San Joaquin Valley I-5/SR 99 Goods Movement Corridor Study

Technical Memorandum for

Strategic Programs and Their Feasibility Assessment

submitted to

Fresno Council of Governments

submitted by

Cambridge Systematics, Inc.

in association with

Fehr & Peers

The Tioga Group

technical memorandum

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date

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1.0 Executive Summary

Introduction

Building on the Task 1 memorandum findings, this memorandum employs additional types of data/information, including: (1) statewide, regional and local transportation plans to identify projects, strategic goals and objectives as they relate to goods movement; (2) recent and relevant project concept reports including truck only toll lanes and inland port facility; (3) summary of ongoing research in the areas of truck parking, intelligent transportation systems (ITS), and truck platooning, and (4) best practices for goods movement performance measures and criteria for feasibility analysis.

Goods Movement Issues and Operations

Truck Traffic Generators

In the Task 1 memorandum, seventeen freight clusters were identified. These existing freight clusters contribute to major truck trip generation in the Valley. The intent of focusing on existing clusters correlates to a purchase of truck GPS data for the purpose of adding truck origins and destinations information to the travel demand model. While this data is only partial and is not able to tell us about the future, it is very useful for validating the model outputs. As part of the Task 1 memorandum, the I-5/SR 99 Technical Advisory committee provided significant feedback about existing and planned freight activity centers. The planned facilities will be important, especially in Task 4 when we investigate the opportunities for identifying east/west connectors with the highest potential for shifting truck traffic from SR 99 to I-5. As part of this next effort, additional truck generators, such as truck parking/storage facilities and service stations, were added to the maps. This additional layer of information provides more details about likely truck routing.

Congested Segments

For this analysis, data collection locations were selected for all state highways in the San Joaquin Valley, limited to Tuesdays through Thursdays, for the entire month of October 2015. The selection was further refined to the peak hours of 6:00 to 9:00 AM and 4:00 to 7:00 PM. In order to ensure reliable average values, the selection was refined once more to include only locations that had at least 10 days of data on average for each five-minute data point. The HERE dataset is cleaned of outliers or other possible data errors, so this process reduces the likelihood that a location would show irrational or skewed averages.

A comparison of the average speed data aggregated to 15-minute periods and the lowest average speed for any 15-minute period for both AM and PM peak provided an indication of locations experiencing congested speeds. This method allows for the variation among regions, or even among different road segments, which may experience the worst of the peak period at different times. This information was used to identify locations with critical congestion issues as shown in **Figure 1-1**.

Figure 1-1 Critical Congested Locations

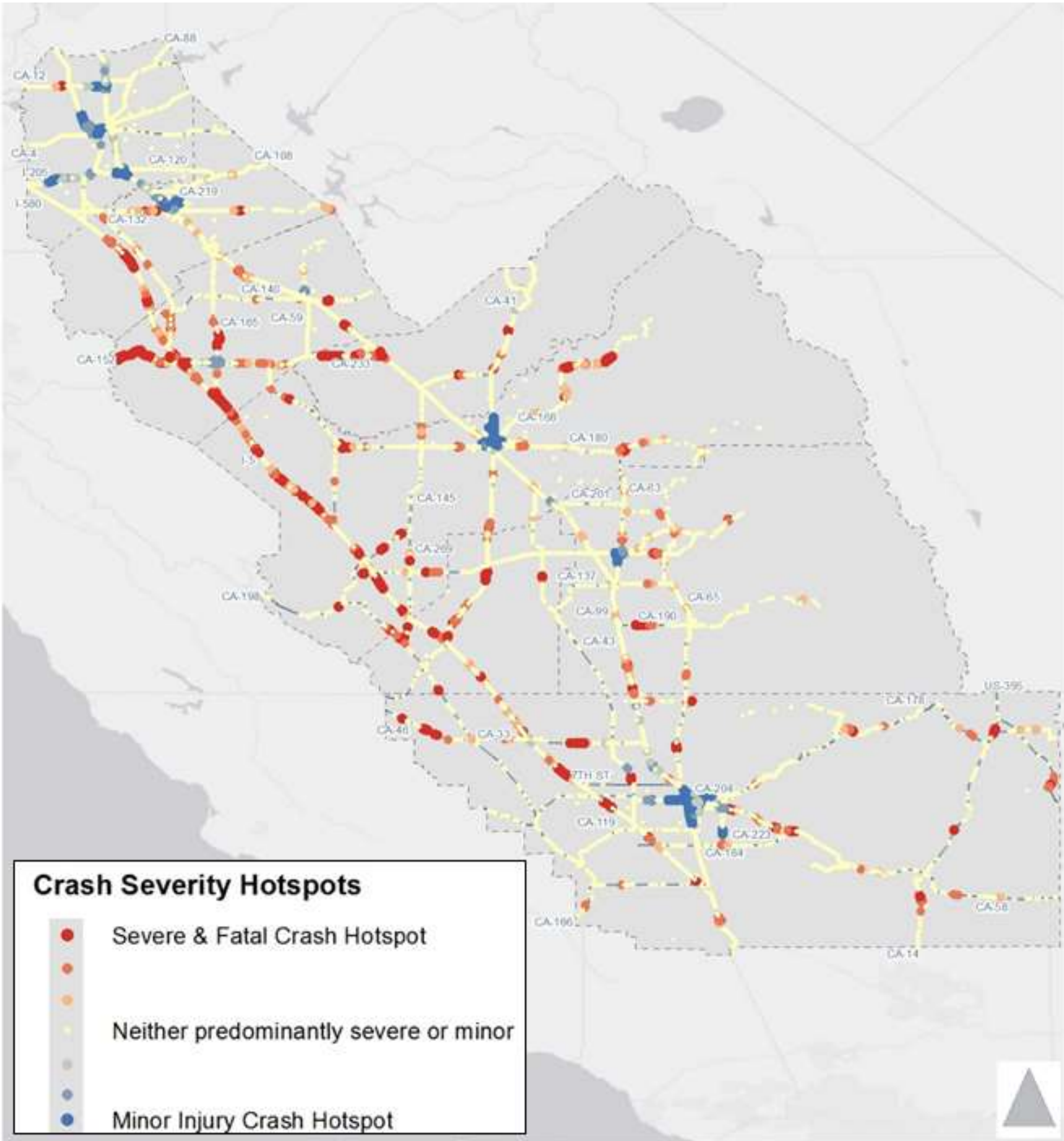
Safety and Reliability

In order to determine significant safety hot spots, the Task 1 memorandum describes the use of the Getis-Ord GI Optimized Hot Spot Analysis tool to identify statistically significant "hot" and "cold" spots based on high and low values in the data (**Figure 1-2**). The tool analyzes the severity of each collision in relation to the severity of others nearby. Collisions are coded on a scale of 1-4, with 1 meaning fatal and 4 being only complaint of pain. In the figure below, every dot represents a unique incident. Red dots indicate statistically significant hot spots of severe collisions (groups of points near where most other collisions are severe or fatal). Blue dots indicate statistically significant groups of minor collisions (nearby collisions are mostly not severe or fatal). The yellow dots represent incidents where there is not a statistically significant prevalence of either severe or fatal collisions.

The blue hot spots are found almost exclusively in urban areas, especially Bakersfield, Fresno, and Stockton. These areas are expected to have higher volumes of collisions in general, and hot spots of minor collisions are a reasonable result because speeds are lower in urban areas.

Red hot spots are much more widespread across the study area, but are still heaviest along I-5 where speeds are higher and potential points of conflict (ramps, for example) are fewer. Red hot spots along rural highways are more likely to face a diverse set of challenges. For example, there could be poor sight lines at crossroads or driveways, leading to high incidence of broadside (t-bone) collisions.

Figure 1-2 All Collisions: Severity Hotspots Analysis

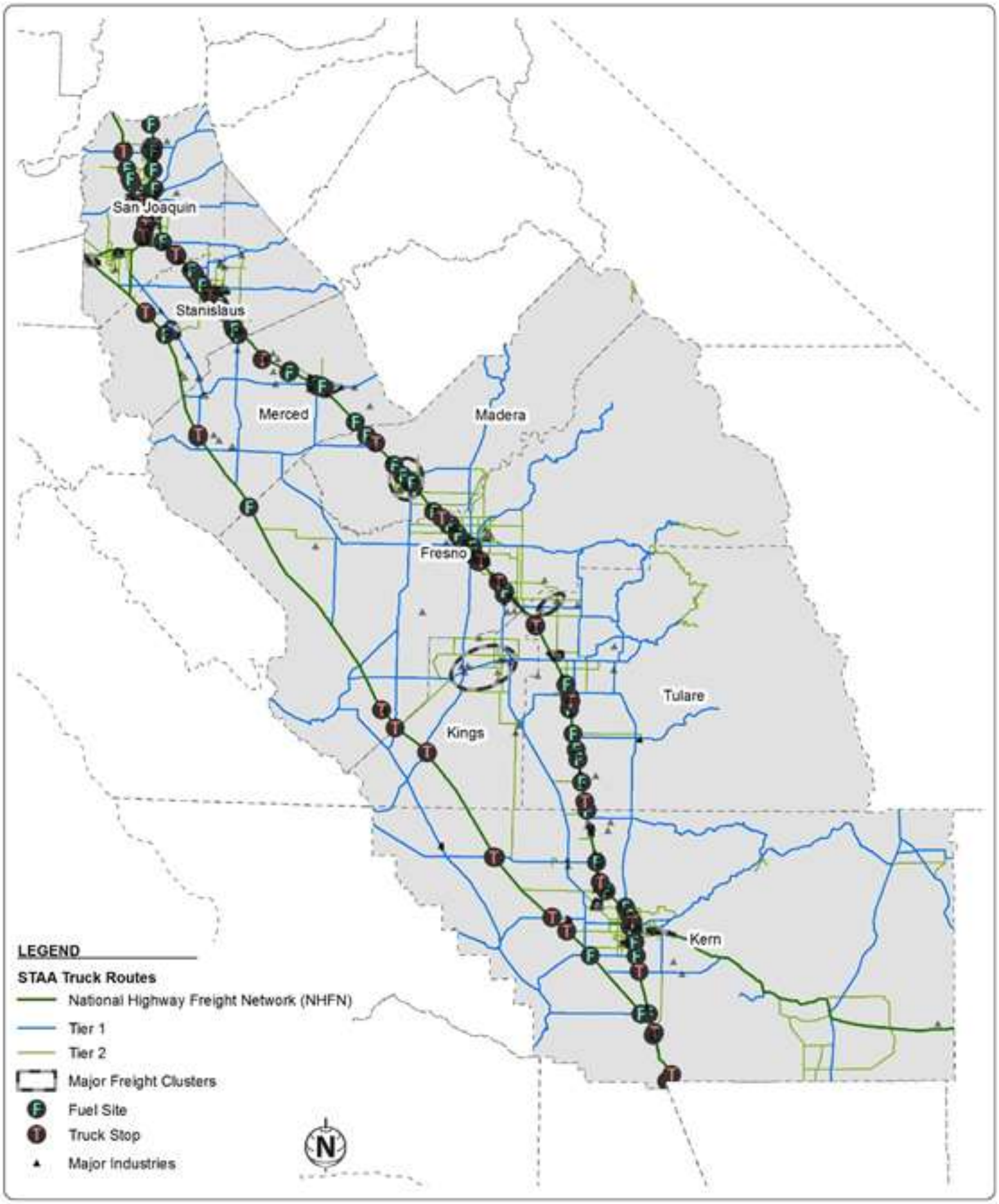


Source: [TIMS, 2009-2013]

Truck Service Facilities

In the Task 1 memorandum, existing freight clusters were identified by using different data sources and with input from the I-5/SR 99 TAC members. The purpose of the freight clusters was primarily to understand where GPS truck data should be purchased in order to capture truck origins and destinations within the region. Building on that effort, the future conditions investigation identified locations where industrial land use is anticipated to occur. As part of this task, additional truck generators, including freight facilities, truckstops and fueling stations were identified as shown in **Figure 1-3**.

Figure 1-3 Freight Clusters and Truck Service Facilities



Goods Movement Related Projects

Project Lists

The most recent statewide, regional and local transportation plans were used to compile a master list of goods movement related projects and programs on the I-5 and SR 99 corridors in the San Joaquin Valley region. These included projects on I-5 and SR 99, key connectors between the two corridors and key ingress/egress routes of the region that connect to the San Francisco Bay Area and Southern California. The total project cost, project status and likely timeline for implementation were updated in consultation with Caltrans and regional metropolitan planning organizations. The planned projects are expected to address issues in all critical locations. **Figure 1-4** shows the locations of the projects in all counties.

Figure 1-4 Goods Movement Project Map, All Counties

Programs

A literature review of several programmatic project concepts, including ITS solutions for truck parking, truck platooning testing, zero- and near-zero emissions truck technology and truck only toll lanes provided information about benefits and challenges. Data analysis and interviews were conducted to evaluate mode shifting opportunities from truck to potential short-haul rail service.

The literature review on ITS solutions for truck parking included options for real-time parking detection technologies, a comparison of their physical and operational capabilities, and a summary of past tested public-private-partnership opportunities for truck parking. The relationships between hours of service limits and illegal truck parking, and between crash rates involving large trucks and truck parking shortfalls are explained in this memorandum.

The literature review on truck platooning and connected truck technologies includes information about the truck platooning concepts throughout the world. This section summarizes nine completed tests of the technology, including participants involved, configuration of truck platooning, corridor characteristics, equipment used, objectives of demonstration, and design and results. A more complete and current report will be submitted as part of Task 7, the Truck Platooning Demonstration. The nine demonstrations included: (1) Texas truck platooning test program, (2) FHWA partial automation for truck platooning (California), (3) FHWA partial automation for truck platooning (Alabama), (4) Nevada truck platooning tests, (5) Safe Road Train for the Environment (SARTRE), aerodynamic tests, (6) Safe Road Train for the Environment (SARTRE), CACC and ACC tests, (7) Safe Road Train for the Environment (SARTRE), V2V communications tests, (8) Japanese energy ITS project, and (9) CHAUFFEUR project in Europe.

The literature review of zero- and near-zero emissions truck technology and more broadly applicable strategies, includes AERIS (EcoDriving) and Freight Advanced Traveler Information System (FRATIS). The technology readiness levels and operations of different technologies are described in this memorandum.

The literature review on a programmatic project concept of truck only toll lanes. Additional features that are being considered for this project concept include no toll for zero- and near-zero emission trucks and increasing weight limitation beyond existing 80,000-pound limit. The review found that the pricing strategy is critical and there is a large opportunity cost for building truck only lanes that needs to be balanced by public benefits. Some criteria for considering truck lanes as an alternative include implications of roadway pricing, added benefits of increased weight limits, and opportunities to encourage zero and near-zero emission truck technology. Truck only toll lanes on I-5 in both directions between I-5 and SR 99 junction in Kern County and I-5 and I-205 junction in San Joaquin County are being proposed in this memorandum.

A programmatic project concept of mode shifting from truck to potential short-haul rail service was assessed using a review of past studies and initiatives, an analysis of rail intermodal facility location options for major California ports, and an estimation of VMT reduction on I-5 and SR 99 on a per trip basis for the various. The review found that distance and volume are key determinants for rail carriers to provide rail shuttle service and price the rail shuttle service; the price and convenience are key determinants for shippers to select rail shuttle service instead of truck drayage. Previous concepts including CIRIS between Port of Oakland and Stockton in San Joaquin County, and SLC concept between Ports of Long Beach/Los Angeles and Shafter in Kern County did not show a price advantage for a rail shuttle service over truck drayage. The mode shift would have varying VMT reduction impacts on I-5 and SR 99 depending on the location of rail intermodal facility, the best potential VMT reductions would come from mid-SJV locations such as Madera, Visalia, or Porterville.

Improvements on I-5 /SR 99 Connectors

In addition to planned improvements, the memorandum also identified connectors between I-5 and SR 99, which upon undergoing significant improvements could reduce congestion and improve safety on SR 99 by shifting trucks to I-5. Based on truck GPS origin/destination data, as well as existing truck traffic and the RTP future growth and network development projects, the following connectors were identified as candidates for further analysis: (1) SR 58, (2) SR 198, (3) SR 132, and (4) SR 140 (5) SR 165. In addition to these, three more STAA routes could also be included in the analysis, including: (1) SR 152, (2) SR 41, and (3) Lerdo/SR 43 The methodology that would be used for analyzing their benefits in Task 4 is documented in this memorandum.

Feasibility Assessment of Planned Projects

The memorandum identified strategic goals and objectives that are a common theme across statewide and regional transportation plans. The strategic goals were related to: (1) economic competitiveness; (2) infrastructure preservation; (3) mobility and travel time reliability; (4) safety and security; (5) environment; (6) technology, and (7) funding.

Based on these, projects and programmatic project concepts were bundled into strategic programs for the I-5 and SR 99 corridors. These strategic programs were qualitatively assessed using three measures, namely, capital cost per project element, potential to reduce truck VMT, and funding availability. Additional comments regarding feasibility are also provided. The results of the feasibility assessment are shown in **Table 1-1**.

Table 1-1 Qualitative Assessment of Feasibility for I-5/SR 99 Strategic Programs

Strategic Program for I-5 and SR 99 commercial vehicle corridors	Capital Cost per Project Element	Percent Truck VMT Reduced	Public Funding Situation	Comments on Feasibility
I-5/SR 99 Roadway Pavement and Bridge Maintenance	Mostly Low, Sometimes Medium	Not Applicable	Mostly Funded	This program already exists. Maintenance of long and old bridges would be resource intensive.

Strategic Program for I-5 and SR 99 commercial vehicle corridors	Capital Cost per Project Element	Percent Truck VMT Reduced	Public Funding Situation	Comments on Feasibility
Overweight/oversize policy to allow heavier/longer trucks on I-5 in both directions between San Joaquin County boundary to Kern County boundary (exact boundaries of this project can be identified during future project development)	Unknown; potential need to add dedicated lanes, reinforce bridges and lanes to carry heavier loads, and add ITS	High	Not Applicable	The economic advantages to freight transportation system users, and possible extension to Oregon along I-5 in the north and possible extension to Nevada along SR-58/I-15 in the east needs to be further evaluated. The institutional barriers to implementing this program would be difficult to cross. There are also operational challenges to freight transitioning from the policy implemented portion of I-5 to other parts of the freight transportation system.
Truck only Toll Lanes on I-5 between I-5 and I-205 junction in San Joaquin County and I-5 and SR 99 junction in Kern County	High	Not Applicable	Unfunded	This program could improve mobility, safety and air quality, as well as reliability; however, I-5 does not experience severe congestion. Congestion relief and time savings would be limited. The trucking industry in various parts of the U.S. are opposed to tolling. Constructing a major truck-only facility on I-5 would be costly with a high potential for under-utilization.
Truck climbing lanes at steep locations such as Altamont Pass, Pacheco Pass and Tehachapi Passes (Grapevine area and SR-58 Eastbound).	Medium	Not Applicable	Unfunded	This program would have substantial mobility and safety benefits to freight transportation system users. They would also strengthen interregional connectivity.
I-5/SR 99 Capital Projects for Bottlenecks Congestion Relief	Mostly Medium	Not Applicable	Partially Funded	This program would have substantial mobility and travel time reliability benefits to freight system users, and projects under this program are already planned. Site constraints could reduce the anticipated benefits.

Strategic Program for I-5 and SR 99 commercial vehicle corridors	Capital Cost per Project Element	Percent Truck VMT Reduced	Public Funding Situation	Comments on Feasibility
I-5/SR 99 Operational Projects for Bottlenecks Congestion Relief	Mostly Low	Not Applicable	Partially Funded	This program would have local mobility benefits to freight system users, and projects under this program are already planned.
I-5 to SR-99 Connector Capital and Operational Projects for Improved Accessibility	Mostly Medium	Not Applicable	Partially Funded	This program would have substantial mobility and travel time reliability benefits to freight system users, and projects under this program are already planned. Site constraints could reduce the anticipated benefits. Improvements to a few east/west connectors between I-5 and SR 99 needs to be further evaluated.
I-5/SR 99 Interchanges Reconfiguration Program for Key Freight Access Interchanges with Inadequate Design	Mostly High, Sometimes Medium	Not Applicable	Partially Funded	This program would have local but substantial mobility and safety benefits to freight system users, and projects under this program are already planned. Site constraints could reduce the anticipated benefits.
I-5/SR 99 Capital Projects for Safety Hotspots Alleviation	Mostly Medium	Not Applicable	Partially Funded	This program would have substantial safety and travel time reliability benefits to freight system users, and projects under this program are already planned. Site constraints could reduce the anticipated benefits.
I-5/SR 99 Operational Projects for Safety Hotspots Alleviation	Mostly Low	Not Applicable	Partially Funded	This program would have local safety benefits to freight system users, and projects under this program are already planned.

Strategic Program for I-5 and SR 99 commercial vehicle corridors	Capital Cost per Project Element	Percent Truck VMT Reduced	Public Funding Situation	Comments on Feasibility
Container depot service near Stockton for Port of Oakland and in Shafter for Ports of Long Beach and Los Angeles service	Not Applicable	Low	Unfunded	This program would improve access to freight equipment mainly for port users. The economic advantages to freight transportation system users needs to be further evaluated.
Short-haul rail service between SJV region and Port of Oakland	High (if new rail intermodal facility is built), otherwise Low (mostly relating to Rolling Stock for Rail Shuttle)	High for mid-SJV locations, Low otherwise	Unfunded	This program would increase mode choice mainly for port users and create new economic development opportunities. This would also require an agreement with the railroad operator to provide a short-haul rail service, and a competitive pricing.
Short-haul rail service between SJV region and Ports of Long Beach/Los Angeles	High (if new rail intermodal facility is built), otherwise Low (mostly relating to Rolling Stock for Rail Shuttle)	High for mid-SJV locations, Low otherwise	Unfunded	This program would increase mode choice mainly for port users and create new economic development opportunities. This would also require an agreement with the railroad operator to provide a short-haul rail service, and a competitive pricing.
Caltrans' Truck Parking Information System on I-5	Medium	Not Applicable	Partially Funded	This program would increase utilization of existing parking supply, improve HOS compliance, and minimize side-of-the-road truck parking. The economic advantages of truck parking information system needs to be further evaluated.

Strategic Program for I-5 and SR 99 commercial vehicle corridors	Capital Cost per Project Element	Percent Truck VMT Reduced	Public Funding Situation	Comments on Feasibility
Truck Platooning	Medium	Not Applicable	Not Applicable	This program would increase utilization of highway capacity, reduce fuel consumption and reduce emissions. The institutional barriers and safety concerns relative to mixed flow operations need to be further evaluated.

Conclusions and Next Steps

- Several critical locations in terms of mobility, safety, and economic growth are identified in this memorandum.
- This memorandum provides the latest information on planned goods movement related projects and programs. The planned projects are expected to address issues in all critical locations.
- Findings from data analysis, literature review and stakeholder interviews on programmatic project concepts, including ITS solutions for truck parking, truck platooning and connected truck technologies, zero- and near-zero emissions truck technology and more broadly applicable emission reduction strategies, short-haul rail service, and truck only toll lanes are summarized in this memorandum.
- The projects and programmatic project concepts were bundled into strategic programs aligned to strategic goals and objectives of statewide and regional transportation plans and their feasibility was qualitatively assessed.
- In the next tasks, economic advantages and public benefits of some of the strategic programs will be further evaluated using a quantitative approach. A demonstration for truck platooning on I-5 corridor will be conducted. Lastly, potential public and private funding opportunities for strategic programs will be identified.

2.0 Introduction

The Task 1 memorandum for this Study identified several goods movement issues and opportunities for San Joaquin Valley region. Continuing from Task 1, this memorandum: (1) identifies critical mobility, safety, economic development and environmental issues and opportunities, (2) compiles a master list of planned goods movement related projects on I-5 and SR 99 highway corridors in the San Joaquin Valley region, (3) identifies programs and develops project concepts for a few critical goods movement issues and opportunities, and (4) qualitatively assesses feasibility of strategic programs in terms of cost, VMT reduction and public funding situation. Further quantitative assessment on a few strategic programs will be carried out in Task 4 memorandum.

Building on the Task 1 memorandum findings, this memorandum employs additional types of data/information, including: (1) statewide, regional and local transportation plans to identify projects, strategic goals and objectives as they relate to goods movement; (2) recent and relevant project concept reports including truck only toll lanes and inland port facility; (3) summary of ongoing research in the areas of truck parking intelligent transportation system (ITS) and truck platooning, and (4) best practices for goods movement performance measures and criteria for feasibility analysis.

Technology feasibility is being assessed in this memorandum primarily based on already implemented or demonstrated technologies in the U.S. and Europe. For a better understanding on the applicability of a few of the innovative technologies to the San Joaquin Valley region, a demonstration will be conducted and findings will be reported in later tasks of this study.

The memorandum is organized into seven sections as follows:

Section 1: Summarizes the key findings and conclusions from this memorandum.

Section 2: Introduction

Section 3: Goods Movement Issues and Opportunities

Section 4: Planned Projects and Programs along I-5 and SR 99

Section 5: Investigation of East/West Connectors

Section 6: Feasibility Assessment

Section 7: Conclusions and Next Steps

3.0 Goods Movement Issues and Opportunities

3.1 Truck Traffic Generators

In the Task 1 memorandum, seventeen freight clusters were identified. These existing freight clusters contribute to major truck trip generation in the Valley. The intent of focusing on existing clusters correlates to a purchase of truck GPS data for the purpose of adding truck origins and destinations information to the travel demand model. While this data is only partial and is not able to tell us about the future, it is very useful for validating the model outputs. As part of Task 1 memorandum, the I-5/SR 99 Technical Advisory committee provided significant feedback about existing and planned freight activity centers. The planned facilities will be important, especially in Task 4 when we investigate the opportunities for identifying east/west connectors with the highest potential for shifting truck traffic from SR 99 to I-5. As part of this next effort, additional truck generators, such as truck parking/storage facilities and service stations, were added to the maps. This additional layer of information provides more details about likely truck routing.

The databases for additional truck generators were developed to guide the location and definition of freight industry clusters, and are not intended to be exhaustive or definitive, and are described as follows:

- **Freight Facilities Database**. This database is an Excel workbook listing names and addresses of 478 identifiable freight-related facilities in the eight-county study area. Those facilities include:
  - Distribution centers (DCs) operated by retail chains or other private sector freight owners (e.g. the Walmart distribution center at Porterville)
  - Warehouses or distribution centers operated by third-party logistics (3PL) firms, either for specific customers or for multiple clients (e.g. multiple Americold Logistics facilities in the study area).
  - Agricultural producers, packers, or processors (e.g. multiple ConAgra facilities in the study area).
  - Manufacturers likely to depend heavily on freight transportation (e.g. Dart Container Corp. in Lodi).
  - Transloaders that shift freight between rail and truck modes (e.g. MET's Valley Transload in Empire).
  - Trucking firms with substantial terminals (e.g. the YRC terminal at Tracy).
  - Rail carload and intermodal freight facilities (e.g. the BNSF Mariposa intermodal terminal at Stockton).
  - This list should not be considered exhaustive, and it is possible that some facilities may have opened, closed, or changed names. There was no fixed size or volume cutoff; inclusion was based on scale information found in directories, on websites, or apparent in Google earth aerial photos.
  - Sources used to compile the list include databases created for previous San Joaquin Valley projects and industry directories. Extensive use of Google Earth, Google Maps, and company websites was made to locate and identify major facilities in the study area.

- **Truckstops Database.** Within the freight industry, a "truckstop" is normally a large facility providing fuel, food, supplies, services, and overnight parking for heavy-duty trucks. **Figure 3-1** shows a cluster of truckstops near Lost Hills. A database of 182 commercial truckstops was developed from industry listings. This database extended beyond the study area. The listings were reviewed to focus on substantial facilities catering to heavy-duty trucks, and to exclude truckstops that were actually just filling stations or convenience stores.

Figure 3-1 Truckstops, I5/CA46 at Lost Hills

Source: [Google Earth, 2016]

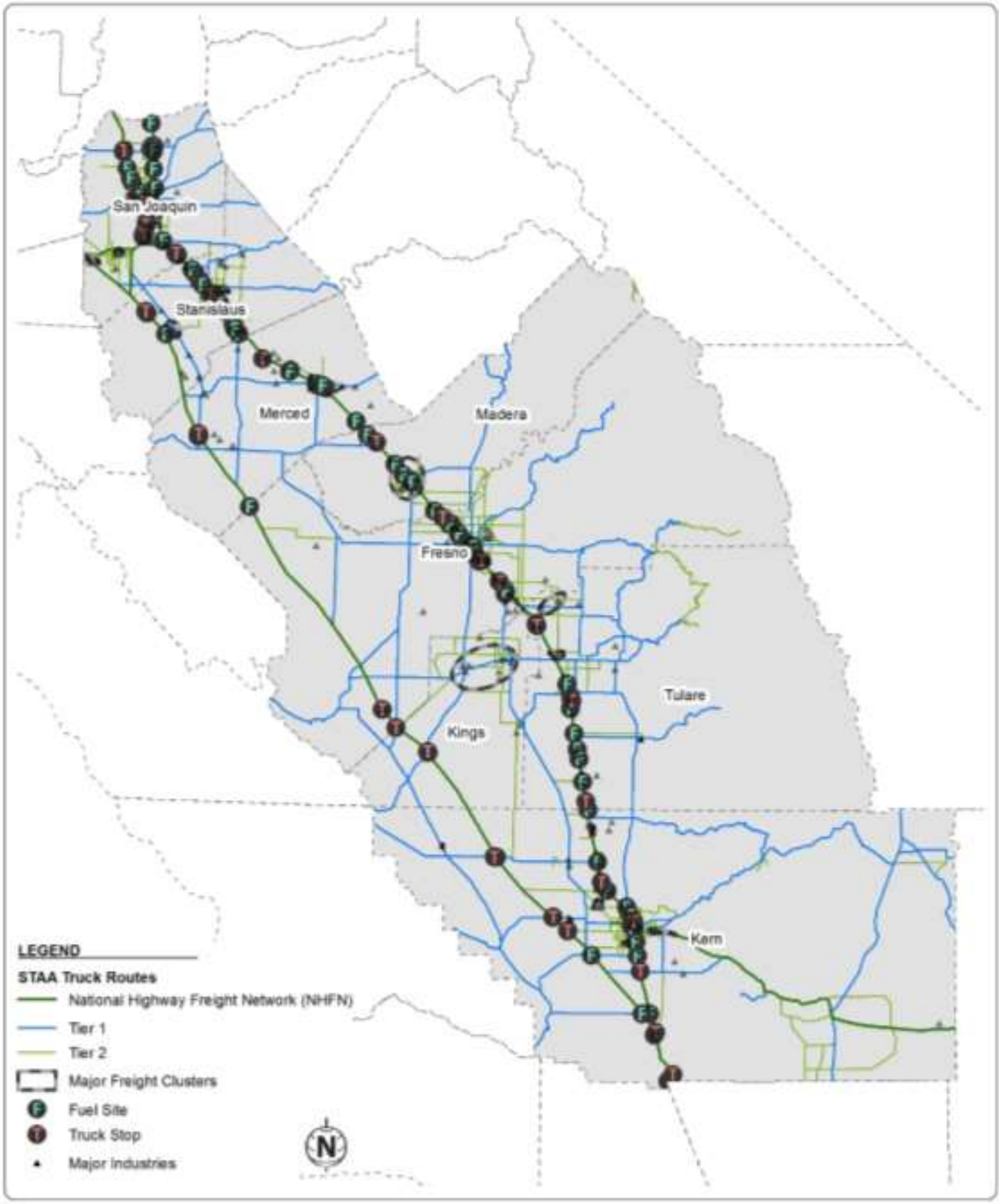
- **Fueling sites.** Heavy duty trucks do not normally patronize normal consumer gas stations. Their drivers obtain fuel at company yards, at truckstops, or at commercial fueling sites. Many commercial fueling sites are unmanned "card lock" locations (**Figure 3-2**), while others are fuel dealers or large gas stations. A database of 242 such sites was developed in the study area, drawing on listings from the two major western fueling networks: Pacific Pride and CFN. A brief review of the data was conducted to eliminate ordinary gas stations that happened to accept Pacific Pride of CFN credit cards.

Figure 3-2 Unmanned Pacific Pride "Card Lock" fueling Site

Source: *[Google Earth, 2016]*

Figure 3-3 shows the additional truck generators identified in the San Joaquin Valley region using the above databases. A majority of the freight facilities, truckstops and fueling stations are located along SR 99.

Figure 3-3 Freight Clusters and Truck Service Facilities



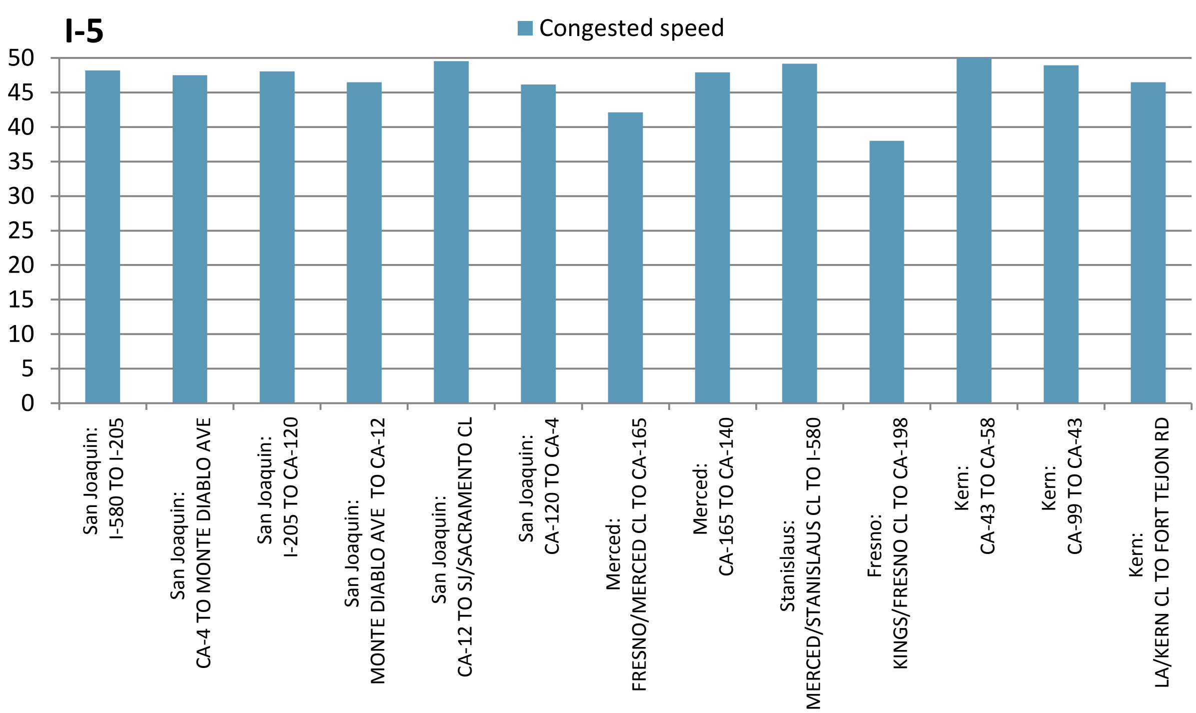
Source: [Consultants' Databases Development and Analysis, 2016]

The Regional Transportation Plans (RTP) for each county provided the basis for future industrial land use and growth assumptions, including industrial warehouses, distribution centers, and truck support facilities. The RTP travel demand model land use data were used to determine the existing and future industrial employment growth for each transportation analysis zone (TAZ). The base and future years were defined based on available model data. The base year ranges from 2005 to 2014 and the future year is 2040, except for Madera County which is 2035. These are shown and discussed in Sections 3.4 to 3.11 of this memorandum.

3.2 Mobility

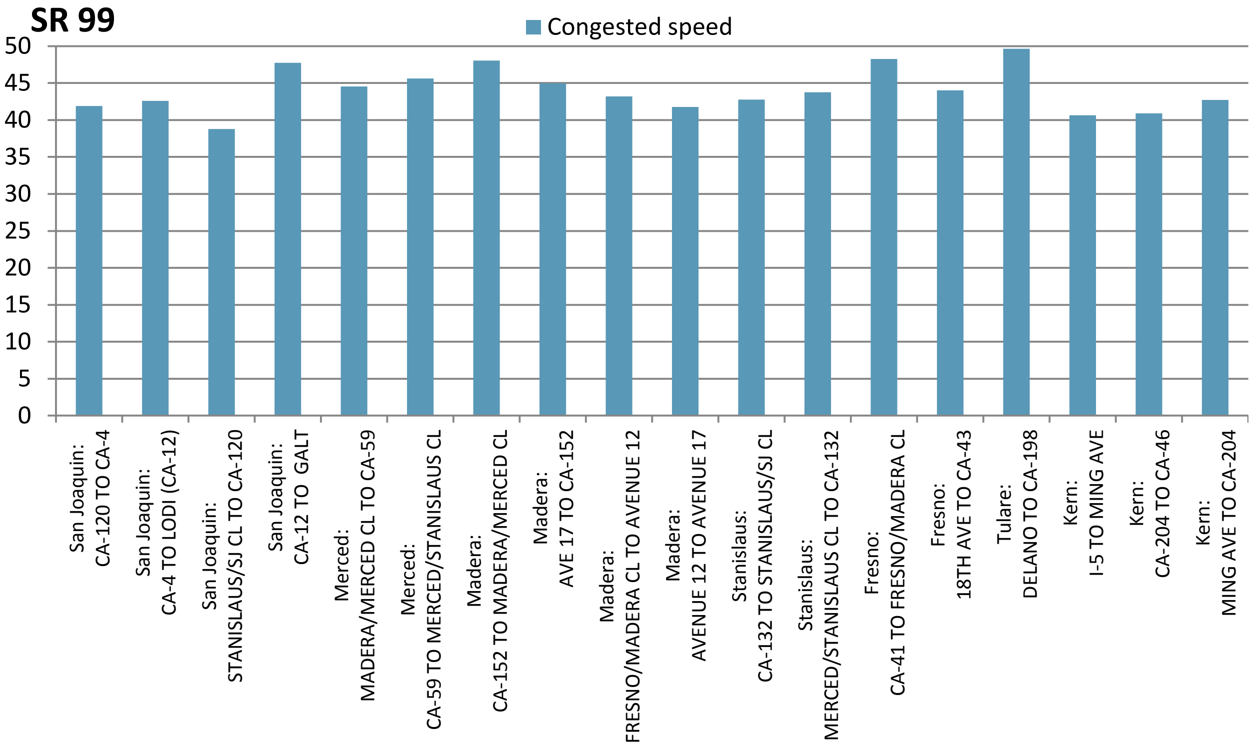
Two charts displaying congested speeds at locations along I-5 and SR 99 and a map of locations with congestion and travel time reliability issues provided in Task 1 memorandum are included again here as a starting point for a more detailed discussion about the critical locations. As stated in Task 1 memorandum, this data posed two problems, including lack of reliable historical data and speed limits shown do not always apply to truck traffic. Commonly, a posted speed limit of 65 mph applies to automobiles while a 55 mph speed limit applies to heavy trucks. For these reasons, actual speeds shown in **Figure 3-4** and **Figure 3-5** below that indicate traffic is moving 10 to 15 percent slower than the posted speed may be due to missing or incorrect data or significant truck traffic that is restricted to a 55 mph speed limit. This information provides a good starting point for identifying critical locations, but this memorandum includes additional information to determine truck bottlenecks. Near dense urban areas, the average V/C along I-5 and SR 99 during peak periods is 0.25 and 0.51, respectively.

Figure 3-4 I-5 Congested Speed (2014)



Source: [PeMS, 2014]

Figure 3-5 SR 99 Congested Speed (2014)



Source: [PeMS, 2014]

Data for the travel time of vehicles (and in many cases, trucks as well) was collected from "HERE", otherwise known as the National Performance Management Research Data Set (NPMRDS). These data are collected at locations across the US highway network. Each location is composed of a certain length of roadway and is available in either direction. Data are averaged by five-minute increments and gathered into one-month batches by state. The data coverage is generally comprehensive, but not all locations have robust data sets for all times of all days of a given month. The HERE data for each month includes a correspondence table that identifies the length of the segment and the observed average travel time by vehicle type. Vehicle classification is not available for all locations. Using this information, the average speed can be calculated for each segment by type (all vehicle vs Truck only).

For this analysis, data collection locations were selected for all state highways in the San Joaquin Valley, limited to Tuesdays through Thursdays, for the entire month of October 2015. The selection was further refined to the peak hours of 6:00 to 9:00 AM and 4:00 to 7:00 PM. In order to ensure reliable average values, the selection was refined once more to include only locations that had at least 10 days of data on average for each five-minute data point. The HERE dataset is cleaned of outliers or other possible data errors, so this process reduces the likelihood that a location would show irrational or skewed averages.

A comparison of the average speed data aggregated to 15-minute periods and the lowest average speed for any 15-minute period for both AM and PM peak provided an indication of locations experiencing congested speeds. This method allows for the variation among regions, or even among different road segments, which may experience the worst of the peak period at different times. **Figure 3-6** and **Figure 3-7** PM Peak Period Traffic Congestion (2015)

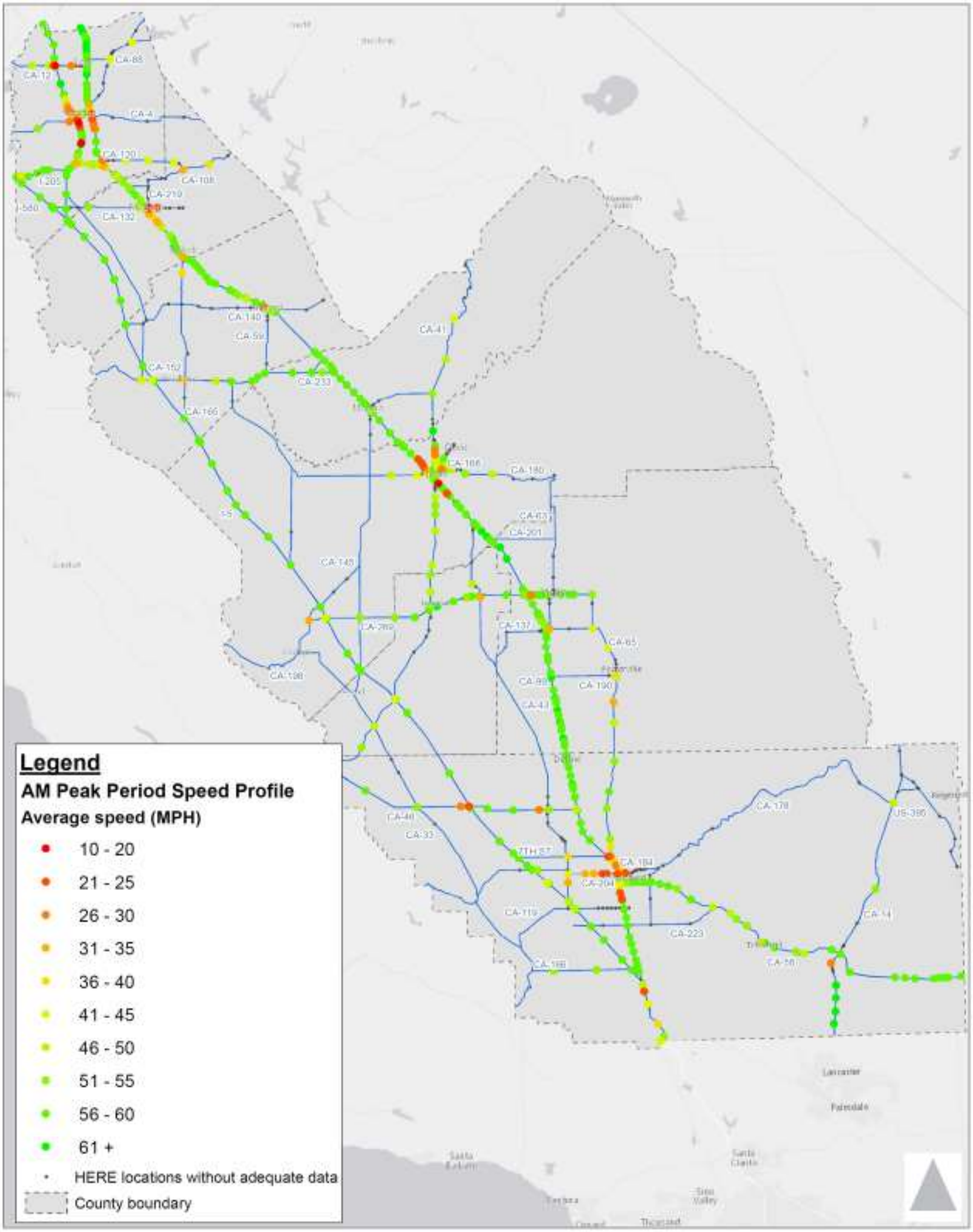
show the speeds for all vehicles and trucks only for the AM and PM peak periods.

To identify congestion issues, the worst 15-minute average speed was compared to the posted speed limit of that facility. In some cases, during the worst 15 minutes vehicles were moving at an average speed 25 percent of the posted speed limit. This method of comparison was calculated for all vehicles, as well as trucks only, where the data were available. On some segments of major freeways and multilane highways, trucks are subject to speed restrictions (often, a limit of 10 mph less than general traffic) that would not be captured by the posted speed limit data source used. Because of this, the ratio of average truck speed to posted speed limit on multilane highways may be somewhat exaggerated, and actual speed values may be more relevant.

Further examination of locations with the lowest average peak period speeds across the entire region yielded ten example areas for further analysis and project prioritization. The basis for selecting an additional ten locations for prioritization included those with a combination of the lowest speeds, at least ten percent truck mix, and a one-mile minimum length. Each location selected was supported by HERE data and validated against Google Maps historical traffic data to ensure some other condition, such as construction, was not skewing the results. The locations selected cover a variety of areas across the region; however, not all counties have segments that reach the level of severity employed by this analysis. This is not to say that some counties do not have any congestion or safety issues, but rather, that the severity of issues does not meet the thresholds established for analyzing the entire region. Setting the thresholds lower would result in an unmanageable number of issue locations in the counties that already meet the minimum thresholds, and furthermore, could overstate and over-correct perceived issues. Critical locations occur most frequently in urban areas where AADT tends to be higher, exit and entry ramps or interchanges are more frequent, and the risk of crashes more prominent.

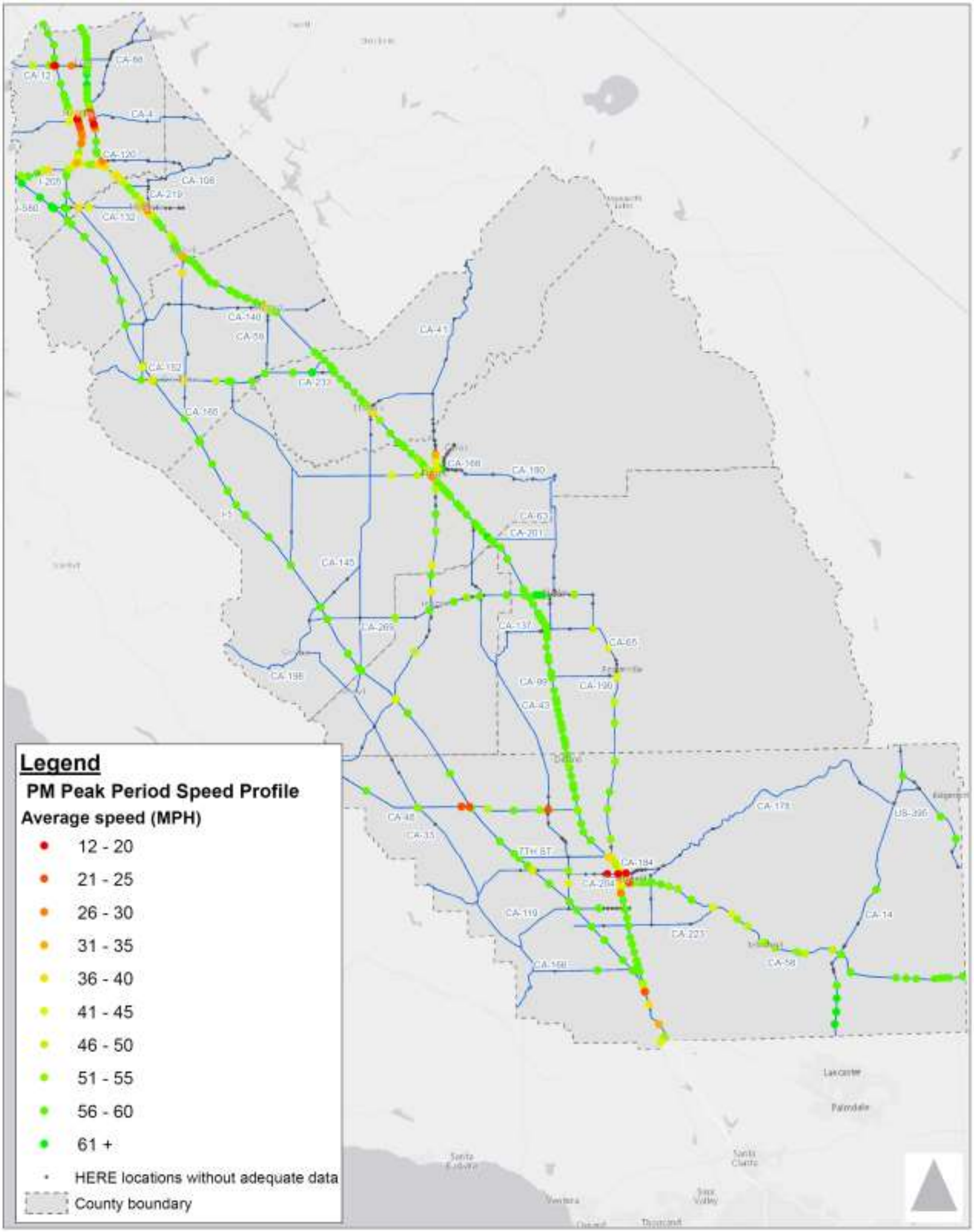
As shown in the following three figures, congestion occurs primarily on SR 99 near urban centers. In order to measure the severity, this analysis employed thresholds for critical locations. The thresholds included locations with congested speeds of more than 15 percent below posted speed limits. Based on this criteria, **Figure 3-8** depicts the critical locations based on existing congested conditions.

Figure 3-6 AM Peak Hour Traffic Congestion (2015)



Source: HERE data, October 2015

Figure 3-7 PM Peak Period Traffic Congestion (2015)



Source: HERE data, October 2015

Figure 3-8 Critical Mobility Issues, SR-99 & I-5 Only

Source: HERE Data

3.3 Safety and Reliability

The Task 1 memorandum investigated crashes by type along the I-5 and SR 99 corridors, including frequency, severity, and collision type (rear-end, side-swipe, etc.). The most recent available TIMS Data were obtained for all collisions coded as occurring on a state highway in the eight counties between January 1, 2009 and December 31, 2013.

Table 3-1 summarizes collisions by involvement of trucks and by year. During the 5-year period, collisions average 4,551 per year, with truck-involved collisions accounting for over 10 percent of all collisions each year.

Table 3-1 Collisions by truck involvement and year

Collision Involvement	2009	2010	2011	2012	2013	Total
No Truck Involved	4,253	4,147	4,059	3,992	3,886	**20,337**
Truck Involved	483	479	490	479	489	**2,420**
% Truck Collisions	10.2%	10.4%	10.8%	10.7%	11.2%	**10.6%**
Total	**4,736**	**4,626**	**4,549**	**4,471**	**4,375**	**22,757**

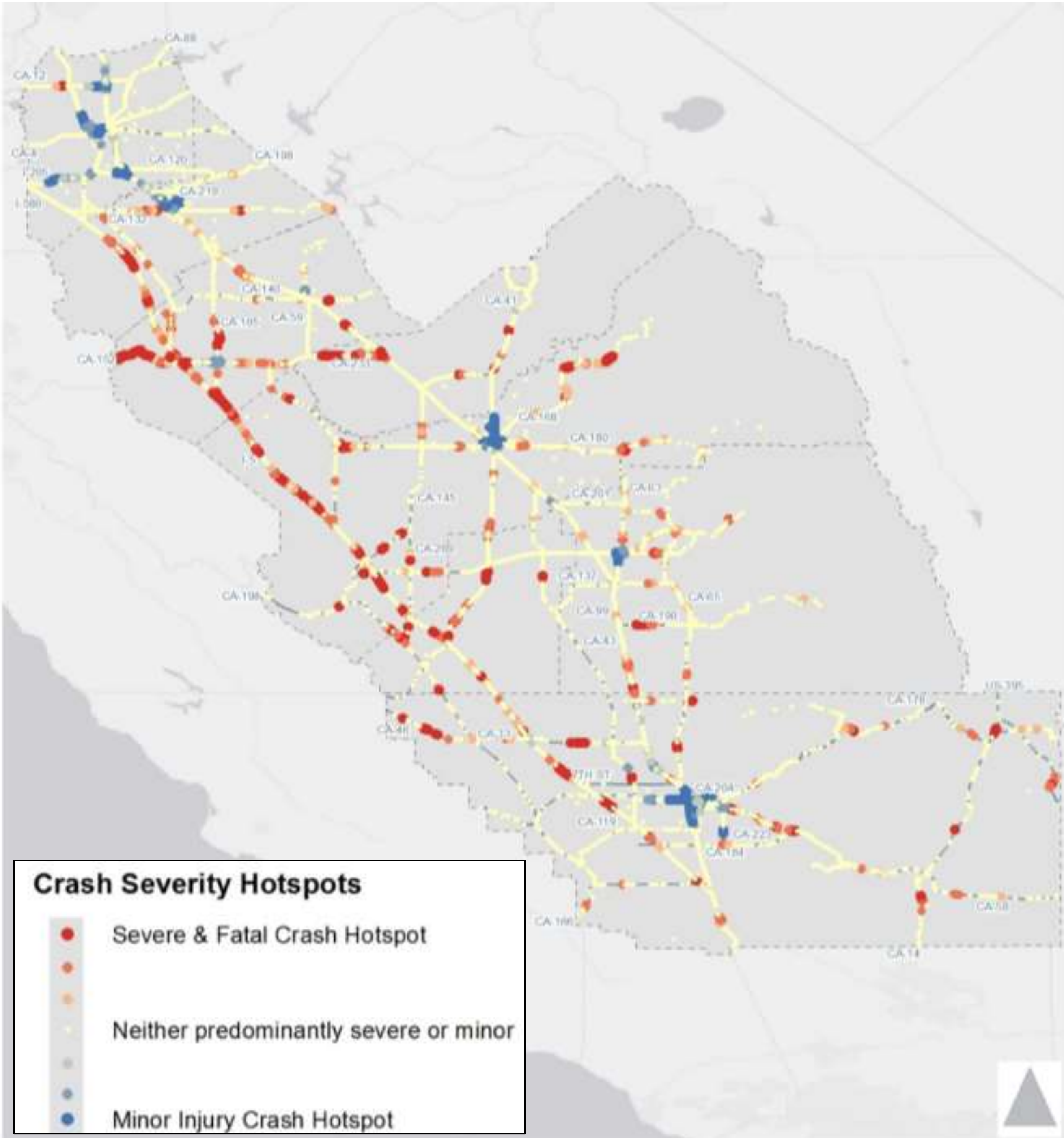
Source: [TIMS, 2009-2013]

In order to determine significant safety hot spots, Task 1 memorandum describes the use of the Getis-Ord GI Optimized Hot Spot Analysis tool to identify statistically significant "hot" and "cold" spots based on high and low values in the data (**Figure 3-9**). The tool analyzes the severity of each collision in relation to the severity of others nearby. Collisions are coded on a scale of 1-4, with 1 meaning fatal and 4 being only complaint of pain. In the figure below, every dot represents a unique incident. Red dots indicate statistically significant hot spots of severe collisions (groups of points near where most other collisions are severe or fatal). Blue dots indicate statistically significant groups of minor collisions (nearby collisions are mostly not severe or fatal). The yellow dots represent incidents where there is not a statistically significant prevalence of either severe or fatal collisions.

The blue hot spots are found almost exclusively in urban areas, especially Bakersfield, Fresno, and Stockton. These areas are expected to have higher volumes of collisions in general, and hot spots of minor collisions are a reasonable result because speeds are lower in urban areas.

Red hot spots are much more widespread across the study area, but are still heaviest along I-5 where speeds are higher and potential points of conflict (ramps, for example) are fewer. Red hot spots along rural highways are more likely to face a diverse set of challenges. For example, there could be poor sight lines at crossroads or driveways, leading to high incidence of broadside (t-bone) collisions.

Figure 3-9 All Collisions: Severity Hotspots Analysis



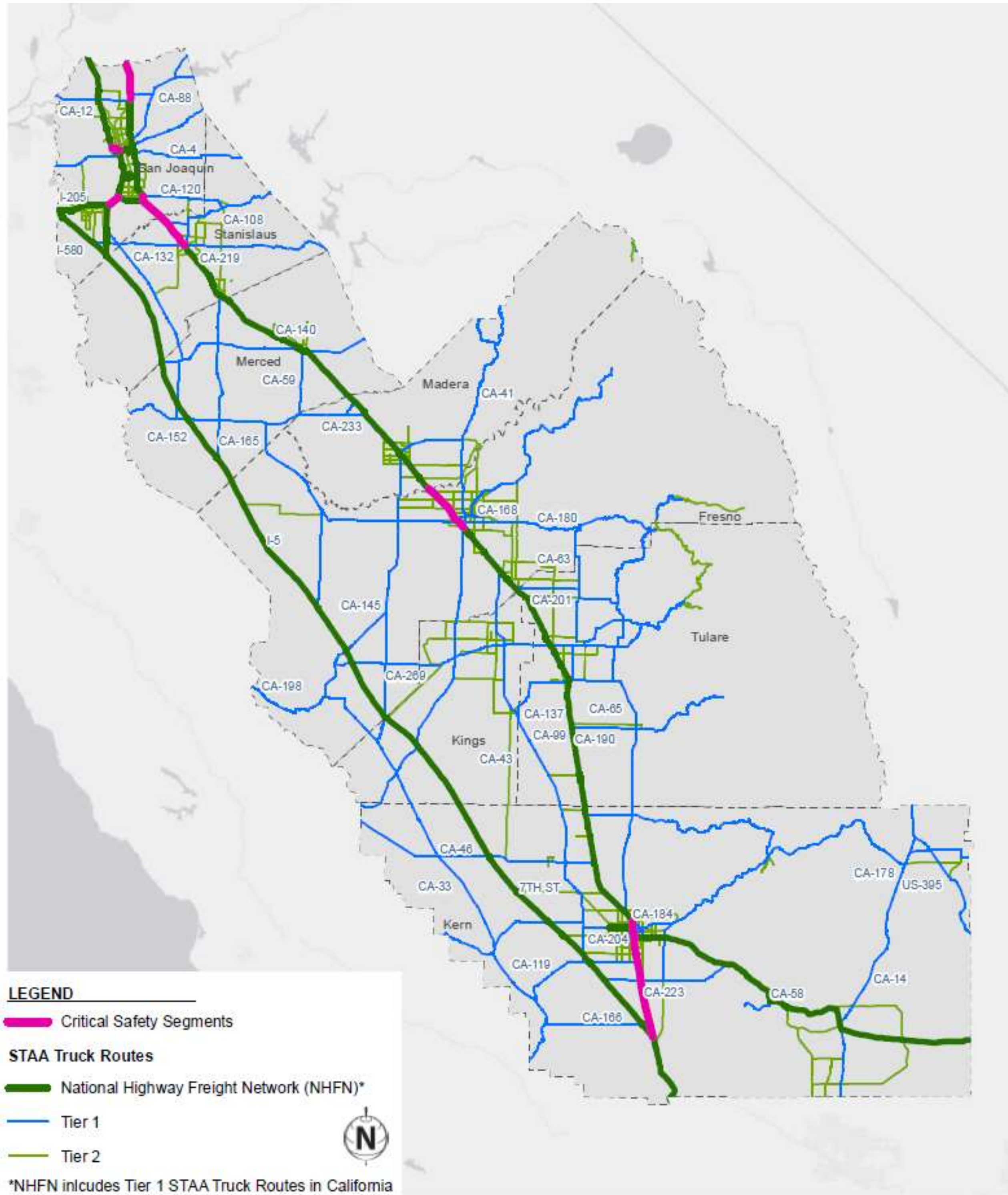
Source: [TIMS, 2009-2013]

Similar to how congested speed data assisted with identifying a starting point for investigating mobility issues, the regional hot-spot analysis provided a starting point for narrowing down a list of locations to investigate. Where data were available, the rate of collisions per 1,000 average daily trips was calculated. Locations where two or more similar crashes occurred were investigated more closely to determine if an improvement could alleviate risk of future collisions (**Table 3-2**). **Figure 3-10** shows critical safety locations identified through closer examination of crash cause and frequency.

Table 3-2 List of Segments with High Number of Collisions

Highway	Segment	Collisions 2009-2013	ADT	Collisions Per 1,000 ADT
SR 99	Delano (Kern/Tulare Cl) To Visalia (SR 198)	530	46,200	11.5
SR 99	Merced (SR 59) To Merced/Stanislaus Cl	422	54,000	7.8
SR 99	Merced/Stanislaus Cl To Modesto (SR 132)	689	89,100	7.7
SR 99	Manteca (SR 120) To Stockton (SR 4)	436	69,900	6.2
SR 99	Fresno (SR 41) To Fresno/Madera Cl	588	98,200	6.0
SR 99	I-5 To Bakersfield (Ming Ave)	322	65,300	4.9
SR 99	Modesto (SR 132) To Stanislaus/San Joaquin Cl	520	115,400	4.5
SR 99	Stockton (SR 4) To Lodi (SR 12)	321	82,100	3.9
SR 99	Bakersfield (SR 204) To SR 46	290	78,100	3.7
SR 99	Selma (SR 43) To Fresno (SR 41)	314	87,800	3.6
SR 99	Lodi (SR 12) To Galt (San Joaquin/Sacramento Cl)	193	57,900	3.3
SR 99	Ming Ave To SR 204 (Bakersfield)	407	128,700	3.2
SR 99	Avenue 12 To Avenue 17 (Madera)	192	64,400	3.0
SR 99	Stanislaus/San Joaquin Cl To Manteca (SR 120)	225	89,900	2.5
SR 99	Fresno/Madera Cl To Avenue 12	118	61,000	1.9
SR 99	SR 152 To Madera/Merced Cl	99	54,400	1.8
SR 99	SR 46 To Delano (Kern/Tulare Cl)	97	61,600	1.6
I-5	I-5 (San Joaquin Cl) To SR 205	671	70,700	9.5
I-5	Monte Diablo Ave (Stockton) To SR 12	148	19,300	7.7
I-5	SR 165 To Merced/Stanislaus Cl (SR 140)	355	90,900	3.9
I-5	Lathrop (SR 120) To Stockton (SR 4)	108	40,700	2.7
I-5	SR 12 To San Joaquin/Sacramento Cl	80	33,400	2.4
I-5	SR 99 To SR 43	35	19,200	1.8
I-5	I-580 To I-205	55	34,800	1.6
I-5	SR 43 To SR 58	128	82,600	1.6

Figure 3-10 Critical Safety Issues on SR-99 and I-5



Source: TIMS Data

3.4 Fresno County

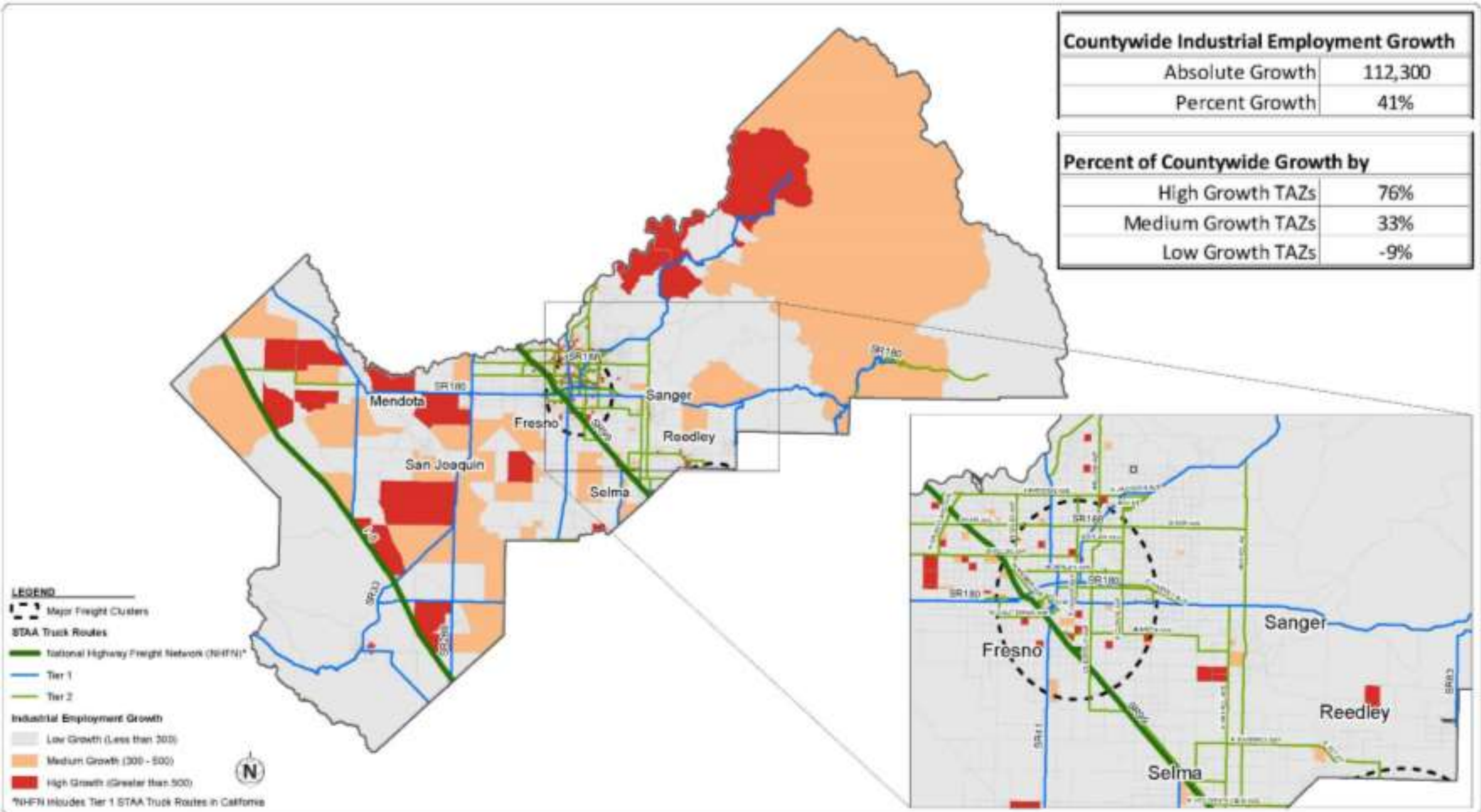
3.4.1 Traffic Generators

In Task 1 memorandum, a freight cluster[1] consisting of five distribution centers, two large agricultural businesses, an airport, and an import/export distribution facility was identified in Fresno. The distribution centers identified for this cluster focus on transportation and warehousing as well as wholesale and retail trade, and one of the centers specializes in groceries/retail and employs 500 to 999 employees and another center employs 1,000 to 4,999 employees. The agricultural businesses each employ 1,000 to 4,999 people.

The Fresno Council of Governments (Fresno COG) provided base year and future year land use data for 2014 and 2040 respectively. As per **Figure 3-11,** TAZs with highest expected industrial growth are located in Fresno, Selma, and Reedley. The western portion of Fresno County is also expected to have moderate to high industrial growth as seen in the figure below.

[1] Employment data provided a starting point for determining the locations of freight cluster. Initial investigations identified the following industrial employers. The clusters were expanded and revised based on input from the I-5/SR 99 TAC.

Figure 3-11 Industrial Employment Growth (2010 – 2040)



Source: Fresno Council of Governments (COG) 2014 Regional Transportation Plan (RTP)

3.4.2 Congested Segments

Table 3-3 List of Congested Segments, Fresno County

Segment	Urban Area	County	Length (miles)	Lanes	Direction	Posted Speed	Congested peak period speed AM	PM	AADT	Truck AADT	% trucks of AADT
SR-99 from SR 41 to Belmont Ave	Fresno	Fresno County	3.2	4	South bound	65	23	51	80,000	16,800	21%

The section identified in **Table 3-3** is considered to be located in a mixed urban land use setting. The critical issue with this congested segment is that the SR 99 passes through Fresno to the west of the core area, with several exit ramps accessing industrial areas and downtown. The truck volume in this segment is relatively high due to the industrial areas along it.

3.4.3 Critical Safety Segments

Table 3-4 List of Critical Safety Segments, Fresno County

Segment	County	Length	# of Lanes	# of Collisions	Collisions per Lane Mile	Total Fatalities	Fatalities Per Mile	Truck Involved Collision	Percent Truck Involved	Speed limit
SR 99 from SR 41 to Fresno/ Madera County Line	Fresno County	12.7	6	532	6.98	19	1.50	76	14%	65

Table 3-4 shows the details of a critical safety segment in Fresno. The Shaw Avenue and Herndon Avenue intersections on SR 99 have the highest number of truck collisions. There are 10 import/export businesses within 10 miles of this segment with 3 significant freight businesses in close proximity, as well. This segment has a significant number of fatalities, alcohol related crashes, freight facilities and goods movement, and a high percentage of sideswipe truck collisions, especially near Herndon and Shaw Avenues.

3.5 Kern County

3.5.1 Traffic Generators

The Task 1 memorandum identified four significant, existing freight clusters[2] in Kern County, Including: Bakersfield, Shafter, Delano, and Tejon. Truck GPS data pulled for these locations allowed for calibration and validation of the existing truck patterns in Kern County. The following describes the four existing clusters where truck data was derived.

- **Shafter:** The Shafter cluster consists of two goods movement sub-clusters. The Lerdo Hwy/SR 99 sub-cluster includes 5 major manufacturing and agricultural processing facilities. The 7th Standard Rd/Santa Fe Way sub-cluster includes 6 major distribution centers including Target, Ross and FedEx Ground, and 3 oil production/refining companies, covering less than half of a 5-square mile industrial zoned area. This cluster is located at the geographic center of population for the State of California, and is also the hub for 10 distribution clusters located throughout southern Central Valley. It is also the site of a new freight container yard to be operated by Shipper's Transport Express, a partner with Stevedoring Services of America (SSA) Marine that operates marine terminals throughout the world, including both container and non-container terminals at the Ports of Los Angeles/Long Beach and Port of Oakland. The planned inland cargo container yard will provide intermodal rail access, storage for full and empty containers and chassis, and provide an equipment reservation system that allows exporters to plan ahead and avoid delays in moving their products to market. Rail service via Union Pacific and BNSF Railway is also available. **Bakersfield:** The Bakersfield cluster consists of three distribution centers and five large goods movement related businesses, including a distribution center that specializes in agricultural production and shipping and employs 1,000 to 4,999 people and one that provides logistic park access for other businesses. Cluster businesses include two with 500 to 999 employees and three businesses with 1,000 to 4,999 employees. These businesses focus on industries such as oil production/refining, agriculture, mining, manufacturing, and wholesale and retail trade. Several ongoing projects in recent years have improved the accessibility and connectivity of this cluster including widening 7th Standard Road and SR 58. Additional phases of these projects are being recommended by Kern COG for inclusion in the National Highway Freight Network (NHFN).

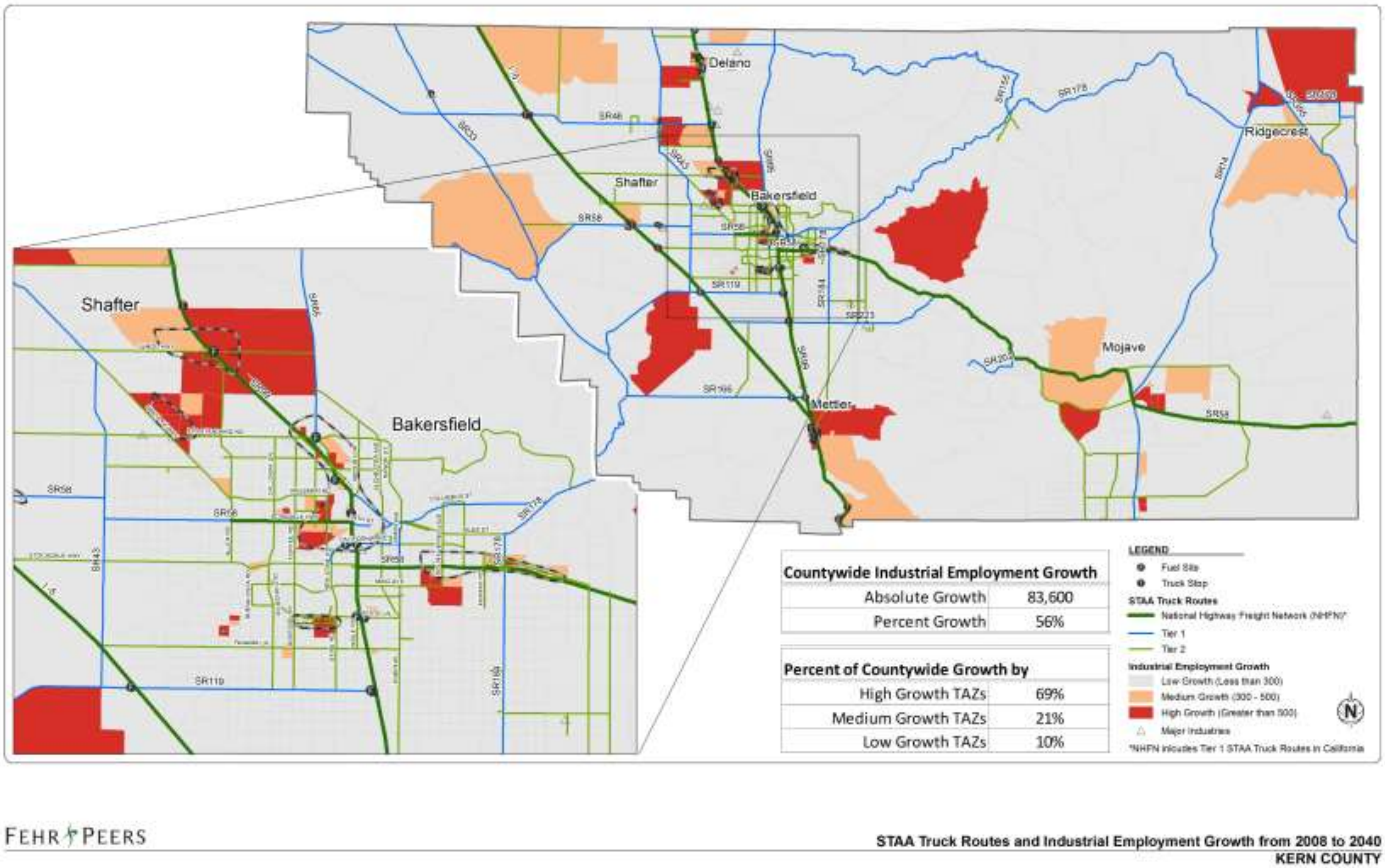
- **Delano:** The Delano cluster features a distribution center and large agricultural business. The distribution center specializes in wholesale and retail trade and employs 500 to 999 people. The agricultural business employs 1,000 to 4,999 people. Delano is also home to RailEx, the Southwest U.S. node to a national intermodal refrigerated boxcar service that ships agriculture and high value products (liquor/wine) between the San Joaquin Valley and the East Coast of U.S.

[2] Employment data provided a starting point for determining the locations of freight cluster. Initial investigations identified the following industrial employers. The clusters were expanded and revised based on input from the I-5/SR 99 TAC.

- **Tejon Ranch:** The Tejon Ranch cluster includes 5 distribution centers anchored by IKEA that rely heavily on imports that come through the Ports of Los Angeles/Long Beach, 2 truck stops, and a new retail outlet mall. Like other locations in the Valley, it has a significant amount of entitled area to accommodate future development of similar facilities.**:** Other goods movement clusters include 3 centers in and near Wasco (SR 46 corridor), 3 centers near Buttonwillow (SR 58 corridor), S.E. Bakersfield/Edison/Lamont (agricultural processing facilities), Tehachapi/Mojave (mining, renewable energy production and aerospace), and the large oilfields scattered throughout the south part of the Valley. These other locations account for the majority of resource related goods movement tonnage in Kern.

The Kern County Council of Governments (Kern COG) provided base year and future year land use data for 2008 and 2040 respectively. TAZs with the highest anticipated industrial growth (over 500 employees per square mile) are located within Bakersfield. Tejon, Mojave, and Ridgecrest are also expected to have moderate to high industrial growth (**Figure 3-12**). The growth in the TAZ at southeast of Shafter between SR-43 and SR-99 is related to planned distribution centers similar to what has been developing in this area over the past few years. Truck network accessibility is a concern in Kern County, as the county is over 8000 square miles. Depends on the location of the establishments in the TAZ, It could be three to ten miles from a truck route.

Figure 3-12 Kern County Industrial Employment Growth (2010 - 2040)



Source: Kern Council of Governments (COG) 2014 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS)

3.5.2 Congested Segments

Table 3-5 List of Congested Segments, Kern County

Segment	Urban Area	County	Length (miles)	Lanes	Direction	Posted Speed	Congested peak period speed AM	Congested peak period speed PM	AADT (by direction)	Truck AADT(by direction)	% trucks of AADT
SR-99 from SR 204 to SR 58	Bakersfield	Kern County	3.8	4	South bound	65	55	30	71,200	9,300	13%
SR-58 from Allen Rd to Oak St	Bakersfield	Kern County	6	2-3	West bound	35	23	17	49,500	10,891	22%
SR-46 From Lost Hills to I-5	East of Los Hills	Kern County	1.9	1	East bound	45	29	19	10,200	2,551	25%

The segments in **Table 3-5** present critical congestion issues. The SR-99 segment is an area that is considered light industrial and mixed urban land use. It has many exit ramps that have access to truck-serving industries as well as several east-west state highways crossing or overlapping. This segment also has relatively high truck volume.

The SR-58 segment has high truck volumes as well, more so than the SR-99 segment. The segment is only considered mixed urban in terms of land use. It has a high frequency of driveway cuts on main thoroughfare. It also is near many truck-serving or truck-served industries. It is a diverse corridor with low density warehousing, light industrial and big-box retail near to SR-99, transitioning to single-family residential towards Rosedale. The SR-46 segment is mixed urban land use. It has expected high volumes of turning trucks accessing truck stops.

3.5.3 Critical Safety Segments

Table 3-6 List of Critical Safety Segments, Kern County

Segment	County	Length	# of Lanes	# of Collisions	Collisions per Lane Mile	Total Fatalities	Fatalities Per Mile	Truck Involved Collision	Percent Truck Involved	Speed limit

SR 99 from Ming Ave to SR 204	Kern County	4.66	8	401	10.76	6	1.29	52	13%	65
SR 99 from I-5 to Ming Ave	Kern County	23.57	6	297	2.10	15	0.64	44	15%	65

The segment of SR 99 from Ming Avenue to SR 204 has three import/export businesses in close proximity. The segment intersects with three other significant highways within this stretch. SR 58 east to SR 99 south is a short radius cloverleaf with a 20 MPH speed limit and 1,000 feet in length. California Avenue interchanges are both short radius cloverleaf design ramps with a length of under 1,000 feet. The intersection with SR 58 and south of the intersection have the highest number of truck collisions.

The segment of SR 99 from I-5 to Ming Avenue has the highest number of truck collisions north of the SR 99 and Panama Lane intersection. Collisions are concentrated between Ming Avenue and SR 119, in the south end of Bakersfield. Trucks were involved in 16 percent of collisions, which is the highest rate of truck collisions in the San Joaquin Valley. Caltrans is currently widening SR 99 by adding more lanes.

3.6 Kings County

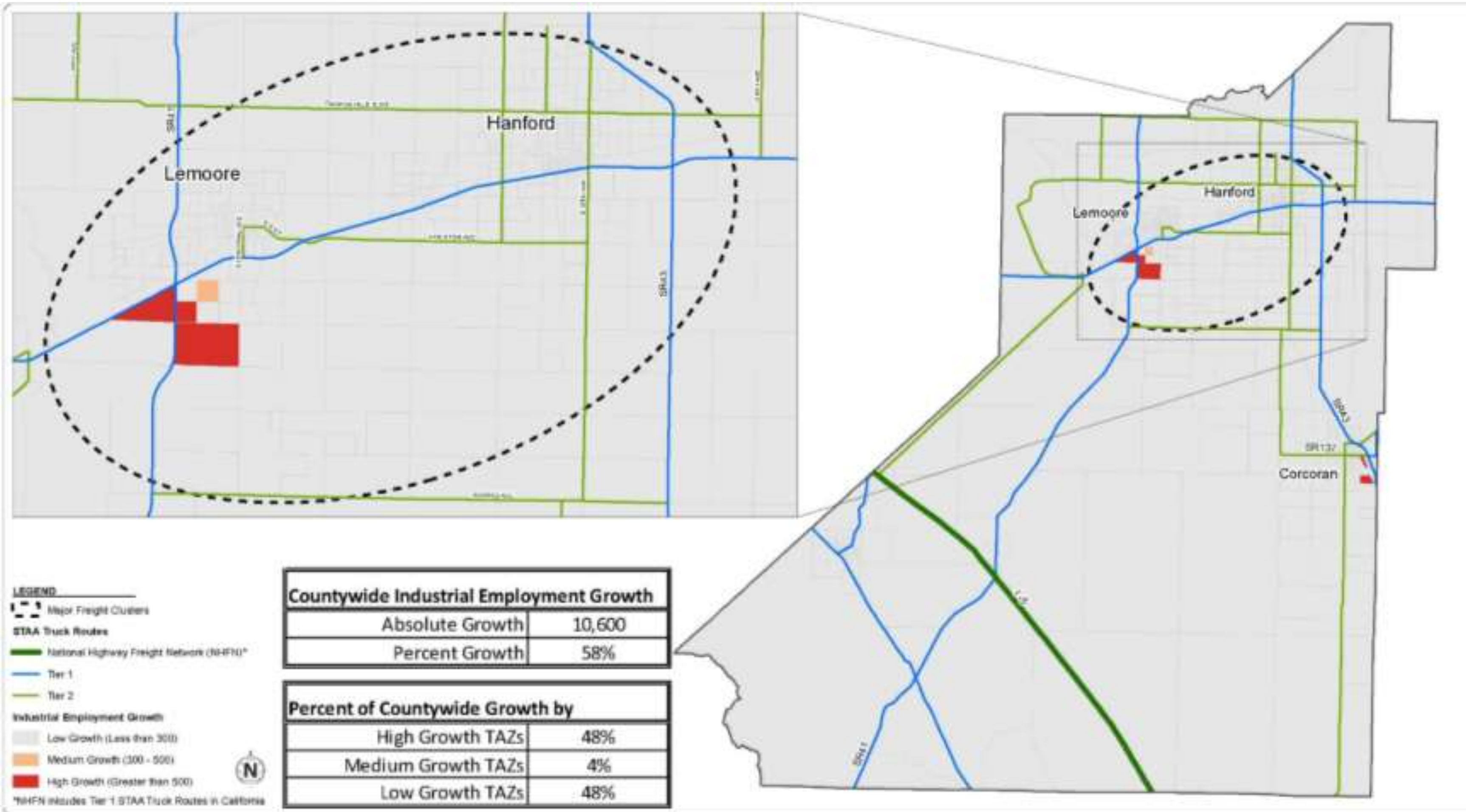
3.6.1 Traffic Generators

The Hanford freight cluster[3] in Kings County consists of two distribution centers, six large businesses, and one import/export business. The distribution centers focus on wholesale and retail trade, each with 250 to 499 employees. The six businesses have a range of specialties in the agriculture and manufacturing industries. Of the cluster businesses, three employ 100 to 249 employees, two employ 250 to 499, and one employs 1,000 to 4,999.

The Kings County Association of Governments (KCAG) provided base year and future year land use data for 2005 and 2040 respectively. Greater Lemoore, Hanford, and Corcoran areas are anticipated to have the highest industrial growth in Kings County (**Figure 3-13**). Only a few TAZs in Kings County are expected to have industrial growth exceeding 500 jobs.

[3] Employment data provided a starting point for determining the locations of freight cluster. Initial investigations identified the following industrial employers. The clusters were expanded and revised based on input from the I-5/SR 99 TAC.

Figure 3-13 Kings County Industrial Employment Growth (2010 - 2040)



Countywide Industrial Employment Growth	
Absolute Growth	10,600
Percent Growth	58%

Percent of Countywide Growth by	
High Growth TAZs	48%
Medium Growth TAZs	4%
Low Growth TAZs	48%

Source: Kings County Association of Governments (CAG) 2014 Regional Transportation Improvement Program (RTIP)

3.6.2 Congested Segments

There are no identified congested segments for Kings County due to a lack of PEMS data.

3.6.3 Critical Safety Segments

Crashes identified in King County are not clustered in a way that points to a critical safety segmentThere are no identified segments with critical crash and collision levels in Kings County that meet the criteria established for this study.

3.7 Merced County

3.7.1 Traffic Generators

The Merced freight cluster[4] identified in Task 1 memorandum consists of six large businesses and distribution centers. Three of these entities focus on wholesale and retail trade and employ between 100 to 499 people. One of the businesses specializes in agriculture and employs 250 to 499 people. Another business serves as a distribution center and focuses on transportation and warehousing and has 250 to 499 employees. The last business concentrates on manufacturing and employs 500 to 999 people.

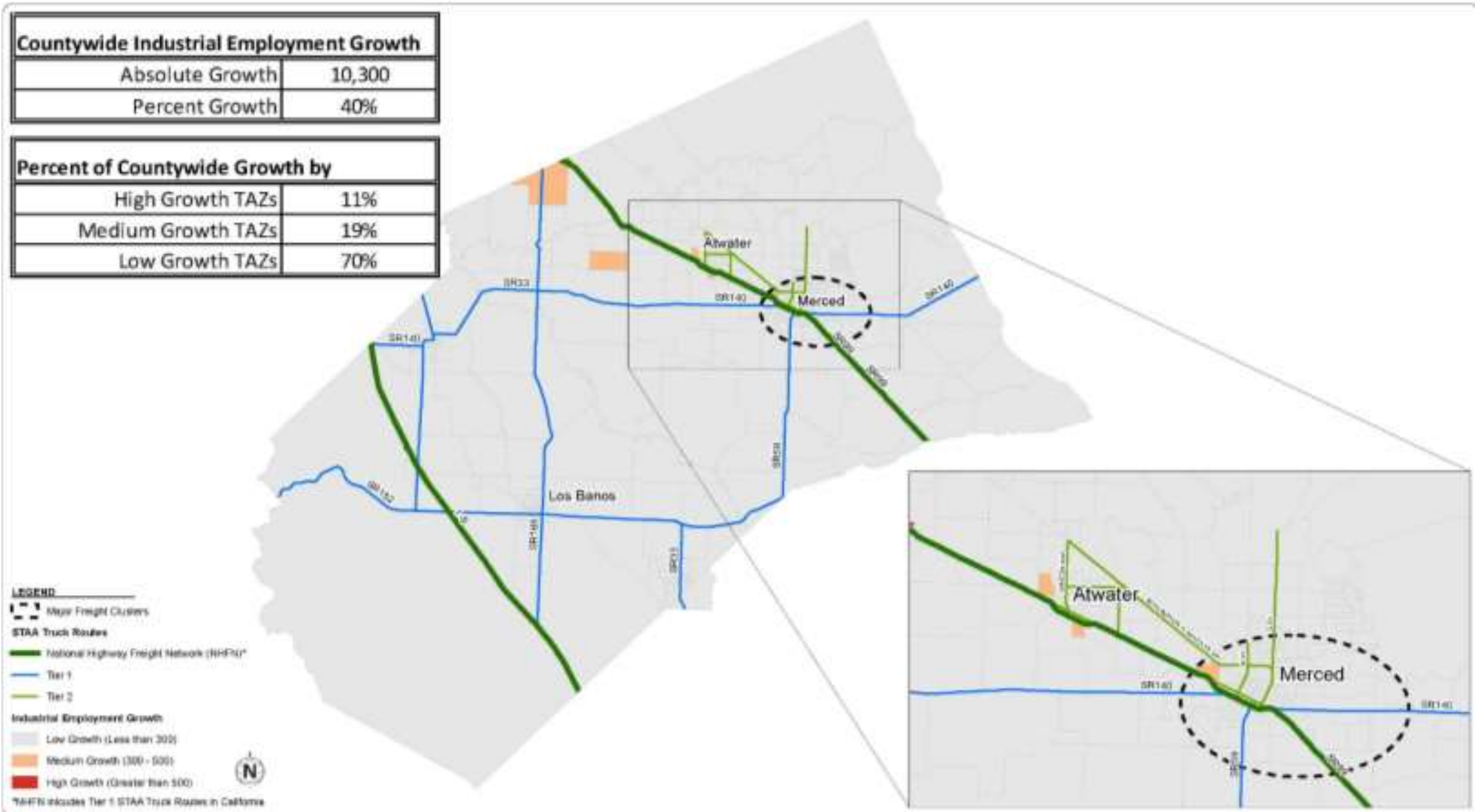
Merced County provided base year and future year land use data for 2010 and 2040 respectively. Merced and Atwater areas are anticipated to have the highest industrial growth. Los Banos and Gustine also expected to have moderate to high industrial growth (**Figure 3-14**). High industrial growth areas (TAZs with employment growth over 500) are generally located in agricultural TAZs.

3.7.1 Congested Segments

There are no identified congested segments for Merced County.

[4] Employment data provided a starting point for determining the locations of freight cluster. Initial investigations identified the following industrial employers. The clusters were expanded and revised based on input from the I-5/SR 99 TAC.

Figure 3-14 Merced County Industrial Employment Growth (2010 - 2040)



Source: *Madera County Transportation Commission 2014 RTP/SCS*

3.7.2 Critical Safety Segments

Table 3-7 List of Critical Safety Segments, Merced County

Segment	County	Length	# of Lanes	# of Collisions	Collisions per Lane Mile	Total Fatalities	Fatalities Per Mile	Truck Involved Collision	Percent Truck Involved	Speed limit
SR 152 from SR 33 (east) to Santa Clara County Line	Merced County	34.03	4	261	1.92	18	0.53	28	11%	65

There is only one identified critical safety segment in Merced County as outlined in **Table 3-7.** The intersection of SR 152 and Badger Flat road, near the large box retail area, has the highest number of truck collisions. The segment is near freight related activity that includes commercial areas in Los Banos, the surrounding agricultural area, and the corridors connections to I-5 and the Central Valley. There are significant number of fatalities, especially relative to the volumes on the roadway on the segment. The collisions are concentrated in Los Banos, especially near the intersection with SR 165. The intersection is wide, between 78 and 87 feet and is part of the commercial area of Los Banos. There is also a high pedestrian collision history within the Los Banos city limits. Five pedestrian collisions have occurred with two being truck collisions.

3.8 Madera County

3.8.1 Traffic Generators

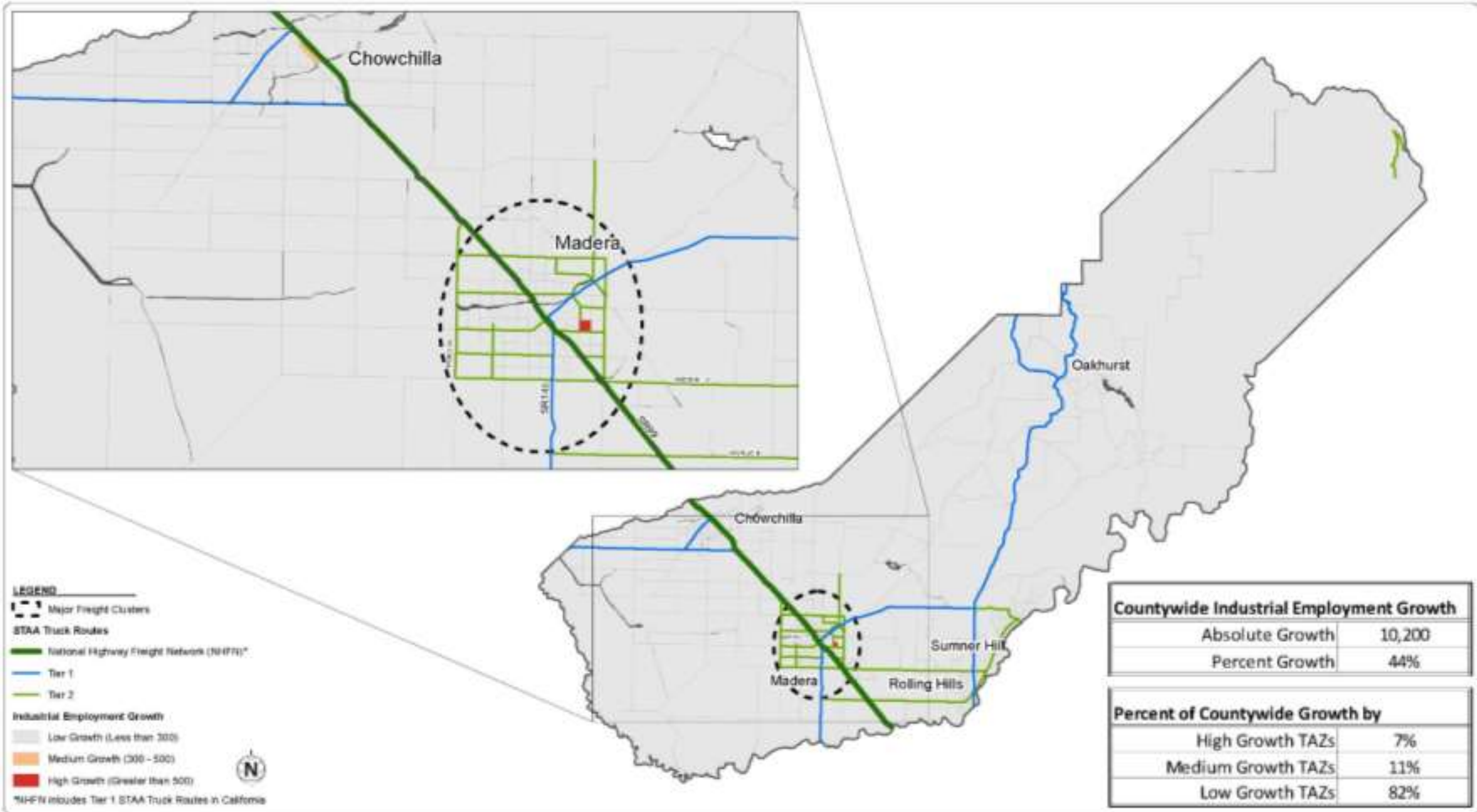
The Madera freight cluster[5] identified in Task 1 memorandum for the purpose of understanding existing truck patterns consists of a number of large businesses and distribution centers. Three of the businesses focus on agriculture and employ 100 to 499 people. Four of the businesses specialize in manufacturing with one employing 100 to 249 people, two employing 250 to 499 people, and the fourth business employing 500 to 999 people. Two of the businesses focus on wholesale and retail trade and employ 100 to 499 employees. The distribution entity specializes in transportation and warehousing and employs 100 to 249 people.

Madera County Transportation Commission (MCTC) provided base year and future year land use data for 2010 and 2035 respectively. The future industrial growth anticipated to concentrate along the 99 corridor. Rolling Hills, Sumner Hill, and Oakhurst are anticipated to

[5] Employment data provided a starting point for determining the locations of freight cluster. Initial investigations identified the following industrial employers. The clusters were expanded and revised based on input from the I-5/SR 99 TAC.

have high industrial growth (**Figure 3-15**). The TAZs with high industrial growth are a mix of industry and agricultural. There are only a few TAZs in Madera County with industrial employment growth over 500.

Figure 3-15 Madera County Industrial Employment Growth (2010 - 2040)



Source: Merced County Association of Governments 2014 RTP/SCS

3.8.2 Congested Segments

Table 3-8 List of Congested Segments, Madera County

Segment	Urban Area	County	Length (miles)	Lanes	Direction	Posted Speed	Congested peak period speed AM	Congested peak period speed PM	AADT	Truck AADT	% trucks of AADT
SR-99 from Roberts Ave to Almond Ave	Madera	Madera County	1.9	2	South bound	65	57	39	64,000	12,606	20%

The detail of the congested SR-99 segment are outlined in **Table 3-8**. The land use surrounding this segment is considered mixed urban and has a high density of exits in a short stretch through small urban areas.

3.8.3 Critical Safety Segments

There are no identified segments with critical crash and collision levels in Madera County

3.9 San Joaquin County

3.9.1 Traffic Generators

Task 1 memorandum identified three significant freight clusters[6] in San Joaquin County, including Tracy, Lathrop, and Lodi. These clusters provided a basis for truck origins and destinations within the County under current conditions. The clusters are described as follows:

- **Tracy/San Joaquin County**

[6] Employment data provided a starting point for determining the locations of freight cluster. Initial investigations identified the following industrial employers. The clusters were expanded and revised based on input from the I-5/SR 99 TAC.

The Tracy cluster contains two distribution centers that focus on wholesale and retail trade including Amazon fulfillment center. This cluster enjoys connections with three interstate highways that include I-5, I-205, and I-580. These highways provide a significant connection to Bay Area and its ports as well.

- **Lathrop:** The Lathrop cluster consists of three distribution centers that focus on wholesale and retail trade and a major intermodal rail yard.
- **Lodi:** The Lodi cluster includes three significant businesses, including two businesses that specialize in manufacturing. One of these employs 500 to 999 employees and the other employs 1,000 to 4,999 employees.

The San Joaquin Council of Governments (SJCOG) provided base year and future year land use data for 2010 and 2040 respectively. Highest Future industrial growth is expected at central areas of Stockton, Lathrop, Tracy, and Lodi. The TAZs with high industrial growth are a mix of industry and agricultural. TAZs located west of Tracy, in southeast Lathrop, and southeast Stockton are anticipated to have over 500 employment growth in future (**Figure 3-16**).

Figure 3-16 San Joaquin County Industrial Employment Growth (2010 - 2040)

Source: *San Joaquin Council of Governments (COG) 2014 RTP/SCS*

3.9.2 Congested Segments

The congested segments are detailed in **Table 3-9** with further analysis and description for each in **Table 3-10.**

Table 3-9 List of Congested Segments, San Joaquin County

Segment	Urban Area	County	Length (miles)	Lanes	Direction	Posted Speed	Congested peak period speed		AADT	Truck AADT	% trucks of AADT
							AM	PM			
I-5 from Fremont St. to El Dorado St	Stockton	San Joaquin County	6.29	3	North bound	55-65	29	31	139,000	34,054	24%
SR- 99 from SR 4 to Arch Rd	Stockton	San Joaquin County	4.2	2	North bound	65	23	21	96,000	12,673	13%
SR-12 from I-5 ramps to Flag City Blvd	West of Lodi	San Joaquin County	1	2	East bound	55	25	19	16,400	2,280	14%
SR-99 from Woodward Ave to Hammett Ave	Ripon	San Joaquin/ Stanislaus County	5.3	3	South bound	65	48	36	129,000	17,415	14%

Table 3-10 Congested Segments Critical Issue Description, San Joaquin County

Segment	County	Land Use	Description of Critical Issue(s)
I-5 from Fremont St. to El Dorado St	San Joaquin County	Mixed urban	• Numerous ramps plus freeway interchange with SR 4 and Port of Stockton access • High relative volume of trucks to general traffic
SR- 99 from SR 4 to Arch Rd	San Joaquin County	Primarily industrial, some low-density residential	• Some large areas of truck-serving industry • SR 4 merges with SR 99 for a brief stretch, joining east-west traffic with north-south • Truck volumes moderate

SR-12 from I-5 ramps to Flag City Blvd	San Joaquin County	industrial	• Expected high volumes of turning trucks entering and exiting SR 12 from low speed or stopped • Several truck stops near interchange, as well as a hotel and RV resort. Further from the interchange is a large trucking firm and many nearby farms.
SR-99 from Woodward Ave to Hammett Ave	San Joaquin/ Stanislaus County	Primarily residential and farms	• Moderate truck activity • two truck stops at the north end of Ripon

3.9.3 Critical Safety Segments

The critical safety segments are outlined in **Table 3-11** with their freight related land use, highest truck collision intersection and overall analysis found in **Table 3-12.**

Table 3-11 List of Critical Safety Segments, San Joaquin County

Segment	County	Length	# of Lanes	# of Collisions	Collisions per Lane Mile	Total Fatalities	Fatalities Per Mile	Truck Involved Collision	Percent Truck Involved	Speed limit
SR 99 from SR 12 to Galt/County Line	San Joaquin County	9.6	4	209	5.44	1	0.10	27	13%	65
I-5 from SR 4 to Stockton/ Monte Diablo Ave	San Joaquin County	2.97	8	188	7.91	0	0.00	25	13%	65
I-5 from I-205 to SR 120	San Joaquin County	3.18	8	146	5.74	0	0.00	24	16%	70
99 from SR 120 to Stanislaus County Line	San Joaquin County	5.92	8	227	4.79	1	0.17	37	16%	65
I-205 from I-5 to SR 580	San Joaquin County	12.92	8	437	4.23	2	0.15	48	11%	70

Table 3-12 Critical Safety Segments Description, San Joaquin County

Segment	County	Intersections/Locations with highest # of truck collisions	Related Freight Land Use	Analysis
SR 99 from SR 12 to Galt/County Line	San Joaquin County	Woodbridge Rd (south of)	Mostly agricultural/rural areas; connects Stockton, Lodi, and Galt with Sacramento	• Many rear-end collisions • Woodbridge Rd entrances/exits are each ~600 feet long with limited line of sight distances (around 100-200 feet) due to sight obstructions such as trees and grade changes. • SR 99 is two lanes in each direction on this segment. • Caltrans made improvement to the pavement surface in this area in 2015; however, they did not improve the Woodbridge offramps
I-5 from SR 4 to Stockton/ Monte Diablo Ave	San Joaquin County		3 import/export businesses within 1/2 mile of this segment; industrial area southwest of the segment; residential to the northeast	• Significant volumes travel this short segment; significant truck volumes as well • Primary violation is illegal merge • Analysis of 2009-2014 road conditions shows two SR 4 lanes merging into the four I-5 lanes at the I-5 and SR 4 interchange • Caltrans is making significant changes to the roadway configuration as of Aug 2015.
I-5 from I-205 to SR 120	San Joaquin County	Stewart Rd San Joaquin River Rd	Agricultural/watershed in direct proximity to segment; connects Manteca and Tracy, locally, and Sacramento and the Bay Area, regionally	• Significant volumes travel this short segment; significant truck volumes as well • Significant number of truck related collisions • Sideswipes account for 42% of truck collisions on this segment.

Segment	County	Intersections/Locations with highest # of truck collisions	Related Freight Land Use	Analysis
SR 99 from SR 120 to Stanislaus County Line	San Joaquin County	Austin Rd (20 truck collisions) Jack Tone Rd (11)	11 import/export businesses within the local area; 3 other freight generating businesses	• Significant number of truck collisions, especially at Austin Rd • Many collisions occur near the SR 99 and SR 120 interchanges • Significant freight activity and truck volumes on this segment.
I-205 from I-5 to SR 580	San Joaquin County	11th St Macarthur Dr Mountain House Pkwy Tracy Blvd Paradise Rd	1 import/export business directly next to freeway;	• Most collisions occur between Tracy Blvd and MacArthur Dr; some hills in the area; merging lanes/ramps seems well configured, though, lanes do merge to cross the bridges in the area. • 1/3 of all truck collisions occurred in 2009 (19); only 6 collisions in 2013 • half of all collisions occurred between 3 am and 9 am. • Caltrans improved truck signage in 2015

3.10 Stanislaus County

3.10.1 Traffic Generators

Task 1 memorandum identified two existing freight clusters[7] in Stanislaus County, including one in Modesto and another in Patterson. The clusters provide a good understanding of truck origins and destinations within Stanislaus County. The following describes the two clusters.

- **Patterson:** The Patterson cluster contains one distribution center and one large business. The distribution center specializes in wholesale and retail trade. The business focuses on manufacturing and employs 500 to 999 employees.

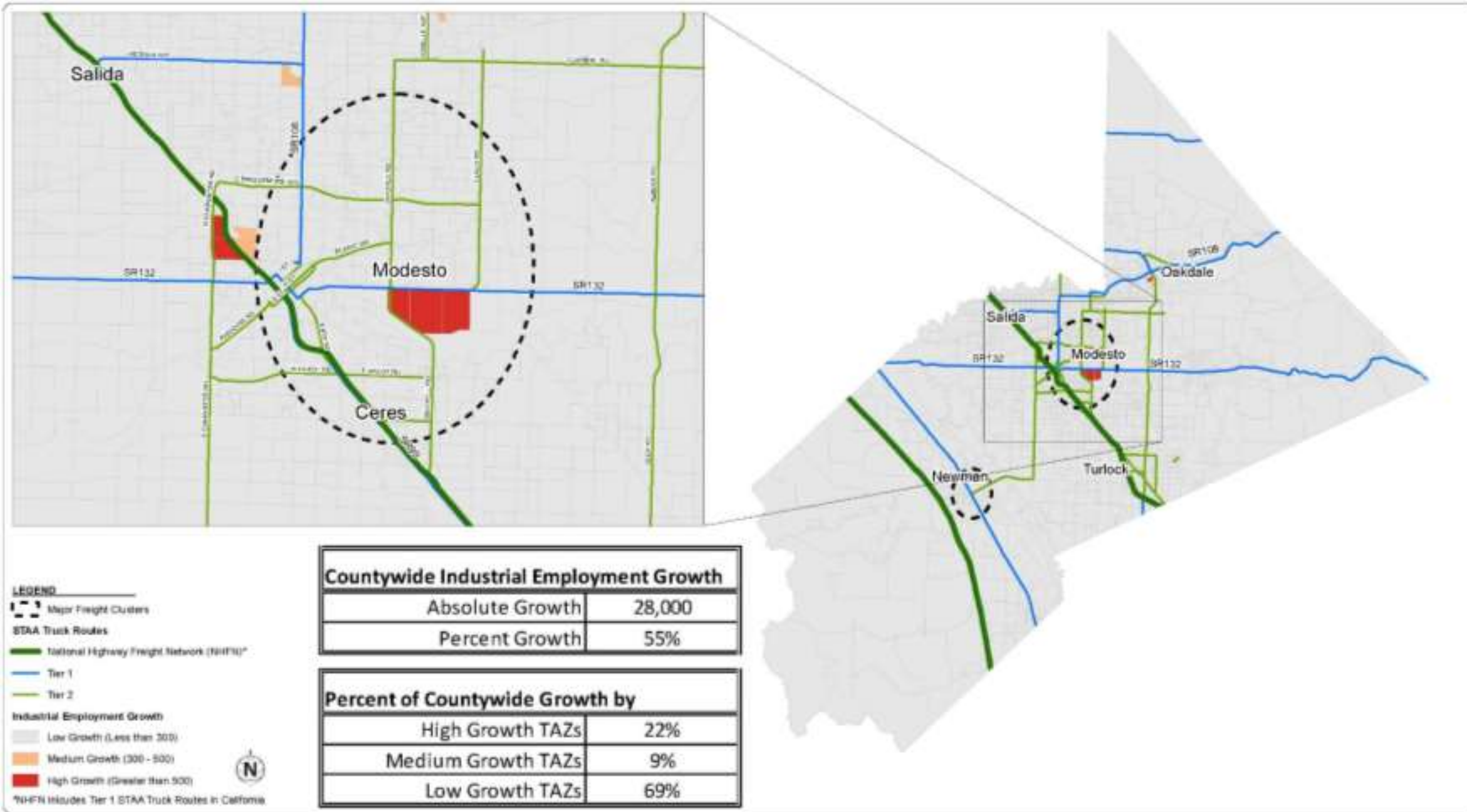
- **Modesto:** The Modesto cluster consists of a number of large agricultural industry employers, two distribution centers, and an import/export business. Eight of the businesses focus on the wine industry and employ 1,000 to 4,999 employees. Two businesses

[7] Employment data provided a starting point for determining the locations of freight cluster. Initial investigations identified the following industrial employers. The clusters were expanded and revised based on input from the I-5/SR 99 TAC.

specialize in manufacturing; one employs 1,000 to 4,999 people and the other 500 to 999 employees. One distribution center employs 500 to 999 employees and focuses on wholesale and retail trade. The other center resides in an industrial district with a number of large tenants and provides these businesses with connections to highways, rail, and the airport.

The Stanislaus Council of Governments (StanCOG) provided base year and future year land use data for 2010 and 2040 respectively. The highest industrial growth is expected along the SR 99 corridor and in central Modesto, Turlock, and Oakdale (**Figure 3-17**). The majority of this growth is located in TAZs already dominated by industrial land use.

Figure 3-17 Stanislaus County Industrial Employment Growth (2010 - 2040)



Countywide Industrial Employment Growth	
Absolute Growth	28,000
Percent Growth	55%

Percent of Countywide Growth by	
High Growth TAZs	22%
Medium Growth TAZs	9%
Low Growth TAZs	69%

Source: *Stanislaus Council of Governments (COG) 2014 RTP/SCS*

3.10.2 Congested Segments

Table 3-13 List of Congested Segments, Stanislaus County

Segment	Urban Area	County	Length (miles)	Lanes	Direction	Posted Speed	Congested peak period speed AM	PM	AADT	Truck AADT	% trucks of AADT
SR-99 from Beckwith Ave to Crows Landing Rd	Modesto	Stanislaus County	5.8	3	North bound	65	33	30	103,000	12,414	12%
SR-99 from Woodward Ave to Hammett Ave	Ripon	San Joaquin/ Stanislaus County	5.3	3	South bound	65	48	36	129,000	17,415	14%

The surrounding area of the segment of SR 99, from Beckwith Avenue to Crows Landing Road, is considered to be mixed urban land use while the other section, from Woodward Avenue to Hammett Avenue, is primarily residential and farmland land use.

The former segment is near a core urban area with near-to-freeway industrial uses. Near the downtown Modesto area, the exit density is high but the languidness extends upstream were exists are less frequent. Numerous curves in route through Modesto may be a cause of congestion.

The portion from Woodward Avenue to Hammett Avenue has moderate truck activity, with two truck stops on the northern end of Ripon.

3.10.3 Critical Safety Segments

Table 3-14 List of Critical Safety Segments, Stanislaus County

Segment	County	Length	# of Lanes	# of Collisions	Collisions per Lane Mile	Total Fatalities	Fatalities Per Mile	Truck Involved Collision	Percent Truck Involved	Speed limit
SR 99 from SR 132 to San Joaquin County Line	Stanislaus County	8.95	6	474	8.83	12	1.34	60	13%	65

The segment detailed in **Table 3-14** has the highest number of truck collision on the SR 99 intersections with Carpenter Road or Beckwith Road. In the surrounding area of the segment, there are 4 import/export businesses and 5 freight related business, since much of this corridor is industrial. The segment has significant vehicle volumes, truck volumes, and truck collisions, with 37 percent of truck involved collisions are sideswipes near freeway on and off ramps. Some issues are due to exit 227 being short and blocked by grade changes, and the northbound off ramp having a 200-foot line of sight for a 900-foot ramp.

3.11 Tulare County

3.11.1 Traffic Generators

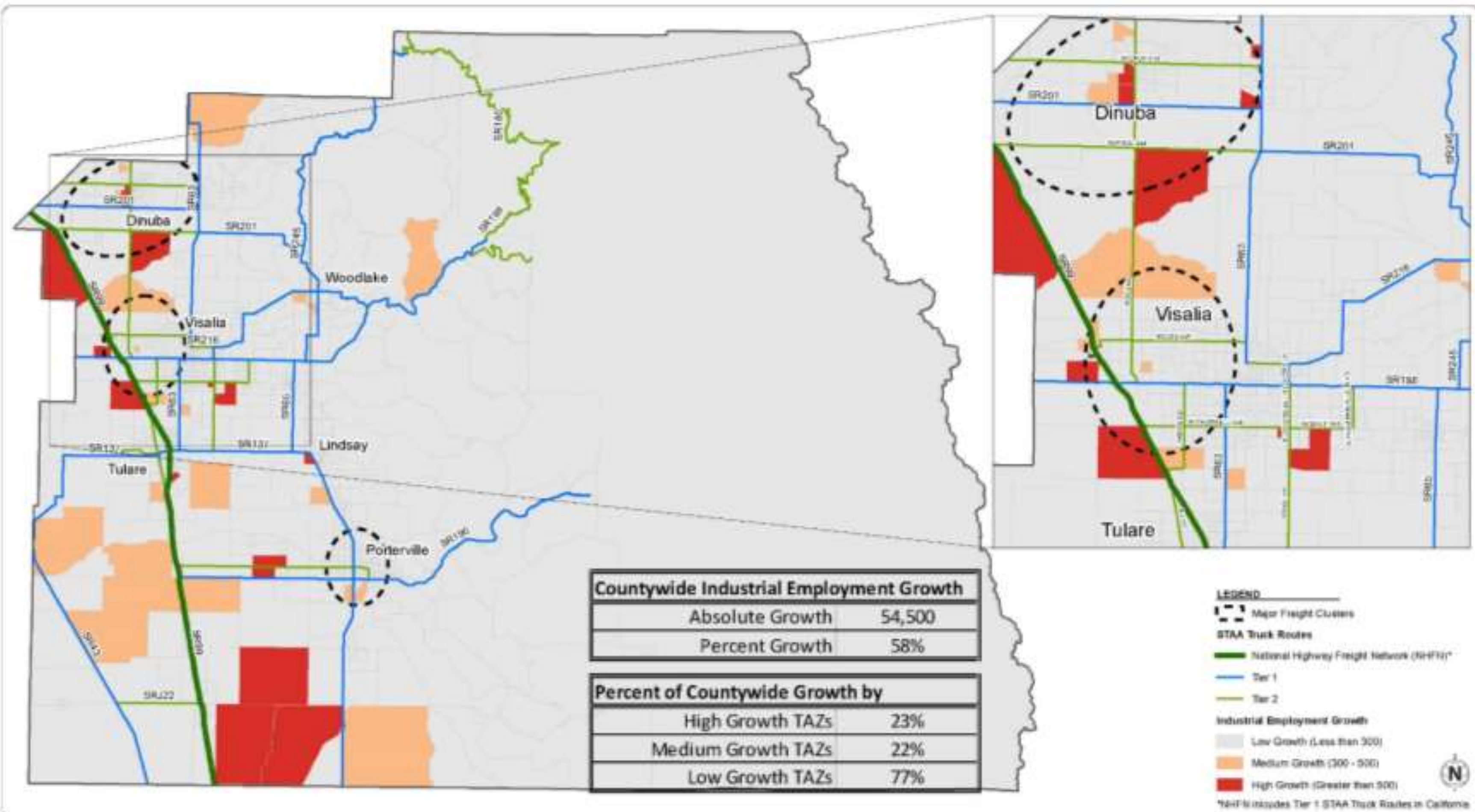
Task 1 memorandum identified the two freight clusters[8] in Tulare County, including Visalia and Porterville. Truck trips to and from these clusters provided information about truck movements in the County. The two clusters are described below.

- **Porterville:** The Porterville freight cluster contains a distribution center and one large business. The distribution center employs 1,000 to 4,999 employees with a focus on wholesale and retail trade. The business employs 250 to 499 employees and also focuses on wholesale and retail trade.
- **Visalia:** The Visalia freight cluster includes a number of distribution centers and businesses. One distribution center focuses on wholesale and retail trade. The businesses are associated with agriculture, manufacturing, wholesale and retail trade.

[8] Employment data provided a starting point for determining the locations of freight cluster. Initial investigations identified the following industrial employers. The clusters were expanded and revised based on input from the I-5/SR 99 TAC.

The Tulare County Association of Governments (TCAG) provided base year and future year land use data for 2010 and 2040 respectively. The highest industrial growth is anticipated in Dinuba, Visalia, Woodlake, Tulare, Lindsay, and Porterville as well as along the SR 99 and SR 245 corridors (**Figure 3-18**).

Figure 3-18 Tulare County Industrial Employment Growth (2010 - 2040)



Source: *Tulare County Association of Governments 2014 RTP/SCS*

3.11.2 Congested Segments

There are no identified congested segments for Tulare County.

3.11.3 Critical Safety Segments

Segment	County	Length	# of Lanes	# of Collisions	Collisions per Lane Mile	Total Fatalities	Fatalities Per Mile	Truck Involved Collision
SR 99 from Kern county border to Visalia	Tulare County	8.95	6	474	8.83	12	1.34	60

The segment detailed in **Table 3-14** has the highest number of truck collision on the SR 99 intersections with Carpenter Road or Beckwith Road. In the surrounding area of the segment, there are 4 import/export businesses and 5 freight related business, since much of this corridor is industrial. The segment has significant vehicle volumes, truck volumes, and truck collisions, with 37 percent of truck involved collisions are sideswipes near freeway on and off ramps. Some issues are due to exit 227 being short and blocked by grade changes, and the northbound off ramp having a 200-foot line of sight for a 900-foot ramp.

3.12 Truck Service Facilities

3.12.1 Weigh Stations

Weigh Stations and WIM locations serve dual purposes, including compliance with truck size and weight requirements and safety inspections.

No unit on the California road system can weight more than a total of 80,000 lbs limit. Also, the weight on any one axle cannot exceed 20,000 lbs and any wheel cannot exceed 10,500 lbs.[9] Weigh stations and WIM (weight-in-Motion) sites are used to regulate the truck weight and catch those that exceed the designated weight limits. Weigh stations require the trucks to come to a complete stop and have their weights recorded, while WIM sites can calculate the weight of the truck while they are in motion.

Weight limits are enforced in order to preserve the pavement infrastructure of the highways. Those that have a higher weight to axle ratio produce more pavement damage. [10]

There are a total of three weigh station locations along SR 99 and I-5 in the San Joaquin Valley. SR-99 has only one location – a Class B northbound location at Chowchilla River. Interstate has two locations, Santa Nella and Grapevine. The Santa Nella location is a class C location with weigh

[9] Caltrans, Weight Limitations, http://www.dot.ca.gov/trafficops/trucks/weight.html

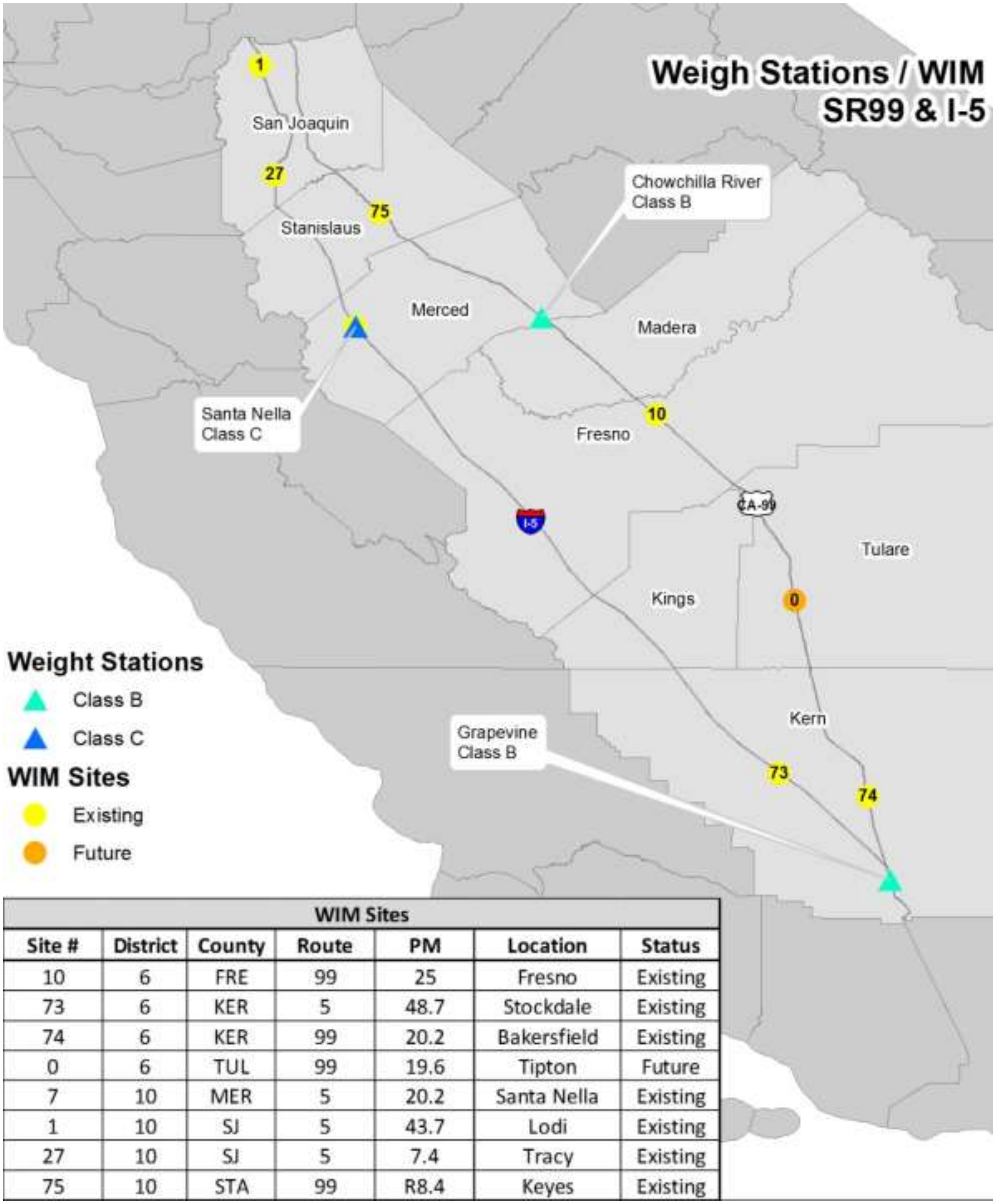
[10] http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.726.8521&rep=rep1&type=pdf

stations in both the north and south directions. The Grapevine location is a Class B weigh station that only serves the northbound direction. Theses weigh stations are visible in **Figure 3-19.**

Both the class B and C weigh stations are located on major highway routes, but the class B weigh stations are open 24 hours a day and seven days a week. The Class C weigh stations hours and days of operation are dependent on variable truck traffic. Class B weigh stations are more likely to also have WIM sites as compared to Class C weigh stations. Both the class B and C weigh stations are designed and staffed to support the general purpose of inspecting vehicle size, weight, equipment, and loads.

According to the trucking industry, the Grapevine Class B location is not equipped with WIM so trucks are required to stop. This poses problems due to the grade. Upon exiting the weigh station, trucks face a steep grade and experience difficulty regaining speed.

Figure 3-19 Weigh Stations and WIM Locations



WIM Sites						
Site #	District	County	Route	PM	Location	Status
10	6	FRE	99	25	Fresno	Existing
73	6	KER	5	48.7	Stockdale	Existing
74	6	KER	99	20.2	Bakersfield	Existing
0	6	TUL	99	19.6	Tipton	Future
7	10	MER	5	20.2	Santa Nella	Existing
1	10	SJ	5	43.7	Lodi	Existing
27	10	SJ	5	7.4	Tracy	Existing
75	10	STA	99	R8.4	Keyes	Existing

Source: Caltrans, Last Update: 9/22/15

WIM devices are designed to capture and record axle weights and gross vehicle weights as vehicles drive over a measurement site. Unlike static scales typically used at Weigh Stations, WIM systems are capable of measuring vehicles traveling at a reduced or normal traffic speed and do not require the vehicle to come to a stop. This makes the weighing process more efficient, and, in the case of commercial vehicles, allows for trucks under the weight limit to bypass static scales or inspection.

There are 13 Caltrans WIM Stations in the San Joaquin Valley. This is the only continuously available database that provides truck classification data by axle configuration. There are four stations along I-5, three stations along SR 99, and six other stations on other state highways, as shown in **Table 3-15**.

Table 3-15 WIM Locations

WIM Station ID	Location
I-5 Stations:	
1	I-5 San Joaquin County at post mile 43.7 near Lodi
27	I-5 San Joaquin County at post mile 7.4 near Tracy
7	I-5 San Merced County at post mile 20.2 near Santa Nella
73	I-5 Kern County at post mile 48.7 near Stockdale
SR 99 Stations:	
74	SR 99 Kern County at post mile 20.2 near Bakersfield
10	SR 99 Fresno County at post mile 25 near Fresno
75	SR 99 Stanislaus County at post mile 8.4 near Keyes
Other Highways:	
113	SR 580 San Joaquin County at post mile 8.2 near Carbona
44	SR 205 San Joaquin County at post mile 9.5 near Banta
99	SR 102 Tuolumne County at post mile 6.4 near Tulloch
115	SR 65 Tulare County at post mile 23.4 near Porterville
114	SR 58 Kern County at post mile 64.9 near Arvin
36	SR 33 Merced County at post mile 20.2 near Los Banos

WIM ByPass

Trucks have the opportunity to bypass open weigh stations if they register for the PrePass program with Caltrans. They receive a transponder that creates communication between the weigh station and the truck. If the truck receives a green light at the weigh station, they can bypass it. If it receives a red light, it is required to then go through the weigh station. This system is in practice at the Grapevine weigh station. While this does allow vehicles to bypass the weigh station and therefore requiring less time for their trips, they are still required to slow down at the weigh station to receive either a green or red light. Since the Grapevine weigh station is located on a very steep hill, the trucks have trouble accelerating after they slow down. There currently are no plans to replace this station with a WIM, which would alleviate the complications from trucks slowing down on a steep hill. [11]

Issues

The stakeholders identified two main issues that arise with the weigh stations, including queuing and avoidance. Stakeholders raised concerns about queuing and mainline impediments caused by the I-5 weigh station on the Grapevine. This station requires trucks to stop at the scales and then attempt to merge onto the northbound mainline on a steep grade with an insufficient truck acceleration lane. Stakeholders indicated that truck drivers avoid the weigh station located at Chowchilla River and suggested the addition of a weigh station.

Recommended Considerations

- WIM at Grapevine or add truck climbing lane or longer auxiliary/acceleration lanes for trucks
- Add new WIM on E/W Connector near Chowchilla River

3.12.2 Truck Parking Facilities

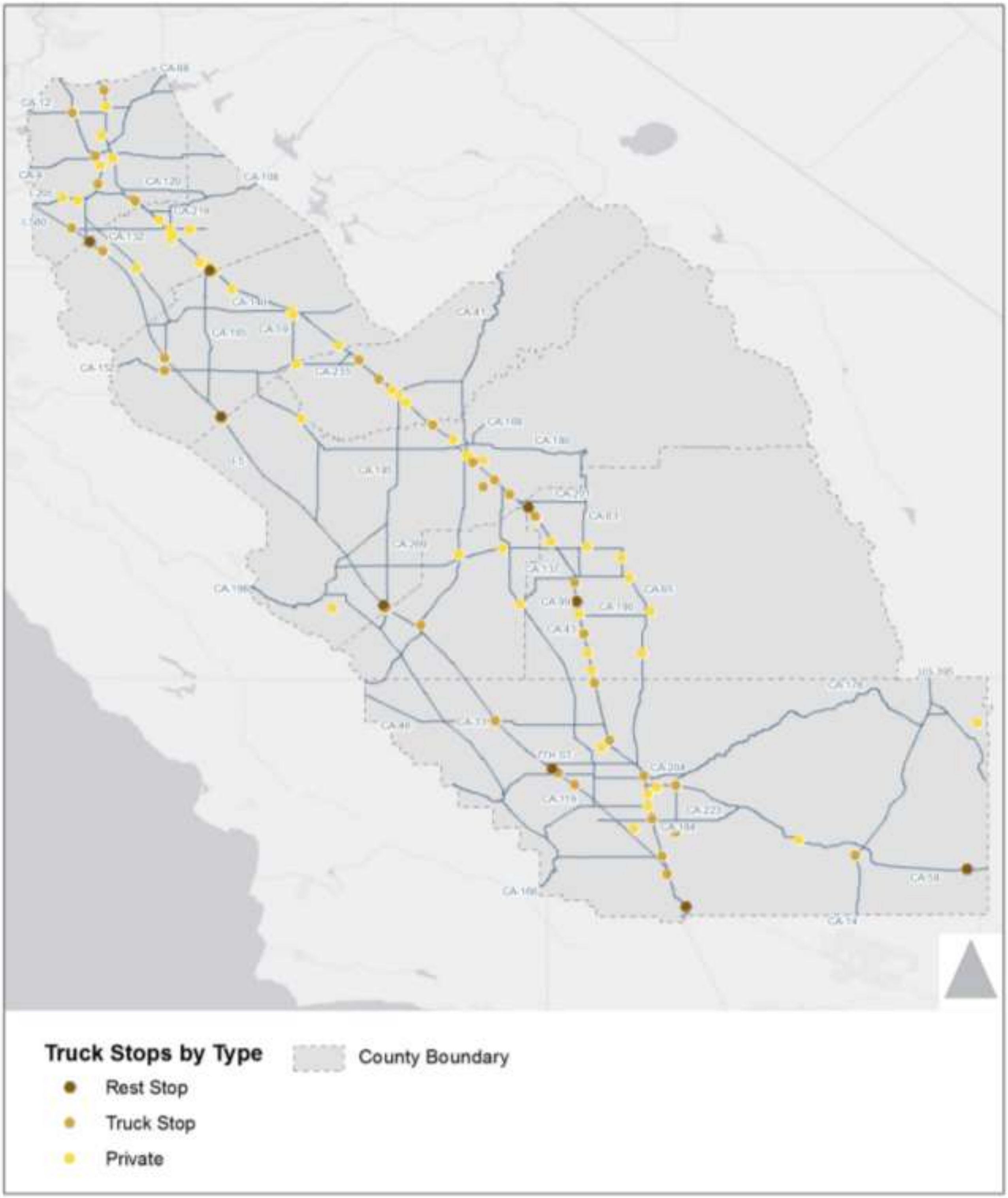
There are 47 Caltrans truck stop facilities located in the San Joaquin Valley, as shown in **Figure 3-20**, including 22 along I-5 and 25 along SR 99. There are many more privately-owned truck stops[12] available along SR 99, with a fairly even distribution along the length, while I-5 has very sparse coverage with lengthy gaps between stops. According to our estimates, there are 74 total (public and private) truck stops within one mile of SR 99, which is 285 miles long in the study area. There are only 37 total truck stops within one mile of I-5, which is 298 miles long through the study area. In both cases, truck stops tend to cluster, but the clustering of stops along I-5 is greater, leaving gaps ranging from only a few miles to as long as 65 miles between available facilities. On SR 99 the gaps are generally much smaller, with no gap greater than 16 miles observed. Please refer to the GIS web maps for location of truck stops along each segment.

There is at least one truck stop facility per county on I-5. Kern County has the most evenly distributed and highest quantity of truck stops. On SR 99, truck stop coverage is generally evenly distributed among each county. Truck stops are often located near interchanges with state routes, especially on I-5 between Kern, Kings, Merced, and San Joaquin counties. This is less true along SR 99, where the urbanized areas are more frequent and geographic coverage is greater.

[11] http://www.dot.ca.gov/trafficops/wim/bypass.html

[12] Private truck stops are identified based on online search. There was no consolidated list available.

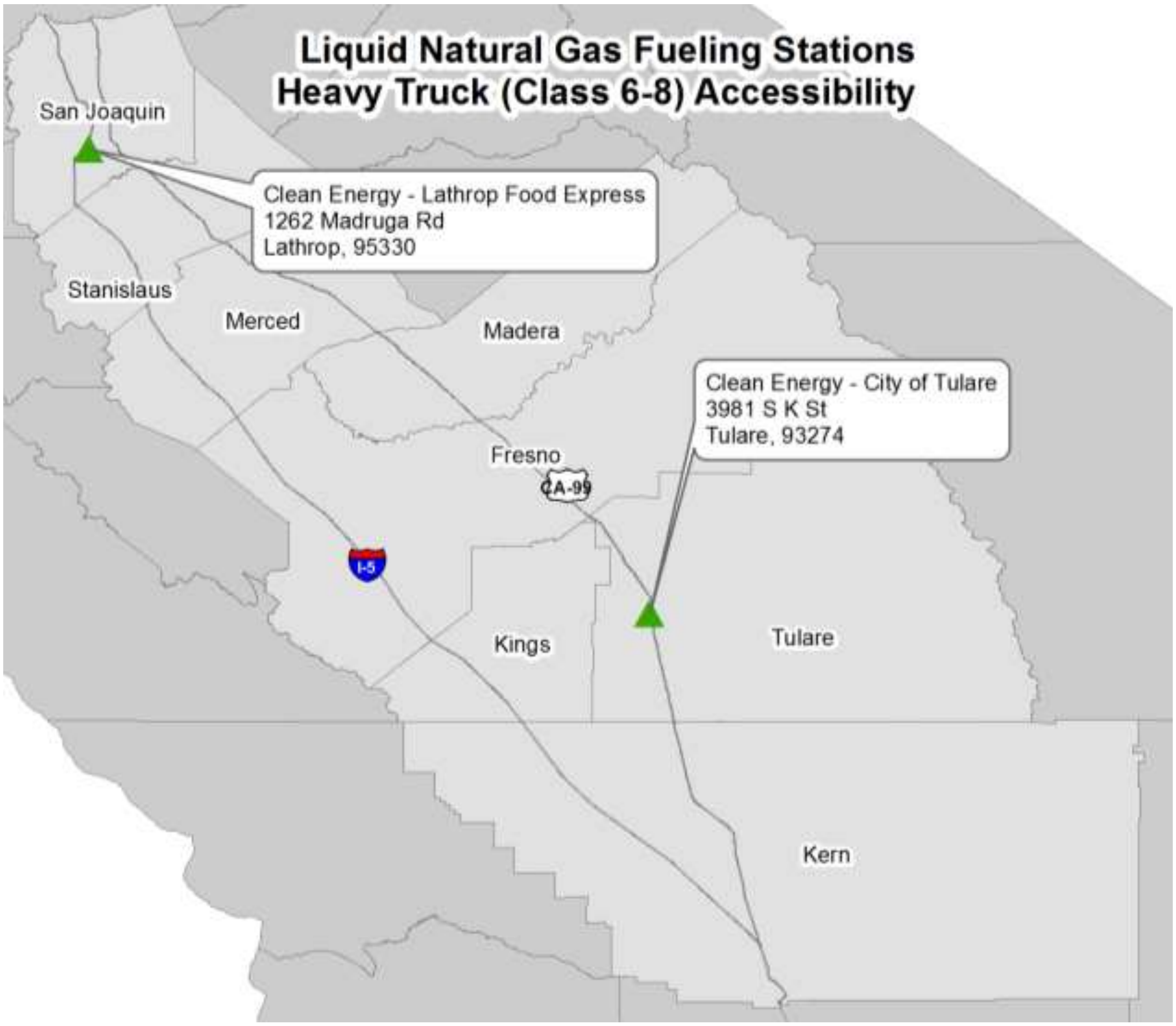
Figure 3-20 Truck Parking Facilities



3.12.3 Liquid Natural Gas Fueling Stations

While there are several natural gas fueling locations along the I-5 and SR 99 corridors, only two locations are capable of accommodating fueling of Class 6-8 trucks. The stations are shown in **Figure 3-21.** There is one on I-5 and one on SR-99.

Figure 3-21 Liquid Natural Gas Fueling Stations



Source: US Department of Energy, Alternative Fuels Data Center, Last Update: 7/01/2016

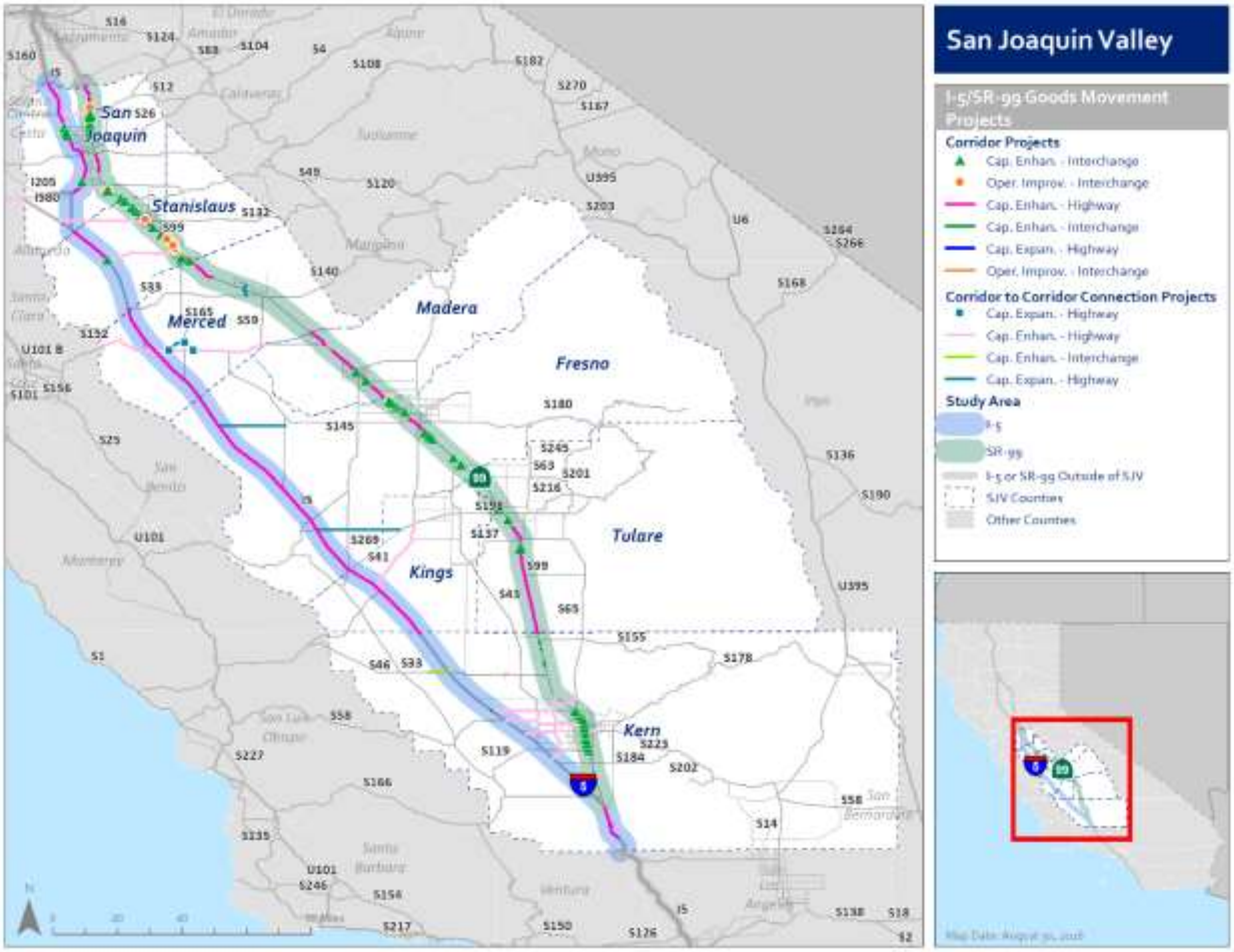
4.0 Identification of Goods Movement related Projects

Several statewide, regional and local transportation plans were searched in order to develop a master list of goods movement related projects and programs on the I-5 and SR 99 corridors in the San Joaquin Valley region. The plans included: (1) California Department of Transportation (Caltrans) 2014 California Freight Mobility Plan; (2) California 2014 State Transportation Improvement Program (STIP); (3) Fresno Council of Governments (COG) 2014 Regional Transportation Plan (RTP); (4) Kern Council of Governments (COG) 2014 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS); (5) Kings County Association of Governments (CAG) 2014 Regional Transportation Improvement Program (RTIP); (6) Madera County Transportation Commission 2014 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS); (7) Merced County Association of Governments 2014 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS); (8) San Joaquin Council of Governments (COG) 2014 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS); (9) Stanislaus Council of Governments (COG) 2014 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS); and (10) Tulare County Association of Governments 2014 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS).

The three key basis for selection of the projects are as follows: (1) They are located on I-5 or SR 99 corridors and would improve economic efficiency and productivity, alleviate mobility and safety-related goods movement issues, as well as support the growth of agricultural and industrial land uses; (2) they are located on connectors between I-5 and SR 99 corridors and would meaningfully increase network redundancy and alleviate congestion on the SR 99 corridor, along which a majority of freight clusters are located; and/or, (3) they are located on key ingress/egress routes of the San Joaquin Valley region and would likely enhance its economic opportunities of handling trade and logistics for the ports and large populations in the Bay Area and Southern California.

Information collected for the projects includes: (1) location and route, (2) project ID, (3) project title and description, (4) project type, (5) project cost, (6) timeline for implementation, and (7) source of project information. The following provides information about projects planned along I-5 and SR 99, as well as along some major east/west or north/south connectors between I-5 and SR 99 that may alleviate SR 99 congestion.

Figure 4-1 Goods Movement Project Map, All Counties

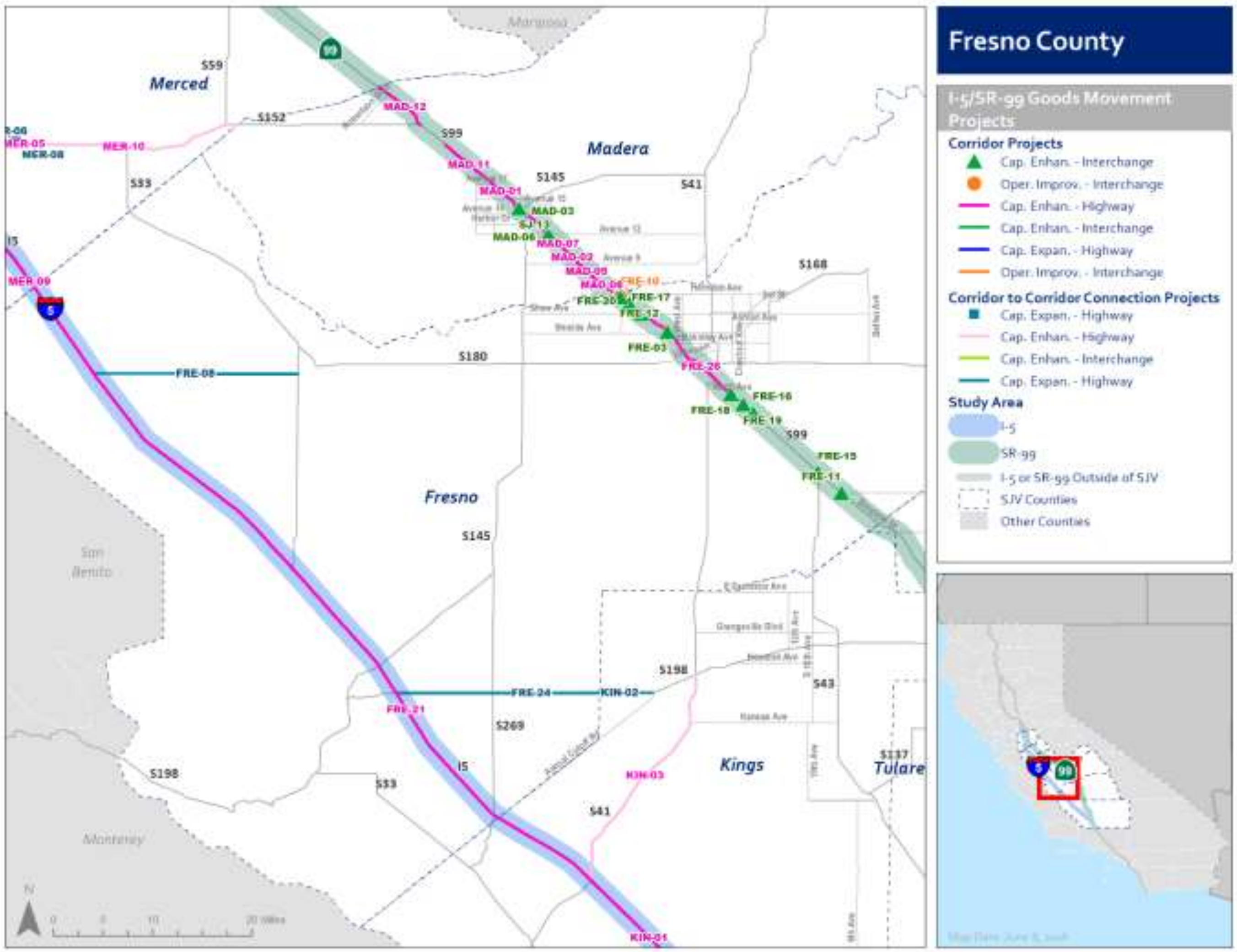


4.1.1 Fresno

Table 4-1 Goods Movement Project List, Fresno County

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
Corridor	FRE-03	0-5	FRE500766	SR 99	California High-Speed Rail Project-SR 99 Re-Alignment	Cap. Enhan. - Interchange	2014 Fresno COG RTP	$ 189,500
Corridor	FRE-10	6-15	FRE111353	SR 99	Herndon @ SR 99- Widen Undercrossing	Oper. Improv. - Interchange	2014 Fresno COG RTP	$ 26,365
Corridor	FRE-11	0-5	FRE500404	SR 99	Mountain View and SR 99 Overcrossing: Widen Overcrossing and Improve Ramps	Cap. Enhan. - Interchange	2014 Fresno COG RTP	$ 45,000
Corridor	FRE-12	0-5	FRE500143	SR 99	NB SR 99 Herndon Off Ramp: Signalize & Widen Ramp	Cap. Enhan. - Interchange	Fresno COG RTP 2014	$ 1,000
Corridor	FRE-15	16-24	FRE500520	SR 99	SR 99 & SR 43/Floral Rd Interchange: Widen and Replace Bridge	Cap. Enhan. - Interchange	2014 Fresno COG RTP	$ 13,000
Corridor	FRE-16	6-15	FRE111352	SR 99	SR 99 @ American Avenue Interchange	Cap. Enhan. - Interchange	2014 Fresno COG RTP	$ 10,385
Corridor	FRE-17	16-24	FRE500521	SR 99	SR 99 Interchange at Shaw: Improvements	Cap. Enhan. - Interchange	2014 Fresno COG RTP	$ 86,000
Corridor	FRE-18	6-15	FRE111355	SR 99	SR 99 InterchangeNorth & Cedar	Cap. Enhan. - Interchange	2014 Fresno COG RTP	$ 81,605
Corridor	FRE-19	6-15	FRE500518	SR 99	SR 99-Central and Chestnut: Upgrade Interchange	Cap. Enhan. - Interchange	2014 Fresno COG RTP	$ 72,500
Corridor	FRE-20	6-15	FRE111328	SR 99	Veterans Blvd Barstow to BullardBryan-New 6 LD Super Arterial, Freeway Interchange & Grade Separation @ SR 99	Cap. Enhan. - Interchange	2014 Fresno COG RTP	$ 105,619
Corridor	FRE-21	0-5	15d	I-5	Widen I-5 between Kings County and Merced County lines	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 198,000
Corridor	FRE-26	0-5	99e	SR 99	Widen SR 99 from 6 to 8 lanes from Central Ave to Bullard Ave.	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 283,000
Connector	FRE-08	6-15	FRE500514/21	SR 180	Extend SR 180 from Mendota to I-5	Cap. Expan. - Highway	California Freight Mobility Plan December 2014	$ 223,000
Connector	FRE-24	6-15	NEW	SR 198	Widen SR 198 from 2 to 4 lanes from Lemoore Naval Air Station to I-5 (Fresno County Portion).	Cap. Expan. - Highway	California Freight Mobility Plan December 2014	$ 193,000

Figure 4-2 Goods Movement Project Map, Fresno County



4.1.2 Kern County

Table 4-2 Goods Movement Project List, Kern County

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
Connector	KER-02	0-5	KER08RTP020	SR 58	Centennial Corridor	Cap. Enhan. - Highway	Kern 2017 STIP Kern 2014 2014	$ 698,000
Connector	KER-03	0-5	51 / KER08RTP114	Centennial Connector	Centennial Connector - SR 58/Cottonwood Rd to Westside Parkway	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	698,000
Connector	KER-52	25 or more years	KER08RTP020	Centennial Corridor	I-5 to Westside Parkway at Heath Rd	Cap. Enhan. - Highway	2014 CFMP	$ 500,000
Corridor	KER-32	25 or more years	15e / KER08RTP027	I-5	Widen I-5 between Fort Tejon and SR 99.	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 86,000
Connector	KER-51	0-5	KER14RTP001	SR 46	Brown Material Rd to I-5 - interchange upgrade at 1-5 - Phase 4A	Cap. Enhan. - Interchange	2014 CFMP	$ 27,000
Connector		6-15	KER08RTP018	SR 46	Brown Material Rd to I-5 - interchange upgrade at 1-5 - Phase 4B	Cap. Enhan. - Interchange	2014	$ 70,000
Connector	KER-31	6-15	45 / KER08RTP072 KER08RTP113	7th Standard Rd	Widen 7th Standard Road from I-5 to Sante Fe Way.	Cap. Enhan. - Highway	Kern 2014 RTP	$ 90,000
Corridor	KER-43	25 or more years	KER08RTP028	I-5	7th Standard Rd Interchange - reconstruct	Cap. Enhan. - Interchange	Kern 2014 RTP	$ 54,000
Corridor	KER-45	-24	KER08RTP105	SR 99	At various locations - ramp improvements (HOV - ramp metering)	Oper. Improv. - Interchange	Kern 2014 RTP 2014 CFMP	$ 148,000
• Corridor	KER-45a	16-24	KER08RTP105	SR 99	SR-99 & Hwy 119	Cap. Enhan. - Interchange	Kern County	
• Corridor	KER-45b	16-24	KER08RTP105	SR 99	SR-99 & Hosking Avenue (completed 2016)	Cap. Enhan. - Interchange	Kern County	
• Corridor	KER-45c	16-24	KER08RTP105	SR 99	SR-99 & Panama Lane	Cap. Enhan. - Interchange	Kern County	
• Corridor	KER-45d	16-24	KER08RTP105	SR 99	SR-99 & White Lane	Cap. Enhan. - Interchange	Kern County	
• Corridor	KER-45e	16-24	KER08RTP105	SR 99	SR-99 & Ming Avenue	Cap. Enhan. - Interchange	Kern County	
• Corridor	KER-45f	16-24	KER08RTP105	SR 99	SR-99 & California Avenue	Cap. Enhan. - Interchange	Kern County	
• Corridor	KER-45g	16-24	KER08RTP105	SR 99	SR-99 & Rosedale Highway	Cap. Enhan. - Interchange	Kern County	

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
• Corridor	KER-45h	16-24	KER08RTP105	SR 99	Hageman Flyover	Cap. Enhan. - Interchange	Kern County	
• Corridor	KER-45i	16-24	KER08RTP105	SR 99	SR-99 & Olive Drive	Cap. Enhan. - Interchange	Kern County	
• Corridor	KER-45j	16-24	KER08RTP105	SR 99	SR-99 & Snow Road (New Interchange)	Cap. Enhan. - Interchange	Kern County	
• Corridor	KER-45k	16-24	KER08RTP105	SR 99	SR-99 & 7th Standard Road	Cap. Enhan. - Interchange	Kern County	
Corridor	KER-46	16-24	KER08RTP115	SR 99	At Snow Rd - construct new interchange	Cap. Enhan. - Interchange	Kern 2014 RTP 2014 CFMP	$ 138,200
Corridor	KER-49	25 or more years		SR 99	Reconstruct interchange at Whisler	Cap. Enhan. - Interchange	Kern 2014 RTP 2014 CFMP	$ 54,000
Corridor	KER-48	25 or more years		SR 99	Reconstruct interchange at Pond Rd	Cap. Enhan. - Interchange	Kern 2014 RTP 2014 CFMP	$ 54,000
Corridor	KER-47	25 or more years	KER18RTP001	SR 99	Construct new interchange at Hanawalt	Cap. Enhan. - Interchange	Kern 2014 RTP 2014 CFMP	$ 88,811
Corridor	KER-44	25 or more years	KER08RTP056	SR 99	Rt 99 - w iden bridge to four lanes; reconstruct ramps	Cap. Enhan. - Interchange	Kern 2014 RTP 2014 CFMP	$ 134,000
Connector	KER-60	25 or more years	KER18RTP002	North Beltway	I-5 to SR 65 - Burbank Street Alignment - construct new highway	Cap. Enhan. - Highway	Kern 2014 RTP	$ 500,000
Connector	KER-59	16-24	KER08RTP139	West Beltway	Pacheco Rd. Westside Parkway - construct new facility	Cap. Enhan. - Highway	Kern 2014 RTP	$ 115,793
Connector	KER-58	6-15	KER08RTP102,	West Beltway	Rosedale Hwy to 7th Standard Rd - construct new facility	Cap. Enhan. - Highway	Kern 2014 RTP	$ 115,793
Connector	KER-57	16-24	KER08RTP097	West Beltway	Taft Hwy to Pacheco Rd - construct new facillity	Cap. Enhan. - Highway	Kern 2014 RTP	$ 90,000
Connector	KER-55	25 or more years	KER08RTP076	West Beltway-North	7th Standard Rd to Rt 99 -extend freeway	Cap. Enhan. - Highway	Kern 2014 RTP	$ 100,000
Connector	KER-54	25 or more years	KER08RTP075	West Beltway-South	Taft Hwy to I-5 - extend freeway	Cap. Enhan. - Highway	Kern 2014 RTP	$ 100,000
Connector	KER-50	6-15	KER08RTP016	West Beltway	Rosedale Hwy to Westside Parkway - construct new facility	Cap. Enhan. - Highway	Kern 2014 RTP	$ 93,500
Connector	KER-56	6-15	KER08RTP092	SR 58 (existing)	Rosedale Hwy - Rt 43 to Allen Rd - widen existing highway	Cap. Enhan. - Highway	Kern 2014 RTP 2014 CFMP	$ 59,000
Connector	KER-53		KER08RTP038, KER08RTP092	SR 58 (existing)	Widen SR 58 (Rosedale Hwy) - I-5 to Rt 43	Cap. Enhan. - Highway	Kern 2014 RTP 2014 CFMP	$ 500,000

Figure 4-3 Goods Movement Project Map, Kern County (North)

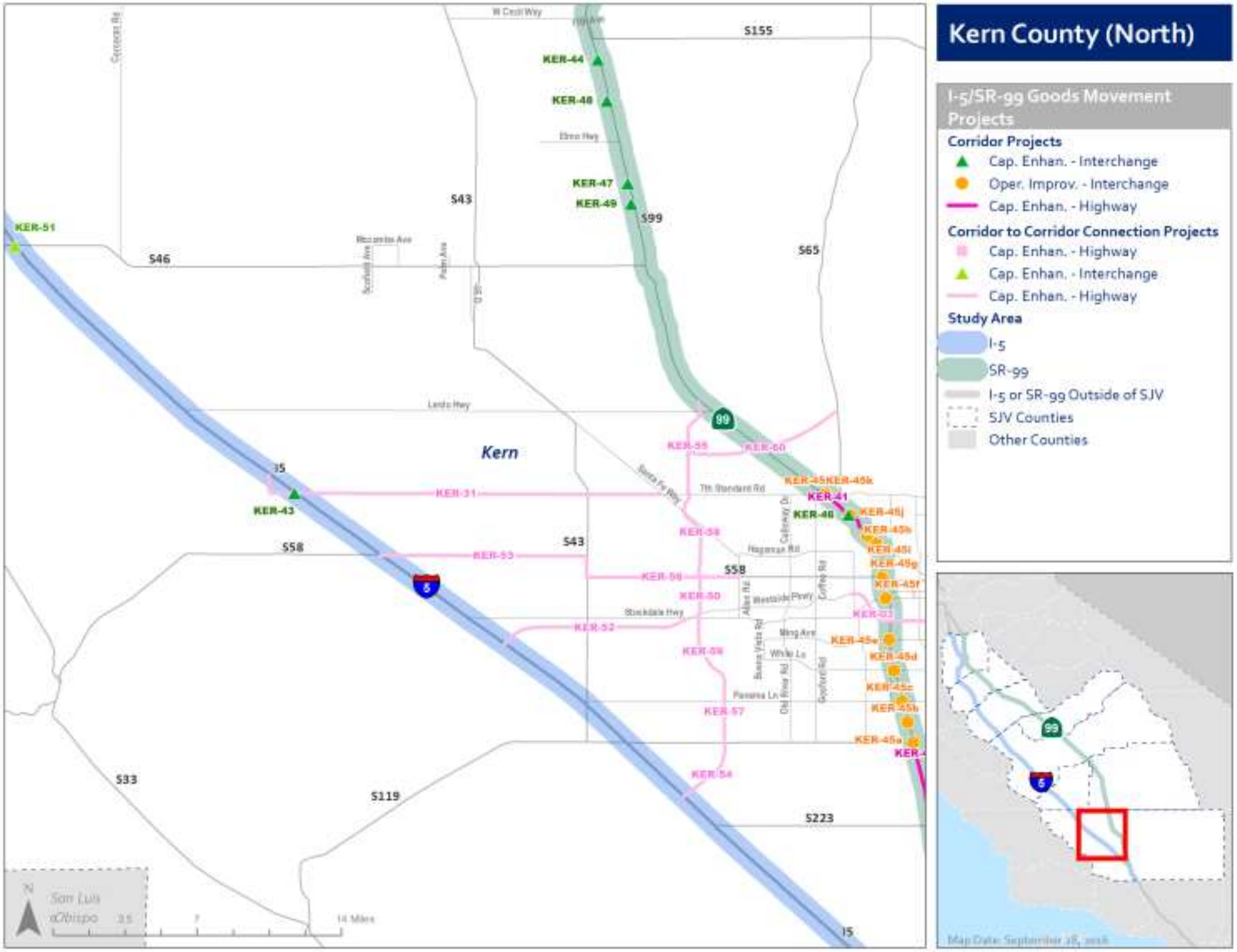
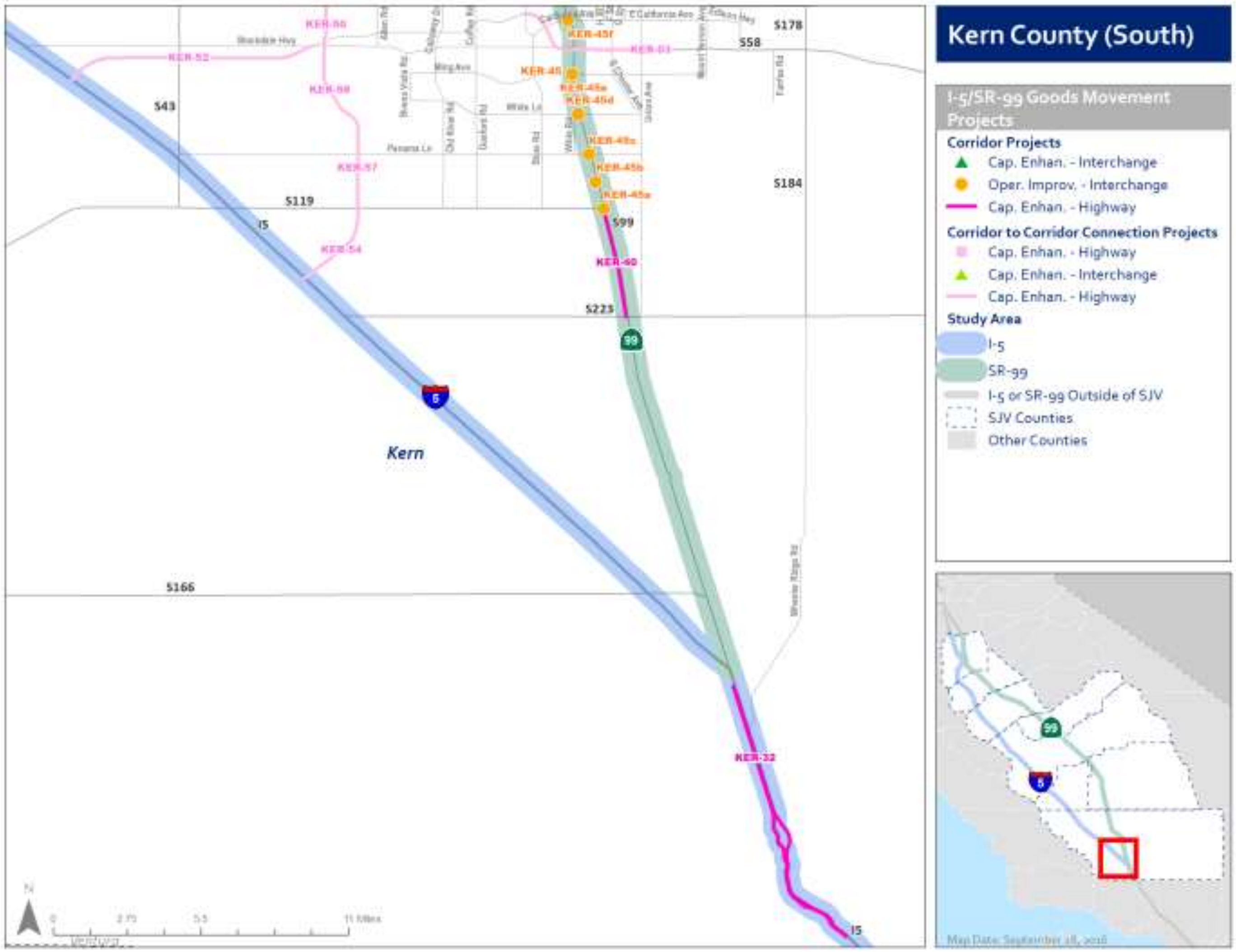


Figure 4-4 Goods Movement Project, Kern County (South)

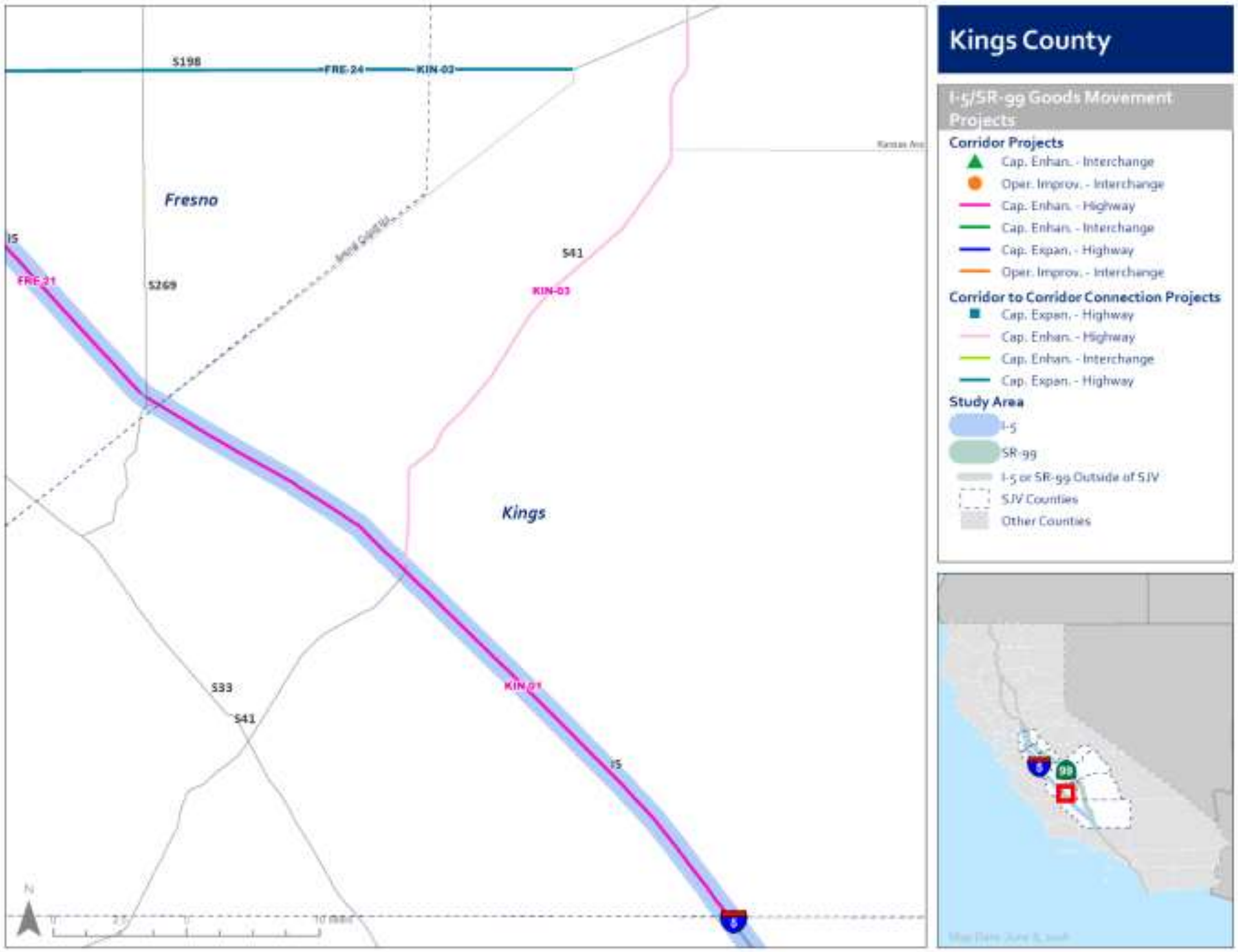


4.1.3 Kings County

Table 4-3 Goods Movement Project List, Kings County

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
Corridor	KIN-01	6-15	NEW	I-5	Widen I-5 from 2 to 4 lanes between Kern and Fresno Counties.	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 80,000
Connector	KIN-02	6-15	63	SR 198	Widen SR 198 from 2 to 4 lanes from Lemoore Naval Air Station to I-5 (Kings County Portion).	Cap. Expan. - Highway	California Freight Mobility Plan December 2014	$ 31,000
Connector	KIN-03	6-15	65	SR 41	Widen SR 41 from 2 to 4 lanes from SR 198 to I-5.	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 68,000

Figure 4-5 Goods Movement Project Map, Kings County

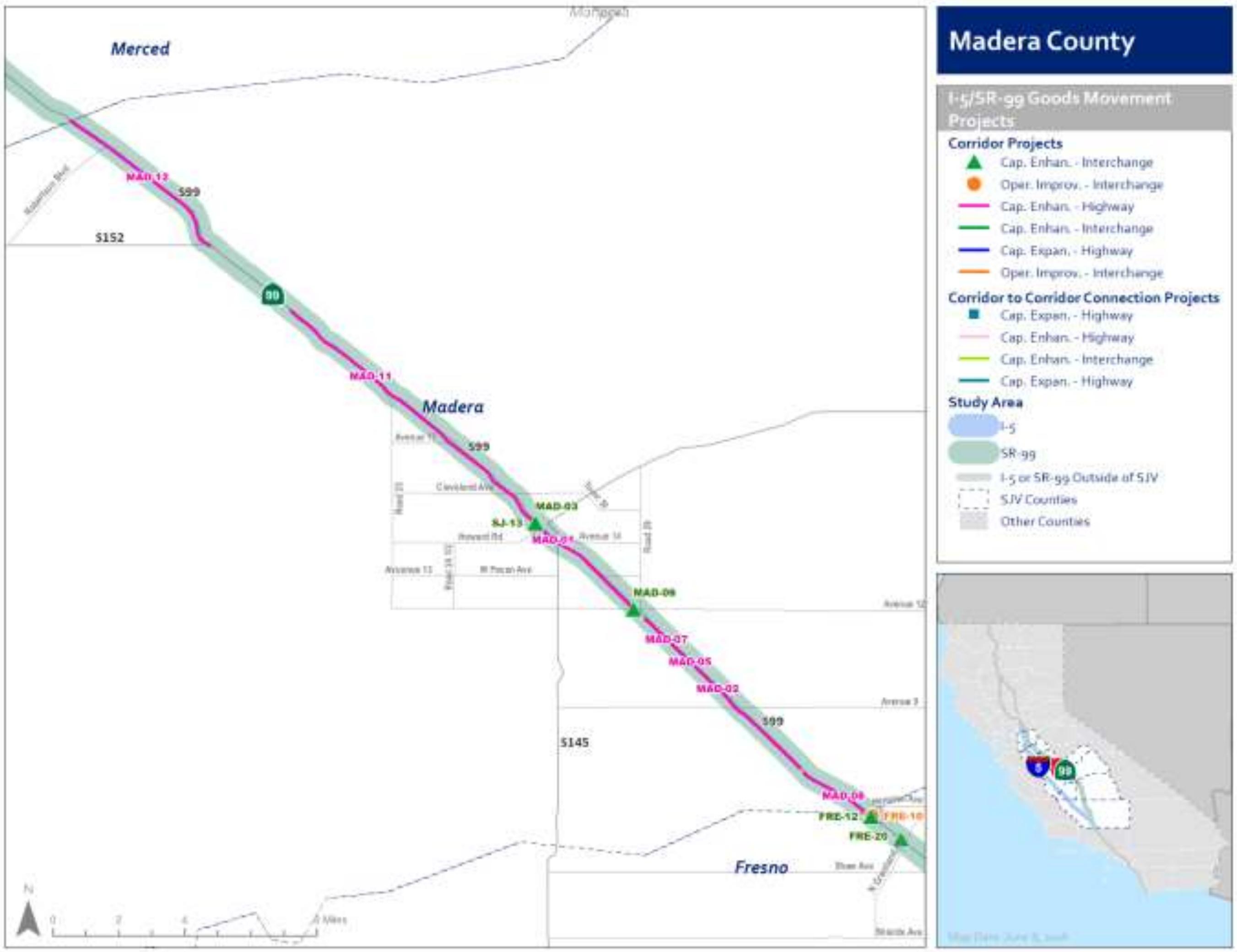


4.1.4 Madera County

Table 4-4 Goods Movement Project List, Madera County

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
Corridor	MAD-01	0-5	MAD417004	SR 99	SR99: 4-Lane Freeway to 6-Lane Freeway Ave 12 to Ave 17	Cap. Enhan. - Highway	2013 MCTC FTIP	$ 91,010
Corridor	MAD-02	16-24	MAD417003	SR 99	SR99: 4-Lane Freeway to 6-Lane Freeway, Ave 7 to Ave 12	Cap. Enhan. - Highway	2013 MCTC FTIP	$ 160,571
Corridor	MAD-03		MAD217030	SR 99	4th Street/SR 99 Interchange Improvements	Cap. Enhan. - Interchange	MCTC 2013 FTIP	$ 5,918
Corridor	MAD-05	0-5	5335	SR 99	Madera 6 Lane	Cap. Enhan. - Highway	2014 STIP	
Corridor	MAD-06	0-5	MAD417001	SR 99	Reconstruct Interchange	Cap. Enhan. - Interchange	MCTC 2013 FTIP	$ 68,000
Corridor	MAD-07	0-5	6297	SR 99	South Madera 6 Lane	Cap. Enhan. - Highway	2014 STIP	
Corridor	MAD-08	0-5	MAD418002	SR 99	Widen SR99: In Fresno & Madera Counties, from south of Grantland Ave UC to north of Avenue 7	Cap. Enhan. - Highway	2013 MCTC FTIP	$ 54,000
Corridor	MAD-11	Unknown	0	SR 99	Widen SR 99 from 4 to 6 lanes from Avenue 17 to Avenue 21	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	N/A
Corridor	MAD-12	Unknown	0	SR 99	Widen SR 99 from 4 to 6 lanes from Avenue 23 to Madera County Line	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	N/A

Figure 4-6 Goods Movement Project Map, Madera County

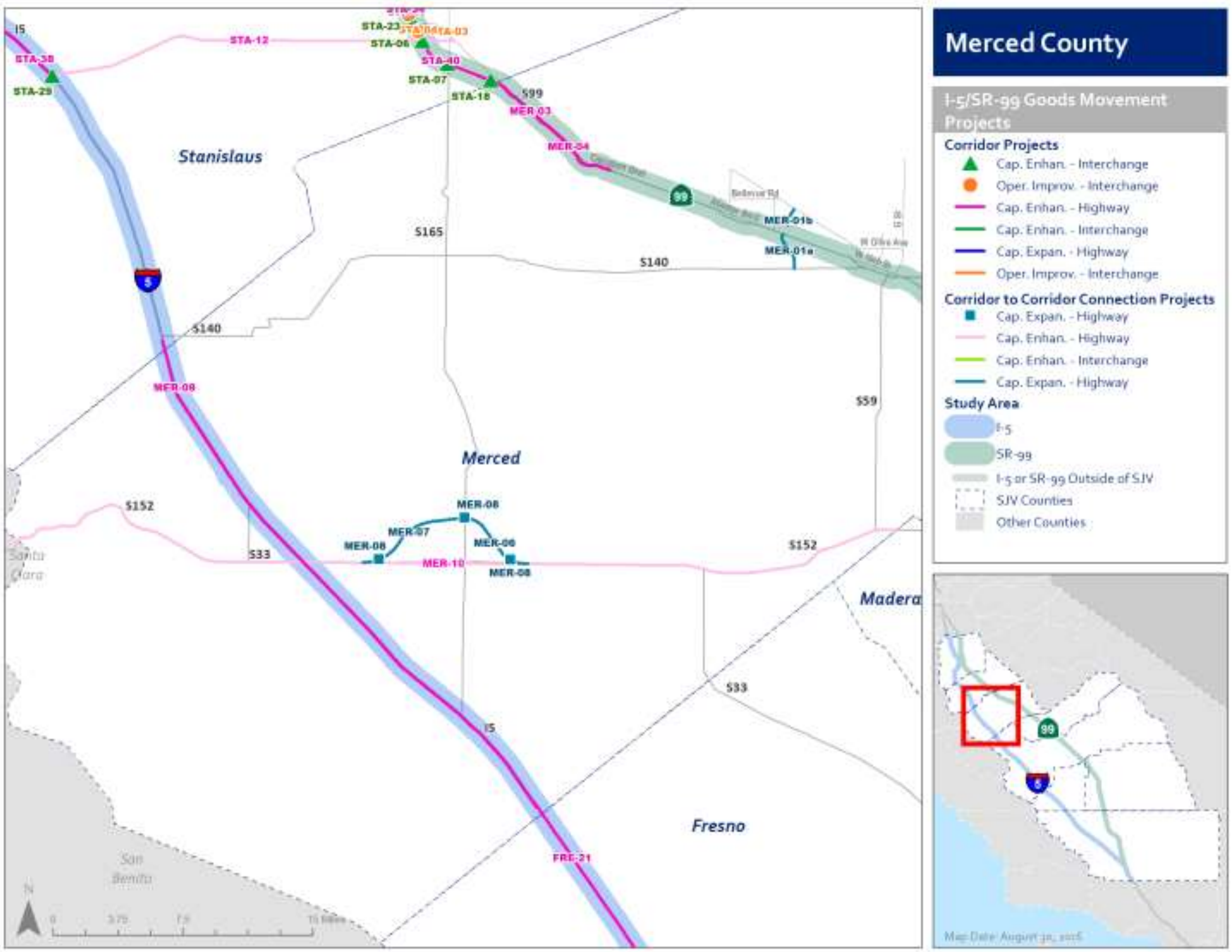


4.1.5 Merced County

Table 4-5 Goods Movement Project List, Merced County

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
Corridor	MER-03	0-5	0161A	SR 99	Highway 99: Livingston Widening Northbound	Cap. Enhan. - Highway	MCAG	$ 42,870
Corridor	MER-04	0-5	0161B	SR 99	Highway 99: Livingston Widening Southbound	Cap. Enhan. - Highway	2014 California STIP	$ 38,950
Corridor	MER-09	25 or more		I-5	Widen I 5 from 4 to 6 lanes in Merced County	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	N/A
Connector	MER-01a	6-15		Atwater-Merced Expressway	Atwater-Merced Expressway, Phase 1B: Green Sands Ave to Santa Fe Drive (Access to Castle Development & Airport)	Cap. Expan. - Highway	MCAG	$ 66,200
Connector	MER-01b	6-15		Atwater-Merced Expressway	Atwater-Merced Expressway, Phase 3: New Hwy 99 Interchange to Hwy 140	Cap. Expan. - Highway	MCAG	$ 71,800
Connector	MER-06	6-15	5707A	SR 152	Los Banos Bypass, Segment 1: Btwn. Hwy 165 and E. Hwy 152 with signalized intersections	Cap. Expan. - Highway	MCAG	$ 54,000
Connector	MER-07	25 or more	5707B	SR 152	Los Banos Bypass, Segment 2: Btwn. Hwy 165 and W. Hwy 152 with signalized intersections	Cap. Expan. - Highway	MCAG	$ 206,000
Connector	MER-08	25 or more		SR 152	Los Banos Bypass, Segment 3: Construct 3 interchanges at W. Hwy 152, Hwy 165 and E. Hwy 152	Cap. Expan. - Highway	MCAG	$ 192,000
Connector	MER-10	0-5	19	SR 152	Widen SR 152 between SR 99 and US 101 (in Merced County)	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	N/A

Figure 4-7 Goods Movement Project Map, Merced County



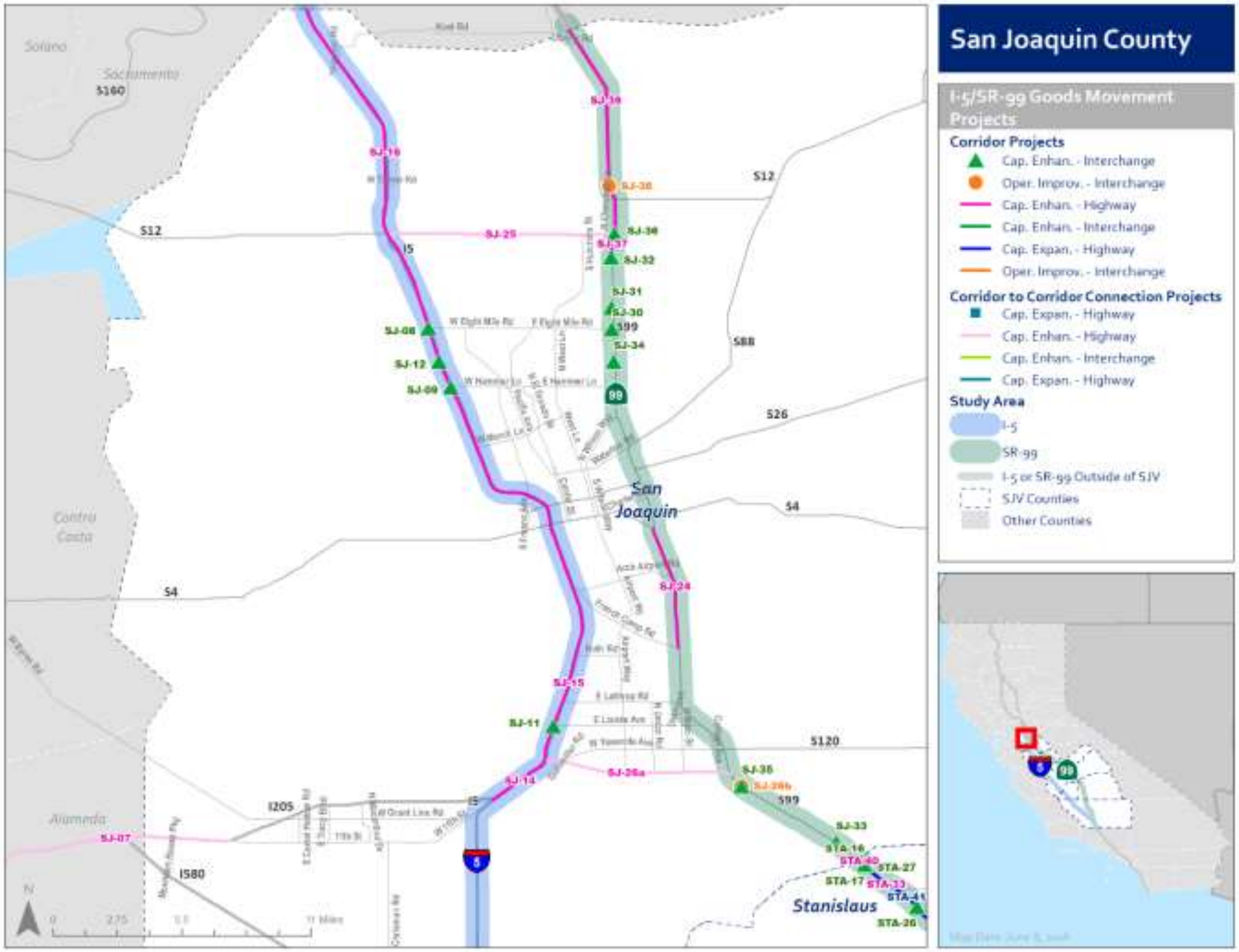
4.1.6 San Joaquin County

Table 4-6 Goods Movement Project List, San Joaquin County

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
Corridor	SJ-08	6-15	SJ07-2020	I-5	I-5 at Eight Mile Road Interchange	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 51,400
Corridor	SJ-09	6-15	SJ11-2004	I-5	I-5 at Hammer Lane Intercahnge	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 37,200
Corridor	SJ-11	0-5	SJ07-2005	I-5	I-5 at Louise Avenue Intechnage	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 33,000
Corridor	SJ-12	6-15	SJ11-2006	I-5	I-5 at Otto Drive Interchange	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 92,800
Corridor	SJ-13	0-5	SJ11-3066	I-5	I-5 at Roth Road Interchange	Cap. Enhan. - Interchange	SJCOG RTP 2014	$ 16,800
Corridor	SJ-14	0-5	15b	I-5	Widen I-5 between SR 120 and I-205	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 207,970
Corridor	SJ-15	0-5	15a	I-5	Widen I-5 from 1 mile north of SR-12 to SR-120	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 91,000
Corridor	SJ-16	6-15	15c	I-5	Widen I-5 from 4 to 6 lanes from 1 mile north of SR-12 to Sacramento County line	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 94,000
Corridor	SJ-24	0-5	99a	SR 99	Widen SR 99 from French Camp Rd to Mariposa Rd 6 to 8 lanes, with new interchange	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 100,000
Corridor	SJ-26b	0-5	SJ11-2023	SR 99	SR-99 at Austin Road Interchange	Oper. Improv. - Interchange	2014 SJCOG RTP	$ 3,000
Corridor	SJ-30	0-5	SJ11-2002	SR 99	SR-99 at Eight Mile Road Interchange	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 65,900
Corridor	SJ-31	0-5	SJ11-2008	SR 99	SR-99 at Gateway Boulevard Interchange	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 9,930
Corridor	SJ-32	16-24	SJ07-2006	SR 99	SR-99 at Harney Lane Interchange	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 39,183

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
Corridor	SJ-33	0-5	SJ07-2015	SR 99	SR-99 at Main Street/UPRR Interchange (Ripon)	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 10,000
Corridor	SJ-34	0-5	SJ11-2001	SR 99	SR-99 at Morada Interchange	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 69,800
Corridor	SJ-35	0-5	SJ 14-2001	SR 99	SR-99 at Raymus Expressway Interchange	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 3,000
Corridor	SJ-36	6-15	SJ11-2015	SR 99	SR-99 at SR-12 West (Kettleman Lane) Interchange	Cap. Enhan. - Interchange	2014 SJCOG RTP	$ 16,164
Corridor	SJ-37	Unknown	SJ14-1003	SR 99	SR-99 Widening	Cap. Enhan. - Highway	2014 SJCOG RTP	$ 3,000
Corridor	SJ-38	0-5	3045	SR 99	Turner Road Interchange Operational Improvements	Oper. Improv. - Interchange	2014 California STIP	$ 3,061
Corridor	SJ-39	6-15	0	SR 99	Widen SR 99 From Lodi to Sacramento County Line	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 40,000
Connector	SJ-07	6-15	6	I-205/I-580	I-580 Westbound Truck Climbing Lanes	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 114,200
Connector	SJ-25	0-5	26	SR 12	Widen SR 12 between I-5 and SR 99	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 60,000
Connector	SJ-26a	0-5	16	SR 120	Widen SR 120 between I-5 and SR 99, with new interchange at SR 99	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 115,191

Figure 4-8 Goods Movement Project Map, San Joaquin County



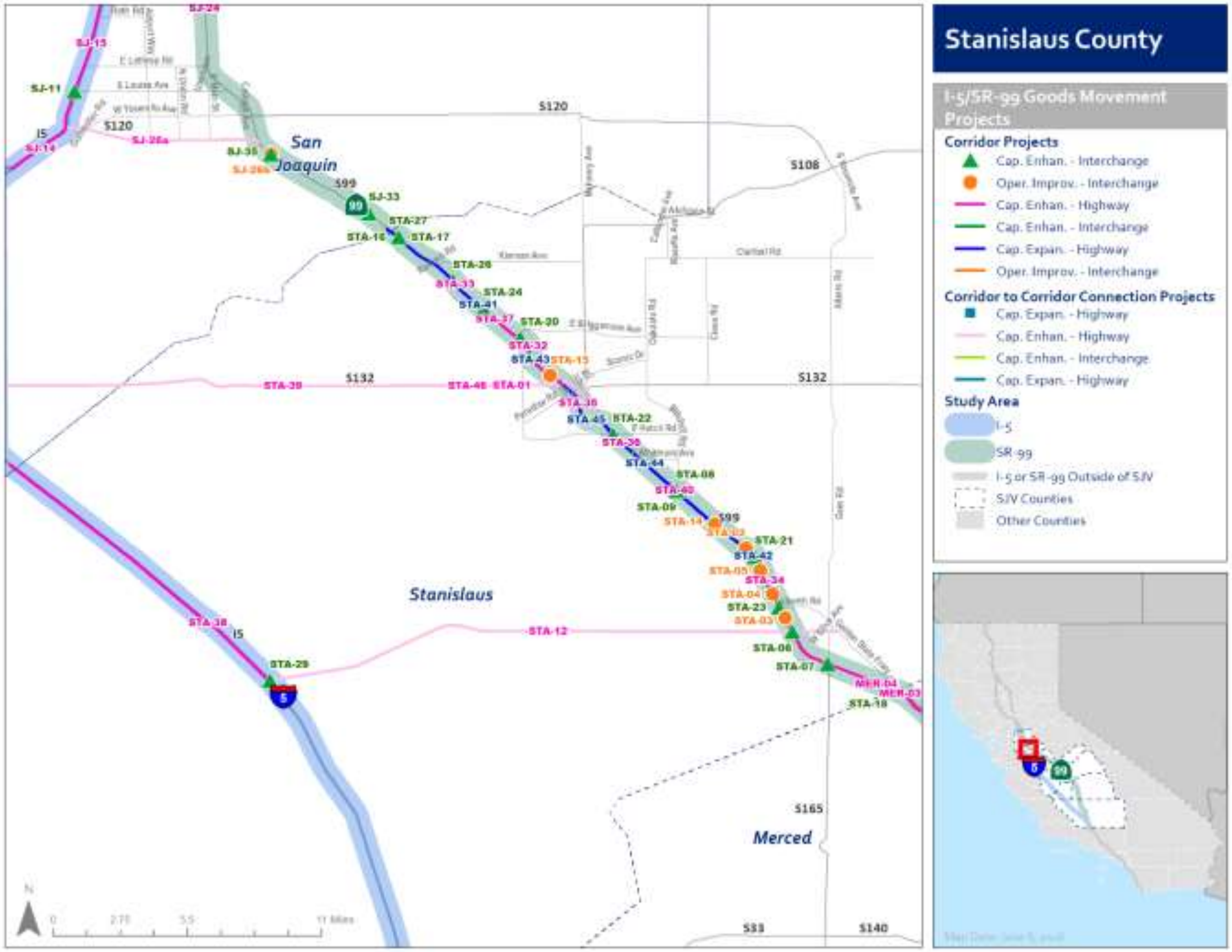
4.1.7 Stanislaus County

Table 4-7 Goods Movement Project List, Stanislaus County

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
Corridor	STA-02	6-15	RE02	SR 99	Keyes Rd to Taylor Rd	Oper. Improv. - Interchange	2014 Stanislaus RTP	$ 6,227
Corridor	STA-03	6-15	RE05	SR 99	Fulkerth Rd to West Main Street	Oper. Improv. - Interchange	2014 Stanislaus RTP	$ 6,403
Corridor	STA-04	6-15	RE04	SR 99	Monte Vista Ave to Fulkerth Rd	Oper. Improv. - Interchange	2014 Stanislaus RTP	$ 6,462
Corridor	STA-05	6-15	RE03	SR 99	Taylor Rd to Monte Vista Ave	Oper. Improv. - Interchange	2014 Stanislaus RTP	$ 6,520
Corridor	STA-06	6-15	T26	SR 99	W. Main St Interchange	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 19,091
Corridor	STA-07	6-15	T25	SR 99	SR-99, Lander Ave (SR-165) to S. City Limits	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 35,785
Corridor	STA-08	6-15	TIER II	SR 99	Mitchell Rd/Service Rd Interchange Phase 2	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 49,586
Corridor	STA-09	6-15	C08	SR 99	Mitchell Rd/Service Rd Interchange Phase 1	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 122,987
Corridor	STA-14	16-24	RE07	SR 99	Mitchell Rd to Merced County Line	Oper. Improv. - Interchange	2014 Stanislaus RTP	$ 3,097
Corridor	STA-15	6-15	RE06	SR 99	San Joaquin County Line to Mitchell Rd	Oper. Improv. - Interchange	2014 Stanislaus RTP	$ 15,758
Corridor	STA-16	0-5	TIER II	SR 99	Interchange Ramp and Auxiliary Lane Improvements	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 27,685
Corridor	STA-17	0-5	SC02	SR 99	SR-99 & Hammett Rd	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 95,524
Corridor	STA-18	6-15	TIER II	SR 99	Golden State to Youngstown Road	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 20
Corridor	STA-20	0-5	M15	SR 99	SR-99 & Briggsmore Interchange	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 12,668
Corridor	STA-21	6-15	T27	SR 99	Taylor Rd & SR 99: Reconstruct Interchange	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 7,694
Corridor	STA-22	16-24	TIER II	SR 99	Hatch Rd & SR-99: Reconstruct Interchange	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 222,129
Corridor	STA-23	0-5	T01	SR 99	Reconstruct Interchange at Fulkerth Road	Cap. Enhan. - Interchange	2014 California Freight Mobility Plan	$ 12,667
Corridor	STA-24	16-24	TIER II	SR 99	SR-99 & Standiford Ave: Reconstruct Interchange	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 78,944
Corridor	STA-26	0-5	M17	SR 99	Reconstruct to 8-lane Interchange - Phase II	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 5,835

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
Corridor	STA-29	0-5	P02	I-5	I-5 to Rogers Road: Interchange Improvements and Widen Sperry Ave	Cap. Enhan. - Interchange	2014 Stanislaus RTP	$ 17,505
Corridor	STA-32	6-15	TIER II	SR 99	SR 99: Kansas Ave to Carpenter Rd	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 60,046
Corridor	STA-33	6-15	TIER II	SR 99	Carpenter Rd to San Joaquin County Line	Cap. Enhan. - Highway	2014 Stanislaus RTP	$ 82,278
Corridor	STA-34	6-15	TIER II	SR 99	Widen SR99 from Hatch Rd to Tuolumne Rd	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 102,701
Corridor	STA-35	6-15	TIER II	SR 99	Widen SR99 from Tuolumne Rd to Kansas Ave	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 128,243
Corridor	STA-36	6-15	TIER II	SR 99	Widen SR99 from Mitchen Rd to Hatch Rd	Cap. Enhan. - Highway	2014 Stanislaus RTP	$ 221,877
Corridor	STA-37	0-5	M02	SR 99	Widen from 6 to 8 lanes	Cap. Enhan. - Highway	2014 Stanislaus RTP	$ 50,671
Corridor	STA-38	16-24	(TIER II)	I-5	Widen I-5 from 4 to 6 lanes SJ County line to Sperry Ave	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 300,063
Corridor	STA-40	0-5	99b	SR 99	Widen SR 99 from 6 to 8 lanes in Stanislaus County	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 473,000
Corridor	STA-41	25 or more	ST06	SR 99	Widen STA-99 between Carpenter Road and the SJ County line to eight lanes	Cap. Expan. - Highway	California Freight Mobility Plan December 2014	$ 82,278
Corridor	STA-42	25 or more	ST03	SR 99	Widen STA-99 between Hatch and Tuolumne Road to eight lanes	Cap. Expan. - Highway	California Freight Mobility Plan December 2014	$ 102,701
Corridor	STA-43	25 or more	ST05	SR 99	Widen STA-99 between Kansas Ave. and Carpenter Road to eight lanes	Cap. Expan. - Highway	California Freight Mobility Plan December 2014	$ 60,046
Corridor	STA-44		ST02	SR 99	Widen STA-99 between Mitchell and Hatch Road to eight lanes	Cap. Expan. - Highway	California Freight Mobility Plan December 2014	$ 221,877
Corridor	STA-45	25 or more	ST04	SR 99	Widen STA-99 between Tuolumne Road and Kansas Ave. to eight lanes	Cap. Expan. - Highway	California Freight Mobility Plan December 2014	$ 128,243
Connector	STA-01	2020 Open to traffic Year	M01	SR 132	State Route 132 West Freeway/Expressway	Cap. Enhan. - Highway	2014 Stanislaus RTP	$ 59,085
Connector	STA-12	6-15	103	South County Corridor	Expressway connector between SR 99 and I-5 from Turlock to Patterson	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	N/A
Connector	STA-39	0-5	17	SR 132	Widen SR 132 connecting SR 99 and I-580	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 100,000
Connector	STA-46	2028 Open to traffic year	RE01	SR 132	SR 132 West Freeway/Exressway	Cap. Enhan. - Highway	2014 Stanislaus RTP	$ 335,009

Figure 4-9 Goods Movement Project Map, Stanislaus County

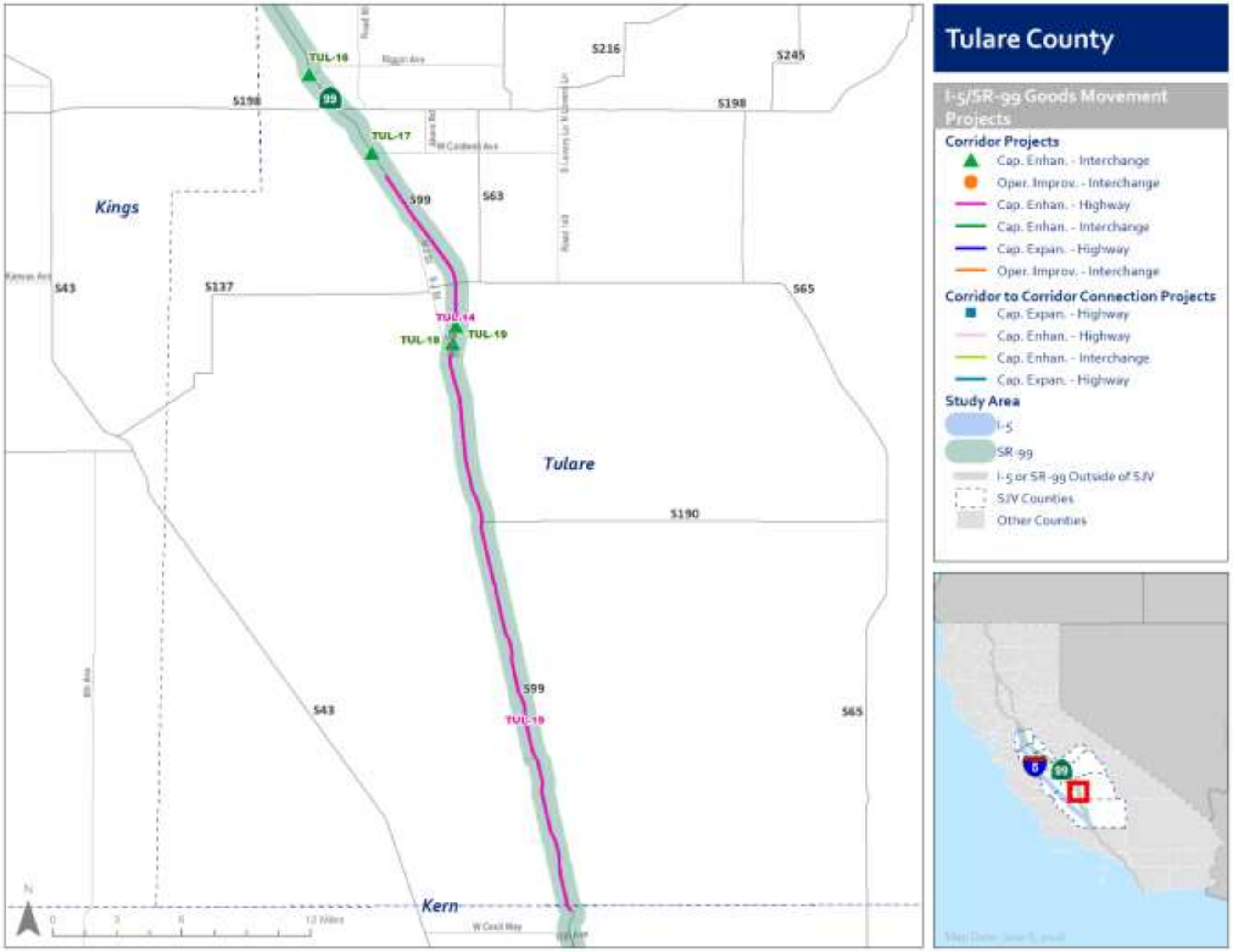


4.1.8 Tulare County

Table 4-8 Goods Movement Project List, Tulare County

Location	StudyID	Timeline (in Years)	ProjectID	Route or Facility ID	Project Title and Description	Project Type	Source	Total Project Cost (thousands)
Corridor	TUL-14	6-15	99f	SR 99	Widen SR 99 from Avenue 200 to 1.2m south of Avenue 280.	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 186,800
Corridor	TUL-15	25 or more	99g	SR 99	Widen SR 99 from Kern County line to Avenue 200.	Cap. Enhan. - Highway	2014 California Freight Mobility Plan	$ 332,500
Corridor	TUL-16	0-5		SR 99	State Route 99/Betty Drive Interchange	Cap. Enhan. - Interchange	2014 Tulare County RTP	$ 66,720
Corridor	TUL-17	6-15		SR 99	State Route 99/Caldwell Avenue Interchange	Cap. Enhan. - Interchange	2014 Tulare County RTP	$ 76,303
Corridor	TUL-18	6-15		SR 99	State Route 99/Commercial Interchange	Cap. Enhan. - Interchange	2014 Tulare County RTP	$ 60,980
Corridor	TUL-19	6-15		SR 99	State Route 99/Paige Avenue interchange	Cap. Enhan. - Interchange	2014 Tulare County RTP	$ 73,969

Figure 4-10 Goods Movement Project Map, Tulare County



4.2 Identification of Goods Movement Related Programmatic Projects

To support the truck technology component of the study, four freight-oriented technologies and strategies are introduced and described herein. Specific examples are included where relevant and insightful, but information related to costs or operator-oriented benefits are excluded from the present discussion.

The following is a summary of the topics included in this overview.

- Truck VMT patterns in the San Joaquin Valley
- Truck parking technologies/ITS
- Truck platooning testing programs
- Zero- and Near-Zero Emissions Truck Technology

4.2.1 Truck Vehicle Miles Traveled (VMT) Patterns and Data Collection

Using Caltrans PeMS data, estimates for average weekly truck vehicle miles traveled (VMT) have been calculated for SR 99 and I-5, separately by direction. These VMT estimates are for the full lengths of the respective routes within the study region (i.e., within the boundaries of the eight counties comprising the San Joaquin Valley Regional Planning Agencies). The estimates have been aggregated into four bins according to time-of-day:

- AM Peak (6-9 AM)
- Midday (9 AM to 3 PM)
- PM Peak (3-7 PM)
- Night (7 PM to 6 AM)

Data were taken for the five-week period between March 27 and May 1, 2016, excluding Sundays. PeMS data were only used from detectors that had at least an 85 percent observation rate in the field during the five-week period (i.e., any stations that had more percent imputed data were excluded from the analysis). Detectors that met this quality threshold were used to estimate VMT across the full corridor based on their specific locations and corresponding ranges of influence.

Results

The estimated weekly average truck VMT results are shown in **Figure 4-11** and **Table 4-9**. To facilitate comparisons between periods of different durations (e.g., between the 11-hour "night" period and the 3-hour "AM Peak" period), all results have been normalized by hour and are therefore reported on a per-hour basis.

Figure 4-11 Average Weekly Truck VMT by Route

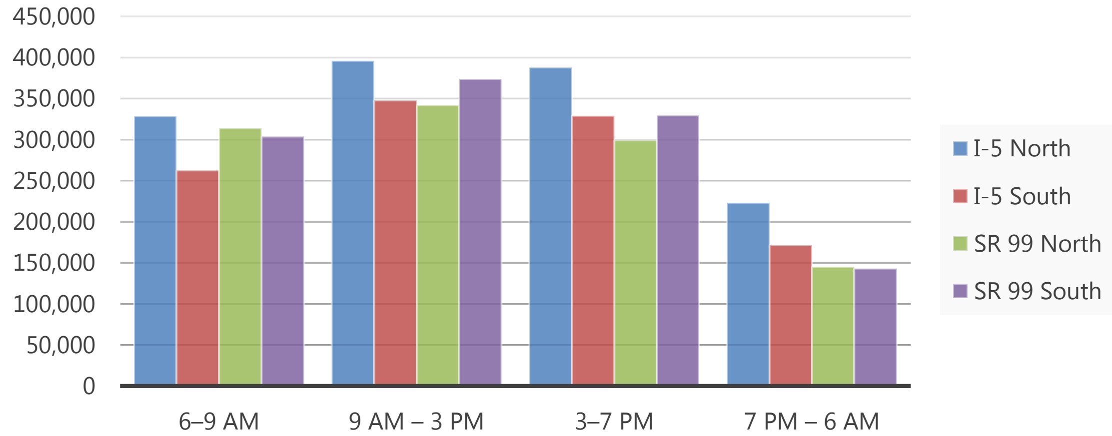


Table 4-9 Average Weekly Truck VMT by Route

Route	6–9 AM	9 AM – 3 PM	3–7 PM	7 PM – 6 AM
I-5 North	328,444	395,957	387,611	223,322
I-5 South	262,382	347,649	329,057	171,468
SR 99 North	313,818	341,786	299,056	145,085
SR 99 South	303,697	373,625	329,330	143,042

4.2.2 Intelligent Transportation Systems (ITS) for Truck Parking Availability

Information and Communications Technology (ICT) Infrastructure can be used to measure the number of available spaces in a certain truck parking areas, for integration into real-time or near-real-time truck parking availability reporting systems. Candidate ICT technologies for this purpose are introduced and described in **Table 4-10** and **Table 4-11**, with additional details for each technology provided at the end of this section.

Table 4-10 Detailed Qualitative Comparison Chart of Parking Detection Technologies

Sensor Technology	Cabling Required (typically)	Bandwidth Needs	Installation requires parking closure?	Maintenance Needs	Detection Accuracy	Reconfigurable	Cost per detector	Calibration Effort Required
Inductive Loops	Yes	Low to moderate	Yes	Moderate to high	Excellent	No	Low	Low
Magnetometer (two-axis fluxgate)	No	Low	Yes	Low	Very good	No	Moderate	Low
Microwave Radar	Yes	Moderate	No	Low	Very good	Yes	Low to moderate	Moderate to High
Passive Infrared	Yes	Low to moderate	No	Low	Good	Yes	Low to moderate	Low
Ultrasonic	Yes	Low	No	Low	Good	Yes	Low to Moderate	Moderate
Video Image Processing	Yes	High	No	Moderate to high	Good	Yes	Moderate to High	Moderate

Table 4-11 Quantitative Comparison Chart of Parking Detection Technologies

Sensor Technology	Wireless Data Transmission Available	Battery Power Option	Ease of Installation	Maintenance Needs	Detection Accuracy	Cost per detector	Typical Coverage per detector
Inductive Loops	No	No	2 hrs, invasive	Generally maintenance free for first two years. Annualized cost of $746	Best accuracy.	$500 to $800	One space
Magnetometer (two-axis fluxgate)	Yes	Yes	10 min to 1 hour, invasive	Battery replacement after 5-9 years	Approx. 95% in real-world conditions	$900 to $6,300	One space
Microwave Radar	No	No	1 hour, noninvasive, 17 feet high	Minimal. 1.6% needed repair. Annualized cost of $314	Approx. 90% in real world conditions, coupled with Magnetometer	$700 to $3,300	Up to 6-10 spaces
Passive Infrared	Only for on-pavement detectors	Only for in-pavement detectors	30-minute installation, noninvasive, 15-20 feet overhead	Low. Mean time between failures is four years.	Above 99% under ideal conditions.	$700 to $1,200	1-2 spaces
Ultrasonic	No	No	Non-invasive overhead.	Low—no moving parts.	No data.	$600 to $1,900	1-2 spaces
Video Image Processing	Yes	No	1 hour, noninvasive, 30-50 feet high	Lens requires cleaning every 6-12 months. Annualized cost of $580	81% accurate in field tests.	$5,000 to $26,000	Up to 6-8 spaces

Inductive Loops

As the most commonly-used traffic sensing method in the US, inductive loops are a proven, mature, and well-understood technology. Installation is invasive, however, and requires closure of the facility for the cutting and wiring of the loops themselves (as well as any future maintenance). This generally decreases pavement life and increases pavement maintenance costs as well. This technology is generally resilient to most types of inclement weather, but is susceptible to electrical surges or lightning.

Magnetometer (two-axis fluxgate)

As with inductive loops, magnetometers are installed in the pavement and therefore require closure of the facility for installation and maintenance. Some models include wireless communication capability, eliminating the need for lead wire cuts to the sensor. The magnetometer is sensitive to installation depth and lateral position, and can yield inaccurate readings if either is incorrect. As with inductive loops, this technology is relatively resilient to most types of inclement weather.

Microwave Radar

This technology is more susceptible to weather-related interference than in-pavement technologies, but has the advantage of being able to read data from multiple parking stalls simultaneously. Different types of microwave radar exist, but the only type suitable for parking occupancy measurement is frequency modulated continuous wave (FMCW) radar for presence detection.

Passive Infrared

Passive infrared technology is helpful for large scale detection, though it is adversely affected by fog, snow, or any other weather that reduces visibility to less than 20 ft (which can be an issue with Tule Fog in the Central Valley). The most commonly required maintenance needed is periodic lens cleaning, which may require closure of the facility to accomplish.

Ultrasonic

These sensors are heavily used in Japan, but US experience with this technology is limited. These sensors have no moving parts and are therefore relatively durable with reduced maintenance needs. They can be affected by turbulent winds or certain temperature conditions, however.

Video Image Processing

Video-based sensing technology can monitor multiple spaces simultaneously, and allows for relatively easy repositioning if needed. Because it is an optical method, it is sensitive to poor visibility conditions that could arise from inclement weather (e.g., rain, snow, fog). The most commonly required maintenance needed is periodic lens cleaning.

4.2.3 Private Truck Parking & Public-Private Partnership Opportunities

This section explores the potential of using private parking facilities to supplement the limited supply of publicly maintained truck parking along the I-5 and SR 99 corridors.

Past Experience with Public-Private Partnerships

Following a 1997 Caltrans study of its rest areas, the agency established an In-Route Truck Issues Task Force. This task force proposed a PPP approach that involved building lighted and fenced parking areas adjacent to existing private facilities in parts of the state where truck parking capacity was not adequate for prevailing demands. Restroom facilities, sanitation, and security would be provided by private entities through competitive contracts with the state, and signage would be available to direct motorists to these free facilities from the highway.[13]

In 1997, New York State DOT developed a rest area plan that encouraged the formation of PPPs through working groups, low-interest loans, and lease agreements.[14] Other states with existing PPPs for truck parking include Vermont and Iowa.[15]

In 2001, the Connecticut DOT explored the feasibility of using electronic display signs to convey real-time truck parking information to drivers, but found that such a system could not offer a net benefit at the time due to an inability to obtain continuously updated truck parking information to supply the signboards.[16]

In Florida in 2011, the state partnered with a private truck parking facility to construct new parking spaces on land adjacent to the private property, to alleviate a severe shortage of truck parking capacity at that location. This was considered to be a prime example of the type of public-private partnership that FHWA envisioned in its 2002 Adequacy Study, and was included as an eligible type of investment for funding under Congress' Truck Parking Pilot Program.[17]

A 2015 Virginia Truck Parking Study recommended partnering with private industry and local governments to expand existing truck parking capacity, with highest priority given to the areas with the greatest deficit of parking.[18]

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[13] http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_317.pdf

[14] http://www.dot.state.mn.us/ofrw/PDF/MN_TrkParkFnlRpt.pdf

[15] http://www.ntsb.gov/news/events/Documents/truck_bus-SIR0001.pdf

[16] http://www.dot.state.mn.us/ofrw/PDF/MN_TrkParkFnlRpt.pdf

[17] http://ops.fhwa.dot.gov/freight/documents/cmvrptcgr/index.htm

[18] Virginia Truck Parking Study, July 2015

Current State of Truck Parking in the San Joaquin Valley

Out of the 2,763 parking spaces along the I-5 Corridor, only about 10 percent are publicly maintained. Similarly, out of the 2,139 parking spaces along the SR-99 Corridor, only about 6 percent are publicly maintained. Details regarding parking inventory along both corridors is provided in **Table 4-12**.

A survey in 2010 revealed that 78 percent of respondents on Interstate 5 have encountered truck stops that were full.[19] Although the private sector invests in truck parking facilities where profitable, there is often a mismatch between where parking is needed and where it is provided by private entities.[20]

An NTSB Special Report on Truck Parking Areas[21] explored the current shortage of truck parking and found that California ranks in the top four states across the country with respect to truck parking demand. The report further found that an estimated 80 percent of public rest area and 53 percent of private truck stops across the country are full during overnight hours.

Table 4-12 Summary of Parking Supply on I-5 and SR-99

Ownership Type	I-5	SR 99	Total	Percent
Public	288	128	**416**	**8.5%**
Private	2,475	2,011	**4,486**	**91.5%**
Total	**2,763**	**2,139**	**4,902**	**100%**

ITS Truck Parking Safety and Hours-of-Service (HOS) Benefits

In 2011, the Commercial Vehicle Safety Alliance (CVSA) explored the issue of truck drivers being unable to find legal parking spaces upon reaching their hours-of-service (HOS) limits. **Table 4-13** highlights some of the HOS results from this study. An additional safety-related consideration with respect to truck parking and HOS limits is that the two are often on conflict with each other. As the study pointed out, "enforcement officers are presented with a difficult enforcement choice: force the driver to move the vehicle to a safer location when a driver has reached the HOS limit, or leave the vehicle illegally parked."[22]

[19] http://ops.fhwa.dot.gov/freight/documents/cmvrptcgr/index.htm

[20] http://www.ntsb.gov/news/events/Documents/truck_bus-SIR0001.pdf

[21] http://www.ntsb.gov/news/events/Documents/truck_bus-SIR0001.pdf

[22] http://ops.fhwa.dot.gov/freight/documents/cmvrptcgr/index.htm

Table 4-13 Percent of Illegally Parked Drivers Due to Hours of Service Limits and Lack of Available Truck Parking

State	Illegally Parked Drivers Who Cannot Find a Parking Space and Are Out of HOS
Idaho	25%
Maine	2%
Minnesota	<5%
Montana	3%
Nebraska	73%
Wisconsin	5%

Source: NATSO, 1999

Measures to address driver fatigue can produce safety benefits, as driving while fatigued accounts for 16 percent of total truck-involved crashes and 5 percent of total fatal truck-involved crashes. Furthermore, providing trucks with guidance to available parking can reduce fuel consumption and emissions.[23] However, in 1999, NATSO investigated the relationship between a lack of truck parking and crash rates, and found no relationship between accident occurrence and truck parking shortfalls, with respect to number of crashes or number of fatal incidents involving large trucks.[24]

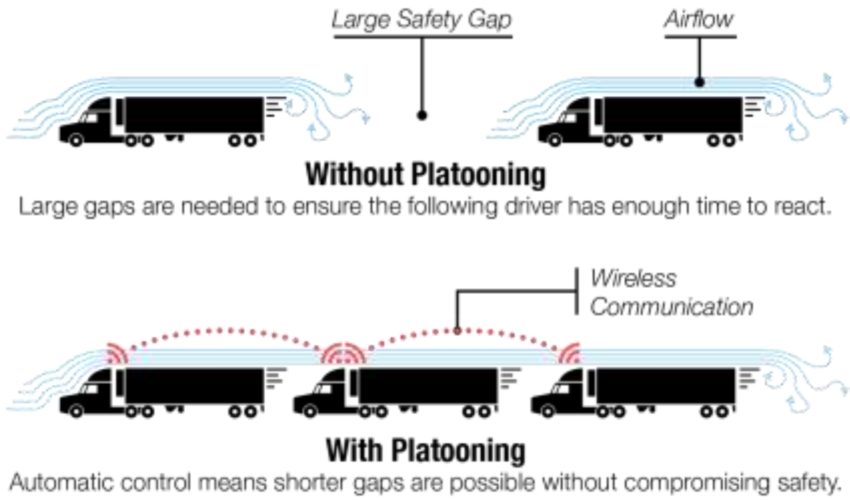
4.2.4 Truck Platooning and Connected Truck Technologies

A truck platoon is a series of trucks following each other on the road, with acceleration and braking controlled automatically (steering is typically still manual). When any truck's speed changes, the others behind it are instantly notified wirelessly, and those trucks respond immediately by braking or accelerating. This allows for much closer following distances, which reduces wind resistance and increases the number of trucks that can fit on the road at high speeds, thereby increasing roadway capacity (see Figure 4-12). This also protects against rear-end crashes by automating brake reaction time.

[23] I-5 Smart Truck Parking in California: Public-Private-Academic Collaboration to Aid Truckers in Finding Safe, Legal, and Available Parking Through ITS Technology, Presentation, 4/4/2012

[24] Examination of the Relationship between Truck Crash Rates and Truck Parking Shortfall Estimates, cited in http://www.ntsb.gov/news/events/Documents/truck_bus-SIR0001.pdf

Figure 4-12 Truck Platooning Concept



The remainder of this section provides a short summary of pilot studies of this technology in different parts of the nation, including (when available):

- Identification of involved parties
- Description of the on-board technology
- Description of corridor and traffic conditions of test
- Summary of key findings and recommendations

Texas Truck Platooning Test Program

In concept development phase.

- **Participants:** Testing performed by the Texas Transportation Institute (TTI)
- **Configuration:** TBD
- **Corridor:** TBD in Texas
- **Vehicles and Equipment:** TBD – program includes multiple industry partners, including truck OEM's.
- **Objectives:** Test Level 2 truck platooning – an extension of cooperative adaptive cruise control that uses automated lateral and longitudinal vehicle control, while maintaining a tight formation of vehicles with short following distances
- **Design:** TBD – Concept of Operations currently under development
- **Results:** TBD.

FHWA Partial Automation for Truck Platooning (California)

Test program in progress.

- **Participants:** Testing performed by UC Berkeley PATH and Volvo
- **Configuration:** Two and three-truck platoons, multiple configurations
- **Corridor:** I-580 in California, between Dublin and Tracey
- **Vehicles and Equipment:** Volvo trucks.
- **Objectives:** Perform high speed testing, longitudinal maneuvers (platoon splitting, platoon joining), fuel economy analysis, fault detection consideration.
- **Design:** Engine control included both torque control and brake system control.
- **Results:** Testing planned for fall 2016.

FHWA Partial Automation for Truck Platooning (Alabama)

Test program in progress.

- **Participants:** Testing performed by University of Auburn and Peloton
- **Configuration:** Two-truck platoons
- **Corridor:** TBD
- **Vehicles and Equipment:** Peterbilt trucks with Meritor Wabco advanced brake system integration and Peloton prototype commercial-off-the-shelf two-truck platooning system
- **Objectives:** Test how the system reacts to passenger car cut-ins or other highway anomalies; test how to find similarly equipped vehicles on the road for the platoon; test improved fuel economy, test the role of the lead driver; estimate return on this investment..
- **Design:** Peloton prototype commercial-off-the-shelf two-truck platooning system technology, integrating vehicle-to-vehicle communications with adaptive cruise control
- **Results:** Testing planned for 2016.

Nevada Truck Platooning Tests

- **Participants:** Testing performed by UC Berkeley PATH
- **Configuration:** Three-truck platoons, 6 meter spacing at 53 mph
- **Corridor:** SR 722 in Nevada

- **Vehicles and Equipment:** Freightliner trucks equipped with a Cummins C-Celect Engine ECU, a V2V communications system (Savari DSRC), a WABCO "Euro" E85, an accelerometer, a gyroscope, a PC104 control computer, Lidar sensors, and Radar sensors.

- **Objectives:** Perform high speed testing, longitudinal maneuvers (platoon splitting, platoon joining), fuel economy analysis, fault detection consideration.

- **Design:** Engine control included both torque control and brake system control.

- **Results:** Performance is sensitive to changes in roadway grade. Line-of-sight was necessary for reliable V2V communications, resulting in the middle truck's being offset laterally by 0.5 meters. First, second, and third truck achieved fuel savings of 4.54 percent, 11.91 percent, and 18.4 percent respectively.

Safe Road Train for the Environment (SARTRE), Aerodynamic Tests

- **Participants:** Volvo Trucks, Volvo Cars and SP (Sweden), Ricardo (UK), IKA (Germany), IDIADA, and Technalia (Spain).

- **Configuration:** Platoons of two trucks, followed by three passenger cars. Spacing of as little as 5 meters.

- **Corridor:** Fuel consumption was evaluated at the IDIADA high-speed test track in Spain.

- **Vehicles and Equipment:** Platoon operation based on radar data and Wi-Fi communication between trucks. Side radar units monitor traffic, forward-facing radar maintains vehicle spacing, and a camera measures position in the lane. A Wi-Fi antenna is mounted above the cabin for wireless communication to other platoon vehicles. New technologies were intentionally not developed for this project, as it was intended to be a demonstration of truck platooning using currently available technology. Acceleration and braking was controlled using radar, adaptive cruise control, and automated emergency braking. Steering control was provided using Volvo's Dynamic Steering system. The Radar and camera equipment is standard production technology, and the Wi-Fi communications use the 802.11p standard.

- **Objectives:** Test aerodynamic effects of platooning and resultant fuel savings.

- **Design:** Control system included steering, acceleration, and braking. Aerodynamic testing was performed at night to minimize fluctuations in temperature and wind.

- **Results:** At a spacing of 5 meters, fuel savings were 8 percent for the lead truck and 13 percent for the following truck. At a spacing of 25 meters, fuel savings were 1.5 percent for the lead truck and 7.5 percent for the following truck.

Safe Road Train for the Environment (SARTRE), CACC and ACC Tests

- **Participants:** Isuzu, HINO, FUSO, UD Trucks

- **Configuration:** Four-truck platoons. In one test headways are 1 second and speed is deliberately reduced from 80 kph (start) to 50 kph (finish).
- **Corridor:** Unspecified.
- **Vehicles and Equipment:** Four different trucks by four different manufacturers (Isuzu CYL, HINO FW1EXBL, FUSO FS55VVZ, UD Trucks QGK-CD), each approximately 12 meters and 10 tons. Vehicles included V2V communications antennas on the roof of the cabin, a GPS antenna on the top of the cabin, an acceleration sensor, yaw rate sensor, wheel sensor, Laser Radar (IBEO), 76G Millie wave radar, a GPS unit, Rapid Pro unit, Micro Auto Box unit, and HMI screen/indicator lamps.
- **Objectives:** Demonstrate feasibility of truck CACC technology and operation.
- **Design:** In ACC mode, truck control is handled using V2V distance sensors only. In CACC mode, truck control is handled using V2V distance sensors and wireless communication.
- **Results:** At 20 meter spacing, fuel savings were 8 percent on average. At 10 meters, fuel savings were 14 percent on average. At 5 meters, fuel savings were 16 percent on average.

Safe Road Train for the Environment (SARTRE), V2V Communications Tests

- **Participants:** SARTRE participants.
- **Configuration:** Platoons of two trucks followed by three passenger cars, at a spacing of 13 meters. Testing was performed at 50, 70, and 85 kph (6 minutes at each speed).
- **Corridor:** IDIADA test track in Spain
- **Vehicles and Equipment:** Trucks had two separate radios and antennas for V2V communication. Passenger cars only had one.
- **Objectives:** Investigate potential V2V issues in a platooning environment.
- **Design:** Data is broadcast to all vehicles, not relayed from one to another. Data was encrypted and communicated using 802.11p. Data was sent and received from the SARTRE CAN bus. The experiment did not focus on minimizing data volume or transmission needs. For time synchronization, a GPS/NTP method was used.
- **Results:** Side mirrors were tested as alternate mounting locations for antennas, but were ultimately not selected. Line-of-sight issues may have contributed to lost messages between vehicles in some configurations. Interruptions in V2V communications between vehicles were typically shorter than 100 ms.

Japanese Energy ITS Project

- **Participants:** Ministry of Economy, Trade, and Industry; New Energy and Industrial Technology Development Organization.
- **Configuration:** Four-truck platoons at 80 kph. In CACC mode, the spacing was 30 meters; in fully automated mode, the spacing was 4 meters. Additional demonstrations were performed with three- and four-truck platoons at 30, 10, and 4.7 meter spacings.
- **Corridor:** Tomei Expressway around Tokyo. 100 km segment. Traffic composed of 69 percent light vehicles and 31 percent heavy vehicles. Additional demonstrations performed at AIST test track.
- **Vehicles and Equipment:** Image processing, radar (front bumper mounted), laser scanner (front bumper mounted), V2V communications (antennas installed at rear corners of trailer), and Lidar cameras on the sides of the vehicle. Human-Machine interface includes in-vehicle display and additional indicators on the back of the leading vehicle trailer.
- **Objectives:** Demonstration of automated truck platoons and energy savings. Testing of obstacle avoidance and cut-in scenarios.
- **Design:** Steering and speed control automated. Image processing is used for lane-keeping. Radar, laser, and V2V data are used for gap/longitudinal control.
- **Results:** 13.7 percent fuel reduction for CACC mode, and 15.9 percent fuel reduction in fully automated mode. CO_2 emissions were reduced by 2.1 percent at 10-meter gaps, and 4.8 percent at 4-meter gaps.

CHAUFFEUR Project

- **Participants:** European Union, Daimler Chrysler, Renault Recherche, IVECO, Centro Ricerche Fiat, WABCO, Bosch, ZF Lenksysteme, Central Research Laboratories, TUV Rheinland, PTV, Clifford Chance & Punder, and CSST.
- **Configuration:** Two-truck and three-truck platoons with 6-12 meter spacing..
- **Corridor:** Not specified.
- **Vehicles and Equipment:** DaimlerChrysler and IVECO trucks. Dedicated infrared image processing with two cameras, for measurement of tow bar angle and distance. 5.8 GHz V2V communication for platoon formation and coordination.
- **Objectives:** Proof of concept for "electronic tow bar" operation of trucks.
- **Design:** System controls lateral movement (lane keeping) and vehicle spacing, using a lane keeping system and cruise control. The infrared image processing uses a pattern of markers on the backside of the leading truck's trailer, arranged in an octagon.

- **Results:** Up to 20 percent reduction in fuel consumption.

4.2.5 Zero- and Near-Zero Emissions Truck Technology

Leading zero-emissions (ZE) and near-zero-emissions (NZE) truck technologies include: Dual-Mode Hybrid Electric Vehicles (HEVs), Plug-In Hybrid Electric Vehicles (PHEVs), Range-Extended Electric Vehicles (REEVs) with integrated engine, REEVs with integrated fuel cell, Battery Electric Vehicles (BEVs), and range extenders utilizing roadway power. The market readiness of each of these technologies has been evaluated according to NASA's technology readiness level (TRL), described in **Table 4-14**.[25]

In addition to these technologies that are specifically designed to support ZE and NZE truck operations, other congestion mitigation and mobility strategies can help reduce overall emissions levels across all vehicles. Examples of such broadly-applicable strategies include AERIS (EcoDriving) and Freight Advanced Traveler Information System (FRATIS).

Table 4-14 NASA Technology Readiness Levels

Level	Definition
TRL 1	Basic principles observed and reported
TRL 2	Technology concept and/or application formulated
TRL 3	Analytical and experimental critical function and/or characteristic proof-of concept
TRL 4	Component and/or breadboard validation in laboratory environment
TRL 5	Component and/or breadboard validation in relevant environment
TRL 6	System/subsystem model or prototype demonstration in a relevant environment (ground or space)
TRL 7	System prototype demonstration in a space environment
TRL 8	Actual system completed and "flight qualified" through test and demonstration (ground or space)
TRL 9	Actual system "flight proven" through successful mission operations

Dual-Mode Hybrid Electric Vehicles

This is an advanced parallel hybrid with the internal combustion engine being the main source of power. It is a moderately mature technology, with little to no changes in operations as compared to a diesel-operated truck. However, the actual ZE range is limited, as it only functions in ZE mode at low

[25] Technology Readiness Levels: A White Paper", John C. Mankins, Office of Space Access and Technology, NASA 1995.

speeds and/or is subject to certain load limits. These trucks achieve approximately 15 percent emissions savings compared to conventional diesel trucks. It is ranked with a 5 on the TRL scale.

Plug-In Hybrid Electric Vehicles

Unlike the HEVs, the PHEVs have batteries that are recharged through the electrical grid. This results in a larger battery, which also provides greater range in ZE mode. Despite this advantage over HEVs, PHEVs are based on a technology that is still in its relative infancy, is more costly, and generally more complex.

Range-Extended Electric Vehicles with integrated engine

These vehicles can use either electric power or diesel fuel, but the primary source of energy is the electric motor. The engine can run either on diesel or compressed natural gas (CNG) when the batteries are depleted. The determining factor for ZE range is battery size. Therefore, this truck type can be designed for specific ZE ranges as needed, subject to corresponding changes in cost. The technology has a TRL score of 7. These trucks achieve approximately 25 percent emissions savings compared to conventional diesel trucks.

Range-Extended Electric Vehicles with integrated fuel cells

This technology is analogous to the REEV with integrated engine, except that it relies on a fuel cell in place of an integrated engine when the vehicle battery is depleted. The fuel cells require hydrogen refueling stations for recharging, such that these trucks are a practical solution only in areas where such refueling stations exist. The technology can be designed to fit within tight spaces and can be accommodated by a standard diesel truck, though this comes at a higher price point compared to other technologies. These vehicles also offer relatively long useful lifespans and small maintenance costs. This technology is already available on the market, and scores a 7 on the TRL scale. Because these vehicles are capable of operating in true zero-emissions mode, it is relatively easy to obtain regulatory certification for them.

Battery Electric Vehicles

The BEV an electric-only vehicle powered by its battery alone, meaning that longer ranges require larger, heavier, more costly batteries. The vehicle batteries can be recharged using dedicated recharging stations or overhead/in-pavement catenary power systems (if the vehicle is properly equipped to draw power from such a source). Recharging of the internal battery requires more time than refueling a REEV fuel cell or internal combustion engine. The actual truck technology has a TRL score of 7, while the fuel cell technology has a score of 6. Because these vehicles are capable of operating in true zero-emissions mode, it is relatively easy to obtain regulatory certification for them.

Range extenders utilizing roadway power

The technology requires roadway infrastructure to charge the electric trucks while on route using technologies that are already widely used for transit vehicles. This technology allows for smaller, cheaper on-board batteries and therefore lower vehicle costs as well. This cost savings per vehicle is offset by significantly greater costs for infrastructure supporting systems relative to other ZE/NZE technologies, however. This system scores a 5 on the TRL scale. Because these vehicles are capable of operating in true zero-emissions mode, it is relatively easy to obtain regulatory certification for them.

4.2.6 Mode Shift: Rail Intermodal

Shifting highway freight movements to rail where possible is a key element of many regional goods movement strategies. The existence of active rail corridors parallel to I-5 and SR 99 suggests that some existing or forecast truck flows could be modal shift candidates; however, in-state rail shipments currently consist primarily of heavy-weight commodities, including borax from the RioTinto mine in eastern Kern County that travels by rail o the Ports of Los Angeles/Long Beach. Besides reducing heavy truck movements on I-5, SR 99, or connecting routes, shifting truck movements to rail might reduce criteria pollutants, fuel use, and GHG emissions.

Rail intermodal service involves rail movement of highway trailers or freight containers between rail terminals, with origin pickup and destination delivery movements made by truck. The ability of intermodal options to compete with highway service depends heavily on distance. Multi-step intermodal service entails substantial cost and time at terminals, but offers unit cost savings on the line-haul move between the terminals. To be cost-competitive and service-competitive with door-to-door truckload service, the rail line-haul move must cover a long enough spread for the line-haul cost savings to offset the pickup, terminal, and delivery costs. For these reasons, most active U.S. rail intermodal corridors are in excess of 500 miles.

There are two active rail intermodal terminals in the SR 99 corridor. These facilities concentrate on domestic movements: UP Lathrop and BNSF Mariposa (Stockton). BNSF formerly offered Chicago service from its Fresno terminal, but discontinued that service in December 2014.

The practical potential for truck-to-rail modal shift depends on technical, economic, and market factors:

- Technical - The rail option must be operationally feasible in terms of customer access, rail network connectivity, rail equipment supply, and commodity compatibility with rail movement.
- Economic - The door-to-door option must be cost-competitive with trucking while yielding an acceptable profit margin to the railroad and other involved parties. Customers expect to pay substantially less for a rail option.
- Market - The rail option must meet the needs of both shipper and receiver in terms of reliability, transit time, shipment size, frequency, access, and cost.

If these criteria are met, customers can choose between roughly equivalent rail and truck options.

There have been multiple studies and initiatives related to additional rail intermodal terminals in the Valley. The primary aim of these proposals has been to take international container movements from the Ports of Oakland, Los Angeles, and Long Beach off the highways. One main proposal has been for a terminal in the Stockton-Lathrop area linked by rail shuttles to the Port of Oakland (the California

Inter-Regional Intermodal Service, or "CIRIS" concept). The other major proposal has been for a terminal near Shafter, linked by rail shuttles to Oakland, Los Angeles-Long Beach, or both (the Shafter Logistics Center, or "SLC" concept, superseded by the Paramount Logistics Park and now the Wonderful Logistics Park). There was also a proposal to establish a rail intermodal terminal as part of a business park development at Crows Landing, but rail intermodal service is no longer contemplated as part of that project. Furthermore, this is one intermodal truck to rail terminal in Delano called RailEx, which provides non-stop, unit train, refrigerated box car service between Delano and Albany, New York.

Potential Customer Interest, Volumes, and Costs. Port rail shuttle interest, volume, and cost issues were addressed in a 2003 survey conducted by Cambridge Systematics (CS) for SJCOG; a 2003 feasibility study conducted for SJCOG by Tioga and Railroad Industries: a 2006 study conducted by Tioga, CS, and Railroad Industries on behalf of SJCOG; and a 2009 study conducted by Moffat and Nichol from the City of Shafter. These studies found that rail shuttle services might be attractive to customers, but face serious cost challenges. Most recently, due to the downturn in coal and oil cargo movements, the rail industry has been revisiting short-haul rail opportunities. According to a study being conducted by the Port of Long Beach, trucking costs have increased and rail costs have decreased so the cost difference is shrinking. However, the Port of Long Beach short-haul rail concept includes an assumption that short-haul rail would serve inland port destinations in the Inland Empire and not in the Valley.

The 2003 CS survey found considerable interest in rail intermodal options among SJV shippers and receivers. CS found very clear price sensitivity:

> "The overwhelming response of the interviews is that the usage of CIRIS was found to be extremely sensitive to the price of the CIRIS option relative to the current truck dray operations. CIRIS was considered not to be a viable alternative when the transportation costs were slightly higher than the current trucking operations. Shippers were also reluctant to switch if the price of CIRIS and the current truck dray were the same."

If the rail option were less expensive, however, CS found that a significant portion of the shippers interviewed stated that they would use a rail intermodal service:

> "The highest positive response rating was for next-day service from the Northern San Joaquin Valley region at 81 percent compared to 60 percent, which was the lowest response rating for Kern County."

The 2003 Tioga study estimated potential daily Oakland rail shuttle startup volumes at about 52 annual containers in the Stockton and Fresno markets, growing to about 265 containers at maturity. The study found that rail costs would exceed trucking costs, and estimated the public subsidy need at about $220 per trip.

The 2006 Tioga/CS study updated the 2003 estimates and examined phase implementation option, and confirmed the need for a subsidy:

> "CIRIS service will not be a profitable venture, especially on the shorter Oakland-Stockton leg. Although the upward pressure on trucking costs is raising the CIRIS rate and revenue ceiling, the length of haul is basically too short for profitable rail line haul economics."

The 2009 Moffat & Nichol study examined the potential for rail intermodal service between the ports and Shafter, and concluded that:

> "The challenge with Shafter, as with other potential "inland ports" throughout the United States, is that intermodal rail services become economic for both rail carriers and their customers only under a minimum level of distance and (mostly) volume. It is unclear whether current container volumes to/from the SJV can generate this demand… From Moffatt & Nichol's interviews with shippers, it is unclear that even if intermodal service from and to the Ports of Oakland, Los Angeles or Long Beach was available, it would be used. This is because current round-trip truck service that includes obtaining or returning an empty container from the port along with the loaded move is approximately $650~$700 or about the same as the total costs of a one-way intermodal rail move, including drayage and lift costs."

Importantly, since completion of the 2009 Moffatt & Nichol study, industrial warehousing in Shafter has more than tripled in size with the addition of four major distribution centers. As of 2016, these facilities generate 300 trucks per day.

Potential VMT Reductions. The potential for truck VMT reductions on I-5 and SR 99 through rail intermodal service depends on geography and truck routing patterns, as well as volume. To gauge the potential effectiveness of different rail intermodal strategies in truck VMT reduction, the study team analyzed the truck routing patterns for different combinations of port intermodal terminal locations, and inland importer/exporter locations. The analysis included:

- Routes from the Ports of Oakland and Los Angeles/Long Beach.
- Potential rail intermodal terminal sites at UP Lathrop (representative of the Stockton-Lathrop area), the Shafter Logistics Center, and the dormant BNSF rail intermodal terminal at Fresno (chosen as representative of a mid-SJV site). (**Figure 4-13**).
- Eleven representative distribution centers and production facilities known to be or potentially engaged in containerized import or export movements. (**Figure 4-14**)

Figure 4-13 Potential SJV Rail Intermodal Terminal Sites

Figure 4-14 SJV Representative Importers and Exporters

For each SJV site and port pair (e.g. Oakland to E&J Gallo at Modesto), the team used Microsoft MapPoint 2006 to determine the likely truck route and segment mileages from the port itself, and from each of the three possible rail intermodal terminals. There were thus five possible routes (two ports and three inland terminals) for each of 11 inland facilities, a total of 55 route combinations. The team then determined the change in VMT on I-5 and SR 99 in the study area and the net VMT difference for the combined I-5/SR 99 corridor.

Port of Oakland Options. The truck VMT for Port of Oakland trips would be concentrated on:

- Short stretches of I-5 and SR 99 north of SR 120.
- SR 99 between SR 120 and SR 152.
- I-5 between I-580 and SR 152.
- SR 99 south of SR 152.

The study team's findings suggest that:

- A rail shuttle between the Port of Oakland and a Lathrop-area terminal might be effective in reducing port truck VMT on the I-880/I-238/I-580/I-205 east-west corridor, but the effects on north-south I-5/SR 99 corridor would depend heavily on the final destinations of goods.
- A rail shuttle service between Oakland and Fresno would have a different set of VMT impacts. Rail intermodal service via Fresno would increase corridor truck VMT for points between Modesto and Stockton because Fresno is farther from those points than the SR 120 interchange where trucks from Oakland would access SR 99. Corridor VMT would decrease for points from Madera south.
- A shuttle between Oakland and Shafter would, as expected, significantly increase corridor VMT for origins and destinations in the upper SJV (e.g. Modesto and north); however, it is unlikely that goods coming through the Port of Oakland and destined for locations north of Shafter would travel by rail to Shafter. It is much more likely that rail trips to Shafter would originate from the Ports of Long Beach/Los Angeles rather than Oakland.

These findings reinforce the critical role of SJV geography in freight transportation. The route from Oakland meets the I-5/SR 99 corridor at the I-580/I-5/I-205 "triangle" to serve the Stockton/Lathrop area and points south. Replacing this trip with a rail shuttle would reduce east-west VMT but have minimal impact on north-south I-5/SR 99 corridor VMT. A rail shuttle to Fresno and/or Shafter would reduce truck VMT for the lower SJV but there would be no point in trucking containers north from Fresno or Shafter and back toward Oakland.

Ports of Los Angeles/Long Beach Options. The study team used a point on Terminal Island as a representative origin for container movements from the Ports of Los Angeles and Long Beach. From this point the likely route to SJV facilities would cover I-710/I-5 to the point where I-5 and SR 99 diverge north of the Kern County border. For points north of the I-5/SR 99 split, a truck from LA/LB would use either SR 99 or I-5 as appropriate. The analysis suggest that:

- A Shafter rail shuttle would move containers farther north on the same route as the highway trip resulting in some additional backhaul; however, this would still result in a net corridor VMT reduction for almost all SJV points examined due to the VMT reduced between the Ports of Los Angeles/Long Beach and the Kern County logistics facilities. The exception would be for the IKEA facility at Lebec, which is south of the Shafter site. There would also be a 46 VMT reduction on I-5 south of Kern County and a 45 VMT reduction on I-710/I-5 in LA County. Note, however, that large VMT reductions in serving Walmart in Porterville via Shafter would come from diverting trucks off of SR 99/SR 190 to SR 65. Intermodal service at Shafter remains in the planning stages with initial service to the Midwest via BNSF Railway possible due to the favorable travel distance.

- An LA/LB-Fresno rail shuttle would increase corridor VMT south of Fresno and reduce corridor VMT to the north. There would be little point in moving containers by rail to Fresno and then back tracking to points such as Bakersfield or Lebec.
- An LA/LB-Lathrop rail shuttle might yield large corridor VMT savings to points in the upper SJV such as Tracy and Lathrop, but realistically, those locations are more efficiently served via Oakland. There would be substantial VMT increases in the unlikely event that containers were trucked from Lathrop back south below Madera.

Summary of Potential Per-Trip VMT Impacts. Table 4-15 summarizes the estimated per-trip VMT changes within the study area on I-5 and SR 99. The data are "grayed out" for logistically challenged combinations (such as serving IKEA in Lebec via Oakland or backtracking from Fresno to Bakersfield on a movement from LA/LB). **Table 4-15** suggests that the best potential corridor VMT reductions would come from mid-SJV points such as Madera, Visalia, or Porterville.

Table 4-15 Summary of Per-Trip VMT Changes

Net SJV I5/SR99 Corridor Truck VMT Change per Trip, Highway vs. Rail Intermodal

Importer or Exporter	Crate & Barrel	Home Depot	Toys R Us	Restoration Hardware	E& J Gallo	Constellation Wines	VF Outdoor Distribution	Walmart	Target	Men's Warehouse	IKEA
City	Tracy	Lathrop	Stockton	Patterson	Modesto	Madera	Visalia	Porterville	Shafter	Bakersfield	Lebec
Intermodal Port & Terminal											
Oakland-Lathrop	8	-1	-7	20	1	36	36	35	20	21	20
Oakland-Fresno	116	108	108	73	78	-27	-80	-81	-96	-92	-97
Oakland-Shafter	179	180	180	143	171	65	-53	-133	-188	-190	-194
LALB-Lathrop	-244	-255	-261	-197	-202	-83	35	75	161	184	233
LALB-Fresno	-136	-146	-146	-144	-125	-146	-81	-41	45	71	116
LALB-Shafter	-73	-74	-74	-74	-32	-54	-54	-93	-47	-27	19

A more complete picture of potential VMT impacts will be analyzed as Part of Task 4. This will include an analysis of the overall anticipated VMT reduction between the port of entry and the logistics facilities in the Valley.

4.2.7 Truck Only Toll Lane

Definition

For the purposes of this analysis, the Truck Only Toll Lanes (TOT) definition includes a separated facility restricted to heavy duty trucks only that allows heavy weight and/or longer vehicles than currently allowed under the California Vehicle Code and federal regulations. Furthermore, the TOT concept includes reduced toll rates for zero and near-zero emission trucks. Zero emission trucks would not be required to pay a toll while near-zero emission trucks would pay a reduced toll. Since this pilot encourages near-zero and zero emission trucks, proper fueling infrastructure is needed along the routes. The weight of the trucks would be able to exceed the 80,000 pounds (current maximum) and exceed the maximum length of 75 feet.

Purpose

The purpose is to minimize conflicts between truck and automobile traffic, improve freight efficiencies by moving more goods with less equipment and labor, encourage emissions reductions, and raise revenue for maintaining the new facility.

Current Locations

There are not many truck only lanes in the United States and there are no truck only toll lanes (TOT) in operation. There are two truck only lanes (non-tolled) near and in the study area, including one in the north and south bound direction of I-5 in Los Angeles County at the SR 14 split and another on southbound I-5 in Kern County at the SR 99 junction near the Grapevine, respectively. [26]

Literature Review

In 2001, Southern California Association of Governments (SCAG) completed a study on truck only toll lanes for SR 60 and found that tolls would only be able to pay for 30 percent of the project costs. CALTRANS investigated truck only toll lanes on I-15 in 2005, and came to a similar conclusion. Caltrans continues to study the implementation of dedicated truck-only toll lanes on I-710 between the Ports of LA/LB and SR 60. A revised EIR/EIS for the project is expected to be recirculated in 2017. One of the alternatives under consideration for the I-710 Corridor includes a four-lane separated, limited access, zero-emission, truck-only toll lane. SCAG included this concept in its 2035 Regional Transportation Plan, along with an east-west connection that would move trucks on a dedicated system throughout the heavily populated Los Angeles region.

University of Virginia looked into truck only toll lanes for I-81, and they concluded that it would produce a positive net present value. This means that the money earned from tolls would be able to not only cover the cost of the project, but also generate profit. Their concept assumed a private-public partnership. However, the trucking industry disagreed with the assumptions that the time savings would be worth the cost so the project has not moved forward.

Georgia DOT explored the potential of implementing truck only toll lanes on I-75, but they concluded that the benefits associated with an HOV lane would outweigh the benefits of a TOT lane. [27] However, the Georgia Institute of Technology studied the potential implementation of TOT lanes in the Atlanta

[26] Caltrans web page, Truck Only Lanes, http://www.dot.ca.gov/trafficops/trucks/truck-only-lanes.html

[27] Florida DOT, District 7, *Planning for Special Treatment of Trucks in Traffic*, January 2015. http://tampabayfreight.com/wp-content/uploads/FreightWhitePaper_PlanningforSpecialTreatmentofTrucks.pdf

region in Georgia and concluded significant benefits of TOT lanes over other transportation strategies. [28]

Oregon looked at truck only toll lanes in 2009 and concluded that the major disadvantage would be that trucks would not be willing to pay said toll during off peak period since they would not be gaining any benefit of time savings. [29]

A multi state study was conducted among Montana, Illinois, Indiana, and Ohio of implementing truck only tolls along I-70 in 2011. However the study and plausibility came to a halt in 2013 due to funding and other priorities the states had.

Nashville MPO did a Preliminary Managed Lanes Feasibility Assessment where they took a glimpse at potential truck only toll lanes, but made no further investigation into a detailed study or implementation. [30]

Tampa Bay took a look at truck only toll lanes in their *Planning for Special Treatment of Trucks in Traffic* Study (2015).

Criteria

In the 2001, Southern California Association of Governments (SCAG) published a feasibility report for the potential implementation of truck only lanes. The report outlines criteria of highways that they found, through literature review, would provide a plausible environment in the application of a truck only lane. It should be noted that these conditions are considered for non-tolled truck only lanes.

- More than 30 percent of vehicle need to be trucks
- Volume greater than 1,800 vehicles per lane-hour during peak hours
- Volume greater than 1,800 vehicles per lane-hour during off-peak hours[31]

It is already noted that the SR 99 has some of the highest truck volumes in the state, ranging from 10 percent to 30 percent, with the state average at 9 percent. [32] In addition to these thresholds, the numbers instead of percentages of trucks should also be considered in urban areas.

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[28] Meyer, Michael D., P.E., *Feasibility of Truck Only Toll Lane Network: The Case of Atlanta, Georgia.* (Date unknown, but approximately 2005). http://ibtta.org/sites/default/files/GT%20report%20on%20TOTLs%20in%20Atlanta%20Metro.pdf

[29] Florida DOT, District 7, *Planning for Special Treatment of Trucks in Traffic*, January 2015. http://tampabayfreight.com/wp-content/uploads/FreightWhitePaper_PlanningforSpecialTreatmentofTrucks.pdf

[30] Parsons Brinckerhoff, Nashville Area MPO, *Managed Lanes Preliminary Feasibility Assessment, February 2015.* http://www.nashvillempo.org/docs/Managed_Lanes-2015.pdf

[31] http://www.dot.ca.gov/traffops/trucks/truck-only-lanes.htm

[32] Caltrans, *Updated Business Plan for SR-99, Vol I-III*, 2013.

Anticipated Benefits

The benefits as stated in the I-710 analysis include safety, reliability and congestion improvements, as well as reductions in emissions and the impacts of emissions. In addition, separate truck only lanes would improve driver comfort, reduce conflicts between trucks and cars, and could moderate travel speeds. The industry benefits would depend upon access to/from the TOT lanes and the time savings – would the savings result in an additional "turn"?

Separation of Trucks and Passenger Vehicles

The separation of heavy vehicles and passenger vehicles decreases risks of crashes for a few reasons, including different travel speeds, vertical sight distance, and braking distance. About 12 percent of passenger vehicle fatalities involve trucks, and the cause of most truck/auto collisions is due to an error made by the automobile driver. Drivers of automobiles often fail to understand the visibility and braking constraints that truck drivers face. The speeds would also increase since large trucks take up more space – removing them would increase the flow

The trucking company benefits as well from the reduced accident rates of a truck only lane. In order to deliver on time, trucking companies consider reliability of corridors based on crash rates to ensure that they build enough travel time into their trip planning. Reducing the severity of incidents, as well as overall incident rates would benefit shippers by improving fleet efficiency, which in turn, could reduce the costs of goods. Furthermore, TOT lanes offer opportunities for smoother speeds and truck platooning – both of which improve fuel efficiency and save time. By eliminating automobile disturbances, such as vehicles merging/diverging at interchanges, trucks would brake less and change lanes less frequently. Just an addition of an extra lane alone will increase capacity, thus relieving congestion and lowering travel times. [33]

When there is a truck only lane, platooning can be implemented. Platooning reduces the distance between trucks, with the aid of wireless communication technology, in order to reduce wind resistance and increase capacity of a lane. [34]

The reduction in accidents, extra capacity, and overall increase in homogenous vehicle types will improve the flow while relieving congestion, this decreases travel times for both passenger and commercial vehicles. Since the SJV is a major agriculture hub and has many distribution centers, it relies heavily on punctual deliveries. Especially for the agriculture industry, the faster the perishable

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[33] Forkenbrock, David J. and Jim March, Public Roads Issue No. Vol. 69 No. 2, Publication No. FHWA-HRT-05-007, *Issues in The Financing of Truck-Only Lanes,* September/October 2005. https://www.fhwa.dot.gov/publications/publicroads/05sep/02.cfm

[34] Kahaner, Larry, Fleetowner, *Platooning si closer than you think – just like the trucks,* May 29, 2015. http://fleetowner.com/driver-management-resource-center/platooning-closer-you-think-just-trucks

goods reach their destination, the better.[35] The reduction in congestion will also reduce the adverse environmental effects. [36]

Truck Tolling Information and Communication Technology

The current national framework for the connected vehicle (CV) environment envisions the use of dedicated short range communication (DSRC), cellular (e.g., 3G, 4G, LTE), or potentially other types of radio communication between vehicles themselves and the surrounding infrastructure. While some of the anticipated applications for CV-instrumented corridors could conceivably utilize non-DSRC communication to realize functionality, DSRC is the only option that would have specific impacts to the infrastructure.

Roadside DSRC has been established by the USDOT as a specifically allocated set of channels and frequencies for use in the anticipated CV world. It is also central to a continuing series of field evaluations and pilots being done by the USDOT. Recent estimates indicate that 20 percent of vehicles will be equipped with some form of CV technology by the year 2025. While other technologies could be implemented to achieve interconnectivity between vehicles, those that are included in the current USDOT-sponsored CV program for accomplishing nationally coordinated standards through non-proprietary (open) solutions.

For freeway and highway driving, on-board communications equipment would be integrated with application equipment and processors that would implement several envisioned application packages. Much of the enabling technology for the autonomous functions will reside in the vehicles themselves and will include, ultimately, a wide variety of Original Equipment Manufacturer on-board vehicle systems. This on-board equipment and technology will communicate with operation centers and remote application servers. The enabling architecture is expected to utilize cellular and DSRC communication.

Some or all of the proposed CV applications will require continuous DSRC coverage over the lengths of the most heavily used freeways and highways in the region (e.g., I-5 and SR 99). To enable this coverage, DSRC roadside installation sites would need to be implemented at regular intervals. Installation may also need to occur on connecting arterials to provide the degree of coverage necessary for some CV applications.

DSRC is capable of communicating with minimal latency over relatively short distances to ensure timely communication with vehicles. A dedicated DSRC installation would include (at minimum) a DSRC radio, pole, and cabinet. Alternative mounting options include existing light poles, catenary support structures, or signal pole standards. Existing ITS control cabinets can be used to house the DSRC equipment as well. The following list summarizes the typical DSRC field components (supporting systems, such as remote monitoring servers, are not included below):

- DSRC radio

[35] Kings County Regional Transportation Plan and Sustainable Communities Strategies (2014)

[36] https://opendot.ideascale.com/a/dtd/Raise-interstate-highway-gross-vehicle-weight-limits/31750-7039

- DSRC poles and mounting structures
- DSRC cabinet and equipment
- Communications, power conduit, and cabling
- Splice vaults and pull boxes

Roadway Pricing Applications for Freight

There are two types of tolls: fixed and variable tolls. The fixed tolls are predetermined based on the distance covered, axle amount, and/or weight per axle of the vehicle, and do not change during the day. The variable tolls are dependent on features, but also change throughout the day either in response to current conditions or according to a predetermined schedule (i.e., by time of day).[37]

California currently has toll lanes that charge fees based on the number of axles, but none of these corridors charge tolls that are dependent on the weight per axle of the vehicle. Charging by weight would be an ideal method for mitigating the damage caused by heavy trucks traveling on I-5 and SR 99. **Table 4-16** lists the states and facilities with toll rates based on per-axle weights.[38]

[37] http://mobility.tamu.edu/mip/strategies-pdfs/travel-options/technical-summary/variable-pricing-4-pg.pdf

[38] FHWA, https://www.fhwa.dot.gov/policyinformation/tollpage/

Table 4-16 Interstate System Toll Roads in the United States (weight per axle tolling)

State	Facility Name
Delaware	John F. Kennedy Memorial Highway (Delaware Turnpike)
Florida	Alligator Alley (Everglades Parkway)
Indiana	Indiana East-West Toll Road
Kansas	Kansas Turnpike
Maine	Maine Turnpike
New Hampshire	F.E. Everett Turnpike
New Hampshire	Spaulding Turnpike
New Hampshire	Blue Star Turnpikes
New York	Gov. Thomas E. Dewey Thruway (Main Line)
New York	Berkshire Section
New York	New England Section
Ohio	Ohio Turnpike
Oklahoma	Turner Turnpike
Oklahoma	Will Rogers Turnpike
Oklahoma	H.E. Bailey Turnpike
South Carolina	Southern Connector

While tolling can be used to fund road maintenance and generate revenue, it also acts as a travel demand management strategy and therefore may reduce emissions. Discounted toll rates for low-emissions vehicles would encourage greater investment in low-emissions vehicles and technologies by operators and fleet managers.[39]

The elasticities of toll-paying behavior are different for freight vehicles than passenger cars. According to a project study jointly sponsored by the National Cooperative Freight Research Program and National Cooperative Highway Research Program, only a small proportion of freight drivers are open to the idea of roadway tolling. As explained in the report:

> *"In completing the surveys, truck drivers stated an extremely low willingness to pay even a token toll for different time savings scenarios. The research found that because respondents*

[39] Interviews for the MTC Freight Emissions Study

had such overwhelmingly negative attitudes about toll roads, they were not able to ascribe a true value to the benefits that toll roads provide."[40]

In general, drivers that were willing to accept tolls were also ones that had experience with tolled facilities in the past and were more familiar with the benefits of such roadway pricing (e.g., travel time savings).

For I-5 in the Central Valley, the most significant challenges to TOT lanes include little if any time savings of such a facility and an alternative parallel route provided by SR 99. Use of TOT lanes would require an incentive to the trucking industry, such as exceedance of the State's truck size and weight limits.

Truck Size and Weight (Increase Size and/or Weight Limitation)

Having a higher weight or length limitation in the truck only toll lane would most directly benefit shippers, but the operating cost savings could also benefit consumers. However, increasing the size and weight limitations could impact safety – either positively or negatively. Arguments in favor of increasing the limits site the fact that fewer trucks would need to travel on the road, thus reducing safety risks. They further argue that the limitations passed in 1982 do not reflect safer equipment and technology on trucks today, such as anti-lock brakes and stringent driver training requirements. Opponents argue that heavier trucks require a longer braking distance, and that crashes involving heavier trucks tend to result in more severe injuries or death. Supporting the proponents, a study recently completed in the UK shows the results of truck safety since the increase in size and weight limits in 2001.

THE STUDY FOUND THAT TRUCK-RELATED CRASHES FELL, AND FATALITIES RELATED TO TRUCK-INVOLVED CRASHES DECREASED BY 35 PERCENT.[1] DEBATES CONTINUE ON THIS TOPIC AT THE FEDERAL LEVEL.

There is currently a shortage of trained truck drivers in the industry. However, this can be alleviated if there is a decrease in the amount of trucks that need driving, which will come about by increasing the weight limit in order to consolidate the same amount of goods needing transport into fewer trucks.[41]

In speaking with trucking industry representatives as part of this study, exceedance of the size (length of trucks) would provide significant benefits as many of the goods that they carry cube out before they weight out. The trucking companies support allowance of longer double trailers, such as two 48-foot trailers. This increase in goods moved by one truck instead of two trucks would improve

[40] http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_w003.pdf

[41] http://www.joc.com/special-topics/driver-shortage

efficiency of the trips by reducing shipping costs (labor, fuel and equipment cost savings). [42] Reducing the number of trucks hauling the goods would also result in emissions reductions.

In addition to longer truck lengths, higher truck weight limits would benefit the agricultural exports moving out of the Valley, including dairy, wine, and nuts. For example, Tulare County is known for its copious amounts of milk exported daily. Those trucks that export the milk also tend to be some of the heaviest, easily hitting the 80,000-pound current limit. Therefore the economies that rely on milk production will be directly influenced, and benefit, from an increased maximum capacity on truck only toll lanes. Tulare also suffers some of the worst air quality due to its basin topography, thus the County as a whole would benefit from the encouragement of greener technologies and the decrease in congestion and trucks passing through due to increase weight limits (increased efficiency). [43]

Greener Technology Incentive

Benefits arise when tolls are implemented, reduced for near-zero emission trucks and non-existent for zero emission trucks. This will mitigate the current environment impacts of current truck technology. This boost of receiving the benefits of the truck only toll lane with increased weight limits will hopefully outweigh the cost of implementing zero emission technology that will exclude the trucks from paying the toll.

Tulare county suffers some of the worst air quality due tot it's basin topography, therefore the county as a whole will benefit from the encouragement of greener technologies and the decrease in congestion and trucks passing through due to increased weight limits (increased efficiency). [44]

[42] Kings County Regional Transportation Plan and Sustainable Communities Strategies (2014)

[43] Tulare County Association of Governments Regional Transportation Plan, Goods Movement Chapter (2014)

[44] Tulare County Association of Governments Regional Transportation Plan, Goods Movement Chapter (2014)

5.0 Identification of I-5/ SR 99 Connectors

Section 4 compiled the lists of planned projects and applied them to the list of critical locations. All locations will be addressed by the planned improvements. In addition to investigating how these planned improvements will impact future traffic congestion and safety concerns, this section discusses improvements to connectors between I-5 and SR 99. Task 4 memorandum will investigate the benefits that significant improvements to these connectors could provide for SR 99.

5.1 Methodology for Analyzing Potential I-5/ SR 99 Connector Improvements

In order to identify the corridors with the most potential for shifting truck traffic from I-5 to SR 99, a commodities analysis was conducted for the region using FAF data. The table below provides the sum of all commodities shipped between the six Freight Analysis Framework (FAF) regions in California by truck and rail. Trucking contributes to 98.4 percent of total commodity flow. Understanding the commodity flows between FAF regions, along with the locations of major freight generators in each region and GPS data of existing truck origin-destination distribution provides the framework for investigation.

Figure 5-1 Volume of Commodities Transported between FAF Regions by Truck and Rail (1,000 tons per year)

Region: From /To	Fresno	Los Angeles	Sacramento	San Diego	San Francisco	Rest of California	Grand Total
Fresno	20,527	1,426	383	136	3,222	10,657	36,350
Los Angeles	2,656	318,945	2,321	12,674	8,581	10,387	355,563
Sacramento	1,140	1,000	34,480	180	8,825	7,176	52,802
San Diego	167	3,693	170	33,787	1,353	584	39,754
San Francisco	2,638	7,525	8,351	1,335	134,618	16,497	170,964
Rest of California	13,590	16,214	6,936	1,216	13,236	112,250	163,443
Grand Total	40,718	348,804	52,640	49,328	169,835	157,551	818,876

Figure 5-2 FAF 4 Regions (2012)

Trucks that carry commodities make up the majority of trucks on state highways. However, empty trucks and non-freight trucks (moving trucks, utility trucks, landscaping, public agency trucks, tow trucks, construction trucks) are also significant, especially near urban areas. According to National surveys, freight truck traffic consists of 30 percent empty truck moves.

Due to the urban centers located along SR 99 and the rural nature of much of I-5 in the Valley, I-5 has more capacity to provide safe and efficient freight moves as compared to SR-99. In order to reduce congestion and encourage regional truck traffic to travel on I-5 in lieu of SR 99, some of the East/ West corridors between I-5 and SR 99 should be considered for improvements.

Based on truck GPS origin/destination data, as well as existing truck traffic and the RTP future growth and network development projects, the following connectors have been identified as candidates for further analysis in the next task.

- SR 58 (future freeway alignment)
- SR 198
- SR 132
- SR 140
- SR 165
- SR 41

SR 43/Lerdo West Beltway

In the next task, the following analysis will be applied to these connectors. The outcomes and recommendations will be based on the feasibility of improvements and the ability of the improved corridors to attain minimum benefits. The proposed criteria for this analysis includes:

- Travel time between different regions via different routes,
- Other amenities such as trucks stops and fuel stations, and
- Volume of commodity flow between each origin-destination pair.

6.0 Feasibility Development of I-5/SR-99 Strategic Freight Programs

Table 6-1 shows goods movement related strategic goals and objectives for the SJV region based on various state and regional transportation planning documents. Appendix A contains the excerpts of vision statements, goals, objectives, policies, and action plans related to goods movement that are part of these planning documents. Based on these, strategic programs are also identified in this table.

Table 6-1 Strategic Goals, Objectives, I-5/SR-99 Strategic Programs

Strategic Goal	Strategic Goal Definition	Strategic Objectives	Strategic Programs for I-5 and SR 99 commercial vehicle corridors
Improve Economic Competitiveness	Improve the contribution of freight transportation system to economic efficiency, productivity, and competitiveness.	• Vitalize/Revitalize commercial vehicle corridors. • Increase transportation choices for freight uses. • Improve access to key economic centers. • Reduce the cost of exporting products from the region, thereby increasing demand for those products and related processing/manufacturing jobs.	• All Strategic Programs under Other Strategic Goals • Overweight/oversize policy to allow heavier/longer trucks on I-5 in both directions between San Joaquin County boundary to Kern County boundary (exact boundaries of this project can be identified during future project development
Preserve Infrastructure	Improve state of good repair of freight transportation system.	• Conduct preventive maintenance and rehabilitation on freight transportation system. • Maximize utilization of available supply for freight uses. • Manage freight demand within existing supply. • Preserve land for future freight uses.	• I-5/SR 99 Roadways Pavement and Bridge Maintenance
Improve Mobility and Travel Time Reliability	Reduce freight transportation system user costs and maintain acceptable levels of service.	• Integrate multiple modes for freight uses. • Minimize congestion and increase operational efficiency for freight uses. • Increase network redundancy for freight uses.	• Truck only Toll Lanes on I-5 between I-5 and I-205 junction in San Joaquin County and I-5 and SR 99 junction in Kern County • I-5/SR 99 Capital Projects for Bottlenecks Congestion Relief • I-5/SR 99 Operational Projects for Bottlenecks Congestion Relief • I-5 to SR-99 Connector Capital and Operational Projects for Improved Accessibility • I-5/SR 99 Interchanges Reconfiguration Program for Key Freight Access Interchanges with Inadequate Design

Strategic Goal	Strategic Goal Definition	Strategic Objectives	Strategic Programs for I-5 and SR 99 commercial vehicle corridors
Improve Safety and Security	Reduce freight transportation system user losses and maintain the lowest level of threat to security.	• Minimize crashes and damages for freight uses. • Improve operations on freight transportation system. • Improve incident management and network resiliency on freight transportation system. • Stay informed about the current level of threat to security on freight transportation system.	• I-5/SR 99 Capital Projects for Safety Hotspots Alleviation • I-5/SR 99 Operational Projects for Safety Hotspots Alleviation
Improve Environment	Improve quality of life for humans and the natural environment impacted by freight uses.	• Stay informed about the current commercial vehicle environmental laws and regulations and improve their enforcement. • Conserve energy and natural resources for freight uses. • Minimize commercial vehicle emissions. • Improve development and implementation of mitigation measures for freight investments. • Improving environmental justice for freight investments.	• Container depot service near Stockton for Port of Oakland and Shafter for Ports of Long Beach/Los Angeles • Short-haul rail service between SJV region and Port of Oakland • Short-haul rail service between SJV region and Ports of Long Beach/Los Angeles
Use Innovative Technology and Practices	Research, test and implement innovative technologies and practices to operate, maintain, and optimize the efficiency of the freight transportation system.	• Develop commercial vehicle alternate fuel technology and fueling infrastructure. • Develop new commercial vehicle to commercial vehicle communications technology applications. • Develop new commercial vehicle operator information systems. • Develop institutional arrangements and business relationships to optimize freight transportation system usage and costs.	• Caltrans' Truck Parking Information System Demonstration on I-5 • This Study for Truck Platooning Demonstration on I-5 • Future Studies and Demonstrations by Public Agencies

Cambridge Systematics, Inc.
6-3

Strategic Goal	Strategic Goal Definition	Strategic Objectives	Strategic Programs for I-5 and SR 99 commercial vehicle corridors
Plan and Collaborate to Fund Investments	Prioritize key freight transportation system investments and reduce public funding gaps through planning and collaboration with private sector.	• Develop freight projects list, timeline for implementation and public funding gap information. • Conduct studies to evaluate benefits of key freight transportation system investments. • Coordinate with other public agencies and private sector for freight project or service development and associated land use planning.	• This Study for Freight Projects List • This Study for Identified Funding Opportunities (will be included in Task 4) • This Study for Quantitative Evaluation of key Strategic Programs (will be included in Task 4) • Future Plans, Studies and Coordination Activities by Public Agencies

Source: (a) CalSTA and Caltrans, 2014 California Freight Mobility Plan[45]; (b) Fresno Council of Governments (COG) 2014 Regional Transportation Plan (RTP)[46]; (c) Kern Council of Governments (COG) 2014 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS)[47]; (d) Kings County Association of Governments (CAG) 2014 Regional Transportation Improvement Program (RTIP)[48], (e) Madera County Transportation Commission 2014 RTP/SCS[49], (f) Merced County Association of Governments 2014 RTP/SCS[50], (g) San Joaquin Council of Governments (COG) 2014 RTP/SCS[51]; (h) Stanislaus Council of Governments (COG) 2014 RTP/SCS[52]; and (i) Tulare County Association of Governments 2014 RTP/SCS[53]

[45] http://www.dot.ca.gov/hq/tpp/offices/ogm/ CFMP/Web/Display_VisionGoalsObj_ARCH_E_36x48.pdf#zoom=85 (last accessed on May 11, 2016)

[46] http://www.fresnocog.org/sites/default/files/publications/RTP/Final_RTP/2014_RTP_Chapter_Six_Final.pdf (last accessed on May 11, 2016)

[47] http://www.kerncog.org/images/docs/rtp/2014_RTP.pdf (last accessed on May 11, 2016)

[48] http://www.kingscog.org/vertical/sites/%7BC427AE30-9936-4733-B9D4-140709AD3BBF%7D/uploads/Chap_3_-_Policy_Element_-_2014_Final_RTP.pdf (last accessed on May 11, 2016)

[49] http://www.maderactc.org/wp-content/uploads/2014/07/MCTC-2014-Final-RTP-SCS.pdf (last accessed on May 11, 2016)

[50] http://www.mcagov.org/DocumentCenter/View/314 (last accessed on May 11, 2016)

[51] http://www.sjcog.org/DocumentCenter/View/484 (last accessed on May 11, 2016)

[52] http://www.stancog.org/pdf/rtp/chapter-6-transportation-plan-and-policies.pdf (last accessed on May 11, 2016)

[53] http://www.tularecog.org/wp-content/uploads/2015/06/Final-2014-Regional-Transportation-Plan-Sustainable-Communities-Strategy-FULL-DOCUMENT.pdf (last accessed on May 11, 2016)

6.1 Factors for Feasibility Assessment

A qualitative assessment of the feasibility of strategic programs was conducted in this memorandum using the following measures:

- Capital cost per project element – High (greater than $250 million), Medium ($50 million to $250 million), Low (less than $50 million)
- Potential Percent of Truck VMT Reduced – High (greater than 5 percent, say), Low (less than 5 percent, say)
- Funding situation – Fully funded, Partially funded, Unfunded

Other qualitative considerations such as operational, technological and institutional barriers associated with the identified strategic programs are discussed earlier in Sections 4.1 and 4.2 of this memorandum.

More detailed evaluation will be conducted for a few of the strategic programs in the Task 4 memorandum of this Study, including: (1) truck only toll corridor on I-5 with and without increased weight limit; (2) I-5 with and without truck platooning; (3) I-5 with varying levels of market penetration of zero emission and near-zero emission commercial vehicles; and (4) east/west connectors between I-5 and SR 99 improvements program.

Potential performance measures for these detailed evaluations are categorized and listed as follows:

1. Facility Owner/Commercial Vehicle Operator related: (a) Capital costs per year; (b) Routine maintenance costs per year; (c) Cost of installation and maintenance of roadside technology; (d) User fee based revenue per year; (e) Cost of installation and maintenance of new vehicle and on-board technology; (f) VMT avoided and related vehicle operating cost savings per year; and (g) Other shipper cost savings per year.

2. Community impacts related: (a) VHT reduction potential; (b) Crash reduction potential; (c) Air emissions impacts avoided.

3. Funding related: (a) Anticipated or Adjusted timeline for implementation of projects and programs; (b) Suitability to new types of federal, state and local funding; (c) Suitability to public-private partnership.

6.2 Feasibility Results

Table 6-2 presents results of a qualitative assessment of feasibility of strategic programs for I-5 and SR 99 commercial vehicle corridors.

Table 6-2 Qualitative Assessment of Feasibility for I-5/SR 99 Strategic Programs

Strategic Program for I-5 and SR 99 commercial vehicle corridors	Capital Cost per Project Element	Percent Truck VMT Reduced	Public Funding Situation	Comments on Feasibility
I-5/SR 99 Roadways Pavement and Bridge Maintenance	Mostly Low, Sometimes Medium	Not Applicable	Mostly Funded	This program already exists. Maintenance of long and old bridges would be resource intensive.
Overweight/oversize policy to allow heavier/longer trucks on I-5 in both directions between San Joaquin County boundary to Kern County boundary (exact boundaries of this project can be identified during future project development)	Unknown (could require reinforcement of bridges and pavement and would likely result in additional maintenance costs)	High	Not Applicable	The economic advantages to freight transportation system users, and possible extension to Oregon along I-5 in the north and possible extension to Nevada along SR-58/I-15 in the east needs to be further evaluated. The institutional barriers to implementing this program would be difficult to cross. There are also operational challenges to freight transitioning from the policy implemented portion of I-5 to other parts of the freight transportation system.
Truck only Toll Lanes on I-5	High	Not Applicable	Unfunded	This program would have substantial mobility, safety and air emission reduction benefits to freight transportation system users, especially if planned in conjunction with OS/OW, truck platooning and clean truck technology
Truck climbing lanes at steep locations such as Altamont Pass, Pacheco Pass and Tehachapi Passes (Grapevine area and SR-58 Eastbound)	Medium	Not Applicable	Unfunded	This program would have substantial mobility and safety benefits to freight transportation system users. They would also strengthen interregional connectivity.
I-5/SR 99 Capital Projects for Bottlenecks Congestion Relief	Mostly Medium	Not Applicable	Partially Funded	This program would have substantial mobility and travel time reliability benefits to freight system users, and

				projects under this program are already planned. Site constraints could reduce the anticipated benefits.
I-5/SR 99 Operational Projects for Bottlenecks Congestion Relief	Mostly Low	Not Applicable	Partially Funded	This program would have local mobility benefits to freight system users, and projects under this program are already planned.
I-5 to SR-99 Connector Capital and Operational Projects for Improved Accessibility	Mostly Medium	Unknown	Partially Funded	This program would have substantial mobility and travel time reliability benefits to freight system users, and projects under this program are already planned. Site constraints could reduce the anticipated benefits. Improvements to a few east/west connectors between I-5 and SR 99 needs to be further evaluated.
I-5/SR 99 Interchanges Reconfiguration Program for Key Freight Access Interchanges with Inadequate Design	Mostly High, Sometimes Medium	Not Applicable	Partially Funded	This program would have local but substantial mobility and safety benefits to freight system users, and projects under this program are already planned. Site constraints could reduce the anticipated benefits.
I-5/SR 99 Capital Projects for Safety Hotspots Alleviation	Mostly Medium	Not Applicable	Partially Funded	This program would have substantial safety and travel time reliability benefits to freight system users, and projects under this program are already planned. Site constraints could reduce the anticipated benefits.
I-5/SR 99 Operational Projects for Safety Hotspots Alleviation	Mostly Low	Not Applicable	Partially Funded	This program would have local safety benefits to freight system users, and projects under this program are already planned.
Container depot service near Stockton for Port of Oakland and in Shafter for	Unknown	Low	Privately funded	This program would improve access to freight equipment mainly for port users. Port truck trips represent a small

Ports of Long Beach/Los Angeles				percentage of overall truck moves in the Valley. The economic advantages to freight transportation system users needs to be further evaluated.
Short-haul rail service between SJV region and Port of Oakland	High (if new rail intermodal facility is built), otherwise Low (mostly relating to Rolling Stock for Rail Shuttle)	High for mid-SJV locations, Low otherwise	Unfunded	This program would increase mode choice mainly for port users and create new economic development opportunities. This would also require an agreement with the railroad operator to provide a short-haul rail service, and a competitive pricing.
Short-haul rail service between SJV region and Ports of Long Beach/Los Angeles	Medium	Low-Medium	Not Applicable	This program would increase mode choice mainly for port users and create new economic development opportunities. This would require the cargo owners, a stevedoring company, vessel operator or other entity contracting with a railroad operator in order to implement short-haul rail service. If implemented by a public agency, such an operation would likely require subsidies in order to attract users.
Caltrans' Truck Parking Information System on I-5	Medium	Not Applicable	Partially Funded	This program would increase utilization of existing parking supply. The economic advantages of truck parking information system needs to be further evaluated.
This Study for Truck Platooning Demonstration on I-5	Medium	Not Applicable	Not Applicable	This program would increase tion of highway capacity. The economic advantages of truck platooning needs to be further evaluated.

7.0 Conclusions and Next Steps

7.1 Conclusions

- County level analysis of truck volume and peak period travel speed data on I-5 and SR 99 showed critical mobility and reliability issues on segments and critical freight access interchanges. Stakeholders also identified a few locations that face unexpected slowdowns and moving queues.

- County level analysis of truck involved crash severity data on I-5 and SR 99 showed critical safety and reliability issues on segments and critical freight access interchanges. Stakeholders identified a few locations that have inadequate or antiquated interchange design (low radius of curvature, poor sight distance, etc.) which lead to crash potential situations involving trucks.

- SJV region level locations of freight clusters and their facilities, truck parking, gas and CNG fueling stations were developed

- County level analysis of employment growth pattern for land use zones and San Joaquin Valley Freight Model based truck trip growth were simultaneously indicated the high potential freight growth land use zones and counties. This would support identification of projects for last mile freight access as well as improvements to I-5 and SR 99 to handle future travel demand.

- Weigh-in-motion stations on I-5 and SR 99 were found to have two main issues: queuing and avoidance.

- The most recent statewide, regional and local transportation plans were used to compile a master list of goods movement related projects and programs on I-5 and SR 99 corridors in the San Joaquin Valley region. These included projects on I-5 and SR 99, key connectors between the two corridors and key ingress/egress routes of the region that connect to San Francisco Bay Area and Southern California. The total project cost, project status and likely timeline for implementation were updated in consultation with Caltrans and regional metropolitan planning organizations. The planned projects are expected to address issues in all critical locations.

- Literature review of several programmatic project concepts, including ITS solutions for truck parking, truck platooning testing, zero- and near-zero emissions truck technology and truck only toll lanes helped understand their benefits and challenges.

- The literature review on ITS solutions for truck parking showed options for real-time parking detection technologies, compared their physical and operational capabilities, and summarized past tested public-private-partnership opportunities for truck parking. The relationships between hours of service limits and illegal truck parking and between crash rate involving large trucks and truck parking shortfalls are explained in this memorandum.

- The literature review on truck platooning and connected truck technologies explained the truck platooning concept and explained participants, configuration of truck platooning, corridor, equipment used, objectives of demonstration, design and results for nine completed tests around the world were summarized. These included: (1) Texas truck platooning test program, (2) FHWA partial automation for truck platooning (California), (3) FHWA partial automation for truck platooning (Alabama), (4) Nevada truck platooning tests, (5) Safe Road Train for the Environment (SARTRE), aerodynamic tests, (6) Safe Road Train for the Environment (SARTRE), CACC and ACC tests, (7) Safe Road Train for the Environment (SARTRE), V2V communications tests, (8) Japanese energy ITS project, and (9) CHAUFFEUR project in Europe.

- The literature review on zero- and near-zero emissions truck technology and more broadly applicable strategies including AERIS (EcoDriving) and Freight Advanced Traveler Information System (FRATIS) are explained in this memorandum. The technology readiness levels and operations of different technologies are described in this memorandum.
- A programmatic project concept of mode shifting from truck to potential short-haul rail service was assessed using a review of past studies and initiatives, an analysis of rail intermodal facility location options for major California ports and estimation of VMT reduction on I-5 and SR 99 on a per trip basis for the various. The review found that distance and volume are key determinants for rail carriers to provide rail shuttle service and price the rail shuttle service; the price and convenience are key determinants for shippers to select rail shuttle service instead of truck drayage. Previous concepts including CIRIS between Port of Oakland and Stockton in San Joaquin County, and SLC concept between Ports of Long Beach/Los Angeles and Shafter in Kern County did not show a price advantage for a rail shuttle service over truck drayage; however, more recent unpublished analysis indicates that the rate gap between drayage and rail is closing. The mode shift would have varying VMT reduction impacts on I-5 and SR 99 depending on the location of rail intermodal facility, the best potential VMT reductions on I-5 and SR 99 in the study area would come from mid-SJV locations such as Madera, Visalia, or Porterville. However, substantial emissions reductions beyond the study area would also benefit the study area.
- Literature was reviewed on a programmatic project concept of truck only toll lanes. Additional features that are being considered for this project concept include no toll for zero and near zero emission trucks and increasing weight limitation beyond existing 80,000 lb limit. The review found that the pricing strategy is critical and there is a large opportunity cost for building truck only lanes that needs to be balanced by public benefits. Some criteria for considering truck lane as an alternative, implications of roadway pricing, and added benefits of increased weight limits and implementing zero and near-zero emission truck technology are also summarized in this memorandum. Truck only toll lanes on I-5 in both directions between I-5 and SR 99 junction in Kern County and I-5 and I-205 junction in San Joaquin County are being proposed in this memorandum.
- In addition to planned improvements, the memorandum also identified improvements to 7 candidate connections between I-5 and SR 99 and described the methodology that would be used for analyzing their benefits.
- The memorandum also identified strategic goals and objectives that are a common theme across statewide and regional transportation plans. The strategic goals were related to: (1)

economic competitiveness; (2) infrastructure preservation; (3) mobility and travel time reliability; (4) safety and security; (5) environment; (6) technology, and (7) funding. Based on these, projects and programmatic project concepts were bundled into strategic programs for I-5 and SR 99 corridors. These strategic programs were qualitatively assessed using three measures namely, capital cost per project element, potential to reduce truck VMT, and funding situation. Some comments on their feasibility are also provided.

7.2 Next Steps

- In the next task, economic advantages and public benefits of some of the strategic programs will be further evaluated using a quantitative approach.
- A demonstration for truck platooning on I-5 corridor will be conducted.
- Potential public and private funding opportunities for strategic programs will be identified.

Appendix A. Goods Movement Related Excerpts from Agency Plans

Different ways were used in the state and regional plans to develop goods movement related strategic investments. Generally, the plans used the following terms with definitions as follows:

- A *goal* is the end toward which an effort is directed; it is general in application and timeless.
- A *policy* is a direction statement that guides present and future decisions on specific actions.
- An *action* is a specific activity in support of the policy.
- An *objective* is a result to be achieved by a stated point in time, realistically attained considering probable funding and political constraints.
- A *performance measure* is a quantitative system-level indicator of how actions in the plan support the goals.

All of the terms or concepts mentioned above were not described for all plans. The Appendix presents the vision statement or overall goal of the plans and the concepts the plans used in identifying goods movement related strategic investments.

Vision Statement/Overall Goal of Plans

- Caltrans CFMP Vision: As the national gateway for international trade and domestic commerce, California enhances economic competitiveness by collaboratively developing and operating an integrated, multimodal freight transportation system that provides safe, sustainable freight mobility. This system facilitates the reliable and efficient movement of freight and people while ensuring a prosperous economy, social equity, and human and environmental health.
- Fresno COG RTP Vision: Fresno County will be composed of unique cities, communities and a diverse population in a connected high quality environment that accommodates anticipated population growth and is supported by: (1) A vibrant economy built on competitive strength, and world class education. (2) A healthy and sustainable environment where air, aquifers, surface waters, forests, soil, agriculture, open space and wildlife resources are enhanced and protected. (3) A focus on Cultural and Community Stewardship where all people enjoy fundamental rights as members of a free society, and where the community takes ownership of problems and their solutions.
- Fresno COG RTP Policy Element: Three themes are indicated: (1) Preservation of existing facilities and services, (2) Sound financial leveraging of existing funding, and (3) Connecting transportation needs with land use and air quality impacts.
- The Kern COG RTP/SCS seeks to: improve economic vitality; improve air quality; improve the health of communities; improve transportation and public safety; promote the conservation of natural resources and undeveloped land; increase access to community services; increase regional and local energy independence; and increase opportunities to help shape our community's future.

- The overall goal of Kings CAG RTIP is to develop a transportation system that encourages and promotes the safe and efficient development, management, and operation of surface transportation systems to serve the mobility needs of people and freight (including meeting the Americans with Disabilities Act requirements, accessible pedestrian walkways, and bicycle transportation facilities) and foster economic growth and development, while minimizing transportation-related fuel consumption and air pollution.

- The overall vision for the Madera CTC 2014 RTP/SCS is: A sound multimodal transportation system facilitating a vibrant economy, enhancing the physical and cultural environment, and ensuring a high quality of life for citizens in Madera County.

- The seven "vision themes" of the Merced CAG RTP/SCS are: (1) Provide a goods system of roads that are well maintained, safe, efficient and meet the transportation demands of people and freight; (2) Provide a transit system that is a viable choice; (3) Support full-time employment with living wages; (4) Preserve productive agricultural land/maintain strong agricultural economy and the quality of life that goes with it; (5) Support orderly and planned growth that enhances the integration and connectivity of various modes of transportation; (6) Support clean air and water and avoid, minimize or mitigate negative impacts to the environment; and (7) Identify and allocate funding and ensure that transportation investments are cost-effective.

- The San Joaquin COG RTP/SCS reflects a region-specific, balanced multimodal plan that not only achieves the intent and promise of SB 375, but can be implemented through existing and planned programs or policies. This Plan embodies local visions through local input on the perspectives of economic development, environmental preservation, air quality, public health, environmental justice, and farmland conversation/preservation. The Plan can be considered the San Joaquin region's "statement of priorities" for the future transportation system from 2012 through 2040.

- The Stanislaus COG RTP/SCS or "Plan" presents a strategy to accommodate the significant expected growth in the region while promoting economic vitality, providing more housing and transportation choices, promoting healthy living, and improving communities through an efficient and well-maintained transportation network.

- The overall goal of the Tulare CAG RTP/SCS is to provide an efficient, integrated multimodal transportation system for the movement of people and goods that enhances the physical, economic, and social environment in the Tulare County region.

For Caltrans CFMP, Fresno COG RTP, San Joaquin COG RTP/SCS and Stanislaus COG RTP/SCS Only:

- **Economic Competitiveness related goals and objectives**
  - Caltrans CFMP Goal - Improve the contribution of the California freight transportation system to support economic efficiency, productivity, and competitiveness.
    - Caltrans CFMP Objective 1 – Build on California's history of investments to seek sustainable and flexible funding solutions with federal, private, and advocacy groups.
    - Caltrans CFMP Objective 2 – Invest in freight projects that enhance economic activity, freight mobility, reliability, and global competitiveness.
  - Fresno COG RTP Goal 1: An efficient, safe, integrated, multimodal transportation system (repeated elsewhere in this document)

- Fresno COG RTP Objective 1: Develop an integrated multimodal transportation network that supports and enhances the region's economy and serves the needs of a growing and diverse population for transportation access to jobs, housing, recreation, commercial, and community services as well as goods movement. (repeated elsewhere in this document)

  - Relevant Policy 1: Integrate transportation modes through a coordinated transportation systems management process.

  - Relevant Policy 2: Work cooperatively with the private sector to ensure that the collected information accurately reflects existing and forecasted conditions that are of importance from a freight transportation perspective. (repeated elsewhere in this document)

  - Relevant Policy 3: Develop air transportation facilities and services that are complementary to other modes of transportation.

  - Relevant Policy 4: Decisions on improvements to the transportation system shall take into account the effective use of all modes and facilities.

- Fresno COG RTP Objective 2: Maintain and improve existing facilities as the basic system which will address existing and future travel demands. (repeated elsewhere in this document)

  - Relevant Policy: Manage the transportation system in a manner designed to increase operational efficiency, conserve energy and space, reduce air pollution and noise, and provide for effective goods movement, safety, personal mobility and accessibility. (repeated elsewhere in this document)

- Fresno COG RTP Goal 2: An integrated and efficient highways, streets and roads network. (repeated elsewhere in this document)

  - Fresno COG RTP Objective: Develop and implement an integrated highways, streets and roads network that meets mobility needs for both urban and rural residents and the movement of goods. (repeated elsewhere in this document)

    - Relevant Policy 1: Improve the urbanized area circulation system, including the future urban freeway network.

    - Relevant Policy 2: Promote development of a highways, streets and roads network that provides for connectivity of the metropolitan network with the system outside the metropolitan network.

    - Relevant Policy 3: Develop a convenient, safe and efficient interface between transportation modes. (repeated elsewhere in this document)

- Fresno COG RTP Goal 3: Acceptable level-of-service (LOS) for the highways, streets and roads network. (repeated elsewhere in this document)

  - Fresno COG RTP Objective: Maintenance of acceptable levels-of-service on the highways, streets and roads network that will allow for efficient movement of people and goods. (repeated elsewhere in this document)

- Relevant Policy 1: Enhance the development of a highways and streets network which will relieve current and future congestion. (repeated elsewhere in this document)

- Relevant Policy 2: Work cooperatively with the private sector to ensure that the mobility needs of the business community within Fresno County are addressed. (repeated elsewhere in this document)

- Relevant Policy 3: Manage the highways, streets and roads network in a manner designed to increase operational efficiency, reduce air pollution and provide adequate mobility for both people and goods. (repeated elsewhere in this document)

o San Joaquin COG RTP/SCS Policy: Support economic vitality. (repeated elsewhere in this document)

  ▪ Relevant Strategy 1: Improve freight access to key strategic economic centers.

    - Relevant building block for aligning the sustainability goals with transportation investment strategies: Invests in infrastructure that improves access to intermodal facilities, airports, the Port of Stockton, and commercial hubs key to goods movement.

  ▪ Relevant Strategy 2: Support transportation improvements that improve economic competitiveness and/or revitalization of commercial corridors and strategic economic centers.

o Stanislaus COG RTP/SCS Goal: Foster job creation in agricultural and non-agricultural sectors, and encourage business attraction, retention, and expansion by improving quality of life through new and revitalized communities. (economic and community vitality) (repeated elsewhere in this document)

  ▪ Stanislaus COG RTP/SCS Objective: Improve the movement of goods in the region by supporting the enhancement of goods by land (including rail) and air. (repeated elsewhere in this document)

    - Relevant Action 1: Provide guidance and assistance on any proposed project which will increase the use of rail to move goods.

    - Relevant Action 2: Adopt and integrate the regional expressway study into the RTP and local general plans.

    - Relevant Action 3: Identify high priority grade separation projects and capacity enhancements/operational strategies to improve travel times and increase safety.

    - Relevant Action 4: Work with the Modesto City-County Airport (MCCA) to develop opportunities to expand air transportation services, including corporate aviation and general aviation; also increase scheduled air carrier service between the MCCA and major airports.

    - Relevant Action 5: Implement projects to improve access to the MCCA.

- **Mobility, Accessibility and Congestion relief related goals and objectives**
  - Caltrans CFMP Goal: Reduce costs to users by minimizing congestion on the freight transportation system.
    - Caltrans CFMP Objective 1 – Identify causes and solutions to freight bottlenecks.
    - Caltrans CFMP Objective 2 – Invest strategically to optimize system performance.
    - Caltrans CFMP Objective 3 – Develop, manage, and operate an efficient integrated freight system.
  - Fresno COG RTP Goal 1: An efficient, safe, integrated, multimodal transportation system (repeated elsewhere in this document)
    - Fresno COG RTP Objective 1: Develop an integrated multimodal transportation network that supports and enhances the region's economy and serves the needs of a growing and diverse population for transportation access to jobs, housing, recreation, commercial, and community services as well as goods movement. (repeated elsewhere in this document)
      - Relevant Policy: Pursue development of strategies and methods to enhance the efficient movement of freight through the multimodal network.
    - Fresno COG RTP Objective 2: Maintain and improve existing facilities as the basic system which will address existing and future travel demands. (repeated elsewhere in this document)
      - Relevant Policy: Manage the transportation system in a manner designed to increase operational efficiency, conserve energy and space, reduce air pollution and noise, and provide for effective goods movement, safety, personal mobility and accessibility. (repeated elsewhere in this document)
  - Fresno COG RTP Goal 2: An integrated and efficient highways, streets and roads network. (repeated elsewhere in this document)
    - Fresno COG RTP Objective: Develop and implement an integrated highways, streets and roads network that meets mobility needs for both urban and rural residents and the movement of goods. (repeated elsewhere in this document)
      - Relevant Policy: Develop a convenient, safe and efficient interface between transportation modes. (repeated elsewhere in this document)
  - Fresno COG RTP Goal 3: Acceptable level-of-service (LOS) for the highways, streets and roads network. (repeated elsewhere in this document)
    - Fresno COG RTP Objective: Maintenance of acceptable levels-of-service on the highways, streets and roads network that will allow for efficient movement of people and goods. (repeated elsewhere in this document)

        - Relevant Policy 1: Enhance the development of a highways and streets network which will relieve current and future congestion. (repeated elsewhere in this document)

        - Relevant Policy 2: Monitor levels of service on the streets and highways network within Fresno County to ensure safe and efficient movement of people and goods. (repeated elsewhere in this document)

        - Relevant Policy 3: Manage the highways, streets and roads network in a manner designed to increase operational efficiency, reduce air pollution and provide adequate mobility for both people and goods. (repeated elsewhere in this document)

  - San Joaquin COG RTP/SCS Policy 1: Support economic vitality. (repeated elsewhere in this document)

    - Relevant Strategy: Promote safe and efficient strategies to improve the movement of goods by water, air, rail, and truck. (repeated elsewhere in this document)

      - Relevant building block for aligning the sustainability goals with transportation investment strategies: Emphasizes focus on a multimodal strategy of investments that de-emphasizes highway or roadway expansion but still delivers a system to reduce vehicle miles travelled and peak hour traffic congestion.

  - San Joaquin COG RTP/SCS Policy 2: Maximize mobility and accessibility. (repeated elsewhere in this document)

    - Relevant Strategy: Improve regional transportation system efficiency.

  - Stanislaus COG RTP/SCS Goal: Improve the ability of people and goods to move between desired locations; and, provide a variety of transportation choices (mobility and accessibility). (repeated elsewhere in this document)

    - Stanislaus COG RTP/SCS Objective 1: Implement complete streets projects to improve roadways impact of quality of life throughout the region and provide greater transportation choices.

    - Stanislaus COG RTP/SCS Objective 2: Apply new technologies to make travel more reliable, convenient, and accessible for all modes. (repeated elsewhere in this document)

      - Relevant Action: Integrate ITS strategies into projects and programs.

    - Stanislaus COG RTP/SCS Objective 3: Integrate the regional expressway study into the 2014 RTP/SCS and local general plans. (repeated elsewhere in this document)

- **Safety and Security related goals and objectives**

  - Caltrans CFMP Goal: Improve the safety, security, and resilience of the freight transportation system.

- Caltrans CFMP Objective 1 – Reduce rates of incidents, collisions, fatalities, and serious injuries associated with freight movement.

- Caltrans CFMP Objective 2 – Utilize technology to provide for the resilience and security of the freight transportation system.

- Fresno COG RTP Goal 1: An efficient, safe, integrated, multimodal transportation system. (repeated elsewhere in this document)

  - Fresno COG RTP Objective: Maintain and improve existing facilities as the basic system which will address existing and future travel demands. (repeated elsewhere in this document)

    - Relevant Policy 1: Manage the transportation system in a manner designed to increase operational efficiency, conserve energy and space, reduce air pollution and noise, and provide for effective goods movement, safety, personal mobility and accessibility. (repeated elsewhere in this document)

    - Relevant Policy 2: Maintain stringent safety requirements for all transportation modes, and identify problem (hazardous) locations and implement counter measures for anticipated problems wherever possible.

- Fresno COG RTP Goal 2: An integrated and efficient highways, streets and roads network. (repeated elsewhere in this document)

  - Fresno COG RTP Objective: Develop and implement an integrated highways, streets and roads network that meets mobility needs for both urban and rural residents and the movement of goods. (repeated elsewhere in this document)

    - Relevant Policy: Develop a convenient, safe and efficient interface between transportation modes. (repeated elsewhere in this document)

- Fresno COG RTP Goal 3: Acceptable level-of-service (LOS) for the highways, streets and roads network. (repeated elsewhere in this document)

  - Fresno COG RTP Objective: Maintenance of acceptable levels-of-service on the highways, streets and roads network that will allow for efficient movement of people and goods. (repeated elsewhere in this document)

    - Relevant Policy 1: Monitor levels of service on the streets and highways network within Fresno County to ensure safe and efficient movement of people and goods. (repeated elsewhere in this document)

    - Relevant Policy 2: Manage the highways, streets and roads network in a manner designed to increase operational efficiency, reduce air pollution and provide adequate mobility for both people and goods. (repeated elsewhere in this document)

- San Joaquin COG RTP/SCS Policy 1: Support economic vitality. (repeated elsewhere in this document)

        - Relevant Strategy: Promote safe and efficient strategies to improve the movement of goods by water, air, rail, and truck. (repeated elsewhere in this document)

    - San Joaquin COG RTP/SCS Policy 2: Increase safety and security. (repeated elsewhere in this document)

        - Relevant Strategy 1: Facilitate projects that reduce the number of and severity of traffic incidents.

        - Relevant Strategy 2: Encourage and support projects that increase safety and security.

            - Relevant building block for aligning the sustainability goals with transportation investment strategies: Invests in high-tech applications or projects that allow motorists to choose travel options and allow local and state agencies to more quickly respond to incidents on the roadway.

        - Relevant Strategy 3: Improve communication and coordination between agencies and public for emergency preparedness. (repeated elsewhere in this document)

    - Stanislaus COG RTP/SCS Goal 3: Operate and maintain the transportation system to ensure public safety and security; and improve the health of residents by improving air quality and providing more transportation options. (health and safety) (repeated elsewhere in this document)

        - All objectives and actions are transit oriented.

- **Freight System Infrastructure Preservation related goals and objectives**

    - Caltrans CFMP: Improve the state of good repair of the freight transportation system.

        - Caltrans CFMP Objective 1 – Apply sustainable preventive maintenance and rehabilitation strategies.

    - Fresno COG RTP Goal 1: An efficient, safe, integrated, multimodal transportation system. (repeated elsewhere in this document)

        - Fresno COG RTP Objective: Maintain and improve existing facilities as the basic system which will address existing and future travel demands. (repeated elsewhere in this document)

            - Relevant Policy 1: Continue support for the preservation of existing transportation facilities and, where practical, addressing transportation needs by using existing transportation modes efficiently.

            - Relevant Policy 2: Identify those transportation problems where transportation systems management can be effective.

    - Fresno COG RTP Goal 2: An integrated and efficient highways, streets and roads network. (repeated elsewhere in this document)

    - Fresno COG RTP Objective: Develop and implement an integrated highways, streets and roads network that meets mobility needs for both urban and rural residents and the movement of goods. (repeated elsewhere in this document)

        - Relevant Policy 1: Preserve and promote the use of existing transportation facilities where feasible.

        - Relevant Policy 2: Preserve rights of way for construction of future street and highway projects where feasible.

  - San Joaquin COG RTP/SCS Policy 1: Maximize mobility and accessibility. (repeated elsewhere in this document)

    - Relevant Strategy: Improve major transportation corridors to minimize impacts on rural roads.

  - San Joaquin COG RTP/SCS Policy 2: Preserve the efficiency of the existing transportation system.

    - Relevant Strategy 1: Optimize existing transportation system capacity through available and/or innovative strategies.

    - Relevant Strategy 2: Support the continued maintenance and preservation of the existing transportation system.

        - Relevant building block for aligning the sustainability goals with transportation investment strategies: Underscore the importance of maintenance through recognition that routine and preventative maintenance is an integral piece toward transportation efficiency.

  - Stanislaus COG RTP/SCS Goal: Maintain the transportation system in a state of good repair, and protect the region's transportation investments by maximizing the use of existing facilities. (system preservation)

    - Stanislaus COG RTP/SCS Objective: Protect the region's investment by preserving the condition of the existing transportation system.

        - Relevant Action 1: Develop a comprehensive traffic management plan for the state highway system and regionally significant routes.

        - Relevant Action 2: Design and implement a countywide Pavement Management Plan to be used in establishing and prioritizing maintenance needs at the regional and local level.

- **Environmental Stewardship and Quality of Life related goals and objectives**

  - Caltrans CFMP Goal: Avoid and reduce adverse environmental and community impacts of the freight transportation system.

    - Caltrans CFMP Objective 1 – Integrate environmental, health, and social equity considerations in all stages of freight planning and implementation.

- Caltrans CFMP Objective 2 – Conserve and enhance natural and cultural resources.

- Caltrans CFMP Objective 3 – Avoid and reduce air and water pollution, greenhouse gas (GHG) emissions, and other negative impacts associated with freight transportation by transforming the freight transportation system to be cleaner and more efficient

- Caltrans CFMP Objective 4 – Consider impacts and mitigation relative to the context of the project location.

- Caltrans CFMP Objective 5 – Develop an efficiency metric that captures the intensity of pollutants per unit of freight moved.

- Fresno COG RTP Goal 1: An efficient, safe, integrated, multimodal transportation system. (repeated elsewhere in this document)

  - Fresno COG RTP Objective: Maintain and improve existing facilities as the basic system which will address existing and future travel demands. (repeated elsewhere in this document)

    - Relevant Policy: Manage the transportation system in a manner designed to increase operational efficiency, conserve energy and space, reduce air pollution and noise, and provide for effective goods movement, safety, personal mobility and accessibility. (repeated elsewhere in this document)

- Fresno COG RTP Goal 2: Attainment and maintenance of federal and state ambient air quality standards (criteria pollutants) as set by the Environmental Protection Agency and the California Air Resources Board.

  - Fresno COG RTP Objective 1: Participate in and support the coordinated transportation and air quality planning efforts between the eight Valley Metropolitan Planning Organizations, Caltrans, the San Joaquin Valley Air Pollution Control District, the Federal Highway Administration, Federal Transit Administration, the California Air Resources Board, and local agencies charged with land use planning.

    - Relevant Policy 1: Participate in developing the transportation/air quality modeling protocol for State Implementation Plans (SIPs) with the San Joaquin Valley Air Pollution Control District.

    - Relevant Policy 2: Work with community members and organizations, including those that have been traditionally underrepresented, to provide outreach and involvement in relevant air quality policies, programs and issues.

    - Relevant Policy 3: Support the efforts of the San Joaquin Valley Air Pollution Control District to integrate appropriate policies and implementation measures identified in the Air Quality Guidelines for General Plans into local general plans.

    - Relevant Policy 4: Support the air pollution enforcement and educational efforts of the San Joaquin Valley Air Pollution Control District.

- Relevant Policy 5: Continue Fresno COG's partnership with the San Joaquin Valley Air Pollution Control District as a Healthy Air Living Business Partner.

- Fresno COG RTP Objective 2: Implement all appropriate Transportation System Management, Transportation Demand Management, and Transportation Control Measure strategies as technologically and economically feasible.

  - Relevant Policy 1: Ensure consistency between and among the goals, objectives, policies, and implementation measures of the Regional Transportation Plan, the Transportation Improvement Program, and State Implementation Plans (SIPs).

  - Relevant Policy 2: Improve vehicular flow and efficiency of the region's circulation system using intelligent transportation systems where feasible.

- Fresno COG RTP Objective 3: Integrate land use planning, transportation planning, and air quality planning to make the most efficient use of public resources and to create a more healthy and livable environment.

  - Consider the air quality impacts of mobile sources when planning transportation systems to accommodate expected growth in the community. Thereby reducing the consumption and dependence upon non-renewable energy resources used by mobile sources of emissions.

  - Pursue non-single occupancy and lower/zero emission vehicle modes shall be pursued as preferred alternatives where feasible.

  - Support the development of infrastructure required for alternative fueled vehicles as well as zero emission vehicles.

  - Continue Fresno COG's established policy to fund cost-effective projects that facilitate air quality improvement through emission reductions with Congestion Mitigation and Air Quality Improvement funds.

- Fresno COG RTP Goal 3: Acceptable level-of-service (LOS) for the highways, streets and roads network. (repeated elsewhere in this document)

  - Fresno COG RTP Objective: Maintenance of acceptable levels-of-service on the highways, streets and roads network that will allow for efficient movement of people and goods. (repeated elsewhere in this document)

    - Relevant Policy: Manage the highways, streets and roads network in a manner designed to increase operational efficiency, reduce air pollution and provide adequate mobility for both people and goods. (repeated elsewhere in this document)

- San Joaquin COG RTP/SCS Policy 1: Enhance the environment for existing and future generations and conserve energy.

  - Relevant Strategy 1: Encourage efficient development patterns that maintain agricultural viability and natural resources.

        - Relevant Strategy 2: Enhance the connection between land use and transportation choices through projects supporting energy and water efficiency.

        - Relevant Strategy 3: Improve air quality by reducing transportation-related emissions.

    - San Joaquin COG RTP/SCS Policy 2: Improve the quality of life for residents.

        - Relevant Strategy: Improve the connection between land use and transportation

            - Relevant building block for aligning the sustainability goals with transportation investment strategies: Increases active transportation project investments to facilitate public health and active communities.

    - Stanislaus COG RTP/SCS Goal 1: Promote and provide equitable opportunities to access transportation services for all populations and ensure all populations share in the benefits of transportation improvements and provide a range of transportation and housing choices. (social equity)

        - Stanislaus COG RTP/SCS Objective: Provide an equitable level of transportation for all modes for all users.

            - Action: Implement complete street projects that provide access to all users.

    - Stanislaus COG RTP/SCS Goal 2: Consider the environmental impacts when making transportation investments and minimize direct and indirect impacts on clear air and the environment. (environmental quality)

        - Stanislaus COG RTP/SCS Objective: Lower overall vehicle miles traveled, reduce greenhouse gas emissions, and improve overall air quality.

            - Relevant Action 1: Incorporate evaluation frameworks such as the Smart Mobility Framework (SMF) and/or Sustainable Transportation Analysis & Rating System (STARS).

    - Stanislaus COG RTP/SCS Goal 3: Operate and maintain the transportation system to ensure public safety and security; and improve the health of residents by improving air quality and providing more transportation options. (health and safety) (repeated elsewhere in this document)

        - All objectives and actions are transit oriented.

- **Innovative Technology and Practices related goals and objectives**

    - Caltrans CFMP Goal: Use innovative technology and practices to operate, maintain, and optimize the efficiency of the freight transportation system while reducing its environmental and community impacts.

        - Caltrans CFMP Objective 1 – Support research, demonstration projects, development, and deployment of innovative technologies.

        - Caltrans CFMP Objective 2 – Promote the use of advanced technologies within the freight industry to support the State Implementation Plan (SIP), attainment of California greenhouse gas reduction targets, and to reduce local air toxics.

        - Caltrans CFMP Objective 3 – Support and incorporate the use of low carbon renewable fuels.

        - Caltrans CFMP Objective 4 – Promote innovative technologies and practices utilizing real time information to move freight on all modes more efficiently.

    - Stanislaus COG RTP/SCS Goal: Improve the ability of people and goods to move between desired locations; and, provide a variety of transportation choices (mobility and accessibility). (repeated elsewhere in this document)

        - Stanislaus COG RTP/SCS Objective: Apply new technologies to make travel more reliable, convenient, and accessible for all modes. (repeated elsewhere in this document)

            - Relevant Action: Integrate ITS strategies into projects and programs.

- **Planning, Collaboration and Funding related goals and objectives**

    - Fresno COG RTP Goal 1: An efficient, safe, integrated, multimodal transportation system. (repeated elsewhere in this document)

        - Fresno COG RTP Objective 1: Develop an integrated multimodal transportation network that supports and enhances the region's economy and serves the needs of a growing and diverse population for transportation access to jobs, housing, recreation, commercial, and community services as well as goods movement. (repeated elsewhere in this document)

            - Relevant Policy 1: Work cooperatively with the private sector to ensure that the collected information accurately reflects existing and forecasted conditions that are of importance from a freight transportation perspective. (repeated elsewhere in this document)

            - Relevant Policy 2: Ensure that public and private transportation providers and other interested parties have an opportunity to provide input into the transportation planning process.

        - Fresno COG RTP Objective 2: Manage the financial resources which are available from government, the private sector, and users of the transportation system in a cost-effective manner to meet regional needs.

            - Relevant Policy 1: Procure and leverage federal, state and local transportation funding to the maximum degree possible, in order to develop a regional transportation network which serves the residents of the region in the most economical, effective and efficient manner possible.

            - Relevant Policy 2: Encourage new or reconstructed facilities to incorporate design standards which extend the life cycle and reduce maintenance costs.

- Relevant Policy 3: Pursue additional funding sources for development of major transportation programs and projects. Work with all interest groups to reach consensus and initiate an active public information program regarding transportation funds needed.

- Fresno COG RTP Goal 2: Planning outcomes that are consistent with various planning efforts.

  - Fresno COG RTP Objective: Ensure consistency with emerging planning efforts.

    - Relevant Policy 1: Seek to ensure, during planning processes, that planning efforts are as consistent as feasible; such as: the Blueprint Planning Principles, Health in All Policies, the intent of SB375 (Senate Bill 375 also known as the Sustainable Communities Protection Act of 2008), Caltrans' Complete Streets Program, and statewide and federal air quality goals, etc.

    - Relevant Policy 2: Incorporate performance measures and outcomes as integral components in planning and programming processes as feasible.

- Fresno COG RTP Goal 3: Improved mobility and accessibility for all regardless of race, income, national origin, age, or disability.

  - Fresno COG RTP Objective: To incorporate concern for environmental justice[54] into transportation decisions.

    - Relevant Policy 1: Seek to ensure fair distribution[55] of the benefits and burdens of transportation projects, and seek to address the transportation needs of the disadvantaged communities through SCS Implementation Programs.

    - Relevant Policy 2: Seek to ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.

    - Relevant Policy 3: Encourage local transportation agencies to leverage federal funding to address unique challenges of the low income, disabled and elderly populations.

- Fresno COG RTP Goal 4: A regional transportation network consistent with the intent of SB 375 (Senate Bill 375 also known as the Sustainable Communities Protection Act of 2008).

  - Fresno COG RTP Objective: Development of a regional transportation network which is environmentally sensitive and helps reduce greenhouse gas emissions wherever possible.

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[54] As per Fresno County RTP: Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

[55] As per Fresno County RTP: Fair treatment means no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies.

- Relevant Policy 1: Under the direction of the Policy Board, identify and coordinate a strategy and methodology to assist member agencies in avoiding or fully mitigating all significant impacts of new transportation facilities on environmentally sensitive areas and natural resources by identifying potential policies and actions to minimize the loss of farmland associated with the construction of transportation facilities.

- Relevant Policy 2: Encourage infill development in areas that take advantage of remaining capacity in existing transportation facilities.

- Relevant Policy 3: Encourage energy conservation through alternatives to single occupancy vehicles, increased transportation efficiency and facility design.

- Relevant Policy 4: Project level decisions should give priority to safety, air pollution, noise and energy considerations.

- Relevant Policy 5: Support the implementation of Transportation System Management, Transportation Demand Management, and Transportation Control Measures that reduce emissions on the circulation system.

- Relevant Policy 6: Continue participation in the development of State Implementation Plans (SIP's) to attain the National Ambient Air Quality Standards (criteria pollutants) with the San Joaquin Valley Unified Air Pollution Control District.

- Relevant Policy 7: Continue to support coordinated transportation planning efforts between the eight Valley Metropolitan Planning Organizations (MPO's) located in the San Joaquin Valley nonattainment air basin.

- Relevant Policy 8: Endeavor to ensure the consistency of regional transportation planning efforts with applicable Federal, State, and local energy conservation programs, goals, and objectives.

- Fresno COG RTP Goal 5: Support cooperative efforts between local, state, federal agencies and the public to plan, develop and manage our transportation system.

  - Fresno COG RTP Objective: Strengthen intergovernmental organizational relationships and lines of communication which foster an understanding and awareness of the overall impacts of transportation/land use/air quality decision making.

    - Relevant Policy 1: Coordinate with other public agencies to ensure that the overall social, health, economic, energy and environmental effects of transportation decisions are understood, and given opportunity for input, by the general public and groups that have been traditionally underrepresented in planning processes.

    - Relevant Policy 2: Work closely with local land use agencies to ensure that land use planning is coordinated with transportation planning to fully mitigate the traffic impacts of new development to the greatest degree possible.

- Relevant Policy 3: Ensure that existing and future land use plans of the communities within the region are recognized in the formulation of transportation decisions.

- Relevant Policy 4: Work together with the appropriate public agencies to identify and potentially preserve rights-of-way for construction of future transportation projects.

- Relevant Policy 5: Communicate with local land use agencies on the likely impacts of transportation policy decisions on land use and development; and strive for consistency (where appropriate) between transportation plans and programs and applicable land use and development plans.

- Fresno COG RTP Goal 6: An integrated and efficient highways, streets and roads network. (repeated elsewhere in this document)

  - Fresno COG RTP Objective: Develop and implement an integrated highways, streets and roads network that meets mobility needs for both urban and rural residents and the movement of goods. (repeated elsewhere in this document)

    - Relevant Policy 1: Continue work with member agencies to ensure that the inter and intra county movement of agricultural commodities remains a priority.

    - Relevant Policy 2: Prioritize transportation improvements that accommodate travel, while fostering the development of safety, maintenance and operational improvements on the streets and highways network within Fresno County.

- Fresno COG RTP Goal 7: Efficient use of available transportation funding.

  - Fresno COG RTP Objective: Pursue all possible federal, state and local transportation funding related to development, maintenance and rehabilitation of the highways and streets network.

    - Relevant Policy: Track overall transportation financing issues to ensure that Fresno County agencies are aware of, and able to react in a timely fashion to, any new or innovative financial strategies.

- Fresno COG RTP Goal 8: Acceptable level-of-service (LOS) for the highways, streets and roads network. (repeated elsewhere in this document)

  - Fresno COG RTP Objective: Maintenance of acceptable levels-of-service on the highways, streets and roads network that will allow for efficient movement of people and goods. (repeated elsewhere in this document)

    - Relevant Policy 1: Facilitate communication between Fresno COG and local land use agencies to analyze impacts on the regional transportation system during the decision making process.

    - Relevant Policy 2: Work cooperatively with the private sector to ensure that the mobility needs of the business community within Fresno County are addressed. (repeated elsewhere in this document)

        - Relevant Policy 3: Continue to coordinate regional transportation network planning with the eight Valley Regional Planning Agencies.

        - Relevant Policy 4: Monitor levels of service on the streets and highways network within Fresno County to ensure safe and efficient movement of people and goods. (repeated elsewhere in this document)

- San Joaquin COG RTP/SCS Policy 1: Increase safety and security. (repeated elsewhere in this document)

    - Relevant Strategy: Improve communication and coordination between agencies and public for emergency preparedness. (repeated elsewhere in this document)

- San Joaquin COG RTP/SCS Policy 2: Promote interagency coordination and public participation for transportation decision-making and planning efforts.

    - Relevant Strategy 1: Engage the public early, clearly, and continuously.

    - Relevant Strategy 2: Use a variety of methods to engage the public, encouraging representation from diverse income and ethnic backgrounds.

        - Relevant building block for aligning the sustainability goals with transportation investment strategies: Identifies land use patterns that encourage infill development and compact development.

- San Joaquin COG RTP/SCS Policy 3: Maximize cost-effectiveness.

    - Relevant Strategy 1: Support the use of state and federal grants to supplement local funding and pursue discretionary grant funding opportunities from outside the region.

    - Relevant Strategy 2: Support projects that maximize cost effectiveness.

    - Relevant Strategy 3: Maximize funding of existing transportation options.

- Stanislaus COG RTP/SCS Goal: Improve the ability of people and goods to move between desired locations; and, provide a variety of transportation choices (mobility and accessibility). (repeated elsewhere in this document)

    - Stanislaus COG RTP/SCS Objective: Integrate the regional expressway study into the 2014 RTP/SCS and local general plans. (repeated elsewhere in this document)

- Stanislaus COG RTP/SCS Goal 1: Foster job creation in agricultural and non-agricultural sectors, and encourage business attraction, retention, and expansion by improving quality of life through new and revitalized communities. (economic and community vitality) (repeated elsewhere in this document)

    - Stanislaus COG RTP/SCS Objective: Improve the movement of goods in the region by supporting the enhancement of goods by land (including rail) and air. (repeated elsewhere in this document)

        - Relevant Action 1: Continue participation in the San Joaquin Valley Goods Movement Task Force and associated Study.

- Relevant Action 2: Adopt and integrate the regional expressway study into the RTP and local general plans.

- Stanislaus COG RTP/SCS Goal 2: Provide mixed land uses and compact development patterns, and direct development toward existing infrastructure to preserve agricultural land, open space, and natural resources. (sustainable development pattern)

  - Stanislaus COG RTP/SCS Objective: Preserve farmland and natural resources by integrating land use and transportation planning.

    - Relevant Action 1: Coordinate with local agricultural, open space, and resource organizations to help reduce impacts on agricultural land, open space, and natural resources.

    - Relevant Action 2: Coordinate with LAFCO and utilize the Municipal Service Review process to better determine whether or not cities and special districts have the capacity and/or capabilities to provide the necessary municipal services within their respective boundaries.

For Kern COG RTP/SCS:

- **NOTE:** Although goods movement related strategic actions are indicated, there are other Kern COG policies or actions that may affect goods movement. For example, one of the land use related strategic actions is: "Promote land use along freight corridors that are compatible with goods movement traffic." There are other such actions.

- **All Goals**

  - Goal 1 (Mobility): Improve the mobility of people and freight.

  - Goal 2 (Accessibility): Improve accessibility to, and the economic wellbeing of major employment and other regional activity centers.

  - Goal 3 (Reliability): Improve the reliability and safety of the transportation system.

  - Goad 4 (Efficiency): Maximize the efficiency and cost effectiveness of the existing and future transportation system.

  - Goal 5 (Livability): Promote livable communities and satisfaction of consumers with the transportation system.

  - Goal 6 (Sustainability): Provide for preservation and expansion of the system while minimizing effects on the environment.

  - Goal 7 (Equity): Ensure an equitable distribution of the benefits among various demographic and user groups.

- **Goods Movement related Strategic Actions**

  - Action 1 (Relates to Mobility, Accessibility, Efficiency and Livability goals): Coordinate planning efforts to ensure efficient, economical, and environmentally sound movement of goods.

- Action 2 (Relates to Mobility, Accessibility, Efficiency and Livability goals): Encourage coordination and consultation between the public and private sectors to explore innovative and efficient goods movement strategies.

- Action 3 (Relates to Mobility, Accessibility, Efficiency and Livability goals): Identify opportunities for truck-to-rail and truck-to-intermodal mode shifts, and evaluate the contributions of truck traffic on regional air quality.

- Action 4 (Relates to Mobility, Accessibility, Efficiency and Livability goals): Encourage the use of rail and air for goods movement to reduce impacts to state and inter county routes and lessen air quality impacts.

- Action 5 (Relates to Mobility, Accessibility, Efficiency and Livability goals): Oppose higher axle load limits for the trucking industry on general purpose roadways.

- Action 6 (Relates to Mobility, Accessibility and Efficiency goals): Advocate programs and projects for the intermodal linkage of all freight transportation.

- Action 7 (Relates to Mobility, Accessibility and Efficiency goals): Consider constructing truck climbing lanes on eastbound SR 58 from General Beale Road to the Bena Road overcrossing.

- Action 8 (Relates to Mobility, Accessibility and Efficiency goals): Program Infrastructure improvements such as widening of Seventh Standard Road in response to proposed freight movements activities in the area.

- Action 9 (Relates to Mobility, Accessibility and Efficiency goals): Widen State Route 184 to four lanes to respond to increasing agriculture trucking activity.

- Action 10 (Relates to Mobility, Accessibility and Efficiency goals): Widen Wheeler Ridge Road to four lanes as a gap-closure measure to tie I-5 to SR 58 via SR184.

- Action 11 (Relates to Mobility and Efficiency goals): Develop an annual freight movement stakeholders group for coordination and expansion efforts.

- Action 12 (Relates to Mobility and Efficiency goals): Encourage communication between short-line rail operators, shippers, and economic development agencies.

- Action 13 (Relates to Mobility and Efficiency goals): Explore options for potential uses of the southern portion of Arvin Subdivision as identifies in the Kern County Rail Study Phase 2.

- Action 14 (Relates to Mobility, Reliability and Efficiency goals): Explore rail intermodal, transfer facility, and alternative transfer options for the region.

- Action 15 (Relates to Mobility, Reliability and Efficiency goals): Continue development of the Paramount Logistics Park for intermodal freight transfer activities.

- Action 16 (Relates to Mobility, Reliability and Efficiency goals): Continue development of the Delano RailEx Facility for intermodal freight shipping to the east coast.

- Action 17 (Relates to Mobility, Reliability and Efficiency goals): Expand rail service to existing distribution centers throughout Kern County when feasible.

- Action 18 (Relates to Mobility, Accessibility and Equity goals): Maintain liaison with Southern California Association of Governments and all San Joaquin Valley Councils of Government for efficient coordination of freight movement between regions and counties.

- Action 19 (Relates to Mobility, Accessibility and Equity goals): Work with other agencies to create an effective Central Valley-wide truck model to track regional commodity flows and to identify critical economic trends that will drive truck flows on regionally significant truck routes.

- Action 20 (Relates to Mobility, Reliability, Accessibility and Equity goals): Provide heavy truck access planning guidance, including a review of the current surface transportation act route system, review of geometric issues, and signaling for all routes identified as major local access routes, as well as the development of performance standards.

- Action 21(Relates to Mobility, Reliability, Accessibility and Equity goals): Add "missing links" (streets) to roadway network that reduce out of direction travel: Centennial Connector will provide a major free flow traffic connector that will improve air quality by reducing stop and go truck travel on local arterials. Hageman Flyover Project will provide another east/west connection over SR 99 to downtown Bakersfield central business district; Mohawk Street Extension provides an extension from Rosedale Highway south that connects to Truxtun Avenue accessing downtown Bakersfield.

For Kings CAG RTIP:

- **NOTE:** Although goods movement related policy and objectives are indicated, there are other Kings CAG policies and objectives that may affect freight. For example, a transportation system management objective is: "Shorten the travel time required to move people and goods on the existing system." There are other such policies and their objectives.

- **Goods Movement related Policy:** Support the efforts of the trucking and rail industries to transport commodities safely and efficiently.

- **Goods Movement related Objectives:**

    - Objective 1: Designate and maintain regional and local truck routes to prevent major pavement deterioration on local streets and roads that are not designed for heavy truck traffic.

    - Objective 2: Where needed, widen regional highways to accommodate them to heavy truck traffic.

    - Objective 3: Support enforcement of local truck route ordinances.

    - Objective 4: Develop plans to mitigate congestion on local streets and at intersections where heavy truck traffic occurs.

    - Objective 5: Support efforts to require all trucks carrying hazardous materials to have a manifest, including identification and instructions for handling materials in case of spills. Also support efforts to improve hazardous waste containers so that spillage or leakage does not occur.

- Objective 6: Support truck weight fees that equitably provide for the highway maintenance costs resulting from heavy trucking.
- Objective 7: Encourage the improvement of railways with the end purpose of increasing the efficiency of goods movements.
- Objective 8: Support the installation of automatic grade protection devices at all grade crossings.
- Objective 9: Improve rail grade crossings as needed to improve traffic flows.
- Objective 10: Encourage the efficient movement of goods through California ports.
- Objective 11: In concert with Caltrans, the California Highway Patrol, and local jurisdictions, restrict roads available for hazardous waste trucking to mitigate potential adverse effects associated with transportation.

For Madera CTC RTP/SCS:

- **NOTE:** There were no goods movement specific goals or objectives. A majority of objectives that relate to goods movement are indicated.
- **All Goals:**
  - To promote Intermodal Transportation Systems that are Fully Accessible, Encourage Quality Growth and Development, Support the Region's Environmental Resource Management Strategies, and are Responsive to the Needs of Current and Future Travelers.
  - To Promote and Develop Transportation Systems that Stimulate, Support, and Enhance the Movement of People and Goods to Foster Economic Competitiveness of the Madera Region.
  - To Enhance Transportation System Coordination, Efficiency, and Intermodal Connectivity to Keep People and Goods Moving and Meet Regional Transportation Goals.
  - To Maintain the Efficiency, Safety, and Security of the Region's Transportation System.
  - To Improve the Quality of the Natural and Human Built Environment through Regional Cooperation of Transportation Systems Planning Activities.
  - To Maximize Funding to Maintain and Improve the Transportation Network.
  - To Identify Reliable Transportation Choices that Support a Diverse Population.
  - To protect the environment and health of our residents by improving air quality and encouraging active transportation (non-motorized transportation, such as bicycling and walking).
- **Goods Movement related Objectives:**
  - Objective 1: Provide the Madera region with transportation mobility options necessary to carry out essential daily activities and support equitable access to the region's assets.

- Objective 2: Shift investment strategies towards a variety of modes.
- Objective 3: Improve and maintain an integrated transportation network that reduces congestion and minimizes safety issues.
- Objective 4: Strive to create a fully "seamless" intermodal transportation system by addressing critical linkages between modes based upon public needs.
- Objective 5: Maintain, repair and rehabilitate the existing and future regional transportation system.
- Objective 6: Undertake transportation investments that enhance the future economic viability and performance of the transportation system.
- Objective 7: Reduce the cost of doing business by providing for the efficient movement of goods, people and information.
- Objective 8: Combine elements of priority projects to maximize funding and provide for a well-connected and seamless transportation system.
- Objective 9: Improve the integration of land use, urban design, transportation, rural and environmental feature preservation, and economic development policies and decisions through incentives and/or policies.
- Objective 10: Make transportation decisions that are compatible with air quality conformity objectives and the preservation of key regional ecosystems.
- Objective 11: Improve marketing and the promotion of successful existing transportation services.
- Objective 12: Conduct effective outreach to ensure fiscally sound transportation investments that result in improved system mobility and safety.
- Objective 13: Maintain partnership-based planning to achieve a social, economic and environmental well-being.
- Objective 14: Directly link land use, transportation, and air quality, thereby prompting reasonable growth management programs through development of the Congestion Management Program (CMP) that effectively utilizes new transportation funds, alleviates traffic congestion and related impacts, and improves air quality.
- Objective 15: Promote and conduct the effective dialogue with agencies, developers, and users or potential users to help guide investment discussions and maintain and improve the effectiveness of the transportation system.

For Merced CAG RTP/SCS:

- **NOTE:** Although goods movement related goal and policies are indicated, there are other Merced CAG goals and policies that may affect freight. For example, under the goal to ensure a safe and efficient regional road system that accommodates the demand for movement of people and goods, there is a policy to maintain a level of service D on all regionally significant roads. This would also assist goods movement.

- **Goods Movement related Goal:** Provide a transportation system that enables safe movement of goods in and through Merced County.
- **Goods Movement related Policies:**
  - Policy 1: Provide an adequate regional road system for goods movement.
    - Action 1: Support and participate in the Valley-wide Goods Movement Study.
    - Action 2: Work with the Freight Advisory Committee to enhance and maintain a viable transportation system for freight and goods movement.

For Tulare CAG RTP/SCS:

- **NOTE:** Although goods movement related goal, objective and policies are indicated, there are other Tulare CAG goals, objectives and policies that may affect freight. For example, under the goal to promote safe, economical, convenient rail systems and schedules that meet the needs of passenger and freight services in the region, there is an objective to support the maintenance, preservation, and expansion of freight rail systems in Tulare County.
- **Goods Movement related Goal 1:** Provide a transportation system that efficiently and effectively transports goods to, from, within and through Tulare County.
  - Objective: Encourage the interaction of truck, rail and air freight transportation.
    - Policy 1: Work with Caltrans and adjacent regions in the development of intermodal corridors.
    - Policy 2: Include comprehensive goods movement planning in the RTP.
    - Policy 3: Implement the San Joaquin Valley Goods Movement Plan.
- **Goods Movement related Goal 2:** Improve goods movement within the region to increase economic vitality, meet the growing needs of freight and passenger services, and improve traffic safety, air quality and overall mobility.
  - Objective 1: Increase the use of freight rail transportation.
    - Policy 1: Restore and maintain freight rail service in Tulare County as a significant transportation mode, providing service to commerce and industry.
    - Policy 2: Coordinate with other agencies to restore and enhance rail service to existing facilities in order to attract new industries to Tulare County.
  - Objective 2: Support an efficient truck transportation system.
    - Policy: Give special consideration to transportation projects that improve air quality and the operational efficiency of goods movement.

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