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

*Technical Memorandum #4: Data Collection*

IBI Group, CH2M HILL, Cheval Research

June 7, 2013; Revised August 26, 2013
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Technical Memorandum #4: Data Collection

TO: Andrea Hoff and Christina Casgar, SANDAG

FROM: IBI Group, CH2M HILL, Cheval Research

DATE: June 7, 2013; Revised August 15, 2013

1. Introduction

This memorandum describes the data collection process, methodology, and findings conducted to support the analysis of the potential truck management strategies identified in Technical Memorandum #3: Strategy Development. This memo includes a summary of both current and projected truck operations and safety data along the region’s freeways, as well as findings from trucking industry stakeholder interviews conducted as a part of this study. The memorandum concludes with a discussion of the recommended corridors and gateways/hub focus areas to evaluate truck management strategies in the region.

2. Background

2.1 Trucking Industry Overview

The trucking industry in the San Diego region has characteristics of any major metropolitan area in the United States and some unique characteristics based on San Diego’s position on the Pacific coast and adjacent to the international border with Mexico. The types of trucking are diverse and include a mix of local, regional, and long-haul operations. Regional trucking operations supporting through-freight movement to and from the U.S.-Mexico border, and to and from the Ports of Los Angeles and Long Beach must traverse San Diego County. Port trucking operations at those two ports are largely containerized with some break bulk freight destined for all points served by those ports internationally and domestically. Likewise, local trucking operations must also serve the large San Diego area population by bringing goods into the region and distributing those goods for local consumption. San Diego is not a high-production and distribution region compared with Los Angeles and the Inland Empire (Riverside, San Bernardino, and Ontario metropolitan areas), so many laden vehicles are coming into the County from external origins for local distribution or cross-border operations.

Additionally, the Port of San Diego has become a less congested West Coast alternative for automobiles, fruit, Hawaii-bound cargo, and bulk cement. Movement of these goods is supported by regional and long-haul car haulers, refrigerated trucking operations, and bulk product trucking operations. Hawaii-bound cargo is supported by trucking operations of all types. The importation of windmills and other large ancillary equipment at the Port of San Diego has also recently been supported by specialty oversize trucking operations and other long-haul carriers. San Diego also hosts a variety of light manufacturing operations and food
and beverage distribution operations, and the trucking operations that support them. Air freight and construction are further supported by respective specialty trucking operations within the County.

Trucking in San Diego locally, regionally, and beyond will be required to adapt to the changes in the region’s demographics. All trucking operations are responsive to shippers and receivers who are, in kind, responsive to the needs and demands of the population. As the population grows, trucking will need to expand to accommodate an increased need for food, clothing, supplies, consumer goods, vehicles, fuel, agricultural products, construction and building materials, and manufacturing materials. The American Trucking Association estimates truckload volumes will grow nationally 3.2% through 2018 and 1.1% annually between 2019 and 2024. Less-than-truckload volume should grow nationally 3.5% annually through 2018 and by 2.4% until 2024\(^1\). Furthermore, San Diego’s truckers will also need to respond to increased goods movements expected due to increases in cross-border trade in the coming decades.

Therefore, the importance of mobility through the region is as important as mobility within the region for the trucking companies tasked with moving both local and through freight. The interviews conducted as part of this data collection effort seek to provide real-world information to validate statistical and model data collected throughout this study and to support the assessment of truck management strategies that make sense for both the region and the truck transportation industry.

### 3. Trucking Industry Stakeholder Interviews

#### 3.1 Trucking Industry Interview Methodology

**Approach to Interviews**

The intent of the trucking and trade industry interviews was to attain a real-world understanding of the mobility issues facing trucking companies operating in the San Diego region. The interviews are not intended to provide a statistically significant data set; instead, their purpose is to supplement and validate statistical and model data compiled by the project team. Sixteen interviews and one focus group were conducted. The goal was to identify problem areas and efficiency issues that would not otherwise be identified by traffic and transportation data collection and model analysis.

**Interviewee Selection**

Interviewees were selected to represent a cross-section of the types of trade and trucking operations currently conducting business within San Diego. Representatives of trade associations, shippers, receivers, manufacturers, and trucking companies were included among the interviewees. The major focus for this study was on truck transportation operations, thus the largest group were the trucking companies.

Different types of trucking operations will be affected somewhat differently by the identified freeway truck management strategies. The operational characteristics of a cross-border container hauler are very different than those of a local beverage distributor or an air freight

---

\(^1\) American Trucking Association, U.S. Freight Forecast to 2024 (June 26, 2013)
carrier. Trucking companies were selected so that a variety of operational characteristics may be broadly considered in strategy development and analysis. The following interview selection factors were used to achieve a variety of interviewees:

- Base of operation
- Range of operation
- Size and weight of vehicles
- Type of operation

Each of the interview selection factors is discussed in the following sections.

**Base of Operations**
For the purposes of this study, major truck trip production areas within the County were identified. The list below identifies areas where truck activity was deemed to be elevated enough to warrant a better understanding of trucking operations and challenges in those areas. During the selection process, at least one interviewee was sought within each of the identified truck trip activity areas. These areas also coincide with the trucking gateways and distribution hubs that were formalized later in the study and are discussed in the Key Findings section of this document (see Figure 65).

- Vista/SR 78 Corridor
- Mira Mesa/Sorrento Valley
- Scripps Poway Parkway
- Kearny Mesa
- San Diego Int'l Airport
- Port of San Diego (10th Avenue Marine Terminal and National City Marine Terminal)
- National Distribution Center (Adjacent to Port of San Diego, National City Marine Terminal)
- El Cajon/Santee
- Military Bases
- US/Mexico International Border
- Based outside the San Diego Region (including, but not limited to, Baja California, Mexico, and the counties of Imperial, Riverside, San Bernardino, Orange, and Los Angeles.)
- Other Regional

**Range of Operations**
For the purposes of this study, ranges of operations were categorized as local, regional, or long-haul to describe the length of a truck trip and where it originates and terminates, and they are defined as follows:

- **Local** – Truck trip originates and terminates within San Diego County. SANDAG model data refers to this type of trip as Internal-Internal. (Shown in red)
- **Regional** – Truck trip originates or terminates in San Diego County, but travels to or from another location within Southern California (for this study, defined as all bordering counties, Baja California/Mexico, and Los Angeles County). (Shown in blue)

- **Long-haul** – Truck trip originates or terminates in San Diego County, but travels outside the region (defined above), **OR**, originates and terminates outside the region, traveling through San Diego County (also known as “through freight”). (Shown in green)

*Figure 1 – Local, Regional and Long-Haul Truck Trips*

Local, regional, and long-haul operators, or a combination thereof, were sought as interviewees for the study. Each type of trip represents different needs in terms of requirements for services, parking, driver accommodations, hours of service, fuel requirements, and operational flexibility. Interviewees were selected that represented each range of operation category, and often more than one category.

**Size and Weight of Vehicles**

For the purpose of this study, trucks were divided into three major categories, light-duty, medium-duty, and heavy-duty, as described in Table 1 below:
Table 1 – Truck Classification

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light-duty</td>
<td><img src="image1.png" alt="Image" /></td>
<td>Generally 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="image2.png" alt="Image" /></td>
<td>Generally 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="image3.png" alt="Image" /></td>
<td>Generally the largest and heaviest trucks (over 33,000 lbs), with 5 or more axles.</td>
</tr>
</tbody>
</table>

a. Truck weights were revised slightly from the definition included in Technical Memorandum #2: Issue Identification. This was done to more closely align the truck type definitions with the definitions used in the SANDAG truck model.

Trucking companies were selected that had vehicles in each representative category so that any particular operational characteristics for that category may be considered in strategy development and evaluation.

**Type of Operation**
The following types of operations represent different types of freight and conveyances with diverse operational requirements. Therefore as interviewees were selected, a cross-section of different types of operations were incorporated as selection factors. The type of operation indicates a broad category of trucking operations that have unique operational characteristics. The operation types used as selection factors include the following:

- Food and Beverage Distributors
- Small Package Carrier
- US/Mexican Cross-Border Carrier
- Produce Carrier
- Container Carrier
- Less than Truckload (LTL) Carriers
- Dry Freight Carrier
- Major Grocery Carrier
- Air Freight Carrier
- Military Support Operations

**Overview of Selected Interviewees in the Region**
Thirty potential interviewees were identified that satisfied the goal of incorporating each of the previously identified selection factors. A total of 17 individual interviews and one focus group were conducted.

The following chart indicates the number of individuals or companies within each organization type that participated in the interviews or focus group.
**Base of Operations**

All identified base of operation areas were covered by the selected interviewees with two exceptions; the base operation zone interviewees in El Cajon/Santee and the National Distribution Center did not respond or were unable to participate within the time required for this study.

---

**Figure 2 – Organization Types**

![Organization Types](image)

**Figure 3 – Base Operations Zone**

![Base Operations Zone](image)
**Range of Operation**
Most interviewees had a combination of both regional and local ranges of operations. The numbers in the chart below represent the total type of operations, where some interviewees had more than one type within their organization.

![Figure 4 – Range of Operations](image)

**Size and Weight of Vehicles**
This chart represents the dominant type of vehicle in the interviewee’s truck fleet. This chart does not represent the number of vehicles in the fleets. Although only three interviewees had light vehicles in their fleets, the largest number of vehicles operating locally are in the class of light vehicles. Most interviewee fleets were comprised of heavy vehicles (tractor/trailer combinations).
Interview and Focus Group Scheduling and Implementation

Potential interviewees were contacted by telephone or in-person at local trucking and trade industry events and meetings. Individual interviewees were company executives or operations managers. Appointments often included a number of individuals within the company that provided complementary operational expertise. Appointments were scheduled for 60 minutes. Most interviews averaged about 90 minutes, with permission of the interviewee. Most interviews required between two and four weeks lead time. Interviewees were provided with project background information and a summary of the information that would be requested during the interview.

For this study, a focus group was formed with selected interviewees to ensure that the border trucking and trade community concerns were documented accurately and comprehensively. The international border with Mexico is a major and important trucking operation zone with an active community interested in participating in the region’s planning processes. Ten border trucking and trade industry representatives were selected to participate in this focus group. This meeting was scheduled for 75 minutes and included a presentation of potential truck management strategies for comment by the group.

Interview Questions and Format

The intent of the interviews was to attain a real-world understanding of the mobility issues facing trucking companies operating within the San Diego region, and to validate quantitative data sources. The interviews and focus group assisted in identifying problem areas and efficiency issues that would not otherwise be identified by traffic and transportation data collection and model analysis. Given these goals, the interview instrument was developed as a guide to assist the project team in understanding what problems currently exist on the San Diego region’s freeway and major arterial systems and why they are problems for certain types of trucking operations or vehicle types. Finally, the interviews were an opportunity for the project team to listen to ideas and solutions that the
trucking and trade community thought would be most applicable and helpful in improving operating conditions, in the near and long term.

The interview was conducted in two parts. The first part focused on demographic information about the interviewee’s transportation operations (e.g. fleet size, vehicle types, operational hours, seasonal fluctuations, etc.). The second part focused on current problem areas and presented potential strategies for addressing truck mobility on San Diego regional freeways and then asked for comments and additional ideas.

Interviews were conducted confidentially. Interview data summarized in this report will not disclose the identity of any individual respondent. This approach allowed respondents to discuss their operational and transportation issues candidly and to protect any competitively sensitive information.

The Interview Guide is provided in Appendix A.

3.2 Trucking Industry Interviews Summary

Demographics Summary

Interviewees included both trucking companies and trade associations that represent trucking and trade communities. Trucking company interviewees were asked to think about their current operations and provide some basic information about their fleet, operations, and current highway operational issues and problems.

Interviewees were asked about their fleet size and the truck types (i.e. the number of light, medium, heavy trucks in their fleet).

Interviewees represented a diverse cross-section of operation types and included both large and small companies; they included owner-operators with a single truck operation and major trucking and distribution operations in San Diego comprising a large number of vehicles and truck movements within and through the County.

Table 2 represents a snapshot of the interviewees and their respective type and size of operation. Among the respondents, there were eight that participated in a Cross-Border Trade and Trucking Focus Group. Their responses have been consolidated in the remainder of the discussion and will be represented in subsequent sections under respondent ID# 1. There were also four trade association representatives interviewed; their demographic information is not applicable due to their representation of a larger group of stakeholders.

This demographic information is intended to provide a sense of the types of companies and organizations that represent the opinions and information conveyed in the remainder of the interview summary sections.
This page intentionally left blank.
<table>
<thead>
<tr>
<th>Respondent ID #</th>
<th>Interview or Focus Group</th>
<th>Operation Type</th>
<th>Base of Operation</th>
<th>Heavy - Tractors (≥ 2 axles)</th>
<th>Heavy - Straight Trucks (≥ 2 axles)</th>
<th>Medium</th>
<th>NA</th>
<th>Light - Other Light Vehicle Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Focus Group</td>
<td>Cross-border carrier</td>
<td>Tecate</td>
<td>51</td>
<td>0</td>
<td>0</td>
<td>107</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Focus Group</td>
<td>Cross-border carrier</td>
<td>San Diego/Otay Mesa</td>
<td>31</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Interview</td>
<td>Trade Association (Manufacturing)</td>
<td>San Diego/Otay Mesa</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>4</td>
<td>Focus Group</td>
<td>Cross-border carrier</td>
<td>San Diego/Otay Mesa</td>
<td>16</td>
<td>0</td>
<td>1</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Focus Group</td>
<td>Cross-border/Port drayage carrier</td>
<td>San Diego/Otay Mesa</td>
<td>168</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Focus Group</td>
<td>Trade Association (Freight Brokerage)</td>
<td>San Diego/Otay Mesa</td>
<td>NA</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Interview</td>
<td>Major Small package carrier</td>
<td>Los Angeles and San Diego</td>
<td>100</td>
<td>0</td>
<td>395</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Interview</td>
<td>Container transport carrier</td>
<td>San Diego/Otay Mesa</td>
<td>Uses for-hire dray operators only</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>Interview</td>
<td>Trade Association (Trucking)</td>
<td>National</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>10</td>
<td>Interview</td>
<td>Air freight carrier</td>
<td>San Diego</td>
<td>15</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Focus Group</td>
<td>Cross-border/Drayage carrier</td>
<td>San Diego/Otay Mesa</td>
<td>34</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>Interview</td>
<td>Local Distribution Trucking</td>
<td>San Diego</td>
<td>2</td>
<td>38</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Interview</td>
<td>Beverage/Snack Foods carrier (Local Distribution)</td>
<td>San Diego</td>
<td>0</td>
<td>0</td>
<td>28</td>
<td>0</td>
<td>77 (route vans)</td>
</tr>
<tr>
<td>14</td>
<td>Interview</td>
<td>Beverage/Snack Foods carrier (Local Distribution)</td>
<td>San Diego</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>Interview</td>
<td>Local Distribution carrier (Private)</td>
<td>Los Angeles</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Interview</td>
<td>Port/produce operation</td>
<td>San Diego</td>
<td>Uses for-hire trucking companies and OOs Moves 500 containers per week</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>17</td>
<td>Interview</td>
<td>Trade Association (Trucking)</td>
<td>State of California</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>18</td>
<td>Interview</td>
<td>Container transport carrier</td>
<td>San Diego (for truckers/owner-operators)</td>
<td>60</td>
<td>0</td>
<td>0</td>
<td>2000 (using rail chassis)</td>
<td>0</td>
</tr>
<tr>
<td>19</td>
<td>Interview</td>
<td>Major Grocery Chain carrier</td>
<td>Los Angeles</td>
<td>239</td>
<td>0</td>
<td>0</td>
<td>750</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>Interview</td>
<td>Major Small package carrier</td>
<td>San Diego</td>
<td>91</td>
<td>32</td>
<td>4</td>
<td>77</td>
<td>10 (vans)</td>
</tr>
<tr>
<td>21</td>
<td>Interview</td>
<td>Beverage Distribution carrier</td>
<td>San Diego</td>
<td>0</td>
<td>62</td>
<td>0</td>
<td>65</td>
<td>0</td>
</tr>
<tr>
<td>22</td>
<td>Focus Group</td>
<td>Cross-border carrier /Freight Forwarding</td>
<td>San Diego/Otay Mesa</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>Focus Group</td>
<td>Freight Forwarder</td>
<td>San Diego/Otay Mesa</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Interview</td>
<td>Dry freight carrier</td>
<td>San Marcos</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Interview</td>
<td>Air freight carrier</td>
<td>San Diego</td>
<td>6</td>
<td>3</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Interview</td>
<td>Local Distribution carrier</td>
<td>Poway</td>
<td>72</td>
<td>20</td>
<td>1</td>
<td>2</td>
<td>(vans)</td>
</tr>
<tr>
<td>27</td>
<td>Interview</td>
<td>Military Support carrier (Trucking &amp; Service Vehicles)</td>
<td>San Diego</td>
<td>43</td>
<td>35</td>
<td></td>
<td></td>
<td>195 (light trucks), 180 (passenger vans)</td>
</tr>
</tbody>
</table>
This page intentionally left blank.
**Operations Summary**

Respondents were asked the following questions during the interviews. A summary of their responses is grouped by operation type.

1. Number of inbound trucks? Per day? Per week? Per Month?
2. Number of outbound trucks? Per day? Per week? Per Month?
3. Are your operations seasonal? Please describe.
4. What locations would you consider your primary trip origins (A general location is ok)
5. What are your primary destinations? (A general location is ok)
6. What major corridors/freeways do your truckers use to traverse the region?
7. What access routes do your truckers use to get to the major corridors?

**Truck Movements and Peak Truck Activity**

How trucks move in and through San Diego County varies widely across carrier types and the customers that they serve. Truck movements, including the frequency, number, and time of day are primarily driven by the shipper or receiver of the freight being hauled. Respondents to the interviews collectively agreed that truckers respond to the requirements of shippers and receivers and adjust their schedules and routes accordingly.

**Small package carriers** (Respondent ID #s 7 and 20) are among the most active and numerous in the County. Respondents indicated that consumer goods purchased online have increased volumes over the recent decade and are continuing to trend upward. Respondent # 7 has major consolidation and wide area distribution facilities located outside the County (in Los Angeles or the Inland Empire). Respondent # 20 also has a major consolidation facility in San Diego County. The large facilities send truckloads into the County to distribution facilities located either centrally (for one carrier) or to any of three locations (for the other carrier). These movements typically take place during early morning off-peak hours. A combination of tractor trailers and smaller vehicles (either straight trucks or package vans) then distribute the packages to their final destinations. The smaller package vehicles operate at varying hours, including during peak traffic hours.

**Cross-border carriers** (Respondent ID #s 1, 2, 4, 11, 22, 23 and 5) and container carriers (Respondent ID #s 8 and 18), including transloaded vehicles and drayage trucks, move much of their freight between the border at Otay Mesa/Mesa de Otay and the Ports of Long Beach and Los Angeles, or to intermodal rail heads in the Inland Empire (east of Los Angeles, in Riverside and San Bernardino Counties). Cross-border carrier truck movements are constrained by the hours of operation of both U.S. and Mexican customs facilities and the shippers and receivers that they serve. Northbound trucks must cross between 6:00 AM and 7:00 PM on weekdays, and 8:00 AM until 2:00 PM on weekends and holidays. Southbound trucks must exit the freeway (SR 905) to local arterials to get into queues to access the outbound U.S. cargo export facility and the Mexican commercial vehicle port of entry. Queues form predominantly on La Media Road and Siempre Viva Rd. The cargo export facility operates from 8:00 AM until 8:00 PM on weekdays, and 9:00 AM until 2:00 PM on weekends and holidays.
Table 3 – Summary of US/Mexican Commercial Vehicle POE Hours of Operation

<table>
<thead>
<tr>
<th></th>
<th>Northbound Commercial Vehicle POE</th>
<th>Southbound Commercial Vehicle POE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weekday Hours</strong></td>
<td>6:00AM – 7:00PM</td>
<td>8:00AM – 8:00PM</td>
</tr>
<tr>
<td><strong>Weekend and Holiday Hours</strong></td>
<td>8:00AM – 2:00PM</td>
<td>9:00AM – 2:00PM</td>
</tr>
</tbody>
</table>

**Air freight carriers** (Respondent ID #s 10 and 25) operating in San Diego schedule their movements around flight schedules. Most third party air freight transportation operations are off-site in San Diego and must use the freeway and/or local arterials to get to the San Diego International Airport (SAN) air freight facilities. Primary access routes include I-5, Harbor Dr., and Pacific Highway. One air freight respondent (ID #25) also shuttles freight between SAN or a Mira Mesa based warehouse facility and Los Angeles International Airport (LAX) and John Wayne International Airport (SNA) in Orange County, using Harbor Dr., Pacific Highway, and I-5.

**Less than truckload (LTL) and local distribution carriers** (Respondent ID #s 12, 15 and 26) interviewed for this study are typically daily route-oriented movements serving customers throughout the County. Most provide a variety of supplies and products to other businesses. Two respondents (#s 12 and 26) are based in San Diego County and the third (# 15) is based in Los Angeles, making daily trips into San Diego County. As with other trucking operations, these carriers are bound by their customer’s receiving schedules, which may not be off-peak traffic hours. Respondent # 15 delivers most freight in the region between midnight and 7:00 AM. All of these carriers attempt to route their drivers to avoid peak traffic congestion areas when possible. Respondent # 15 uses I-5, I-805, and SR 905. Respondents # 12 and # 26 use all major freeways in the County. Respondent # 26 is based in Poway and is heavily dependent on I-15.

**Beverage and snack food distributors** (Respondent ID #s 13, 14 and 21) interviewed serve a variety of stores and outlets for groceries, convenience foods, alcoholic and non-alcoholic beverages located throughout San Diego County. These carriers have routine routes that vary slightly with customer inventories and seasonal summer peaks. Respondent # 14 is responsible for stocking distribution centers and has truckloads coming into various locations in San Diego County from 8:00 AM to 10:00 AM, 11:30 - 1:00 PM and then from 5:00 PM staggered throughout the night. This respondent uses I-5 and I-15 to enter the County and I-8. Respondent # 13 is responsible for daily route deliveries and uses most major freeways and arterials in the County without exception. Respondent # 21 also uses most major freeways and is based in the Miramar area; Miramar Road and Mira Mesa Blvd. are major arterials used.

Respondent # 19 represents a major grocery chain with approximately 55 stores in San Diego County. The chain operates its own tractors and trailers and conducts a 24/7 operation delivering only to its own supermarkets. All warehouse and distribution operations are located in Los Angeles and the Inland Empire. Trucks entering the County use I-5 and I-15 respectively, then use all major freeways to reach store locations. Travel and delivery times depend on the commodity to be delivered and store receiving schedules. Many stores are constrained to receive within curfew hours set by local municipalities, shopping center
owners, or local community groups (which precludes travel and delivery during off-peak hours).

The Military carrier (Respondent ID # 27) interviewed provides transportation services to four major military installations (Naval Base San Diego, Navy Base Coronado, Naval Base Point Loma, and Marine Corps Air Station (MCAS) Miramar) in the San Diego metropolitan area. This respondent’s operation includes an extremely diverse fleet of vehicle types hauling freight, service equipment, and passengers. Trucking operations include heavy tractor-trailer and medium-duty straight trucks. The truck and trailer fleet is comprised of mostly flatbeds, but also includes dry vans, refrigerated vans, end-dumps, tilt-beds, low-boys, roll-offs, cranes, street sweepers, stake beds, fuel tankers, and refused trucks. The operation includes about 800 local round-trips per month to the local Naval bases with occasional trips outside of the San Diego area, but within the region. The truck-trip volumes provided by this respondent include only truck-trips conducted by vehicles in their fleet and do not include for-hire trucks picking up or delivering freight to any of the four bases. The respondent indicated that there is significant for-hire truck activity but was not able to quantify volumes at the time of this interview. This respondent’s operations are conducted predominantly from 6:00 AM to 4:30 PM. The greatest difficulty with congestion around the bases is experienced in the morning between 6:15 AM to 7:00 AM. Frequently used local arterials and state routes include SR 75, 8th Street (National City), Harbor Dr., North Harbor Dr., Pacific Highway, SR 282, Orange Ave. (Coronado), Rosecrans Blvd., and Catalina Boulevard. Corridors used include I-5, I-805, I-15, I-8, SR 94 and SR 125.

Major Congestion and Problem Areas
Interviewees were asked the following:

1. What are your major congestion points now?
2. What are any other problems that you are having moving your trucks to their destinations now?

The following section provides a consolidated summary of their responses.

In general, any major traffic congestion hot spot for commuters is also a problem area for trucks. Respondents indicated that it is more difficult for a large vehicle to merge in tight, slow moving traffic where passenger car drivers are less forgiving. They also indicated that additional fuel costs, driver fatigue, wear and tear on the vehicles, labor costs, and service failures are all negative outcomes of congestion delays.

- Improving and creating access for trucks to freeways from congested arterials is highly-important and of particular concern for trucking operations located in the Miramar, Sorrento Valley, Mira Mesa, and San Marcos areas.
- Event-driven and seasonal congestion mitigation is needed around major venues to assist truckers in maintaining predictable delivery schedules. Respondents repeatedly mentioned delays related to traffic at or near the following locations:
  - San Diego County Fair (Del Mar) and Racetrack at Via De La Valle and I-5
  - Comic-Con in downtown San Diego and SR 163
  - MCAS Miramar Air Show along I-15
Beach event traffic along I-5, from La Jolla to I-8

- Respondents repeatedly expressed safety concerns and frustration with delays at the following highway interchange locations:
  - SR 163/I-8 (congestion and difficulty merging)
  - SR 163 and Friars Rd. (difficulty merging, congestion at southbound exit)
  - The I-805/I-5 merge (both directions in the AM and PM)
  - SR 905/I-805 and SR 905/I-5
  - I-805 northbound in the AM and southbound in the PM
  - Coronado Bridge in the AM (particularly southbound I-5 to SR 75 (Coronado Bridge exit) due to the rapid reduction in lanes requiring quick merges into a single lane)
  - SR 78 at I-15 and I-5
  - Palomar Airport Rd. (congestion, lane change difficulty)
  - San Marcos Blvd. (congestion, lane change difficulty)
  - I-15 in the Rancho Bernardo vicinity (congestion, stop and go traffic speed disparities)
  - I-5 on Fridays (congestion, stop and go traffic speed disparities)
  - I-5 from Oceanside and Carlsbad south to Mission Bay during peak traffic hours on weekdays
  - SR 52 (either direction during peak traffic hours (congestion, stop and go traffic speed disparities))
  - The north end of SR 125 at SR 94 (congestion, difficulty merging)
  - SR 125 at I-8 (congestion, difficulty merging)
  - I-8 signage for wind advisories to far inland
  - Mira Mesa Blvd. during peak traffic hours; I-805/Mira Mesa Blvd. on/off ramps; I-15/Mira Mesa Blvd. on/off ramps
  - Miramar Rd. during peak traffic hours; I-805/Miramar Rd. on/off ramps; I-15/Miramar Rd. on/off ramps
  - I-5 and La Jolla Village Dr. (congestion, stop and go traffic speed disparities)
  - Harbor Dr. and N. Harbor Dr.
  - Arterials serving military base gates (adjacent to Naval Base San Diego, Naval Base Coronado, Naval Base Point Loma, MCAS Miramar as described in the Section: Truck Movements and Peak Truck Activity)
La Media Rd. and Siempre Viva Rd. at the US/Mexican border (Long queues along these roadways during peak commercial vehicle traffic hours; no services for drivers; queue not managed; conflicts with local access to businesses and side streets.)

- Receiving hours, restricted routes, and curfews for certain delivery locations were also mentioned as issues precluding off-peak travel and delivery for many carriers. Labor costs for night crews at the receiving facilities are prohibitive or undesirable for some businesses. Route restrictions and curfews at delivery locations coinciding with residential neighborhoods are also constraints on flexibility for truckers.

- Access to and availability of parking in downtown delivery locations creates delays in deliveries and increased costs due to parking citations. Some carriers consider this a cost of doing business.

- Unpredictability of congestion is a major factor for carriers; routine congestion can be planned for, whereas delays due to traffic collisions can cause service failures for some carriers (up to and including missed jets at air freight terminals).

**Current Truck Focus Areas – Identified by Interviewees**

Current truck focus areas were identified through feedback from the trucking industry stakeholder interviewees. Different interviewees identified different areas depending on the type of operation and time of day, day of the week, or season that their drivers used the interchange, on/off ramp, freeway segment, or connecting arterial or roadway. All locations identified are shown in Figure 6 and include:

- Freeway off ramps or on ramps where trucks experience difficulty negotiating merging traffic.

- Freeway off ramps or on ramps where trucks experience significant delays.

- Freeway segments and interchanges where truck operators indicate they are experiencing significant delays during special events, seasonal events, and/or peak commuter traffic hours. (Indicated in Figure 6 with red circles.)
Figure 6 – Problem Areas Identified by Interviewees
4. Data Collection

4.1 Truck Operational and Safety Data Collection Methodology

Truck operational and safety data sources included:

- **SANDAG Truck Model:** Forecasts provide daily truck volumes, basic truck classifications, peak hour truck volumes, and various other related forecast data through to the 2050 horizon year for the Regional Transportation Plan (RTP).

- **Statewide Integrated Traffic Records System (SWITRS):** Includes aggregated truck accident data from 2008 and 2012.

- **The San Diego Region Occupancy and Classification Study:** Includes regional classification and occupancy counts collected manually by Caltrans and SANDAG. The counts were conducted most recently in 2010 and 2011, and include truck classification for different times of the day.

- **Regional Weigh-in-Motion (WIM) Sites:** Includes truck count and classification data collected on an on-going basis.

The level and extent of truck specific data available for the region is only a small percentage of the data available for total traffic and auto traffic in general. Most tools, counts, performance monitoring systems, and operations systems in the region do not clearly distinguish between trucks and other traffic. Each of the data sources mentioned above has limitations. The most notable regional limitations to truck operational and safety data are:

- Lack of clear truck origin-destination data whether derived from the travel of the trucks themselves or the various supply chain logistics related to the movement of the trucks.

- Significant gaps in truck count and classification data generally caused by a shortage of WIM sites in the region, particularly the northern portions of the County.

- Limitations in aggregated accident data that do not clearly indicate the cause or level of impact generated through accidents involving trucks.

Methods for addressing these limitations are being addressed in a separate Technical Memorandum as part of this project; however, it is important to understand that the data presented in this Memorandum are subject to constraints and that the individual data sets are best considered together and taken as representative of general trends and areas of priority, rather than hard and fast rules of truck mobility and trends in the region.

**SANDAG Truck Model**

SANDAG developed a truck model that generates, distributes, and assigns truck trips to all significant freeways, highways, and arterials/roadways in the County. This model is the best source of projected future truck traffic and was used extensively to generate truck daily volumes, truck types, peak hour truck volumes, and related data for the maps. The model is built upon and is consistent with the SANDAG Series 12 forecast model for 2012, 2020, 2035, and 2050. It takes into account the 2050 Regional Transportation Plan (revenue constrained)
assumptions with consideration for future projects, projected population growth, and many other factors. For this study, the data extracted were particularly related to truck volumes, classifications, trip productions, employment surveys, and other characteristics.

Some of the key areas of information the model provides are:

- Accurate and reliable inclusion of planned roadway improvements, socio-economic and land use trends, and overall existing and forecast traffic conditions. It is a useful resource for identifying problem areas for truck mobility now and into the future.
- The model forecasts volumes for daily and peak truck traffic and basic breakdowns of light, medium, and heavy truck traffic.
- The model provides a better sense of internal to internal (within the region) truck travel patterns than is available from any other potential source.
- The model uses employment data to generate truck trips. This means it provides a reasonable sense of significant areas of truck trip generation and hubs for goods movement distribution, as well as the growth of these areas over time.

**Limitations**

The SANDAG truck model may not represent the logistics patterns of full and empty trucks in the border region. The model uses Freight Analysis Framework (FAF) 2 data to derive trips that start or end outside of San Diego—including those coming from Mexico. But, because FAF data measures the flow of commodities (full trucks), it does not capture estimates of empty trucks; therefore the data are adjusted up to match Department of Transportation border crossing data for empty trucks. These complexities may be one reason why the flow of southbound (often empty) trucks appears to be less than northbound trucks.

Additionally, the model generates truck trips internal to the County, but it borrows the internal truck trip rates from the neighboring Southern California Association of Governments (SCAG) model.

The model network codes freeways as one-way links rather than as bi-directional links. This nuance in combination with the need to illustrate travel characteristics at a regional scale, is why most of the data maps in this memo were separated into “north and west” segments and “south and east” segments to provide better clarity (it is difficult to show data in two directions on multiple segments of all corridors in the region on a map).

**Statewide Integrated Traffic Records System (SWITRS)**

Regional accident data can provide helpful context for the analysis of freeway truck management strategies and how they might be applied to key truck corridors and gateways in San Diego County. Accident data for this study were analyzed at a high level through review of the Statewide Integrated Traffic Records System (SWITRS) database maintained by the California Highway Patrol (CHP). The SWITRS database collects and processes data gathered from a collision scene by three CHP reporting regions: City of San Diego, Oceanside, and El Cajon. SWITRS is the only reasonably available aggregated accident data resource which looks at the overall region and these data provide useful insights to general
corridors with higher levels of truck related accidents, severity trends for truck related accidents, and some focus areas for truck related accidents.

**Limitations**

Although the data set is a useful insight into accident trends over a 5 year period, there are noteworthy limitations to the accuracy of the records. Of the 3,000 recorded truck accidents, a significant portion of the accidents do not have a recorded latitude and longitude. The complete data set also has over 1,000 records that have very minimal information recorded, which suggests that there could be accidents in the data set that involved a truck that were not recorded to be truck related. This data set was collected from SWITRS up to March 1st, 2013; however, there seems to be a drop off in the number of accidents recorded towards the end of the data set, suggesting that there is about a seven month lag in the accidents recorded in the database. CHP acknowledges the limitations in the following statement included within the SWITRS terms of use:

_This Web site and the SWITRS information are provided on an "as is" and "as available" basis. Due to collision records processing backlogs, SWITRS data is typically seven months behind. Data requested for dates seven months up to the current date will be incomplete. Report data is dynamic and may change from the time of an initial report requested based on the processing of new collision records in the SWITRS database._

Although the CHP attempts to maintain the highest degree of accuracy of content on this Web site, you agree to use this information at your own risk. CHP makes no guarantees, representations, or warranties of any kind, express or implied, arising by law or otherwise, including, but not limited to, content; quality; accuracy; completeness; effectiveness; reliability; fitness for a particular purpose; or usefulness. Further, the CHP expressly disclaims liability for errors and omissions in the content of this Web site. Independent verification of this information is strongly recommended before use.

The SWITRS data set has been summarized. These summaries are introduced under the results section later in this document.

**Weigh-in-Motion (WIM) Sites**

Caltrans weigh in motion (WIM) system that provides 24-hour traffic information at key locations on California highways and provides vehicle classifications for passing traffic. Regional truck classification data serve as a key reference when analyzing the freeway truck management strategies. In particular, these data can provide a sense of the potential impacts of strategies that may only apply to certain general classifications of vehicles. Also, heavy or larger vehicles will typically have a significantly greater impact on traffic operations (in terms of speeds, capacities, etc) than smaller trucks.

The purpose of this data collection effort is to investigate the traffic patterns between truck traffic and all other types of traffic as well as light, medium and heavy truck traffic, which is defined as follows:

- **Light Trucks**: up to 14,000 lbs
- **Medium Trucks**: 14,001 – 33,000 lbs
- **Heavy Trucks**: any trucks heavier than 33,000 lbs
In order to analyze the variations in light, medium, and heavy truck traffic peaks throughout the day, the region’s WIM data (over a five year period) was processed for seven stations across key truck corridors in the County. After the data were broken down for each station and each direction of travel, there were 14 data sets that showed when the three different truck traffic types peaked in volume at different times throughout the day. These findings will assist with the assessment of freeway truck management strategies along the corridors with different characteristics. Some of the strategies that apply to only one or two of the truck types (light, medium and heavy) can use this analysis to determine where and when the select strategies might apply.

**Limitations**

Although the WIM data set offers a great insight into how the truck traffic types are distributed among the key truck corridors, there are several limitations to the accuracy of the WIM records. These limitations must be taken into account when using these data to support whether or not to implement any particular strategy. The WIM data have the following limitations due to the complicated environment that these data are collected from:

- WIM sites can be inoperable/broken down or shut down due to maintenance for a substantial amount of time.
- WIM sites sometimes provide inaccurate vehicle classifications when vehicles pass over the sensors in an irregular manor.
- Several of the classifications include truck types that could fall into more than one of our three truck classifications.

**Regional Classification Counts**

The San Diego Region Occupancy and Classification Study conducted by SANDAG and Caltrans included data collection at 23 locations from March to June of 2012. The data provide one day of vehicle classification data for all of the types of vehicles that passed by the 23 sites in each direction of travel along key truck corridors in the County.

In order to analyze the variations in the total truck traffic versus the rest of traffic peaks throughout the day, the regional classification and occupancy count data were processed for the 23 sites across key truck corridors in the County. After the data were broken down for each site and each direction of travel there were 28 data sets that showed when the truck traffic and non-truck traffic types peaked in volume at different times throughout the day. These findings will assist with the assessment of the freeway truck management strategies throughout the various corridors in the County. The strategies that influence truck traffic differently throughout the various peak times will be greatly influenced by these data to determine which corridors, directions and times are best to apply any particular approach.

**Limitations**

Although the regional classification and occupancy count data set offers an insight into how the truck and non-truck traffic types are distributed among the key truck corridors, there are several limitations to the accuracy of the regional classification records. These limitations must be taken into account when using these data to support whether or not to implement any particular strategy. First, the counts are conducted during daylight hours and do not
capture classification for all 24 hours of the day. Also, the regional classification and occupancy count data consist of vehicles classified by sight; the following inaccuracies are related to the process of visually counting and classifying vehicles:

- Missing a vehicle due to being overwhelmed by the volume of vehicles,
- Counting a vehicle more than once due to cross over counting of different team members, and
- Classifying the vehicle in the wrong category due to the speed and/or volume of vehicles passing by at any given time.
- Inexperience of the temporary count staff may also be an issue and lead to some inaccuracies.

Despite the limitations of the four data sources summarized in this section, all of them provide a valuable insight into the traffic patterns between truck traffic and all other types of traffic, as well as light-duty, medium-duty, and heavy-duty truck traffic. These data sets serve as a useful reference throughout the process of assessing the freeway truck management strategies and how they might be applied to key truck corridors and gateways in San Diego County. These data summaries and findings are introduced under the results section later in this document.

4.2 Truck Operational and Safety Data Collection Results

This section provides a summary of the data collected from the SANDAG truck model, SWITRS, WIM stations, and the San Diego Region Occupancy and Classification Study. The information is summarized and presented in maps according to the following topics:

- Truck Trip Productions by Transportation Analysis Zones (TAZs)
- Total Average Daily Traffic (ADT) Volumes
- Truck Percentage of ADT and Daily Truck Volumes
- Truck Peak Hour Volumes
- Light, Medium, and Heavy Truck Volumes
- Level of Service
- Regional Weigh-in-Motion Sites
- Regional Classification and Occupancy Counts
- SWITRS Accident Data Summary
- Steep Grades
- Managed Lanes with Direct Access Ramps (DARs)

**Truck Trip Productions by Transportation Analysis Zones (TAZs)**

The truck trip production maps displayed in this section show the transportation analysis zones (TAZs) from the regional model, shaded to indicate the extent of truck trip
productions within each TAZ. A TAZ represents a geographic area within the region where the generation of trips (in this case trucks) are represented within the model. Land use and socio-economic data inputs to the model impact the level of truck traffic generation within each TAZ.

These maps illustrate truck trip productions, not attractions. Productions were mapped because they help identify areas with high concentrations of trucks; attractions tend to be more dispersed and simply reflect heavily populated and commercial areas. The data for these maps were taken from the SANDAG truck model for 2012, 2020, 2035, and 2050. The internal-internal truck trips (trips that begin and end in San Diego County) were linked to their respective TAZ in order to create each map.\(^2\)

The maps in Figures 7 through 10 show average daily truck production volumes by TAZ. These figures represent only the average daily truck productions and exclude all other types of traffic trip productions. The truck traffic production volumes are represented with six different shades of red, with the darker colors representing greater levels of truck trip productions.

- Figure 7 – 2012 Truck Trip Productions by TAZ
- Figure 8 – 2020 Truck Trip Productions by TAZ
- Figure 9 – 2035 Truck Trip Productions by TAZ
- Figure 10 – 2050 South & East Productions by TAZ

Several conclusions can be drawn by examining these maps:

- The TAZs with the highest truck trip productions are clustered into specific regions:
  - SR 78 corridor/Palomar Airport Road
  - US/Mexico border area at Otay Mesa
  - Miramar/Mira Mesa/Sorrento Valley area
  - San Diego International Airport
  - National City Marine Terminal & National Distribution Center
  - 10th Avenue Marine Terminal & 32nd Street Naval Station
  - Camp Pendleton
  - Poway business district
  - Mid-City
  - El Cajon/Santee

\(^2\) The maps do not show internal to external (I-E) or external to internal (E-I) trips. The method used to distribute I-E or E-I trips throughout the region is based on employment density and while the model adequately predicts how many trips go through a gateway into or out of the region, it is less accurate at predicting precisely where they come from or go to. For this reason, external trips are not shown on the truck trip production maps. Despite this limitation, viewing internal to internal truck trip productions is extremely valuable for identifying major truck activity zones in the region, as there is evidence to show that the majority of truck trips in the region are I-I.
- Kearny Mesa
- Rancho Bernardo

- The following three areas displayed the greatest growth in truck productions in terms of expansion and/or internal TAZ truck production:
  - SR 78 corridor/Palomar Airport Road,
  - US/Mexico border area at Otay Mesa,
  - Miramar/Mira Mesa/Sorrento Valley area.

- Unlike some other areas of the country, the San Diego region does not have substantial areas with extremely high levels of truck trip production (similar to larger manufacturing or intermodal operations), and truck trip production is more dispersed along corridors and sub-regions.
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Figure 7 – 2012 Daily Truck Trip Productions by TAZ

Legend
Truck Trip Production by TAZ (2012)
- 0 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 200
- 200 - 1000

Description: Truck Trip Production by TAZ (2012)
Source: SANDAG Model Data
Date: 4/14/13
Figure 8 – 2020 Daily Truck Trip Productions by TAZ

Legend

Truck Trip Production by TAZ (2020)

- 0 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 200
- 200 - 1000

Source: SANDAG Model Data
Figure 10 – 2050 Daily Truck Trip Productions by TAZ

Legend
Truck Trip Production by TAZ (2050)
- 0 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 200
- 200 - 1000

Description: Truck Trip Production by TAZ (2050)
Source: SANDAG Model Data
Date: 4/14/13
**Total Average Daily Traffic (ADT) Volumes**

The total ADT volumes displayed in the maps below demonstrate the change in total traffic volumes over time in the north-west and south-east directions. The total traffic volumes account for motorcycles, cars and all types of trucks traveling along the general purpose lanes on highways in San Diego County (note the express and HOV lanes are not included). These maps give insight into which freeways have the most traffic and which are less traveled. The data for these maps were taken from the SANDAG forecast model for 2012, 2020, 2035, and 2050. More specifically, the data extracted from the model are representative total ADT values for the freeway corridors, which ranged from 0 – 147,000 vehicles per day.

The total ADT volumes are represented with seven different line thicknesses, with the thicker lines representing higher volumes. It is useful to consider total ADT in relation to forecast truck volumes because:

- It represents the potential level of conflict between trucks and other traffic,
- It highlights areas where truck mobility is most likely to be impacted by other traffic,
- Very high total ADT volumes may indicate greater difficulty in isolating truck traffic from other traffic, and
- It provides a sense of the potential available capacity as part of the model represented Level of Service (LOS).

Some key conclusions can be drawn by examining these maps:

- Generally, total ADT is greatest along the key trucking corridors in the region, with the possible exceptions of outlying freeway segments and SR 905.
- Forecast total ADTs are anticipated to increase substantially by 2050 which will impact truck mobility along key corridors.

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3 The maps are provided in specific directions since the model separates out the directions of travel on freeways. To provide a single map overview of the whole region, the maps must be directional.
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Figure 11 – 2012 North & West Total Average Daily Traffic Volumes

Legend
Total Daily Traffic Volumes
North & West (2012)
- 0 - 20000
- 20001 - 40000
- 40001 - 60000
- 60001 - 80000
- 80001 - 100000
- 100001 - 120000
- 120001 - 180000

Description: North & West Total Daily Traffic Volumes (2012)
Source: SANDAG Model Data
Date: 4/1/13
Figure 12 – 2012 South & East Total Average Daily Traffic Volumes
Figure 13 – 2020 North & West Total Average Daily Traffic Volumes
Figure 14 – 2020 South & East Total Average Daily Traffic Volumes

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

Legend
Total Daily Traffic Volumes
South & East (2020)

- 0 - 20000
- 20001 - 40000
- 40001 - 60000
- 60001 - 80000
- 80001 - 100000
- 100001 - 120000
- 120001 - 180000

Description: South & East Total Daily Traffic Volumes (2020)
Source: SANDAG Model Data
Date: 4/14/13
Figure 15 – 2035 North & West Total Average Daily Traffic Volumes
Figure 17 – 2050 North & West Total Average Daily Traffic Volumes

Legend
Total Daily Traffic Volumes
North & West (2050)

0 - 20000
20001 - 40000
40001 - 60000
60001 - 80000
80001 - 100000
100001 - 120000
120001 - 180000

0 5 10 20 Miles

Description: North & West Total Daily Traffic Volumes (2050)
Source: SANDAG Model Data
Date: 4/14/13
Figure 18 – 2050 South & East Total Average Daily Traffic Volumes

Legend
Total Daily Traffic Volumes
South & East (2050)
- 0 - 20000
- 20001 - 40000
- 40001 - 60000
- 60001 - 80000
- 80001 - 100000
- 100001 - 120000
- 120001 - 180000

Description: South & East Total Daily Traffic Volumes (2050)
Source: SANDAG Model Data
Date: 4/14/13
Truck Percentage of ADT and Daily Truck Volumes

The maps on the following pages show average daily weekday truck volumes as well as the truck percentage of total ADT traveling on general purpose lanes in the north-west and south-east directions. These maps give insight into which freeways have the most truck traffic and which are least traveled by trucks. Additionally, by looking at both truck volumes and percentages, it becomes clear which corridors have a high volume of trucks and which corridors have a relatively high volume of trucks in comparison to total traffic. The data for these maps were taken from the SANDAG forecast model for 2012, 2020, 2035, and 2050. The data used from the model were the Truck ADT and the Adjusted Forecasted Volume (AVOL). The Truck ADT values ranged from 0 – 18,000 trucks per day. The truck percentages were calculated by dividing Truck ADT by the AVOL.

The maps in Figures 19 through 26 represent both the average daily truck volumes and the truck percentage of total ADT with both the thickness and colors of the lines that trace the key truck corridors. (Maps showing total average daily truck volumes alone are provided in Appendix B.)

- Figure 19 – 2012 North & West Total Average Daily Traffic/Truck Percentage of Total Daily Traffic
- Figure 20 – 2012 South & East Total Average Daily Traffic/Truck Percentage of Total Daily Traffic
- Figure 21 – 2020 North & West Total Average Daily Traffic/Truck Percentage of Total Daily Traffic
- Figure 22 – 2020 South & East Total Average Daily Traffic/Truck Percentage of Total Daily Traffic
- Figure 23 – 2035 North & West Total Average Daily Traffic/Truck Percentage of Total Daily Traffic
- Figure 24 – 2035 South & East Total Average Daily Traffic/Truck Percentage of Total Daily Traffic
- Figure 25 – 2050 North & West Total Average Daily Traffic/Truck Percentage of Total Daily Traffic
- Figure 26 – 2050 South & East Total Average Daily Traffic/Truck Percentage of Total Daily Traffic

The daily truck traffic volumes are represented with six different line thicknesses, with thicker lines representing higher volumes. The percentage of the total traffic that is trucks is represented with six variations of color ranging from green (lower percentage of trucks) to red (higher percentage of trucks). Orange and red colors represent truck traffic percentages that can be considered greater than typical. Red colors do not indicate that there is an issue or problem with the percentage of truck traffic, but do highlight those segments where truck traffic is most prevalent.

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4 The maps are provided in specific directions since the model separates out the direction of travel on freeways. To provide a single map overview of the whole region, the maps must be directional.
Several useful conclusions can be drawn by examining these maps:

**Average Daily Truck Volumes:**

- Model results support industry stakeholder input that the key trucking corridors include SR 905, I-805, I-5, and I-15, with SR 52 and I-8 becoming more pivotal by 2050.

- Daily truck volumes along the segments leading in/out of the region generally are projected to more than triple in volume between 2012 and 2050 forecasts.

- Daily truck forecasts on freeways segments internal to the region are generally estimated to be twice as great as the freeway segments leading outside the region. This would tend to indicate that internal regional truck trips are a substantial proportion of truck trips overall.

- North & west segments are generally forecast to have higher volumes than south & east, particularly near the border region. Discussions with SANDAG modeling staff indicate that this could be due to the way the model forecasts external trips using commodity flow data, which would not fully capture empty truck trips.

- The highest daily truck volumes according to the model are projected to occur on the I-5 and I-15 between SR 52 & SR 78.

- By 2035 and 2050, the I-805 is projected to have much higher daily truck volumes, as well as I-5 north of SR 78.

- SR 125 is projected to have lower truck volumes, until 2050 when the facility is no longer assumed to be tolled in model.

**Truck Percentage of ADT:**

- Truck traffic as a percentage of total daily traffic is forecast to substantially increase by 2050.

- North & west percentage data may generally be considered more accurate for some corridors due to the limitations of the model (which applies a nationwide rate for empty trucks and may underestimate empty truck trips in certain corridors).

- Truck percentage data support that the key truck corridors in the region are SR 905, I-805, I-5 and I-15, with SR 52 and I-8 becoming more pivotal by 2050.

- The highest percentages are on the SR 905 and SR 11 near the border.

- The I-5 also has relatively high truck percentages between SR 52 & SR 78.

- In 2050 (NW) I-805 has high truck percentages between the SR 52 & the I-5 merge.

- Only the border region reaches truck percentages over 25 percent.

These maps and the related conclusions can be used to compare the potential applicability and comparative priority of the various truck management strategies being reviewed as a part of this study.
Figure 19 – 2012 North & West Truck Average Daily Traffic / Truck Percentage of Total Average Daily Traffic

Legend

Truck % of Total ADT
North & West (2012)

- 0.0% - 4.9%
- 5.0% - 9.9%
- 10.0% - 14.9%
- 15.0% - 19.9%
- 20.0% - 24.9%
- 25.0% - 37.0%

Daily Truck Volumes
North & West (2012)

- 0 - 1,000
- 1,001 - 2,500
- 2,501 - 5,000
- 5,001 - 7,500
- 7,501 - 10,000
- 10,001 - 20,000
Figure 20 – 2012 South & East Truck Average Daily Traffic / Truck Percentage of Total Average Daily Traffic

Legend

Truck % of Total ADT
South & East (2012)
- 0.0% - 4.9%
- 5.0% - 9.9%
- 10.0% - 14.9%
- 15.0% - 19.9%
- 20.0% - 24.9%
- 25.0% - 37.0%

Daily Truck Volumes
South & East (2012)
- 0 - 1,000
- 1,001 - 2,500
- 2,501 - 5,000
- 5,001 - 7,500
- 7,501 - 10,000
- 10,001 - 20,000

Description: South & East Average Daily Truck Traffic (2012)
Source: SANDAG Model Data
Date: 4/14/13
Figure 21 – 2020 North & West Truck Average Daily Traffic / Truck Percentage of Total Average Daily Traffic

Legend
Truck % of Total ADT
North & West (2020)
- 0.0% - 4.9%
- 5.0% - 9.9%
- 10.0% - 14.9%
- 15.0% - 19.9%
- 20.0% - 24.9%
- 25.0% - 37.0%

Daily Truck Volumes
North & West (2020)
- 0 - 1,000
- 1,001 - 2,500
- 2,501 - 5,000
- 5,001 - 7,500
- 7,501 - 10,000
- 10,001 - 20,000

Description: North & West Average Daily Truck Traffic (2020)
Source: SANDAG Model Data
Date: 4/14/13
Figure 22 – 2020 South & East Truck Average Daily Traffic / Truck Percentage of Total Average Daily Traffic

Legend
Truck % of Total ADT
South & East (2020)

- 0.0% - 4.9%
- 5.0% - 9.9%
- 10.0% - 14.9%
- 15.0% - 19.9%
- 20.0% - 24.9%
- 25.0% - 37.0%

Daily Truck Volumes
South & East (2020)

- 0 - 1,000
- 1,001 - 2,500
- 2,501 - 5,000
- 5,001 - 7,500
- 7,501 - 10,000
- 10,001 - 20,000

Description: South & East Average Daily Truck Traffic (2020)
Source: SANDAG Model Data
Date: 4/14/13
Figure 23 – 2035 North & West Truck Average Daily Traffic / Truck Percentage of Total Average Daily Traffic

Legend
Truck % of Total ADT
North & West (2035)
- 0.0% - 4.9%
- 5.0% - 9.9%
- 10.0% - 14.9%
- 15.0% - 19.9%
- 20.0% - 24.9%
- 25.0% - 37.0%

Daily Truck Volumes
North & West (2035)
- 0 - 1,000
- 1,001 - 2,500
- 2,501 - 5,000
- 5,001 - 7,500
- 7,501 - 10,000
- 10,001 - 20,000

Description: North & West Average Daily Truck Traffic (2035)
Source: SANDAG Model Data
Date: 4/14/13
Figure 24 – 2035 South & East Truck Average Daily Traffic / Truck Percentage of Total Average Daily Traffic

Legend
Truck % of Total ADT
South & East (2035)
- 0.0% - 4.9%
- 5.0% - 9.9%
- 10.0% - 14.9%
- 15.0% - 19.9%
- 20.0% - 24.9%
- 25.0% - 37.0%

Daily Truck Volumes
South & East (2035)
- 0 - 1,000
- 1,001 - 2,500
- 2,501 - 5,000
- 5,001 - 7,500
- 7,501 - 10,000
- 10,001 - 20,000

Description: South & East Average Daily Truck Traffic (2035)
Source: SANDAG Model Data
Date: 4/14/13
Figure 26 – 2050 South & East Truck Average Daily Traffic / Truck Percentage of Total Average Daily Traffic

Legend

Truck % of Total ADT
South & East (2050)
- 0.0% - 4.9%
- 5.0% - 9.9%
- 10.0% - 14.9%
- 15.0% - 19.9%
- 20.0% - 24.9%
- 25.0% - 37.0%

Daily Truck Volumes
South & East (2050)
- 0 - 1,000
- 1,001 - 2,500
- 2,501 - 5,000
- 5,001 - 7,500
- 7,501 - 10,000
- 10,001 - 20,000

Description: South & East Average Daily Truck Traffic (2050)
Source: SANDAG Model Data
Date: 4/14/13
**Peak Hour Truck Volumes**

The peak hour truck volume maps show the truck volumes during the AM and PM peak hours in the north-west and south-east directions. The sixteen maps reveal important truck traffic trends by showing when trucks are travelling in each direction. The data for these maps were taken from the SANDAG forecast model for 2012, 2020, 2035, and 2050. The data extracted from the model were the AM Peak Hour Truck Volumes and the PM Peak Hour Truck Volumes.

The maps in Figures 27 through 42 represent the daily peak truck traffic volumes with the thickness of the brown lines for the AM peak and purple lines for the PM peak that trace the key truck corridors. These figures represent only the peak truck traffic and exclude all other types of traffic. The peak truck traffic volumes are represented with six different line thicknesses that encompass the various truck traffic volumes experienced across the key truck corridors in the County.

- Figure 27 – 2012 North & West AM Peak Hour Truck Volumes
- Figure 28 – 2012 North & West PM Peak Hour Truck Volumes
- Figure 29 – 2012 South & East AM Peak Hour Truck Volumes
- Figure 30 – 2012 South & East PM Peak Hour Truck Volumes
- Figure 31 – 2020 North & West AM Peak Hour Truck Volumes
- Figure 32 – 2020 North & West PM Peak Hour Truck Volumes
- Figure 33 – 2020 South & East AM Peak Hour Truck Volumes
- Figure 34 – 2020 South & East PM Peak Hour Truck Volumes
- Figure 35 – 2035 North & West AM Peak Hour Truck Volumes
- Figure 36 – 2035 North & West PM Peak Hour Truck Volumes
- Figure 37 – 2035 South & East AM Peak Hour Truck Volumes
- Figure 38 – 2035 South & East PM Peak Hour Truck Volumes
- Figure 39 – 2050 North & West AM Peak Hour Truck Volumes
- Figure 40 – 2050 North & West PM Peak Hour Truck Volumes
- Figure 41 – 2050 South & East PM Peak Hour Truck Volumes
- Figure 42 – 2050 South & East PM Peak Hour Truck Volumes

In reviewing these maps, several key conclusions can be made:

- Consistent with daily truck traffic volumes:
  - North & west segments have higher peak hour truck volumes.
  - Highest peak hour truck volumes are on the I-5 and I-15 between SR 52 and SR 78.
- The AM and PM peak hour truck volumes are similar
• The AM and PM peak hour truck volumes as a percentage of daily truck volumes are generally consistent from forecast year to forecast year.

• The AM and PM peak hour truck volumes as a percentage of daily truck volumes are slightly lower than might be anticipated with total traffic on freeway segments, which may indicate that trucks tend somewhat more toward off-peak travel periods. This is consistent with input provided by industry stakeholders.
Figure 27 – 2012 North & West AM Peak Hour Truck Volumes

Legend
AM Peak Truck Volumes
North & West (2012)

- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 2500
- 2501 - 3500

Description: North & West AM Peak Truck Volumes (2012)
Source: SANDAG Model Data
Date: 4/14/13
Figure 28 – 2012 North & West PM Peak Hour Truck Volumes
Figure 29 – 2012 South & East AM Peak Hour Truck Volumes

Legend
AM Peak Truck Volumes
South & East (2012)

- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 2500
- 2501 - 3500

Description: South & East AM Peak Truck Volumes (2012)
Source: SANDAG Model Data
Date: 4/14/13
Figure 31 – 2020 North & West AM Peak Hour Truck Volumes

Legend
AM Peak Truck Volumes
North & West (2020)

0 - 500
501 - 1000
1001 - 1500
1501 - 2000
2001 - 2500
2501 - 3500

Description: North & West AM Peak Truck Volumes (2020)
Source: SANDAG Model Data
Date: 4/14/13
Figure 32 – 2020 North & West PM Peak Hour Truck Volumes

Legend
PM Peak Truck Volumes North & West (2020)

- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 2500
- 2501 - 3500

Description: North & West PM Peak Truck Volumes (2020)
Source: SANDAG Model Data
Date: 4/14/13
Figure 33 – 2020 South & East AM Peak Hour Truck Volumes
Figure 34 – 2020 South & East PM Peak Hour Truck Volumes

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

Legend
PM Peak Truck Volumes
South & East (2020)
- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 2500
- 2501 - 3500

Description: South & East PM Peak Truck Volumes (2020)
Source: SANDAG Model Data
Date: 4/14/13
Figure 35 – 2035 North & West AM Peak Hour Truck Volumes

Legend
AM Peak Truck Volumes
North & West (2035)

0 - 500
501 - 1000
1001 - 1500
1501 - 2000
2001 - 2500
2501 - 3500

Description: North & West AM Peak Truck Volumes (2035)
Source: SANDAG Model Data
Date: 4/14/13
Figure 36 – 2035 North & West PM Peak Hour Truck Volumes

Legend
PM Peak Truck Volumes
North & West (2035)

- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 2500
- 2501 - 3500

Description: North & West PM Peak Truck Volumes (2035)
Source: SANDAG Model Data
Date: 4/1/13
Figure 37 – 2035 South & East AM Peak Hour Truck Volumes

Legend
AM Peak Truck Volumes
South & East (2035)
- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 2500
- 2501 - 3500

Description: South & East AM Peak Truck Volumes (2035)
Source: SANDAG Model Data
Date: 4/14/13
Figure 38 – 2035 South & East PM Peak Hour Truck Volumes
Figure 41 – 2050 South & East AM Peak Hour Truck Volumes

Legend
AM Peak Truck Volumes
South & East (2050)

- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 2500
- 2501 - 3500

Source: SANDAG Model Data
Date: 4/14/13
Figure 42 – 2050 South & East PM Peak Hour Truck Volumes

Legend
PM Peak Truck Volumes
South & East (2050)
- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 2500
- 2501 - 3500

Description: South & East PM Peak Truck Volumes (2050)
Source: SANDAG Model Data
Date: 4/14/13
Light, Medium, and Heavy Truck Volumes

The following maps show the amount of heavy trucks as a percentage of total truck traffic in the north-west and south-east directions as well as the percentage of light and medium trucks at specific locations. These maps show where there are a high percentage of heavy trucks and also give an idea of the split between light, medium, and heavy trucks across the region. The data for these maps were taken from the SANDAG heavy truck model forecasts for 2012, 2020, 2035, and 2050. The data used from the model were the light truck volumes, medium truck volumes, heavy truck volumes, and total truck ADT. The model defines these truck types by weight class. Specifically, light-duty trucks are defined as 8,500 – 14,000 lbs; medium-duty trucks are defined as 14,000 – 33,000 lbs, and heavy-duty trucks are defined as > 33,000 lbs. Each percentage was calculated by dividing each type (light, medium, heavy) by the total truck ADT.

The maps in Figures 43 through 50 represent both the average daily truck volumes and the truck type percentages of the total daily truck traffic. Thicker lines represent higher volumes and color indicates percentage of truck type.

- Figure 43 – 2012 North & West Percentage of Trucks by Type
- Figure 44 – 2012 South & East Percentage of Trucks by Type
- Figure 45 – 2020 North & West Percentage of Trucks by Type
- Figure 46 – 2020 South & East Percentage of Trucks by Type
- Figure 47 – 2035 North & West Percentage of Trucks by Type
- Figure 48 – 2035 South & East Percentage of Trucks by Type
- Figure 49 – 2050 North & West Percentage of Trucks by Type
- Figure 50 – 2050 South & East Percentage of Trucks by Type

These figures show truck volumes alone and do not show other traffic volumes. The map also labels nine key points across the region to call out percentages of light, medium, and heavy truck traffic experienced at these particular locations.

It was indicated by SANDAG staff that due to the characteristics of the model, medium truck percentages may be somewhat over-estimated as a percentage of total truck trips. These data can be compared for corridor review purposes with existing data from the WIM sites, which are also provided in this memo.

A few key characteristics that can be observed from these maps are:

- The areas that consistently have high percentages of heavy trucks are:
  - I-5 north of SR 78
  - I-15 north of SR 78
  - SR 905/SR 11 near the border
  - I-8 east of SR 125
• Areas with high percentages of heavy truck are near gateways to a neighboring county or Mexico. This is consistent with industry input that longer truck trips tend to be made by larger/heavier trucks.
Figure 43 – 2012 North & West Percentage of Truck Type

Legend
Heavy % of Total Trucks
North & West (2012)

- 0.0% - 9.9%
- 10.0% - 19.9%
- 20.0% - 29.9%
- 30.0% - 39.9%
- 40.0% - 49.9%
- 50.0% - 100.0%

Label Attributes
Total Truck Volume
Light %, Medium %, Heavy %
Figure 44 – 2012 South & East Percentage of Truck Type

Legend

Heavy % of Total Trucks
South & East (2012)

- 0.0% - 9.9%
- 10.0% - 19.9%
- 20.0% - 29.9%
- 30.0% - 39.9%
- 40.0% - 49.9%
- 50.0% - 100.0%

Label Attributes
Total Truck Volume
Light %, Medium %, Heavy %

Description: South & East Light, Medium, Heavy Truck Traffic (2012)
Source: SANDAG Model Data
Date: 4/14/13
Figure 46 – 2020 South & East Percentage of Truck Type

Legend
Heavy % of Total Trucks
South & East (2020)

- 0.0% - 9.9%
- 10.0% - 19.9%
- 20.0% - 29.9%
- 30.0% - 39.9%
- 40.0% - 49.9%
- 50.0% - 100.0%

Label Attributes
Total Truck Volume
Light %, Medium %, Heavy %

Source: SANDAG Model Data
Date: 4/14/13
Figure 48 – 2035 South & East Percentage of Truck Type

Legend

Heavy % of Total Trucks
South & East (2035)

- 0.0% - 9.9%
- 10.0% - 19.9%
- 20.0% - 29.9%
- 30.0% - 39.9%
- 40.0% - 49.9%
- 50.0% - 100.0%

Label Attributes
- Total Truck Volume
- Light %, Medium %, Heavy %

Description: South & East Light, Medium, Heavy Truck Traffic (2035)
Source: SANDAG Model Data
Date: 4/14/13
Figure 49 – 2050 North & West Percentage of Truck Type

Legend
Heavy % of Total Trucks
North & West (2050)
- 0.0% - 9.9%
- 10.0% - 19.9%
- 20.0% - 29.9%
- 30.0% - 39.9%
- 40.0% - 49.9%
- 50.0% - 100.0%

Label Attributes
Total Truck Volume
Light %, Medium %, Heavy %

Description: North & West Light, Medium, Heavy Truck Traffic (2050)
Source: SANDAG Model Data
Date: 4/14/13
Level of Service

The following maps show the daily Level of Service (LOS) for total traffic over time in the north-west and south-east directions. LOS indicates level of congestion on corridors. The data for these maps were taken from the SANDAG truck model for 2012, 2020, 2035, and 2050. LOS data from the model is shown in four categories: three free-flow LOS categories, A, B, and C (shown in green) and three substandard LOS categories D (yellow), E (orange), and F (red). Traditionally in transportation analyses on freeways, LOS E and F are considered unacceptable.

Figures 51 through 58 represent the LOS for all types of traffic traveling along the highways in San Diego County. The LOS results displayed in the map take into consideration the improvements already identified in the adopted RTP under the revenue constrained scenario.

- Figure 51 – 2012 North & West Level of Service
- Figure 52 – 2012 South & East Level of Service
- Figure 53 – 2020 North & West Level of Service
- Figure 54 – 2020 South & East Level of Service
- Figure 55 – 2035 North & West Level of Service
- Figure 56 – 2035 South & East Level of Service
- Figure 57 – 2050 North & West Level of Service
- Figure 58 – 2050 South & East Level of Service

A few key characteristics can be observed in these maps:

- LOS over the entire region steadily worsens when comparing each progressive forecast year (e.g. comparing 2012 to 2020).
- More coastal and populated areas generally experience lower LOS compared to less populated areas.
- Numerous key truck corridors, including I-5, I-805 and I-15 are forecast to experience LOS categories of E and F along substantial portions of the facilities.
- SR 125 from SR 905 to SR 54 has an acceptable LOS until 2050, when the segment is no longer tolled.
- North & west segments tend to have worse LOS than the south & east segments.
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Analysis of Freeway Operational Strategies Related to the Use of Managed Lanes by Trucks

Legend
Daily Level of Service North & West (2012)
- A - C
- D
- E
- F

Description: North & West Daily Level of Service (2012)
Source: SANDAG Model Data
Date: 4/14/13
Figure 52 – 2012 South & East Level of Service
Figure 53 – 2020 North & West Level of Service

Legend
Daily Level of Service
North & West (2020)

A - C
D
E
F

Description: North & West Daily Level of Service (2020)
Source: SANDAG Model Data
Date: 4/14/13
Legend
Daily Level of Service
South & East (2020)

A - C
D
E
F

Description: South & East Daily Level of Service (2020)
Source: SANDAG Model Data
Date: 4/14/13
Figure 56 – 2035 South & East Level of Service

Legend
Daily Level of Service
South & East (2035)

A - C
D
E
F

Description: South & East Daily Level of Service (2035)
Source: SANDAG Model Data
Date: 4/14/13
Figure 57 – 2020 North & West Level of Service

Legend
Daily Level of Service
North & West (2050)

- A - C
- D
- E
- F

Description: North & West Daily Level of Service (2050)
Source: SANDAG Model Data
Date: 4/14/13
Figure 58 – 2050 South & East Level of Service

Legend
Daily Level of Service
South & East (2050)

A - C
D
E
F

Description: South & East Daily Level of Service (2050)
Source: SANDAG Model Data
Date: 4/14/13
Regional Weigh-In-Motion (WIM) Sites

Caltrans maintains seven WIM stations across the County. Stations provide information about types of vehicles along key corridors for truck traffic as seen in Figure 59. The WIM data provide useful insights for the truck management strategies because it is possible to determine the time of day heavy, medium and light trucks use each WIM Corridor.

Using the raw WIM data provided by Caltrans, vehicle classifications were separated into light, medium and heavy trucks using the following conversions:

- **Light trucks** are considered to be the following WIM vehicle classifications:
  - Single Unit, 2 Axle & 6 Tires
  - Bus

- **Medium trucks** are considered to be the following WIM vehicle classifications:
  - Single Unit, 3 Axle
  - Single Unit with 4 or more Axles
  - Separate Trailer, Less than 4 Axles

- **Heavy trucks** are considered to be the following WIM vehicle classifications:
  - Separate Trailer, 5 Axles
  - Separate Trailer, 6 or more Axles

Figure 60 shows truck classifications for north and southbound traffic at each station.

The WIM data have the following limitations due to the complicated environment that the data are collected from:

- WIM sites can be inoperable/broken down or shut down due to maintenance for a substantial amount of time.
- WIM sites sometimes provide inaccurate vehicle classifications when vehicles pass over the sensors in an irregular manor.
- Several of the classifications include truck types that could fall into more than one of our three truck classifications.

Appendix C provides a complete set of WIM data for each location. These data show when certain truck classifications are most prevalent during the day at those locations. Figure 61 shows an example of this for WIM data station number 5. The complete set of time-of-day graphs indicate that the peak traffic times for different truck types vary and this also varies by location. These findings will assist with the assessment of the truck management strategies along the corridors with different characteristics. Some of the strategies that apply to only one or two of the truck types (light, medium and heavy) can use this analysis to determine where and when the select strategies might apply.
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Figure 59 – WIM Locations

Legend
- WIM Locations

Description: WIM Locations
Source: Caltrans: Regional Weigh-in-Motion (WIM) Sites
Date: 4/14/13
Figure 61 – The Northbound Data Represented for WIM Location 5

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Regional Classification and Occupancy Counts

Caltrans and SANDAG conducted a vehicle class count across 23 locations from March to June of 2012 along the major highways in San Diego County. Figure 62 shows the different count locations. Counts were conducted for one day from 6 AM to 6 PM at each location and included counts of various types of traffic. The data provided from this effort have been processed to show the variations of truck traffic versus other traffic over the course of a day.

The data included vehicle counts in 15 minute increments throughout the day. For some of the data points, vehicle counts were collected for both directions for the entire day, while for the other data points, the data were only collected for one direction in the AM and the other direction in the PM. A summary of the data that are represented at each data point is outlined in Table 4. Data points for locations that are outside of the study area (along SR 67, SR 73 and SR 76) have been omitted from the data analysis.

The data provided for each data point were analyzed to summarize the amount of truck traffic versus other traffic in each direction. Figure 63 is an example of how the vehicle classification data were analyzed to represent the ratio of traffic types throughout the day. In this figure, it is clear that the peak truck traffic time is during the middle of the day, while the other traffic peak times are during the rush hours in the early and later times of the day. The complete set of graphs for all data points is provided in Appendix D.

Although the regional classification and occupancy count data set offers a great insight into how the truck and non-truck traffic types are distributed among the key truck corridors, there are several limitations to the accuracy of the regional classification records. These limitations must be taken into account when using the data to support whether or not to implement any particular strategy. First, the counts are conducted during daylight hours and do not capture classification for all 24 hours of the day. Also, the regional classification and occupancy count data consist of vehicles classified by sight; the following inaccuracies are related to the process of visually counting and classifying vehicles:

- Missing a vehicle due to being overwhelmed by the volume of vehicles,
- Counting a vehicle more than once due to cross over counting of different team members,
- Classifying the vehicle in the wrong category due to the speed and/or volume of vehicles passing by at any given time, and
- Inexperience of temporary count staff can lead to some inaccuracies.
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Figure 62 – Regional Classification Data Collection Points

Legend

Vehicle Class Count Site Direction

- Yellow Circle: One Direction per Peak Period
- Green Circle: Both Directions per Peak Period

Description: Vehicle Class Count Sites
Source: San Diego Region Occupancy and Classification Study
Date: 4/14/13
Table 4 – Summary of Regional Classification Data Provided

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<th>PM Direction(s)</th>
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Figure 63 – Vehicle Classification Summary for Point 604

604: Northbound Traffic Volumes on I-5 near Camp Pendleton

Other Traffic Volumes

Truck Traffic Volumes

Time of Day

Other Traffic Trend

Truck Traffic Trend
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SWITRS Accident Data Summary

The California Highway Patrol provides accident data through the Statewide Integrated Traffic Records System (SWITRS) for three districts in San Diego County (The City of San Diego, El Cajon, and Oceanside). The data are available for all accidents recorded after January 2002. For this effort the data were analyzed from March 1, 2008 to March 1st 2013. Although the system provides 117 data points for each of the 30,000 accidents recorded over the last five years, there are inconsistencies with how these data are populated for each intersection. Another major limitation to the data is that 43 percent of all the accidents provided through SWITRS did not include a latitude and longitude location.

The following findings were derived from an analysis of the available SWITRS data that will be considered for assessing the potential for truck management strategies:

- Most truck related accidents are spread out fairly evenly across the major truck corridors in the County.
- Fatal truck related accidents seem to occur most frequently in areas of transition between major truck corridors (freeway interchanges).

Steep Grades

All trucks are generally more impacted by steeper than average grades along freeways. What constitutes a steep grade is determined by both the slope and the length of a grade and varies by the type of terrain and facility. However, a common criterion for considering truck management strategies is where the running speed of trucks falls 10 miles per hour or more below the running speed of remaining traffic. These areas represent opportunities for freeway truck management strategies, such as active traffic management, additional truck climbing lanes, or special or adjustable truck restrictions, among others. While it was not the purpose of this study to identify all detailed areas with steeper than average grades, it is useful to highlight some of the general areas where this occurs:

- SR 125 (south) – In the more southern portion of the facility between SR 905 and SR 54 there are a couple of areas with steep grades. Current traffic levels are low enough that truck traffic in these areas does not generate any particular issues on the grades; however, it still may be an area for future consideration.
- I-8 (east) – from Alpine to the Imperial County Line there are substantial areas of significant steep grades which occur over several miles. Currently the freeway accommodates a higher than average percentage of trucks in these areas by providing three lanes of travel in each direction. There are emergency runaway truck ramps in the steepest downhill grade areas.
- I-15 (north) – North of Escondido, I-15 has several areas of lengthy above average grades. These are particularly impactful in the Rainbow area.
- I-5 (between I-805 and SR 78) – In the areas near the lagoons along I-5, there are lengthy above average grades, particularly in the vicinity of Via de la Valle and Manchester Avenue.

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5 Caltrans, May 7 2012, Highway Design Manual, Chapter 200: Geometric Design and Structure Standards,
• SR 52 (between I-15 and SR 125) – SR 52 has substantial lengthy grades east of Santo Road and west of Mission Gorge Road. In the last few years additional lanes were added to act as climbing lanes for truck traffic.

• I-15, I-805, and SR 163 moving in and out of the Mission Valley area (both northbound and southbound). Grades in these locations were mentioned by numerous trucking industry stakeholders during the interview process.

Each of these areas may have the potential for the unique application of freeway truck management strategies, and all are anticipated to see substantially increasing truck volumes over time.

5. Key Findings and Next Steps

5.1 Major San Diego Freeway Trucking Gateways/Distribution Hubs

As a result of the data collection and analysis process, several key trucking gateways/distribution hubs were identified. Truck gateways are the areas through which major flows of goods travel, such as the Border, the Port of San Diego, and the San Diego International Airport. Truck distribution hubs are those areas that contain numerous manufacturing and warehousing districts and serve as large generators of truck trips.

The key current and projected trucking gateways and distribution hubs throughout the San Diego region identified as part of this study are shown in Figure 64 and are described below:

• **G1: Border Area**: This area includes SR 905 at the Otay Mesa border crossing and some key arterials, such as La Media Road and Siempre Viva Road.

• **G2: National City Marine Terminal & National Distribution Center**: This area includes the terminal and distribution center near the I-5 and SR 54 interchange.

• **G3: 10th Avenue Marine Terminal & 32nd Street Naval Station**: This area includes the 10th Avenue Marine Terminal & 32nd Street Naval Station, west of I-5, near the Coronado Bridge and Barrio Logan.

• **G4: San Diego International Airport**: This area includes the San Diego International Airport and surrounding arterials that provide access to the cargo facilities (e.g. Harbor Dr.).

• **G5: Mid-City**: This area includes the dense, urban area south of I-8 surrounding El Cajon Boulevard.

• **G6: El Cajon/Santee**: This area includes the developed land surrounding the eastern terminus of SR 52, SR 67 and I-8 through El Cajon.

• **G7: Kearny Mesa**: This area includes the developed land surrounding the SR 52, I-805, and I-15 interchanges.

• **G8: Miramar / Mira Mesa / Sorrento Valley**: This area includes the trucking distribution hub in the vicinity of Mira Mesa, Sorrento Valley, and the I-5 and I-805 interchange.
• **G9: Poway:** This area includes Poway, specifically the developed area surrounding Scripps Poway Parkway.

• **G10: Rancho Bernardo:** This area includes Rancho Bernardo, specifically the developed area east of I-15.

• **G11: Palomar Airport Road / SR 78 Corridor:** This area includes the developed area surrounding the SR 78 corridor, the interchanges of SR 78 with I-15 and I-5, and Palomar Airport Road.

Issues and potential strategy solutions for the truck gateways/distribution hubs listed above will be discussed at a high level in Technical Memorandum #6: Strategy Analysis.
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Figure 64 – San Diego Truck Gateways and Distribution Hubs

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

G1: SR 78 Corridor/ Palomar Airport Road
G10: Rancho Bernardo
G9: Poway
G7: Kearny Mesa
G6: El Cajon/Santee
G5: Mid-City
G1: Border Area
G8: Miramar/Mira Mesa/ Sorrento Valley
G4: San Diego International Airport
G3: 10th Ave. Marine Terminal & 32nd St. Naval Station
G2: National City Marine Terminal and Distribution Center

Description: Trucking Gateways and Distribution Hubs
Source: SANDAG Model Data and Interviews
Date: 9/20/13
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5.2 Projected High Volume Truck Zones in the San Diego Region

To identify locations throughout the region where truck management strategies may be helpful, the project team used the data collected to identify future focus areas for the region’s trucking freeway corridors and gateways/distribution hubs. These focus areas are shown in Figures 65 and 66 and described further below.

Future Truck Focus Areas - Freeways

The future truck focus areas for the key trucking corridors were identified based on the projected data from SANDAG’s Heavy Duty Truck Model for 2035 and 2050. Specifically, the project team looked at freeway corridors where the percentage of trucks out of total traffic volumes is projected to be high for the region (10 percent or greater in one or both directions), and the level of service (LOS) is projected to be fairly poor (E or F). These factors together serve as indicators of locations that may experience safety and operational issues that can hinder goods movement. Additionally, freeway corridors projected to experience truck percentages of total volume over 25 percent are called out. The only area in the region expected to reach this extremely high percentage of trucks is near the Otay Mesa border crossing. This includes SR 11, which, once built, may also reach truck percentages this high in 2050 (though a high level of service is projected to be maintained due to tolling).

As seen in Figure 65, in 2035, freeway corridors that are forecast to have a truck percentage of 10 percent or more combined with a poor LOS include I-5 (between SR 56 and SR 78), portions of I-805 (south of the I-5 interchange), portions of I-15 (mostly near SR 52), SR 52 (near the SR 125 interchange), a section of SR 905 (near the I-805 interchange), and SR 125 (near the SR 54 interchange). Additionally, SR 905 is projected to have truck volumes over 25 percent near the Otay Mesa border crossing. This is displayed graphically in Figure 65.

In 2050, the freeway corridors that are forecast to have a truck percentage of 10 percent or more combined with a poor LOS include the majority of I-5 (from just south of SR 56 to just north of SR 78), major sections of I-805 (north of SR 54 to south of the I-5 interchange), portions of I-15 (near the SR 52 interchange, south of SR 56, and south of SR 78), the majority of SR 52 (east of I-15), and a section of SR 905 (near the I-805 interchange). Additionally, SR 905 is projected to have truck volumes over 25 percent near the Otay Mesa border crossing. This is displayed graphically in Figure 66.

Future Truck Focus Areas – High Truck Volume Gateways/Distribution Hubs

In addition to freeway corridors, high truck volume gateways and distribution hubs were identified based on data from the SANDAG Truck Model and input from the trucking industry stakeholders. The project team assessed those gateways/hubs with the highest projected increases in truck trip productions between 2012 and 2050, by transportation analysis zones (TAZs). This information was combined with the feedback from industry stakeholders to identify the following high volume and high growth gateways/hubs:

- **G1: Border Area:** Example issues in this area include high volumes of trucks crossing the border, long wait times, and a lack of services for truck drivers.

- **G8: Miramar/ Mira Mesa/ Sorrento Valley:** This is generally a high growth area and example issues include congestion at the I-5 and I-805 interchange and along Mira Mesa Boulevard and Miramar Road.
• **G11: SR 78 Corridor/ Palomar Airport Road:** Example issues include truck access and congestion along SR 78 and at the interchanges of SR 78 with I-5 and I-15, which causes trucks to use San Marcos Blvd, Mission Road and South Santa Fe Avenue as alternative routes.

The gateway/hub truck focus areas are displayed graphically in Figures 65 and 66.
Figure 65 – Truck Focus Areas (2035)
Figure 66 – Truck Focus Areas (2050)

Future Truck Focus Areas (2050)

Freeways
- Truck % of Total > 10%
- LOS = E, F *
- Truck % of Total > 25%
* Values for Either Direction (NW, SE)

Gateways/Hubs
- High Projected Growth in Truck Trips

Description: Future Truck Focus Areas (2050)
Source: SANDAG Model Data and Interviews
Date: 4/14/13
5.3 Next Steps

The data collected and described in this memorandum will be used to assess the strategies identified in Technical Memorandum #3: Strategy Development. The strategy analysis methodology and results will be described in Technical Memorandum #6: Strategy Analysis.
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Appendix A: Interview Guide

Introduction to Project (Provided at Start of Interview)

Managed lanes (ML) are becoming an increasingly common option by which the region is addressing the need to reduce congestion, increase throughput, and enhance flexibility on freeways. Therefore, a concurrent investigation is needed of the potential benefits and challenges for use of MLs by trucks and of other operational strategies. Such an investigation will help to ensure that various types of truck traffic (e.g., long and short haul or parcel delivery) are considered as part of the region’s overall transportation system that includes goods movement.

Based on input from private and public sector freight stakeholders, this study will assess near term and long range concepts for accommodating and managing trucks on the region’s freeways, while considering: driver needs and perspectives, incident management needs, community and environmental impacts, data collection needs, and implications for the larger goods movement system. The overall goal is to define the roles and opportunities for these concepts in the long-term mobility planning for the region.

Questions/Discussion Topics:

1. Thinking about your current operations… please tell us about the following:
   a. Fleet size and truck types (number of light, medium, heavy trucks)?
   b. Number of inbound trucks? Per day? Per week? Per Month?
   c. Number of outbound trucks? Per day? Per week? Per Month?
   d. Are your operations seasonal? Please describe.
   e. What locations would you consider your primary trip origins (A general location is ok)
   f. What are your primary destinations? (A general location is ok)
   g. What major corridors/freeways do your truckers use to traverse the region?
   h. What access routes do your truckers use to get to the major corridors?
   i. What types of technologies do you (or your drivers) use in your vehicles for operations (communications, routing, vehicle tracking) and management? Please describe.
   j. What are your major congestion points now?
   k. What are any other problems that you are having moving your trucks to their destinations now?

2. Thinking about your future operations… 10, 20, 30 years down the road, please envision, without constraints, what changes would make future truck movements more efficient in the San Diego region…
   a. What do you envision as the most important changes needed along your current routes to make your operations more efficient and safe?
b. What are some ideas for getting your trucks from your hub/point of origin to the freeways more efficiently?

c. Other ideas or comments?

**Strategy Comments**

3. Other Strategy Specific Questions (to be discussed as applicable):

   a. (3) Travel Demand Management Strategies to be developed with Truckers and Shippers/ Receivers

      i. If delivery schedules were adjusted to allow for more night-time deliveries, would your business see this as a benefit?

      ii. Are there any key shippers/receivers in the San Diego region that, due to their hours or delivery schedule preferences, require your trucks to travel during congested periods?

      iii. Would urban distribution centers on the outskirts of the region be beneficial for long-haul truckers?

      iv. Would this strategy benefit certain industries & truck trip types more than others?

      v. Potential Issues: Off-peak schedules may increase labor costs for receivers (overtime). Not feasible for all freight types/deliveries, based on time requirements for delivery – shippers may already be doing this where possible.

   b. (4) Trucks on the planned network of HOV/HOT managed lanes (restricted access)

      i. Do you use the I-15 express lanes for your trucks that are 2 axles or less? Did you know that you are allowed to do so?

      ii. If occupancy restrictions were removed for trucks, would you use High Occupancy Vehicle lanes (e.g. managed lanes)?

      iii. If current restrictions on HOV/HOT lanes were revised to allow trucks with 3 axles on managed lanes, would your business benefit? Would your business transition to 3 axle vehicles?

      Potential Issue: Access/egress for trucks (would trucks use direct access ramps planned for transit)? Incident management /safety; Legislative - current speed and lane restrictions for trucks with three or more axles; Traffic flow – would lanes be able to maintain minimum required speed of 45 mph with mixed auto and truck traffic? Design/Geometric issues – are managed lanes/DARS being designed to accommodate larger trucks (pavement, turning radii).

   c. (5) Designated Truck Lanes: Construction of New Lanes on an Existing Facility (e.g. truck by-pass lanes, routes, or climbing lanes)

      i. Where do you see a current need for designated truck lanes?

      ii. If LCVs were allowed on designated truck lanes, would your business switch?
iii. Potential Issues: Capital cost requirements, Right-of-way, Access/egress, Community acceptance, Environmental (could have an air quality benefit if traffic flow improves).

d. (6) Separate Dedicated Truck-Only Facilities (Construction of New Facilities)
   i. Where do you see a current or future need for dedicated truck facilities? (Such as, the 905-Port-805-56 bypass idea)
   ii. If LCVs were allowed on a new dedicated truck facility, would your business use LCVs?

e. (7) Intelligent Transportation Systems (ITS)/Active Traffic Management (ATM) and Lane Assignment
   i. If you didn’t have the right lane restrictions during certain times of the day, would that be useful to your drivers?
   ii. What technologies do you see emerging in the future that would enhance your operations and safety? Either in-vehicle or roadside?
   iii. Potential Issues: Legislative (existing truck lane restrictions in CA); Smart technologies may change rapidly in the future; Enforcement; Phasing.
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Appendix B: Total Average Daily Truck Volumes

The truck ADT volumes displayed in the maps below demonstrate the change in weekday truck volumes over time in the north-west and south-east directions. The maps are provided in specific directions as the model separates out the directions of travel on freeways and in order to provide a single map overview of the whole region maps must be directional. These maps give insight into which freeways have the most truck traffic and which are least traveled by trucks. The data for these maps were taken from the SANDAG Heavy Truck Model forecasts for 2012, 2020, 2035, and 2050. More specifically, the data extracted from the model were the Truck ADT values, which ranged from 0 – 18,000 trucks per day. (Note that these maps show average daily truck volumes alone, whereas the maps in the Data Collection Results portion of this memorandum show the same information combined with a display of truck percentage of total ADT.)

The maps in Figures B-1 through B-8 represent the average daily truck volumes with the thickness of the blue lines for each direction of key truck corridors:

- Figure B-1 – 2012 North & West Truck Average Daily Traffic Volumes
- Figure B-2 – 2012 South & East Truck Average Daily Traffic Volumes
- Figure B-3 – 2020 North & West Truck Average Daily Traffic Volumes
- Figure B-4 – 2020 South & East Truck Average Daily Traffic Volumes
- Figure B-5 – 2035 North & West Truck Average Daily Traffic Volumes
- Figure B-6 – 2035 South & East Truck Average Daily Traffic Volumes
- Figure B-7 – 2050 North & West Truck Average Daily Traffic Volumes
- Figure B-8 – 2050 South & East Truck Average Daily Traffic Volumes

These figures represent only the truck traffic and exclude all other types of traffic, the total daily traffic volumes were shown previously in this document. The truck traffic volumes are represented with six different line thicknesses that encompass the various truck traffic volumes experienced across the key truck corridors in the County.
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Figure B-4 – 2020 South & East Truck Average Daily Traffic Volumes
Figure B-5 – 2035 North & West Truck Average Daily Traffic Volumes

Legend
Daily Truck Volumes
North & West (2035)

Description: North & West Average Daily Truck Traffic (2035)
Source: SANDAG Model Data
Date: 4/14/13
Figure B-6 – 2035 South & East Truck Average Daily Traffic Volumes
Figure B-7 – 2050 North & West Truck Average Daily Traffic Volumes
Figure B-8 – 2050 South & East Truck Average Daily Traffic Volumes
Appendix C: Regional WIM Truck Type Data

In this Appendix the truck type data from the Caltrans seven weigh in motion (WIM) stations across San Diego County are summarized for each direction. These 14 truck type summaries are included on the second map of this Appendix and represent the truck traffic types for an average day. The 14 time-of-day graphs that make up the rest of this Appendix represent the truck traffic types and their peak travel times, as explained in the Regional WIM sites section of the document.
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1: Average Truck Traffic I-78 Eastbound San Marcos (2008-2010)

- Heavy Trucks
- Medium Trucks
- Light Trucks

Time of Day:
- 12:00 AM
- 3:00 AM
- 6:00 AM
- 9:00 AM
- 12:00 PM
- 3:00 PM
- 6:00 PM
- 9:00 PM
- 12:00 AM

Number of Heavy and Medium Trucks:
- 0
- 20
- 40
- 60
- 80
- 100
- 120
- 140
- 160

Number of Light Trucks:
- 0
- 200
- 400
- 600
- 800
- 1000
- 1200
- 1400
- 1600
3: Average Truck Traffic I-8 Eastbound East County (2008-2012)
7: Average Truck Traffic I-805 Southbound Chula Vista (2008-2012)
Appendix D: Regional Classification and Occupancy Counts

This Appendix includes the complete set of the 46 time of day graphs described in the regional classification and occupancy counts section earlier in the document. The map of the vehicle class count sites illustrates the location of each site that the data were collected from and these numbers correspond to the labels of each time-of-day graph. The graphs are labeled with the corresponding number to which site the vehicle classification data were collected from, along with the direction of traffic and name of each site location.
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Figure D-1 – Vehicle Class Count Sites

Legend

Vehicle Class Count Site Direction

- Yellow circle: One Direction per Peak Period
- Green circle: Both Directions per Peak Period

Description: Vehicle Class Count Sites
Source: San Diego Region Occupancy and Classification Study
Date: 4/14/13
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4: AM Westbound Traffic Volumes on SR-94 near Emerald Hills

- Other Traffic
- Truck Traffic
- Other Traffic Trend
- Truck Traffic Trend

Time of Day

Other Traffic Volumes

Truck Traffic Volumes
4: PM Eastbound Traffic Volumes on SR-94 near Emerald Hills

![Graph showing traffic volumes over time, with lines representing other traffic, truck traffic, and other traffic trend.](image-url)
10: Southbound Traffic Volumes on I-5 near Old Town

![Graph showing traffic volumes over time.

- Other Traffic
- Truck Traffic
- Other Traffic Trend
- Truck Volume Trend

Time of Day

Other Traffic Volumes
13: AM Westbound Traffic Volumes on I-8 near Mission Valley

- Other Traffic
- Truck Traffic
- Other Traffic Trend
- Truck Traffic Trend
44: AM Southbound Traffic Volumes on I-15 near Ranch Bernardo
72: AM Westbound Traffic Volumes on SR-78 near Oceanside

![Graph showing AM westbound traffic volumes on SR-78 near Oceanside. The graph includes lines for 'Other Traffic', 'Truck Traffic', and two trend lines labeled 'Other Traffic Trend' and 'Truck Traffic Trend'. The x-axis represents time of day, and the y-axis represents traffic volumes.]
102: AM Westbound Traffic Volumes on SR-52 near Mission Trails

![Graph showing traffic volumes over time](image)

- **Other Traffic**
- **Truck Traffic**
- **Other Traffic Trend**
- **Truck Traffic Trend**

**Time of Day:**
- 6:00
- 6:15
- 6:30
- 6:45
- 7:00
- 7:15
- 7:30
- 7:45
- 8:00
- 8:15
- 8:30
- 9:00
- 9:15
- 9:30
- 9:45
- 10:00
- 10:15
- 10:30
- 10:45
- 11:00
- 11:15
- 11:30
- 11:45
601: PM Eastbound Traffic Volumes on SR-56 near Torrey Highlands

Other Traffic Volumes

Truck Traffic Volumes

Time of Day

Other Traffic
Truck Traffic
Other Traffic Trend
Truck Traffic Trend
603: Westbound Traffic Volumes on SR-905 near Otay Mesa
604: Northbound Traffic Volumes on I-5 near Camp Pendleton

Time of Day

Other Traffic Volumes

Truck Traffic Volumes

Other Traffic Trend

Truck Traffic Trend

0
20
40
60
80
100
120
140

0
200
400
600
800
1000
1200

6:00 6:15 6:30 6:45 7:00 7:15 7:30 7:45 8:00 8:15 8:30 8:45 9:00 9:15 9:30 9:45 10:00 10:15 10:30 10:45 11:00 11:15 11:30 11:45 12:00 12:15 12:30 12:45 1:00 1:15 1:30 1:45 2:00 2:15 2:30 2:45 3:00 3:15 3:30 3:45 4:00 4:15 4:30 4:45 5:00 5:15 5:30 5:45 6:00
602: AM Westbound Traffic Volumes on SR-905 near Otay Mesa

Time of Day

Other Traffic Volumes

Truck Traffic Volumes

- Other Traffic
- Truck Traffic
- Other Traffic Trend
- Truck Traffic Trend
605: PM Eastbound Traffic Volumes on I-8 near Lakeside

Time of Day

Other Traffic Volumes

Truck Traffic Volumes
606: Southbound Traffic Volumes on I-5 near Chula Vista

Time of Day

Other Traffic Volumes

Truck Traffic Volumes

- Other Traffic
- Truck Traffic
- Other Traffic Trend
- Truck Traffic Trend
608: AM Northbound Traffic Volumes on SR-125 near Sweetwater Reservoir

Time of Day

Other Traffic Volumes

Truck Traffic Volumes

- Other Traffic
- Truck Traffic
- Other Traffic Trend
- Truck Traffic Trend
608: PM Southbound Traffic Volumes on SR-125 near Sweetwater Reservoir

![Graph showing traffic volumes over time with 'Other Traffic' and 'Truck Traffic' lines, and 'Other Traffic Trend' and 'Truck Traffic Trend' trend lines.](image)
609: Northbound Traffic Volumes on I-5 near Del Mar

- Other Traffic
- Truck Traffic
- Other Traffic Trend
- Truck Traffic Trend

Time of Day

Other Traffic Volumes

Truck Traffic Volumes
611: Northbound Traffic Volumes on I-805 near Chollas View

Time of Day

Other Traffic Volumes

Truck Traffic Volumes

- Other Traffic
- Truck Traffic
- Other Traffic Trend
- Truck Traffic Trend