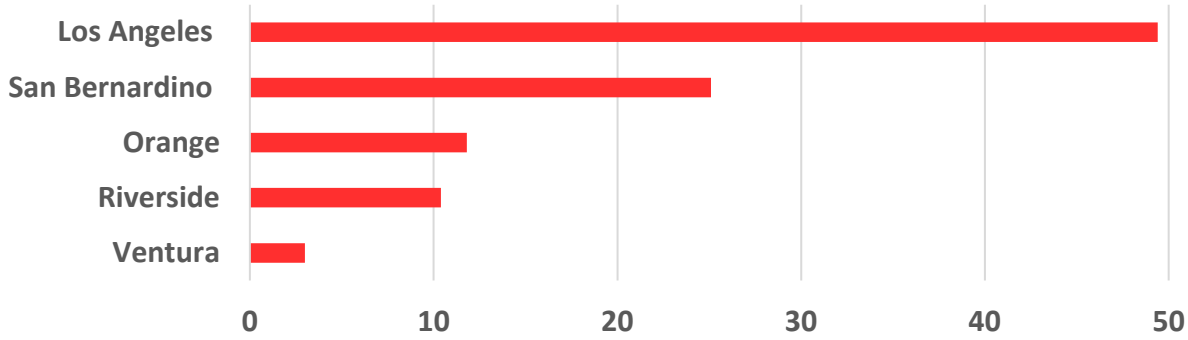
The following sections address these questions.

2. Profile and Outlook for Southern California Warehouse Development

2.1. PROFILE OF SOUTHERN CALIFORNIA WAREHOUSE DEVELOPMENT

The *Industrial Warehousing in the SCAG Region* study (Industrial Warehousing Study) completed by the Southern California Association of Governments (SCAG) in 2018 details the location of industrial warehouse buildings in Southern California and provides projections of new developments for 43 sub-regions. As shown in Exhibit 1, these buildings are heavily concentrated in Los Angeles and San Bernardino, and to a lesser extent Orange, and Riverside Counties.

Exhibit 1. Percentage Share of Total Industrial Warehouse Building Area in Southern California by County in 2014



Source: Southern California Association of Governments, *Industrial Warehousing in the SCAG Region, April 2018*

Exhibit 2 shows the 43 sub-regions used in the Industrial Warehousing Study.

Riverside County includes the following submarket areas:

- Riverside (18)
- Corona (25)
- South Riverside (32)
- Coachella Valley (25)
- Riverside Outlying (36)

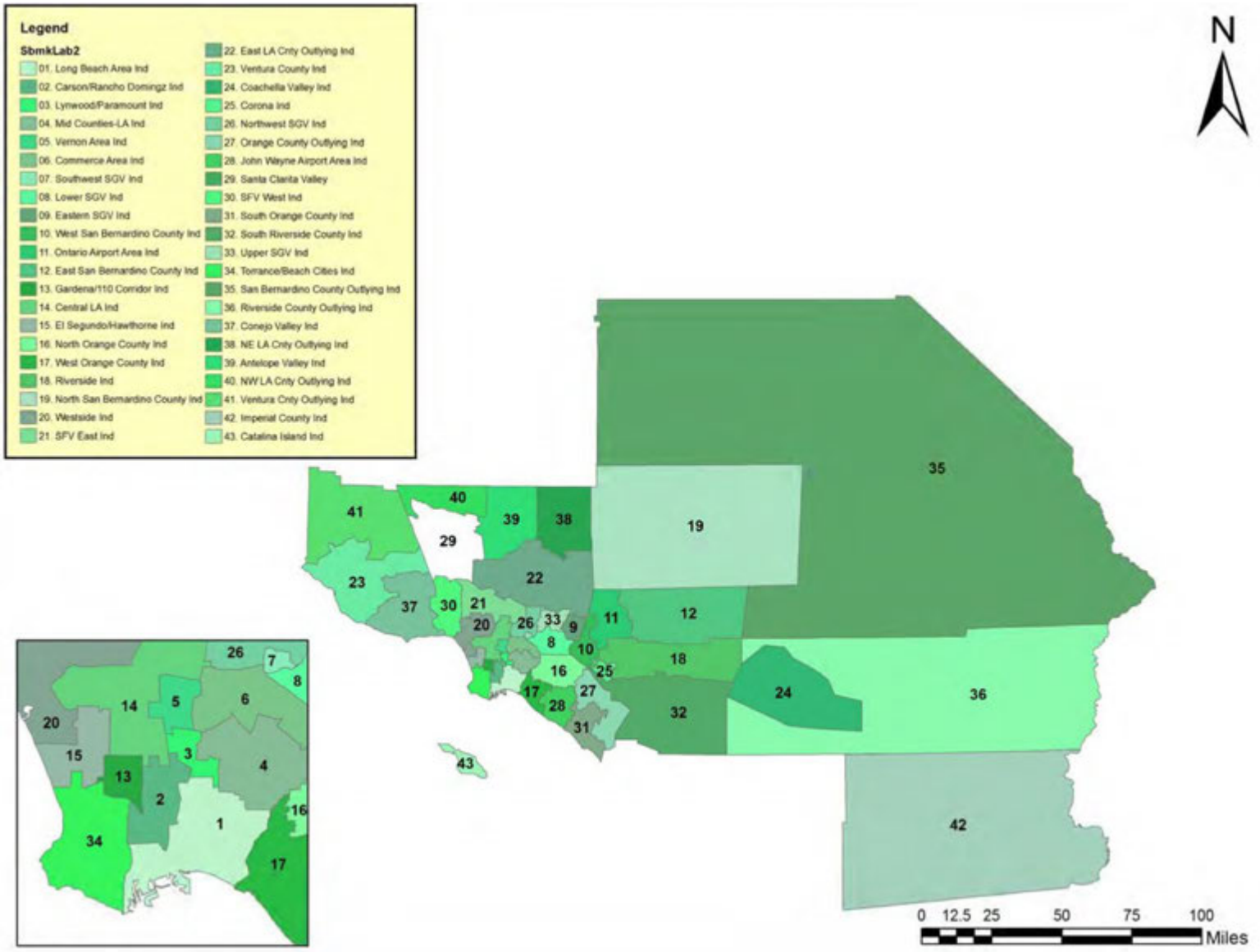
San Bernardino County includes the following submarket areas:

- West San Bernardino (10)
- Ontario Airport Area (11)
- East San Bernardino (12)

- North San Bernardino (19)
- San Bernardino Outlying Areas (35)

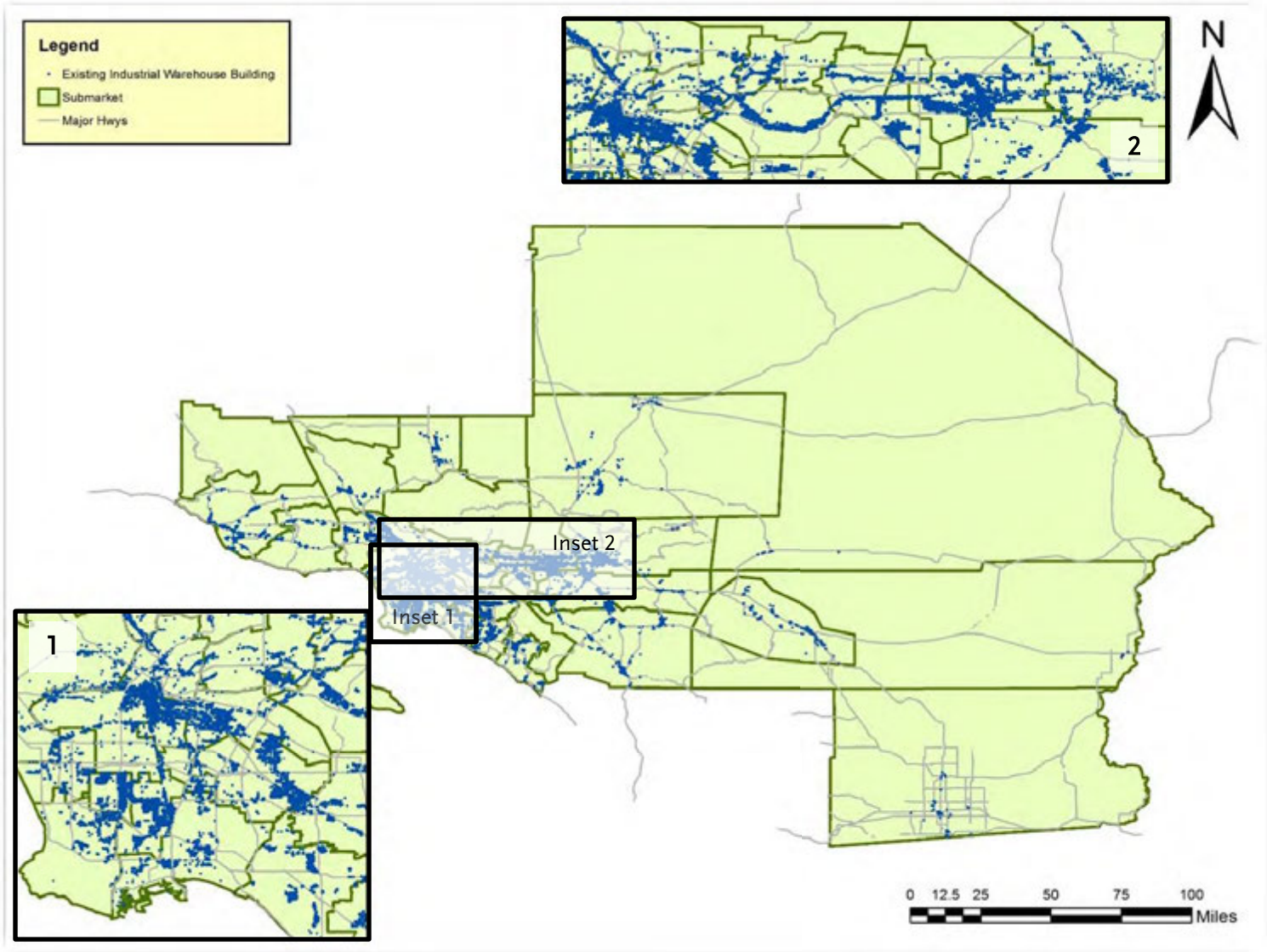
Exhibit 3 shows detail for existing warehouse buildings, with inset 2 extending from the East San Bernardino County submarket to areas to the west. This detail shows that industrial warehouse buildings in San Bernardino are concentrated in the southwest part of the county. To the south of inset 1, it can be seen that in Riverside County industrial warehouse buildings are concentrated in the western portion of the county.

Exhibit 2. Submarket Areas in the SCAG Region



Source: Southern California Association of Governments, *Industrial Warehousing in the SCAG Region*, April 2018

Exhibit 3. Existing Industrial Warehouse Buildings in the SCAG Region (All Building Sizes and All Secondary Types), 2014



Source: Southern California Association of Governments, *Industrial Warehousing in the SCAG Region*, April 2018

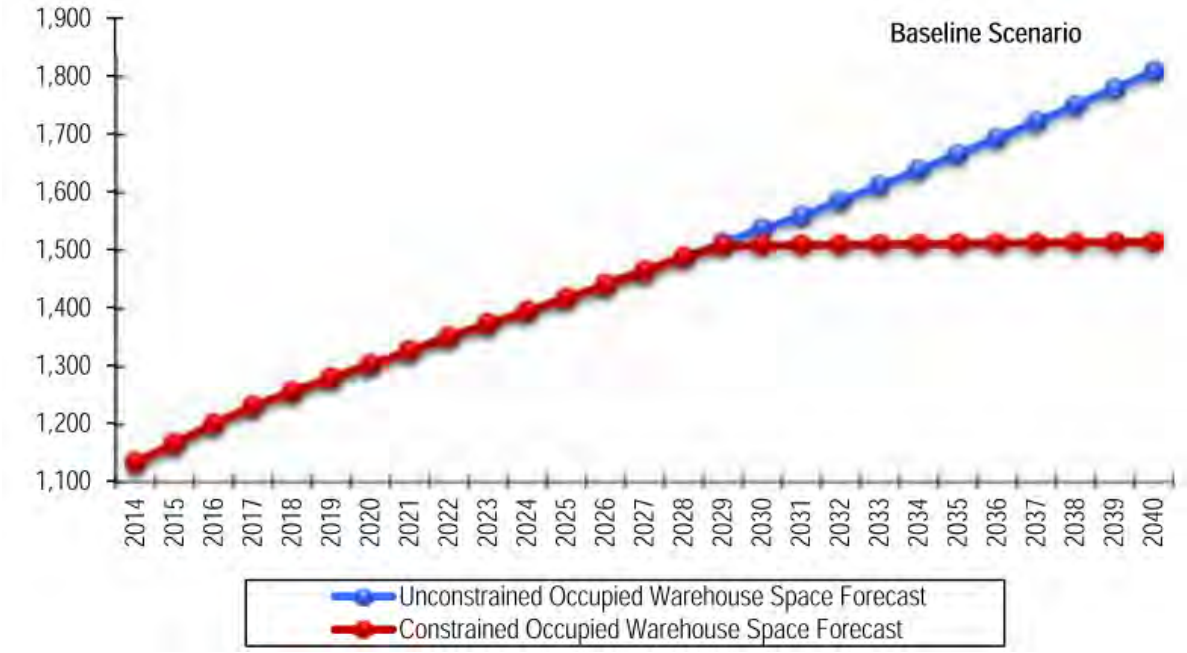
2.2 PROJECTED INDUSTRIAL WAREHOUSE SPACE

The Industrial Warehousing Study included forecasts of supply and demand for warehousing space in 43 geographical submarket areas of the SCAG region shown in Exhibit 2. The forecast was based on an inventory of warehouse space for 2014 and annual forecasts through 2040 for containerized port-related, border-crossing-related, and domestic cargo markets.[1] Each of these cargo sources was further segmented by type of type of warehouse use.

The Industrial Warehousing Study's baseline scenario used recent forecasts of port- and border-crossing-related cargo and assumed no efficiency gains in cargo storage over time and no replacement of obsolete buildings. It also assumed that the warehouse functional-use mix would not change and that current estimates of existing developable space were available for new facilities. The study developed two demand projections – one that assumed no constraint on total warehouse space and the other that would be constrained by limitations on developable areas.

The two projections are shown in Exhibit 4. As shown, total unconstrained 2040 demand for the Industrial Warehousing Study's baseline scenario is 1.81 billion square feet—an increase of 59 percent from 1.13 billion square feet in 2014 (a compound annual growth rate of 1.8 percent).

Exhibit 4. Unconstrained versus Constrained Regional-Level Total Occupied Warehouse Space Forecasts by Year in the SCAG Region, 2040 (millions of square feet)



Source: Southern California Association of Governments, *Industrial Warehousing in the SCAG Region*, April 2018

[1] "Port-related," is containerized cargo handled at San Pedro Bay Ports (i.e., excluding containerized cargo handled at Port Hueneme or Port of San Diego). "Border-crossing related" refers to goods that cross the land ports of entry in Imperial County. "Domestic cargo" is any other type of containerized cargo not classified as "port-related" or "border-crossing-related" cargo.

3. Potential Effects of a Proposed Fee on Locational Decisions

The previous section provided baseline projections of industrial warehouse development in Southern California. However, these projections did not account for changes in costs that could affect locational decisions of developers. In theory, higher development costs represented by a proposed mitigation fee could marginally induce developers to choose locations outside of Riverside County (e.g., in Los Angeles or San Bernardino Counties). The principal question concerning these impacts is how much a proposed fee would increase total development costs including land and construction.

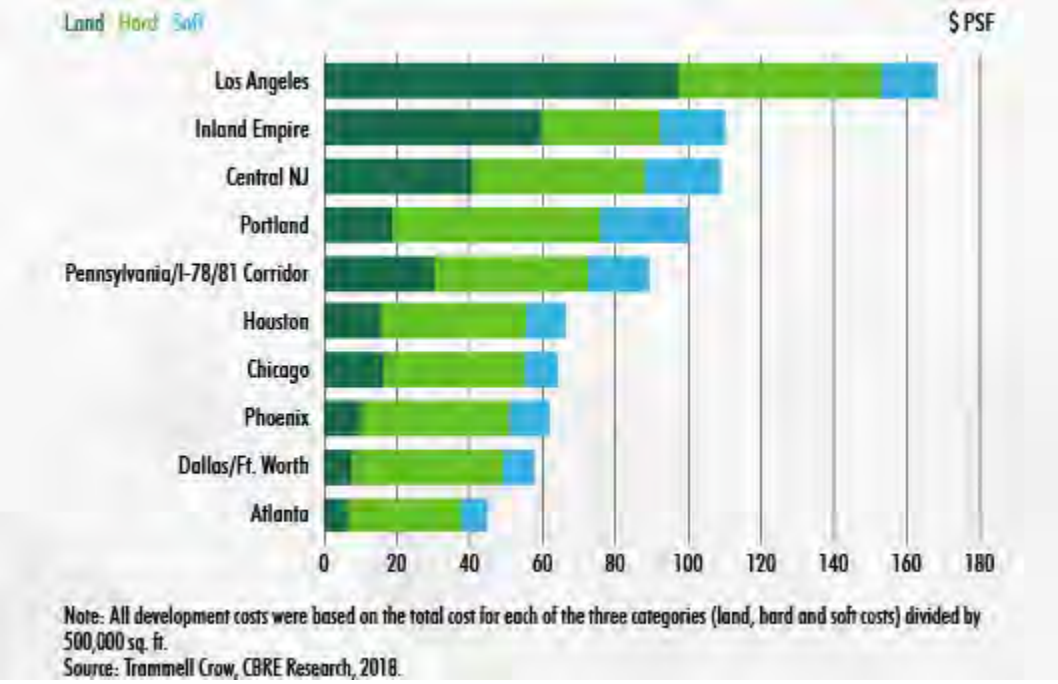
The impacts of larger development costs would also, theoretically, be offset by any perceived benefits developers could see from improved highway transportation that would result from the mitigation fee. This is a smaller point, that is addressed separately, below.

3.1. COST OF A PROPOSED FEE COMPARED TO TOTAL CONSTRUCTION COSTS

Exhibit 5 shows that total construction costs for warehouse space in Los Angeles are the highest in the country at nearly $170 per square foot. Costs in the Inland Empire are the second highest in the country at $110 per square foot. The $110-per-square-foot estimate is slightly less than the $121 per square foot cost estimated in the Western Riverside Council of Governments (WRCOG) Comparative Fee Study that includes $75.35 per square foot in total direct and indirect costs plus $45.35 per square foot in land costs (see Appendix A).[2] Using the $121 per square foot estimate from the WRCOG study, the proposed fee would represent 1.1 percent of total construction costs.

[2] Updated *Analysis of Development Impact Fees in Western Riverside County*, Western Riverside Council of Governments, March 2019

Exhibit 5. Average New Construction Cost Breakdown for a 500,000-square-foot Warehouse



The attraction, and scarcity, of space in Los Angeles clearly results in a large cost premium, so it is unlikely that small additional marginal costs in Riverside County would significantly tip the balance of location toward Los Angeles. As shown in Exhibit 5, development costs are about 55 percent higher in Los Angeles County than in the Inland Empire. Therefore, a 1.1 percent fee is insignificant in comparison.

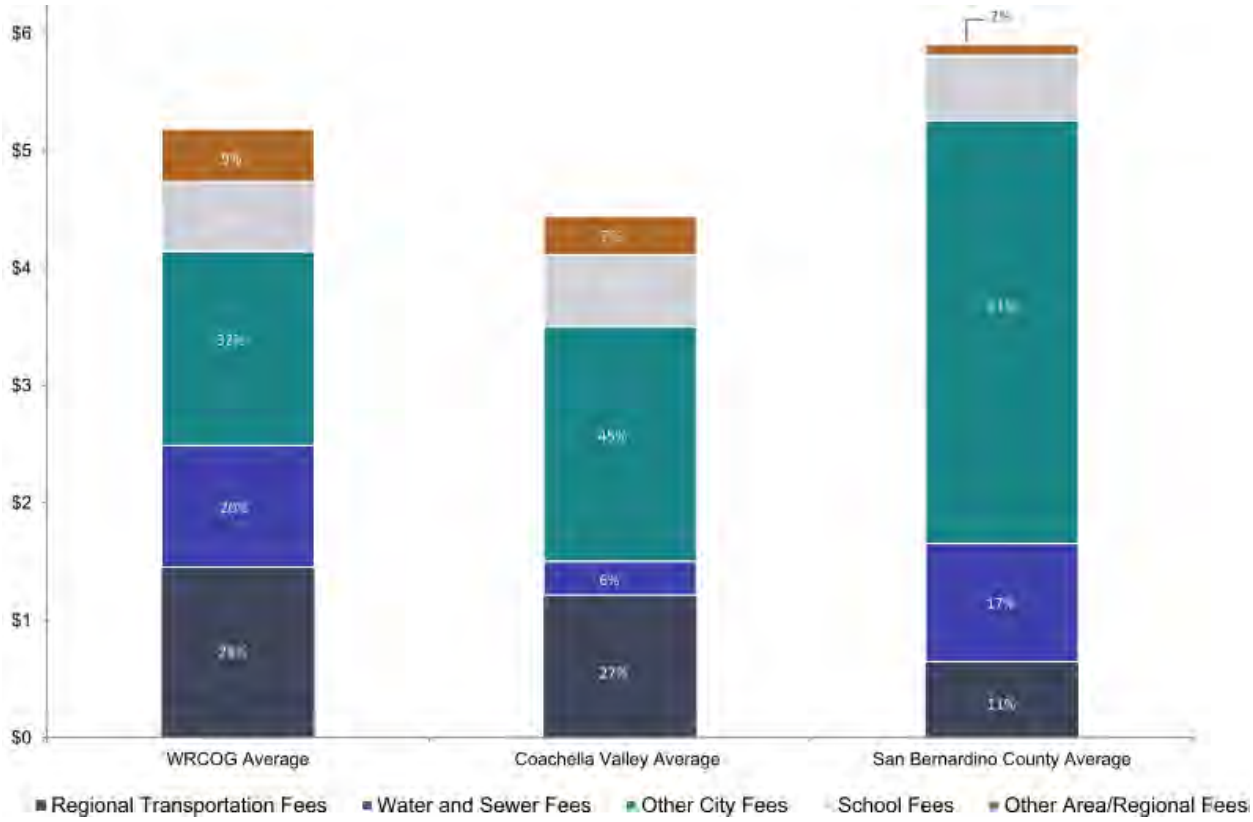
3.2. COMPARATIVE FEES COSTS IN OTHER AREAS OUTSIDE RIVERSIDE COUNTY

The question then becomes whether a 1.1 percent increase in development costs would cause developers to locate in other areas outside of Riverside County, especially in San Bernardino County, part of the Inland Empire immediately to the north of Riverside County and where warehouse development has been concentrated as discussed in the previous section.

In addition to representing a small, 1.1 percent share of total development costs, the proposed fee of $1.28 per square foot would also be much smaller than current fees for industrial development in Riverside and San Bernardino Counties, about 25 percent of the average level of fees in Riverside County, and about 22 percent of the average level of these fees in San Bernardino (see Exhibit 6).

A possible additional consideration is that a proposed fee would be used to fund improvements to highway transportation in Riverside County. This would, over time, reduce transportation costs for industrial warehouse users, and developers could possibly view this as a benefit. Realistically, however, the mitigation fee will represent a real upfront cost while future transportation costs reductions would likely be heavily discounted and therefore have only minimal impacts on locational decisions. In addition, it is difficult to know how much developers would link any future improvements to the fee. This is a possible additional consideration and is not addressed further within this analysis.

Exhibit 6. Current Average Industrial Development Impact Fee Costs Per Square Foot and Proportions in Inland Empire Jurisdictions



Source: Western Riverside Council of Governments, Updated Analysis of Development Impact Fees in Western Riverside County, 2019

4. Comparative Fee Costs

4.1. CURRENT FEE COSTS

The proposed mitigation fee would increase construction costs for warehouse development in Riverside County by about 1.1 percent and, taken alone, this could make San Bernardino County slightly more attractive to developers. However, higher fees in San Bernardino County could dampen this small effect. San Bernardino County's impact fees are higher than those in Riverside County according to the fee comparison study done by the WRCOG. Exhibit 6 shows the jurisdictions that were used to compare fees.

Exhibit 7. Jurisdictions Included in Fee Study

WRCOG Jurisdictions		Coachella Valley	San Bernardino County
Banning	Murrieta	Indio	Fontana
Canyon Lake	Norco	Palm Desert	Yucaipa
Beaumont	Perris	Palm Springs	San Bernardino
Calimesa	Riverside		Ontario
Corona	San Jacinto		Chino
Eastvale	Temecula		Rialto
Hemet	Wildomar		
Jurupa Valley	Temescal Valley		
Lake Elsinore	Winchester		
Menifee	March JPA		
Moreno Valley			

Source Western Riverside Council of Governments, Updated Analysis of Development Impact Fees in Western Riverside County, 2019

Exhibit 6 showed that average industrial development impact fees in WRCOG jurisdictions as well as areas in Coachella Valley are both notably lower than average fees in San Bernardino County. A few WRCOG jurisdictions have relatively high fees. Appendix B includes fee details for individual WRCOG jurisdictions.

4.2. FUTURE FEE DEVELOPMENT COSTS

In addition to current average industrial fees being higher in San Bernardino County than in Riverside County, a factor that could affect warehouse development location decisions is the possibility that fees or other costs could change in San Bernardino County, or other Southern California market areas. The possibility exists, for example, that other counties could implement a fee like the one proposed in Riverside County. While entirely speculative, such a scenario would also be based on needs to fund highway development in San Bernardino County or other regions in Southern California.

5. Summary of Findings

The Southern California region is a well-established, prime location for industrial warehouse development and will continue to be so. Los Angeles County is especially attractive because of its proximity to ports, large regional markets, and transportation connectivity. Because of these advantages and relatively scarce land availability, that market also has the highest construction costs for warehouse development in the United States.

While significantly less than Los Angeles, the Inland Empire has the second-highest costs for warehouse development in the country.

A proposed mitigation fee in Riverside County is likely to have limited impacts on reducing demand on warehouse development in Riverside County because of the following:

- It will represent a small (1.1 percent) share of total development costs, including land and construction costs.
- Total development costs for Los Angeles County will continue to be much higher than for the Inland Empire.
- Impact fees are generally higher in San Bernardino County compared to those in Riverside County.
- Any possible impacts of a proposed fee could be affected by offsetting changes in development costs in San Bernardino County and in other regions in the Southern California market, including increases in mitigation fees.

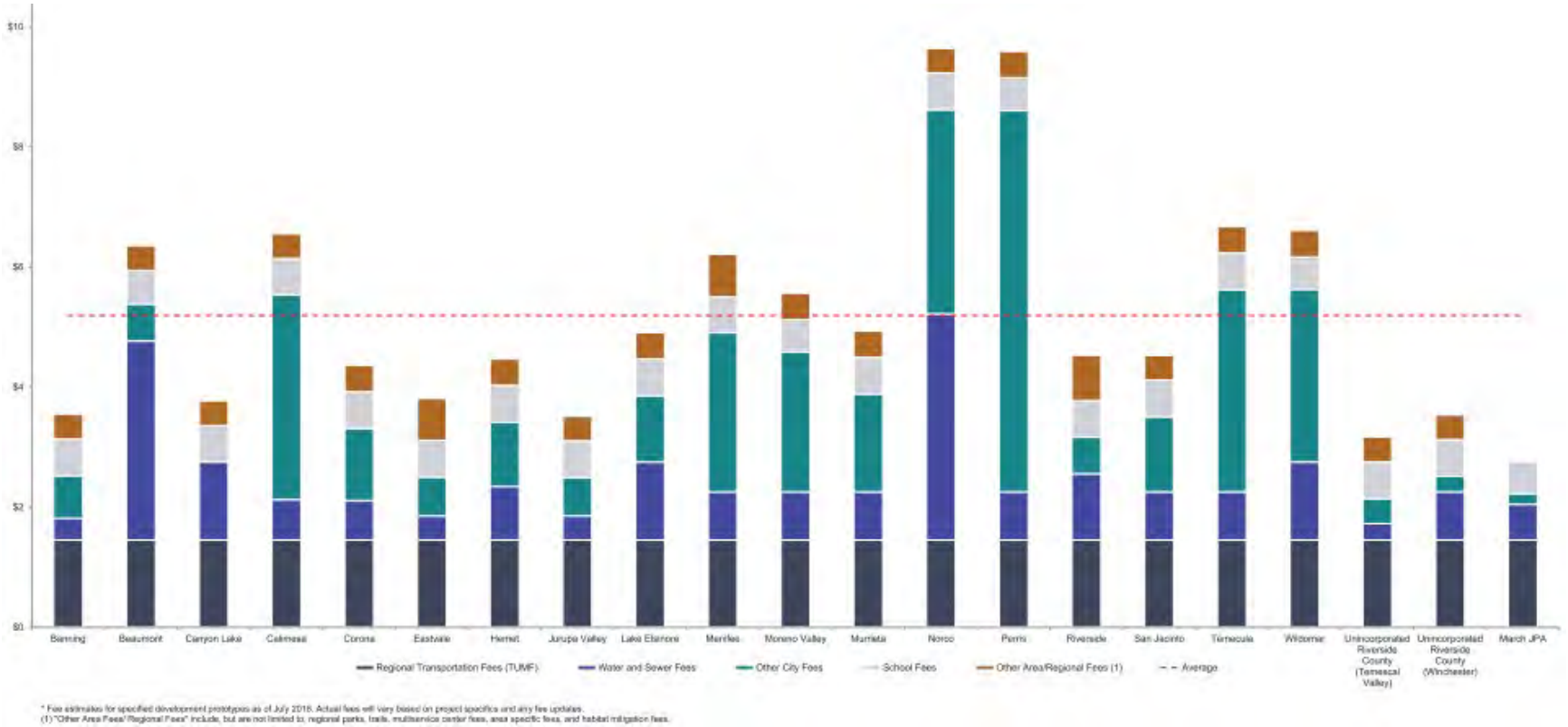
Appendix A
Development Prototypes – Total Development Costs

Total development costs per building square foot of $121.10 for industrial buildings include total direct and indirect costs of $75.35 plus the land value of $45.75.

Development Costs, Land Values, and Return	Single Family Per Unit	Multifamily Per Unit	Industrial Per Bldg Sq.Ft.	Retail Per Bldg Sq.Ft.	Office Per Bldg Sq.Ft.
DIRECT					
Basic Site Work/ Lot Improvements	$31,652	$9,766	$12.13	$26.38	$15.07
Direct Construction Cost	$227,898	$196,540	$37.98	$138.75	$148.31
Hard Cost Total	$259,550	$206,307	$50.12	$165.13	$163.38
INDIRECT					
TUMF	$8,873	$6,134	$1.45	$7.50	$2.19
Other Development Impact Fees	$38,597	$23,572	$3.74	$16.13	$11.87
Other Soft Costs	$56,893	$47,674	$20.05	$31.26	$33.02
Soft Cost Total	$104,363	$77,380	$25.24	$54.89	$47.08
Total Direct and Indirect Costs	**$363,913**	**$283,686**	**$75.35**	**$220.01**	**$210.46**
Developer Return Requirement	$56,160	$33,492	$13.68	$34.02	$32.52
Land Value	$141,527	$17,737	$45.75	$86.21	$82.38
TOTAL COST/RETURN	**$561,600**	**$334,915**	**$136.19**	**$340.25**	**$325.36**

Source: Western Riverside Council of Governments, Updated Analysis of Development Impact Fees in Western Riverside County, 2019

Appendix B
Industrial Prototype Development Fees by Jurisdiction (per building sq. ft.)



* Fee estimates for specified development prototypes as of July 2018. Actual fees will vary based on project specifics and any fee updates.
(1) "Other Area Fees/Regional Fees" include, but are not limited to, regional parks, trails, multiservice center fees, area specific fees, and habitat mitigation fees.

Source: Western Riverside Council of Governments, Updated Analysis of Development Impact Fees in Western Riverside County, 2019