Analysis of Freeway Operational Strategies Related to the Use of Managed Lanes by Trucks

Executive Summary
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ANALYSIS OF FREEWAY OPERATIONAL STRATEGIES RELATED TO THE USE OF MANAGED LANES BY TRUCKS

EXECUTIVE SUMMARY

DECEMBER 2013
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1. **Synopsis**

**Background**

Trucks are the backbone of the goods movement system in the San Diego region. Trucks carry more than 90 percent of freight volume and truck vehicle miles traveled (VMT) on freeways are expected to grow at a rate faster than that for passenger vehicles. Truck bottlenecks exist and are projected to increase during peak periods, straining the region’s multimodal goods movement network and affecting regional economic prosperity. While regional rail capacity is important, it is highly constrained and cannot match the flexibility and reliability of regional truck distribution. Trade and distribution in the region, therefore, is heavily dependent on truck movements. Since the region's roughly 300 miles of urban and rural freeways are not expected to significantly grow, the existing roadway network must simultaneously serve a growing population and growing levels of international and domestic trade.

**Study Overview**

To address the issue of long-term truck mobility in the region, Caltrans provided SANDAG with a grant to assess the potential for freeway operational truck management strategies in the San Diego region, including the potential for trucks to use the planned network of managed lanes. The “Analysis of Freeway Operational Strategies Related to the Use of Managed Lanes by Trucks” (Study) was a long-range planning effort and the results are intended to serve as a framework for more detailed future analysis of truck management strategies moving forward. The Study included a literature review, the collection of regional truck data, and interviews with regional trucking industry stakeholders. Specifically, the results of the Study included 1) a truck management strategy “toolbox” for the San Diego region, 2) a high level assessment of truck mobility issue areas throughout the region, 3) a more detailed look at two conceptual corridors (the Otay Mesa Border Area and I-15 from SR 163 to SR 78), and 4) opportunities for improving regional truck data collection. This Executive Summary provides a summary of the findings of the Study; additional information can be found in Technical Memorandums 1 – 6.

**Summary of Findings**

The Study found that allowing light-duty (and potentially medium-duty) trucks to use the managed lanes network under certain conditions could capitalize on the region’s investment in a managed lanes network and be prudent given the projected increase in truck volumes, the critical role trucks play in goods movement and the regional economy, and the limited potential to shift goods movement to rail and other non-freeway modes. The Study proposes a phased approach to implementation, starting with providing information and incentives for the light-duty, 2-axle commercial trucks that are already legally allowed in the managed lanes (i.e. potential removal of occupancy restrictions and an SOV toll waiver). If this proves successful, the use of the managed lanes by medium-duty, 3- and 4-axle trucks (with length restrictions) could potentially be explored by allowing access to and from the managed lanes via the Direct Access Ramps (DARs) only. A discussion of next steps for the implementation of a Trucks on Managed Lanes Pilot Study and a pilot to improve regional truck data collection is provided at the end of this Executive Summary.
2. BACKGROUND AND PROJECT OVERVIEW

INTRODUCTION

The intent of this Study was to address the issue of long-term truck mobility in the region by assessing the potential for freeway operational strategies for trucks in the San Diego region, including the potential for the allowance of trucks on the planned network of managed lanes. The Study was a long-range planning study and the results are intended to serve as a framework for more detailed future analysis of truck management strategies moving forward.

PROJECT TEAM

The Project was lead by the goods movement planning group at SANDAG with consultant support from IBI Group, CH2M HILL, and Cheval Research.

STAKEHOLDER INVOLVEMENT

The Project Team met regularly throughout the Study with two stakeholder groups, the Project Study Team (PST) and the Freight Stakeholders Working Group (FSWG). The PST included representatives from Caltrans, SANDAG, Federal Highway Administration, the Port of San Diego, and trucking industry representatives. The FSWG included PST members and representatives from local jurisdictions, the Port Tenants Association and Port users, California Trucking Association, American Trucking Association, San Diego County Regional Airport Authority, shippers and carriers using the airport, San Diego and Arizona Eastern Railway, Burlington North Santa Fe Railroad, Union Pacific Railroad, warehouse operators, San Diego Regional and Otay Mesa Chambers of Commerce, San Diego World Trade Center, California Highway Patrol, ADMICARGA Baja California short line rail operator, Imperial County Transportation Commission, Southern California Association of Governments, San Diego County Disposal Association, Environmental Health Coalition, Western Maquiladora Trade Association, Owner Operator Independent Drivers Association, California State University Long Beach, Mexamérica, Total Transportation Services, Inc., Fletes Esquer S A de C V, Duran Freight, Lizarraga Freight Forwarding, 4Liberity, Inc., and Colliers International.

TRUCKING INDUSTRY INTERVIEWS

Additionally, numerous freight and trucking industry representatives were interviewed throughout the Study to collect additional stakeholder input. Eighteen interviews and one focus group were conducted with a cross-section of industry representatives. Interviewees included trade associations, shippers, receivers, manufacturers, and trucking
companies across the region that represented a range of truck types (light-, medium-, and heavy-duty) and trip types (local, regional, and long haul). The intent of the interviews was to attain a real-world understanding of the mobility and operational issues facing trucking companies that would not otherwise be identified through available truck data.

### TABLE 1: Truck Types

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light-duty</td>
<td><img src="image" alt="Light-duty Truck" /></td>
<td>Smaller and lighter trucks (up to 14,000 lbs), with no more than 2 axles.</td>
</tr>
<tr>
<td>Medium-duty</td>
<td><img src="image" alt="Medium-duty Truck" /></td>
<td>Slightly bigger and heavier trucks (up to 33,000 lbs), with 3 to 4 axles.</td>
</tr>
<tr>
<td>Heavy-duty</td>
<td><img src="image" alt="Heavy-duty Truck" /></td>
<td>The largest and heaviest trucks (over 33,000 lbs), with 5 or more axles.</td>
</tr>
</tbody>
</table>

*a Legal axle weights are assumed for all vehicles.

### WHAT ARE MANAGED LANES?

The term “managed lanes” refers to special-use lanes that are distinct from general purpose lanes in that they are “managed” using strategies such as vehicle occupancy and eligibility, static or dynamic pricing, and/or access control to maintain certain desired operational conditions. Examples of managed lanes include high occupancy vehicle (HOV) lanes, high occupancy toll (HOT) lanes, and dedicated lanes for trucks or buses. For the purposes of this Study, the term “managed lanes” primarily refers to the existing network of HOV and Express Lanes throughout the San Diego region and the planned improvements to this network included in the fiscally constrained 2050 Regional Transportation Plan (RTP).

### 3. TRUCK MANAGEMENT STRATEGY DEVELOPMENT

#### LITERATURE REVIEW

The Project Team began by reviewing the recent literature to identify truck management strategies that have been studied or applied elsewhere. The review included domestic and international case studies, a summary of the current relevant regulatory framework in California, and findings from a review of 19 research documents and government reports. The review found that the vast majority of relevant literature is related to truck-only lanes and/or truck-only facilities. While versions of the concept have been studied, there are currently no operating examples of trucks on managed lanes, where the managed lanes are shared by both trucks and passenger vehicles.

#### TRUCK MANAGEMENT STRATEGIES LIST

Based on the information collected in the literature review, a comprehensive list of potential truck management strategies was initially developed. This list was narrowed down to a final set.
of seven strategies for further analysis, based off of a fatal flaw review and input from the PST, FSWG, and trucking industry stakeholders. The seven truck management strategies reviewed as part of this Study are briefly described below. More information on each strategy can be found in Technical Memorandum #3: Strategy Development.

1. **Base-case scenario (current RTP improvements):** This strategy considers what the future looks like for goods mobility in the region if no new actions are taken to address truck mobility (this scenario assumes full build out of improvements identified in the fiscally constrained and currently adopted San Diego 2050 RTP).

2. **Traffic organizational strategies at freight gateways & distribution hubs:** This strategy includes coordinated communication and infrastructure-based strategies to optimize truck traffic flow at key trucking gateways and distribution hubs.

3. **Travel demand management (TDM) strategies to be developed with truckers and shippers/receivers:** This strategy involves working with shippers/receivers to facilitate the shifting of trucks to off-peak travel times through TDM strategies.

4. **Trucks on the planned network of HOV/HOT Managed Lanes (restricted access):** This strategy would allow trucks restricted access to the network of managed lanes, for example during off-peak periods, for off-peak directions, and/or for certain truck types.

5. **Designated truck lanes (e.g. truck routes, by-pass, or truck climbing lanes, etc):** This strategy would include the construction of new lanes designated for trucks on an existing facility, such as truck bypass lanes, truck routes, or truck climbing lanes.

6. **Separate dedicated truck-only facilities:** This strategy would involve developing brand-new, dedicated truck-only facilities.

7. **Intelligent Transportation Systems (ITS)/Active Traffic Management (ATM) and lane assignment:** This strategy would use ITS and ATM technologies (both external and in-vehicle) to improve truck mobility and safety and optimize the use of existing freeway capacity.

**CURRENT REGULATORY FRAMEWORK**

The current California Vehicle Code (CVC) restricts trucks with 3 or more axles to speeds of 55 mph and the right-hand lane (CVC Sections 22406 and 21655). Additionally, the California Highway Patrol website notes that “HOT lanes may not be used by vehicles restricted to a 55
MPH speed limit.” Trucks with 2 axles, however, are not subject to these restrictions. Federal legislation that guides the use and operation of HOV/HOT lanes is currently silent on the issue of trucks. However, U.S.C. Title 23, Section 166 requires state agencies to monitor HOV lane performance if high occupancy toll vehicles or low emission vehicles are allowed to use the lanes and to take action to improve lane operations if the average operating speed falls below minimum requirements.

4. STRATEGY ANALYSIS METHODOLOGY

A three-tiered analysis approach was used to assess the truck management strategies, as described below:

- Tier 1 - Preliminary Strategy Screening: Fatal Flaw Review
- Tier 2 - Quantitative Strategy Analysis: Strategy Applicability Review
- Tier 3 - Final Strategy Analysis: Performance Against Goals

The three tiers included a preliminary strategy screening/fatal flaw review (conducted as part of the strategy identification process), a review of strategy applicability to the San Diego region using local data, and a review of each strategy against the project goals and key issue areas. The three-tiered analysis methodology was developed by the project team with review and feedback from the PST and the FSWG. More information on each tier of analysis and the analysis results are provided in Technical Memorandum #5: Strategy Analysis.

DATA COLLECTION AND NEEDS ASSESSMENT

As part of the Tier 2 analysis process, local truck data were collected to help identify issue areas throughout the region. The project team collected and reviewed truck data from the following sources: the SANDAG Truck Model, Regional Weigh-In-Motion Sites, the San Diego Regional Occupancy and Classification Study, and the Statewide Integrated Traffic Records System (SWITRS) database.

One of the key findings from the data collection effort was the identification of the major truck gateways and distribution hubs in the region, as shown in Figure 4. The gateways include places where goods enter and leave the region (e.g. the Otay Mesa Port of Entry) and the distribution hubs include places that contain manufacturing or warehouse districts. The map

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1 http://www.chp.ca.gov/html/hot_hov.html
was generated based on information from the SANDAG truck model and information from the industry stakeholder interviews.

**FIGURE 4. Trucking Gateways and Distribution Hubs**
More information on the data collection process and results are available in Technical Memorandum #4: Data Collection. Additionally, numerous truck data gaps were identified as a result of the truck data collection effort. Data gaps included: a general lack of truck origin/destination and trip purpose data, accident details where trucks are involved, and a general lack of truck volume and classification data throughout the region’s freeway and highway network. More information on this topic is summarized in Technical Memorandum #6: Data Needs Assessment.

**ISSUE AREAS AND ANALYSIS CATEGORIES**

As part of the literature review, several key issue areas and analysis categories were identified for consideration as part of the Study, as shown in Figure 5.

**FIGURE 5: Truck Management Strategy – Issue Areas and Analysis Categories**

The issue areas and analysis categories were used to conduct the Tier 3 Final Strategy Analysis. This means that, for each strategy, the project team looked at how it would impact goods movement, if it would require legislative changes, if the industry would support it, if it would be supported by the broader community, how it would impact local economic development and the environment, how safety and traffic operations would be affected, and any major engineering or financial issues associated with the strategy. The assessment was completed using a consumer reports style rating system which is described and documented in Technical Memorandum #5: Strategy Analysis.

**KEY STUDY OUTCOMES**

There are four key outcomes of the three-tiered analysis process (Figure 6). The first is an overall summary of findings for each of the seven strategies, including the general strengths and challenges of each strategy. This provides the region with a truck management strategy ‘toolbox’ that can be used in future studies (see Section 5 of this document). The second outcome is a high level assessment of the issue areas for truck mobility throughout the region, as determined through the data collection process, and the initial identification of potential strategies for each location (described in Technical Memorandum #5: Strategy Analysis). The
third is a more detailed look at how the strategies might apply to two conceptual corridors in the region: I-15 from SR 163 to SR 78 and the Otay Mesa Border Area (see Section 6 of this document). The fourth key study outcome is an assessment of the truck data gaps in the region, and recommendations for how truck data collection might be improved (described in Technical Memorandum #6: Data Needs Assessment). Information on a pilot project to improve the collection of truck data in the region is also provided in Section 7 of this Executive Summary.

5. Strategy Analysis Results

Industry Interviews

Freight and trucking industry representatives from a wide variety of operation types and sizes of companies participated in industry interviews. Trucking industry representatives indicated that they support strategies that improve mobility and safety for trucks in the region. However, they also indicated that strategies that increase their costs or decrease their current operational autonomy and access to facilities would not be supported. For the border region, truckers indicated that they support strategies that assist them in addressing the most urgent problems first, including designated access to and from the ports of entry/exit that harmonize with local business access. Truckers expressed concerns about strategies with components that mixed their larger vehicles (eighteen wheelers) with smaller passenger vehicles, and overall, supported strategies that isolated, dedicated, or designated facilities or lanes for purposes of ingress, egress, climbing, by-pass, and expediting through-trucks. Truckers also expressed general opposition to new tolls, unless the value added to their operations is tangible. Truckers appreciated being included as an essential stakeholder in the strategy analysis and planning process. More information on the industry interview findings is provided in Technical Memorandums #4: Data Collection and Technical Memorandum #5: Strategy Analysis.

Summary of Strategy Analysis Results

A brief overview of the strategy analysis results for each strategy is provided in Table 2, including key strengths, key challenges, and a summary of findings. Based on the results, each strategy was given a “thumbs-up,” “neutral,” or “thumbs-down” rating. A “thumbs-up” rating means the strategy performed well throughout the analysis process, is potentially applicable in multiple locations throughout the region, and is generally recommended for further consideration and study. A “neutral” rating means the strategy has key strengths that merit it
remaining in the region’s truck management strategy “toolbox;” however, it appears to have limited applicability in the region for the immediate future. A “thumbs-down” rating means the strategy did not perform well and is not recommended for further consideration at this time. The top-performing, “thumbs-up” strategies include Strategy #2: Traffic Organizational Strategies at Freight Gateways and Distribution Hubs, Strategy #4: Trucks on the Planned Network of HOV/HOT Lanes (Restricted Access), and Strategy #7: ITS/ATM and Lane Assignment. More information on the findings for each strategy, including the strategy-specific industry feedback and Tier 2 and Tier 3 analysis results, is available in Technical Memorandum #5: Strategy Analysis.

6. Conceptual Corridors

To select the conceptual corridors, the project team looked for locations with heavy truck volumes that could serve to demonstrate a variety of the truck management strategies, if implemented, and allow lessons learned to be applied elsewhere in the region. Specifically, the project team looked for freeway corridors with plans for four managed lanes (two in each direction) and DARs to allow for the testing of the managed lanes strategy, as well as locations reported by stakeholders as experiencing high truck delay and needing fixing “sooner than later.” The locations selected include the I-15 corridor from SR 163 to SR 78 and the Otay Mesa Border Area, which includes SR 905 and the SR 905/I-805 Interchange. More information on the Conceptual Corridor findings is available in Technical Memorandum #5: Strategy Analysis.

I-15 Corridor

This key trucking corridor has a system of managed lanes already in place and is projected to experience an increase in truck volumes by 2050 in both directions. The potential strategies reviewed for this corridor included Strategies #3, #4 and #7, which are described below and illustrated in Figure 7.

Strategy #3: TDM Strategies to be Developed with Truckers and Shippers/ Receivers

The TDM strategy was evaluated in this corridor because of its location immediately adjacent to the Rancho Bernardo Trucking Distribution Hub. However, review of local data revealed that auto and truck traffic are not peaking at the same time in this location, so a TDM strategy to shift trucks to off-peak travel times does not appear to be necessary.

Strategy #4: Restricted Access for Trucks on the Planned Network of Managed Lanes

Two potential levels of implementation of Strategy #4 are recommended for consideration along the I-15 corridor.

**Level 1:** The first level is removing the existing occupancy restrictions and single occupancy vehicle (SOV) toll for 2-axle, commercial trucks. Two-axle trucks are already allowed in the managed lanes; however, they must have two or more passengers to use the lanes for free or pay the toll. The trucking industry interviews revealed that the majority of truckers do not know that 2-axle trucks are allowed. A preliminary step to implementing this strategy could be to conduct outreach to truckers and enhance the signage in the corridor to encourage permitted use of the lanes. Further, because commercial trucks do not often have more than one driver, a next step could be removing the occupancy restrictions to allow commercial 2-axle trucks to access the lanes for free, similar to a carpool. The 2-axle commercial trucks could access the
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Key Strengths</th>
<th>Key Challenges</th>
<th>Summary of Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Base Case Scenario (Current RTP Improvements)</td>
<td>N/A - The base case scenario is unique because all of the other strategies were compared to the base case scenario. As such, the Tier 2 and Tier 3 analysis procedures were not applicable to the base case scenario.</td>
<td></td>
<td>Multiple growing demands on the region's freeways (combined with limited capacity to shift goods to rail) will impair the efficient movement of trucks in the region. Additional truck management strategies should be considered to preserve long-term truck mobility and regional competitiveness.</td>
</tr>
<tr>
<td>2. Truck Organizational Strategies at Gateways / Hubs</td>
<td>May improve truck mobility where implemented; supported by industry; no legislative changes required; serves all truck types; relatively low capital and O&amp;M costs expected.</td>
<td>Benefits will likely be localized to the area of improvement and have less affect on regional truck mobility.</td>
<td>This strategy’s ability to improve truck mobility, reduce delays, and route trucks more appropriately through the region’s trucking gateways and distribution hubs makes it an easy “low-hanging fruit” strategy that is a “win-win” for multiple stakeholders.</td>
</tr>
<tr>
<td>3. Truck Travel Demand Management</td>
<td>Comparatively low cost strategy; supported by other facility users; some industry support and examples of success when the right conditions are present.</td>
<td>Shifting to off-peak can increase costs for both truckers and shippers/receivers; trucks are already driving off-peak when they can; shippers/receivers control schedules; could conflict with neighborhood noise curfews.</td>
<td>Interviewees indicated this strategy is not a “silver bullet” and the review of the local data found that there are not many locations throughout the region where the required conditions (truck and auto traffic peaking at the same time) are present. If conditions change, this strategy could be revisited in the future.</td>
</tr>
<tr>
<td>4. Restricted Access for Trucks on the Managed Lanes Network</td>
<td>May improve travel times and reliability for light-duty and possibly medium-duty trucks; maximizes existing and planned improvements; generally supported by industry.</td>
<td>Some legislative changes required; access and safety concerns for larger, heavy-duty trucks; key design and routing issues should be considered; potential policy considerations.</td>
<td>The strategy performed well for certain truck types (light-duty and medium-duty) when certain conditions are met. Use of managed lanes by heavy-duty trucks is not recommended due to the safety and operational concerns expressed by industry. A pilot study is discussed in Section 7.</td>
</tr>
<tr>
<td>5. Designated Truck-Only Lanes</td>
<td>Increased separation of autos and trucks would improve truck mobility, safety, and overall operations; supported by industry.</td>
<td>Higher cost, capital improvement with potential right-of-way constraints; possible legislative challenge due to capacity expansion component.</td>
<td>Due to the high costs and the potential right-of-way and legislative issues, this strategy is only recommended for consideration in bottleneck locations where the truck volumes and local conditions warrant this level of investment.</td>
</tr>
<tr>
<td>6. New Truck-Only Facilities</td>
<td>Increased separation of autos and trucks would improve truck mobility, safety, and overall operations; supported by industry if conditions warrant.</td>
<td>High capital and O&amp;M costs; potential right-of-way and legislative issues; potential community opposition.</td>
<td>Current and projected truck volumes do not merit this level of investment. Due to this and the high expected capital and O&amp;M costs, this strategy is not recommended for implementation in the San Diego region.</td>
</tr>
<tr>
<td>7. ITS/ATM and lane assignment</td>
<td>Optimizes the use of existing capacity; improves safety and mobility for all users; supported by industry; reduces air emissions; cost-effective.</td>
<td>Dynamic lane assignment could require legislative changes; some industry concern with changeable message signs potentially causing distracted driving.</td>
<td>This strategy is “win-win” and has the potential to optimize the use of existing freeway capacity and improve travel times and reliability for all users. The strategy is anticipated to be cost-effective and is likely aligned with improvements already planned.</td>
</tr>
</tbody>
</table>

**TABLE 2: Truck Management Strategy Toolbox – Summary of Analysis Results**
managed lanes from either the Intermediate Access Points (IAPs) or the DARs. Since 2-axle trucks are currently allowed, this would serve as a good step to assess the following: 1) whether access to the managed lane system benefits trucks, 2) the degree of acceptance by other facility users, and 3) how the strategy would affect the capacity and operational function of the managed lanes. Additionally, FasTrak transponders could be required (which would help ensure non-commercial, 2-axle trucks (such as pick-up trucks) with a single occupant do not try to use the managed lanes for free).

Level 2: Due to strong industry feedback regarding operational and safety concerns, medium-duty 3- to 4-axle trucks should not be allowed to access the managed lanes via the IAPs, and heavy-duty trucks with 5 or more axles should be restricted from the managed lanes entirely. However, if Level 1 is successful, the next step could include allowing medium-duty trucks (3 to 4 axles) that meet maximum length restrictions to access the managed lanes via the DARs. This would be more complex and several factors would need to be considered prior to implementation. To test the strategy along I-15 the project team looked at several factors, including pavement index, the ability of trucks to make the turns onto the existing DARs, and the capacity of the managed lanes.

- **Pavement Index:** The project team compared pavement structural sections between the general purpose lanes and managed lanes at three locations along I-15. Initial results showed that, as built, the pavement structural sections are similar to the existing general purpose lanes and could likely accommodate trucks.

- **DAR Truck Turning Radii:** For the DARs, turning radii were tested for standard truck lengths in the light-, medium-, and heavy-duty truck categories for two sample DARs along the I-15 corridor. For these DARs, it was determined that overall, light-duty and medium-duty trucks (with lengths up to certain measurements\(^2\)) could likely make the turns, while most heavy-duty trucks would experience challenges.

- **Managed Lane Capacity:** Based off of one count taken at the I-15 Hale Ave. DAR, the express lanes experience about 1,200 vehicles per hour (vph) during the peak, out of capacity of about 4,000 vph. Carpools/vanpools and transit make up about 30 percent of AM peak traffic and 52 percent of PM peak traffic, with SOVs making up the remainder. This means that trucks could currently be added to the lanes without displacing the carpools/vanpools and transit they were designed to serve. But, additional counts are necessary at different locations to verify this.

If Level 2 were implemented, additional considerations would need to include truck routing to and from the DARs. More information on this strategy is included in Section 7 of this document.

**Strategy #7: ITS/ATM and Lane Assignment**

To improve overall operational flow & safety on the general purpose lanes for all users (including passenger vehicles and all types of trucks, regardless of size), variable speed limits and dynamic lane assignment could be implemented to help maximize truck throughput along the I-15 corridor. In addition, dynamic truck routing in conjunction with the existing Integrated

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2 For light-duty, 2-axle trucks, the standard truck length assumed was a wheelbase of 20 feet. For medium-duty, 3 to 4 axle trucks, the standard truck length assumed for non-articulated trucks was a wheelbase of 25 feet and for articulated trucks it was a kingpin to rear-axle length of 25.5 feet and a steering axle to rear axle length of 38 feet. The truck lengths used were based on AASHTO’s 2011 standard truck classifications as presented in the software program, Auto Turn. For more information, please see Table 5 in Technical Memorandum #5: Strategy Analysis.
Corridor Management (ICM) program (based on real-time response to incidents and congestion levels) could optimize the use of existing corridor capacity and improve truck travel times.

**Otay Mesa Border Area**

The Otay Mesa Border Area was selected as a conceptual corridor because it experiences a high percentage of truck traffic along SR 905, La Media Road, Siempre Viva Road and other key arterials. Key challenges include long, unmanaged queues during peak commercial vehicle traffic hours, a lack of services for drivers, and conflicts with local access to businesses. The potential strategies reviewed for this area included Strategies #2, #5, and #7, which are described below and illustrated in Figure 8.

**Strategy #2: Traffic Organizational Strategies at Freight Gateways and Distribution Hubs**

To address the existing problems with truck back-ups, blocked-drive-ways and queuing off of Siempre Viva Rd. and the northern end of La Media, communication based strategies could be implemented that complement the existing Otay Mesa POE Truck Route Improvements underway by the City of San Diego\(^3\). Improvements could include creating truck queuing waiting areas/lots for southbound trucks waiting to cross the border. The lots could have services for truckers (e.g. restrooms and trash receptacles) to create a more enjoyable crossing experience. This would require an organizational/enforcement strategy, such as taking ticket numbers and crossing when your number is called. Trucks could be routed to the lots through static and dynamic signage (based on current congestion levels at the border).

**Strategy #5: Designated Truck Lanes (e.g. Truck By-Pass, Truck Routes, or Climbing Lanes)**

To address potential increases in truck volumes and percentages at the SR 905/I-805 Interchange, for northbound traffic, a dedicated truck lane could potentially be added to the ramp from westbound SR 905 to northbound I-805. For southbound traffic, an existing lane could potentially be converted to a dedicated truck lane on the flyover from southbound I-805 to eastbound SR-905. For both options, issues with right of way (ROW) constraints, costs, and steep slopes, would need to be addressed, prior to implementation.

**Strategy #7: ITS/ATM and Lane Assignment**

To improve traffic flow along SR 905 for trucks coming to/from the U.S.-Mexico border, dynamic lane assignment could potentially allow trucks on all lanes on SR 905. This would require a gantry with dynamic message signs indicating when trucks are allowed in each lane. To improve traffic flow, southbound trucks heading toward the existing Otay Mesa border crossing could be assigned to the right two lanes and through trucks or trucks heading to the future border crossing could be assigned to the left two lanes. The pavement profile for the left lanes on SR 905 approaching SR 11 and the Otay Mesa East POE would be able to support the weight of trucks. Caltrans is already seeking an exemption for SR 11 to allow trucks in the left hand lane, so implementing this strategy could be well-timed. Additionally, an automated notification system could notify truckers in advance of congestion issues at the border and suggest alternate routes/times of day, so truckers can make their travel decisions based on

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\(^3\) The first phase of improvements (completed in May 2011) included adding an emergency vehicle lane to the truck-only road between Drucker Lane and the inspection facilities at the POE. The second phase of the project will extend Britannia Boulevard to the south, add one truck lane and emergency lane, and extend the truck road parallel to the border between Britannia Boulevard and La Media Road. It also will add a second lane to the truck route between La Media Road and Drucker Lane. Construction of the second phase is scheduled to be complete in FY 2016.
complete information. This could be implemented in conjunction with southbound border wait time systems currently under consideration by Caltrans and SANDAG. Notification could occur through CMS signs located along SR 905 and key surface streets.
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Strategy #4: Trucks on Managed Lanes - Restricted Access (Medium Term)

Remove existing occupancy restrictions for commercial trucks with 2 axles.

- Light-Duty Trucks OK
- Trucks with more than 2 Axles Prohibited

Graphic Not To Scale

LEGEND
- Direct Access Ramps (DARs)
- HOV (Express Lane)
- Intermediate Access Points
- Bus Rapid Transit Center/Park & Ride Lot
- Managed Lanes w/ Variable Barrier (2 each way)
- Managed Lanes w/o Variable Barrier
- Arterial/Rural Lanes

FIGURE 7: Potential Strategy Applicability along I-15 from SR 163 to SR 78
FIGURE 8: Potential Strategy Applicability in the Otay Mesa Border Truck Gateway

Strategy #6: Dedicated Truck Lanes (Long-Term)
Dedicated Truck Lanes on SR-805 Interchange Ramps (add a new lane to the NB ramp and convert an existing lane on the SB ramp)

Strategy #7: ITS (Medium-Term)
Dynamic Lane Assignment, Variable Speed Limits & Advanced Border Communications

Legend:
- Proposed Facilities

Strategy #2: Traffic Organizational Strategies (Near-Term)
(Value-added ideas to complement the City’s Otay Mesa POE Truck Route Improvements already underway)

Services for Truckers

Truck Queue Lots

North
Not to Scale
7. Implementation Opportunities and Next Steps

The strategies summarized in this document and analyzed as part of the overall project effort are intended to provide a framework of options and opportunities for the further review and study of specific freeway operational strategies for truck movement in the region. Future consideration and integration of some of these strategies into the region’s transportation planning and infrastructure improvement processes are critical to maintaining future goods movement mobility.

In addition to a framework for on-going and future regional and corridor planning efforts, the project did identify two near-term implementation opportunities that could be undertaken within the next couple of years by SANDAG, Caltrans, and partner agencies. The implementation opportunities are not meant to test all recommended strategies, but rather leverage some near term opportunities specifically related to enhanced truck data collection and the ability to test regional perceptions to some of the more active freeway management strategies for trucks. These implementation opportunities are described below and include some near term enhanced truck data collection and a trucks on managed lanes pilot study.

Truck Data Collection Next Steps

The Project Team found several gaps in regional truck data collection and availability, particularly with regard to truck volume and classification data. Truck volumes have substantial influence upon traffic operations, safety, emissions, and regional economic productivity. Figure 9 displays the high-level architecture concept for enhancing regional vehicle and truck classification and count data. This approach was developed via meetings with Caltrans and SANDAG staff and is based on:

- **Enhancement of the Field Sensor Network**: Three levels of improvements to the field sensor network are proposed as part of this concept:

  1. **Update, Calibration, and Maintenance of Existing Weigh-In-Motion (WIM) Sites**: Some of the WIM sites are not fully operational or are providing sporadic data. These sites are generally sited in important locations, and the data they can provide is still highly useful. The sites should be checked, and repaired as necessary.

  2. **Calibration and Use of Side-Fire Radar Sites for Supplement Vehicle Classification**: It is possible to utilize some of the existing Caltrans Vehicle Detection System (VDS) to provide supplemental classification data. The VDS in District 11 generally consists of three types of devices:

    - **Caltrans Radar Sites** – Radar-based VDS sites have been deployed along substantial segments of the freeway network. They consist of two different devices, RTMS x3 and Wavetronix 125 with slightly different configurations. The Wavetronix sites seem to provide the best near-term opportunity to provide accurate data with minimal recalibration effort.

    - **Loop-based VDS** – Generally these exist with two loops in each lane of traffic along many freeways and highways in the region. If implemented with both loops active they can provide relatively accurate classification data. Discussions with Caltrans indicate that currently the majority of loop VDS only have one set of loops active. There are 42 sites in the region that have dual-loops activated, but the associated software requires updating to calculate lengths and separate vehicle detection into classification bins or categories. In addition there is a project underway to post-process data from these sites in an attempt to provide classification data, but the results and accuracy of this approach have not yet been fully confirmed.
- **Nokia Radar Sites** – There are a number of VDS that are not controlled by Caltrans, but provide data to Caltrans and regional information systems. These sites are not considered as part of a vehicle classification approach as there is no agency control over configuration, maintenance, and management.

3. **Routing of Data Back Through RMIS/Caltrans:** As many of the sites are already connected to Caltrans field communications networks and are routed through the Caltrans D11 Traffic Management Center, it should be possible to largely utilize existing infrastructure and systems to support the existing, supplemental, and detailed vehicle classification sites. Some modifications may be required to software interfaces to support the detailed vehicle classification sites. Under this approach, basic monitoring and maintenance of the vehicle classifications sites would reside with Caltrans.

- **Use of PeMS as a Data Collection & Dissemination Resource:** Based on discussions with Caltrans and SANDAG, it seems that PeMS is already able to support the desired classification data. PeMS is an excellent resource for collecting this data and making it available; however, it is generally used to look at individual sites and the data would have to be placed into other tools to look at regional patterns and trends. PeMS should be accessible by all potential data users including Caltrans, SANDAG, and industry, etc.
Preliminary high level cost estimates were developed for this pilot effort, and full implementation would cost between $1 million and $1.25 million. Near-term implementation of a set of supplemental sites could be accomplished for approximately $295,000. It is important that any implementation effort include long-term maintenance and monitoring activities to ensure continued proper operation and calibration of the sensors. Funding for this effort has not been identified. The primary responsible implementing agencies would need to be SANDAG and Caltrans. Significant planning and coordination effort would be needed to establish agreed upon truck classifications. These efforts should include participation from the commercial trucking industry. There is possible synergy between future truck data collection and future Integrated Corridor Management (ICM) program implementation. For example, enhanced vehicle classification data could substantially enhance the near real-time predictions of traffic conditions used by the ICM program to rate and suggest response plans.

**Trucks on Managed Lanes Next Steps: Implementation Pilot**

Meetings about the broader concepts of integrating truck mobility and the utilization of the managed lanes network led to discussions about methods to test public perceptions and the desire or willingness of industry for trucks to make use of the managed lanes. Given the restrictions proposed for truck types on managed lanes as part of this Study, discussions centered on public perceptions and policy more than safety and engineering design concerns.

As a result of these meetings, including participation from the Caltrans Corridor Directors and Caltrans and SANDAG staff, the potential for a near-term pilot was discussed that could allow restricted truck traffic onto the I-15 Managed Lanes. The following concept lays out guidelines and objectives for such a pilot if deemed appropriate by SANDAG and Caltrans leadership in the future.

During an initial pilot, it is advisable to allow only light-duty, 2-axle trucks into the managed lanes. This does not require legislative action, as these trucks would already be able to use the lanes legally if they meet occupancy and/or toll payment requirements. The objectives of the pilot could be to:

- Test the policy concepts of more fully utilizing the managed lanes network to balance truck traffic and improve overall corridor mobility.
- Test public perceptions of trucks in the managed lanes.
- Test trucking industry views on the use of managed lanes to assess: value to industry, types of trucking users and trip types most likely to use the lanes, and truck driver views of using the lanes in terms of safety perception, and accessibility.
- Test overall mobility impacts to determine if trucks impact average speed trends or the managed lanes speed objective of 45 mph or greater.

The major shift for the pilot would be to encourage the potential use of the managed lanes by light-duty, 2-axle trucks, which could include:

- **Signage Adjustments**: Current signage along I-15 does not specifically preclude trucks, but does not note that light trucks are allowed. Signage could be temporarily adjusted to make the potential use of the managed lanes by light-duty trucks clear.
- **Marketing Activities**: Marketing and communications actions could be taken to gain involvement of potential trucking fleets and make users of the managed lanes aware of the pilot project.

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4 Although decision makers would include SANDAG and Caltrans leadership, coordination with California Highway Patrol would also be needed.
**Toll Rate Adjustments:** In order to encourage pilot program participation, trucks may be provided transponders, but special toll rates or temporary discounts could be considered to encourage involvement.

The pilot program for light-duty trucks on the I-15 Managed Lanes would include the following efforts:

**Policy Exploration Phase:** Vet the pilot program with SANDAG and Caltrans Executive Management and the SANDAG Board to ensure the goals and duration of the pilot program are understood. The overall duration of the pilot should allow for at least six months of operational testing.

**Project Objectives and Charter:** Define the primary objective of the pilot program to assess whether or not the use of the region’s managed lanes network by trucks is a viable alternative for improving overall corridor mobility and ensuring long-term goods movement sustainability. Also set clear objectives to test industry and public perception of the approach and confirm that light-duty truck traffic can be operated without significant traffic operations impacts.

**Design and Implementation:** As noted, some signage changes and adjustments would be needed. In addition, Changeable Message Signs (CMS) may be used to post program messages and announcements. Depending on program details, it may be necessary to implement some temporary changes to tolling systems and programs, as well as add information to SANDAG, Caltrans, and Express Lanes websites. Finally, additional vehicle classification data should be collected for the managed lanes. This could include calibration of side-fire or loop based vehicle detection sites.

**“Before” Data Collection:** A period of detailed “before conditions” data should be collected for the entire corridor, including speeds, volumes, vehicle classifications, accidents, and Freeway Service Patrol activity.

**Marketing Activities:** Marketing and communications activities should be conducted with industry to ensure they are aware of and utilize the program. In order for the pilot program to properly test public perceptions, it is important that trucks be present in the facility at reasonably anticipated levels.

**Pilot Operations and Assessment Period:** The pilot operations period should be at least six months, during which operations are closely monitored and data is collected on an on-going basis.

**Public and Industry Perceptions:** During the pilot operations period, survey known I-15 Managed Lanes users to assess their perceptions and reactions; conduct similar surveys with industry participants. Any public or industry complaints would be logged during the pilot program period.

**Post-Pilot Evaluation & Policy Confirmation:** Following the pilot program period, assess the overall success and regional perceptions of the pilot program. If the pilot program has proven to provide goods movement mobility value while not impacting traffic operations or perceptions of the managed lanes as a useful and effective option for faster and safer travel along the corridor, then further policy review could be considered.

If the pilot program proves successful, further consideration could be made of a broader policy regarding the use of managed lanes by trucks, including truck type and time of day restrictions, and adjustments to managed lanes design. If success leads to the desire to expand truck on managed lanes opportunities, then the region should consider legislative, design, and policy changes appropriate to allowing both light- and medium-duty trucks onto the managed lanes, with the restrictions discussed in greater detail as part of this Study.