Southern California Association of Governments

REGIONAL SCREENLINE TRAFFIC COUNT PROGRAM for the 2008 Regional Travel Model Validation

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Introduction

In preparation for the upcoming validation of the regional travel demand model of the Southern California Association of Governments (SCAG) to 2008 conditions, a Regional Screenline Traffic Count Program was conducted to establish the validation traffic count dataset. This effort entailed obtaining and reviewing existing traffic counts taken by SCAG's member governments and stakeholder agencies, prioritizing and collecting traffic count data needs, developing a regional traffic count database, and conducting an analysis of count data to apply annual, seasonal, and other factoring to prepare the counts for the validation effort. The Regional Screenline Traffic Count Program was conducted in 2009.

The final traffic count database prepared through this effort includes traffic counts by time-of-day, vehicle classification, and in some cases, occupancy for freeways and high occupancy vehicle (HOV) lanes in the six-county SCAG region. The focus of this effort was to establish validation counts for roadways that cross screenlines, although counts for non-screenline locations are included as well where data was available and resources provided. The final data includes adjusted 2008 average annual April/May/June traffic for all screenline locations by vehicle type and time period. For the Coachella Valley, peak season winter counts are also established.

This report includes chapters for the Quality Control Plan, data adjustment and expansion, the database and GIS systems, and a database User's Guide. It begins with a short discussion of subregions and screenlines defined for the SCAG region and travel demand model.

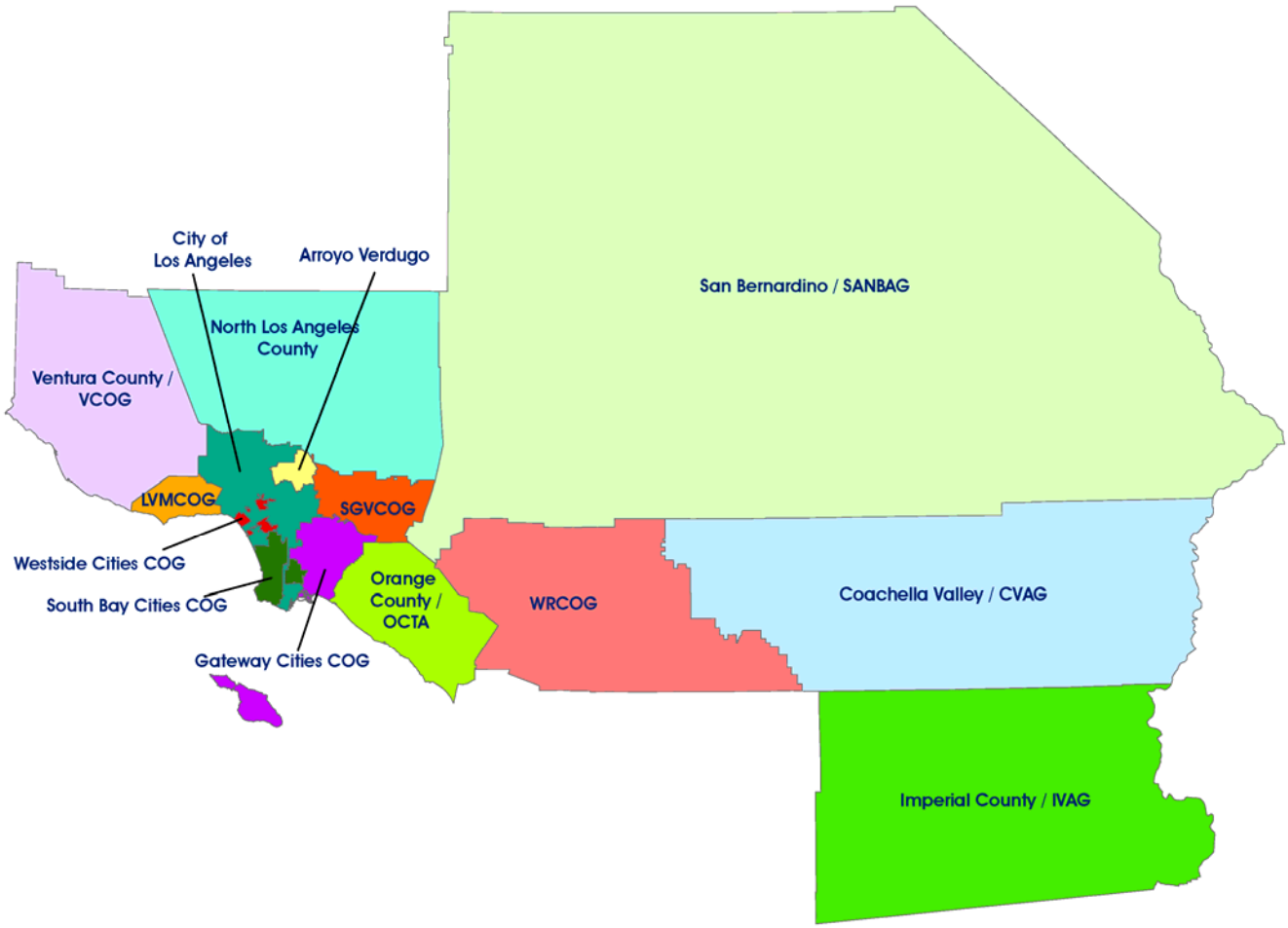
Subregions

The SCAG regional travel demand model covers the six counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura. Within this six-county SCAG planning area are 14 subregions that together comprise the entire SCAG region. The organizations associated with each of the SCAG subregions are listed below and shown graphically in Figure 1. The subregions initially formed the basis of the traffic count review and data collection efforts. However, the timing of responses from local governments and agencies did not allow for the analysis to proceed at the subregion level as anticipated.

- Arroy Verdugo Cities
- City of Los Angeles
- Coachella Valley Association of Governments (CVAG)
- Gateway Cities Council of Governments (GCCOG)
- Imperial Valley Association of Governments (IVAG)
- Las Virgenes Malibu Council of Governments
- North Los Angeles County
- Orange County Council of Governments (OCCOG)
- San Bernardino Associated Governments (SANBAG)
- San Gabriel Valley Council of Governments (SGVCOG)
- South Bay Cities Council of Governments (SBCCOG)

- Ventura Council of Governments (VCOG)
- Western Riverside Council of Governments (WRCOG)
- Westside Cities Council of Governments (WCCOG)

Figure 1: Subregions in the SCAG Region



Screenlines

Along with the SCAG subregions, the SCAG model's screenlines form the basis for the regional traffic count data analysis and development. Screenlines are imaginary delineations that extend across a series of roadway links to form a logical basis for evaluation of regional travel movements in the model. Screenlines can be drawn to separate major activity areas or can be drawn along highways, natural features, or around an activity area. Screenlines that are focused on a single corridor are sometimes called cutlines, while screenlines that completely surround an activity area are sometimes called cordon lines.

In theory, every roadway that a screenline crosses should be included in the screenline validation analysis and should have a recent, accurate traffic count associated with it. There are some exceptions to this rule, including the definition of screenlines in and around freeway-to-freeway interchanges and the lack of some counts on very low volume and unpaved roads.

As part of the Regional Screenline Traffic Count Program, the model's screenlines were reviewed and updated. SCAG solicited input from member governments and agencies to adjust the screenlines early on in the effort, and other changes were proposed and coordinated with SCAG as the analysis continued. Some of the considerations that were used to make these screenline recommendations include:

- Suggestions made by SCAG's staff, local governments, and stakeholder agencies;
- Capture of movements to/from major facilities such as Interstates or other state highways;
- Capture of reasonably distinct movements between counties and/or subregions or across natural features such as rivers or mountain ranges;
- An attempt to complete a cordon around the region and possibly subregions;
- Adjusting the screenline termini so that multiple screenlines end in the same open area – this cleans up the accounting of trips (traffic volumes) and improves the graphical display of screenlines;
- Consistency – such as consistently following a river, natural feature, or a specific side of a major facility; and
- Large areas absent of screenlines.

The desire to extend existing screenlines and/or add new ones was tempered by the reality that each of the screenline links requires a recent, accurate traffic count. Therefore, a careful selection of the most necessary and desirable screenline adjustments and additions was carried out in order to best match the needs with available resources.

The screenline adjustments increased the number of screenlines and count locations from 23 screenlines with 423 arterial, 120 freeway, and 45 HOV links to 34 screenlines with 535 arterial, 182 freeway, and 53 HOV links. The new screenlines are shown in Figures 2A and 2B.

Figure 2A: Screenlines (Regional)

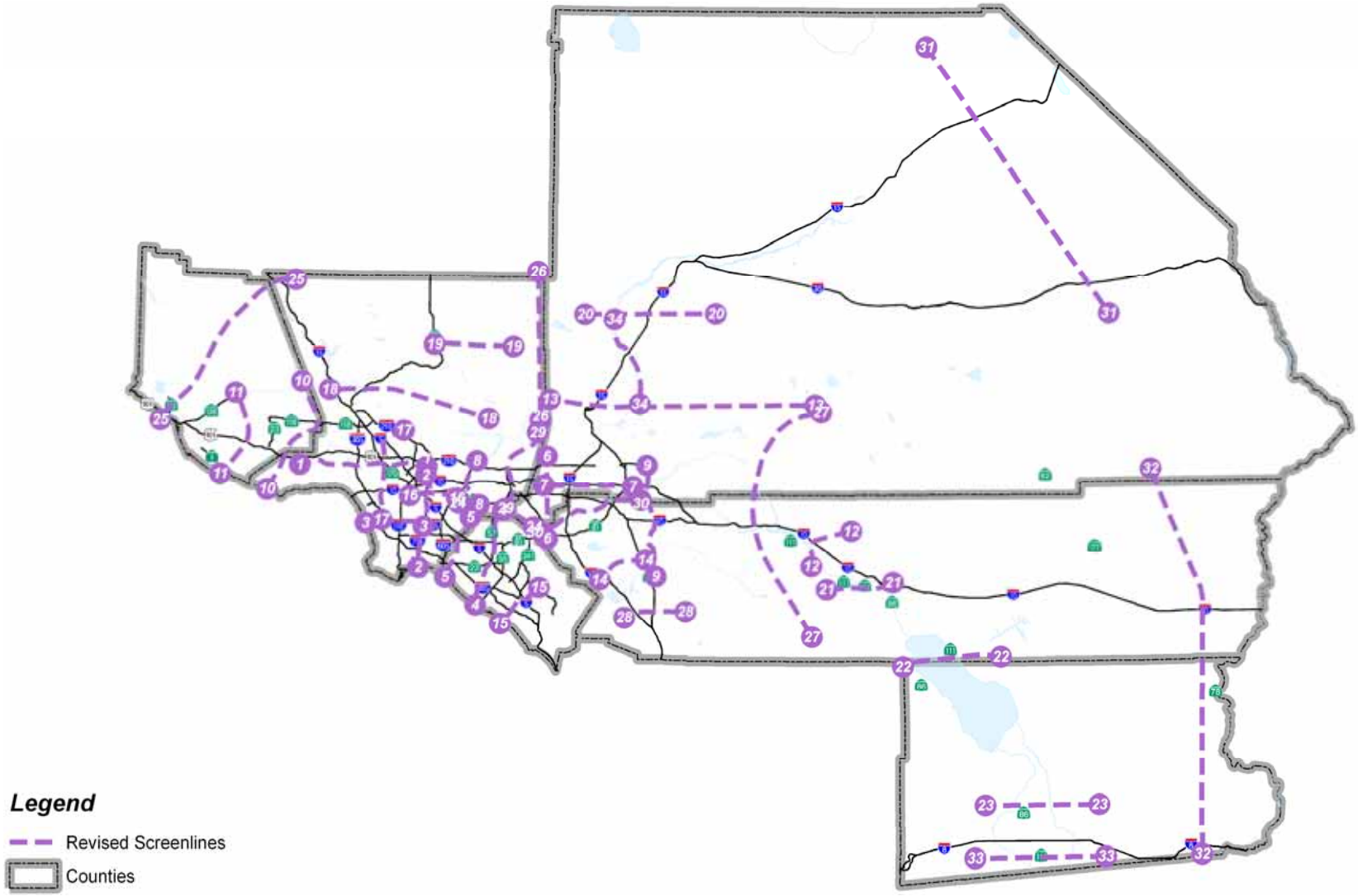
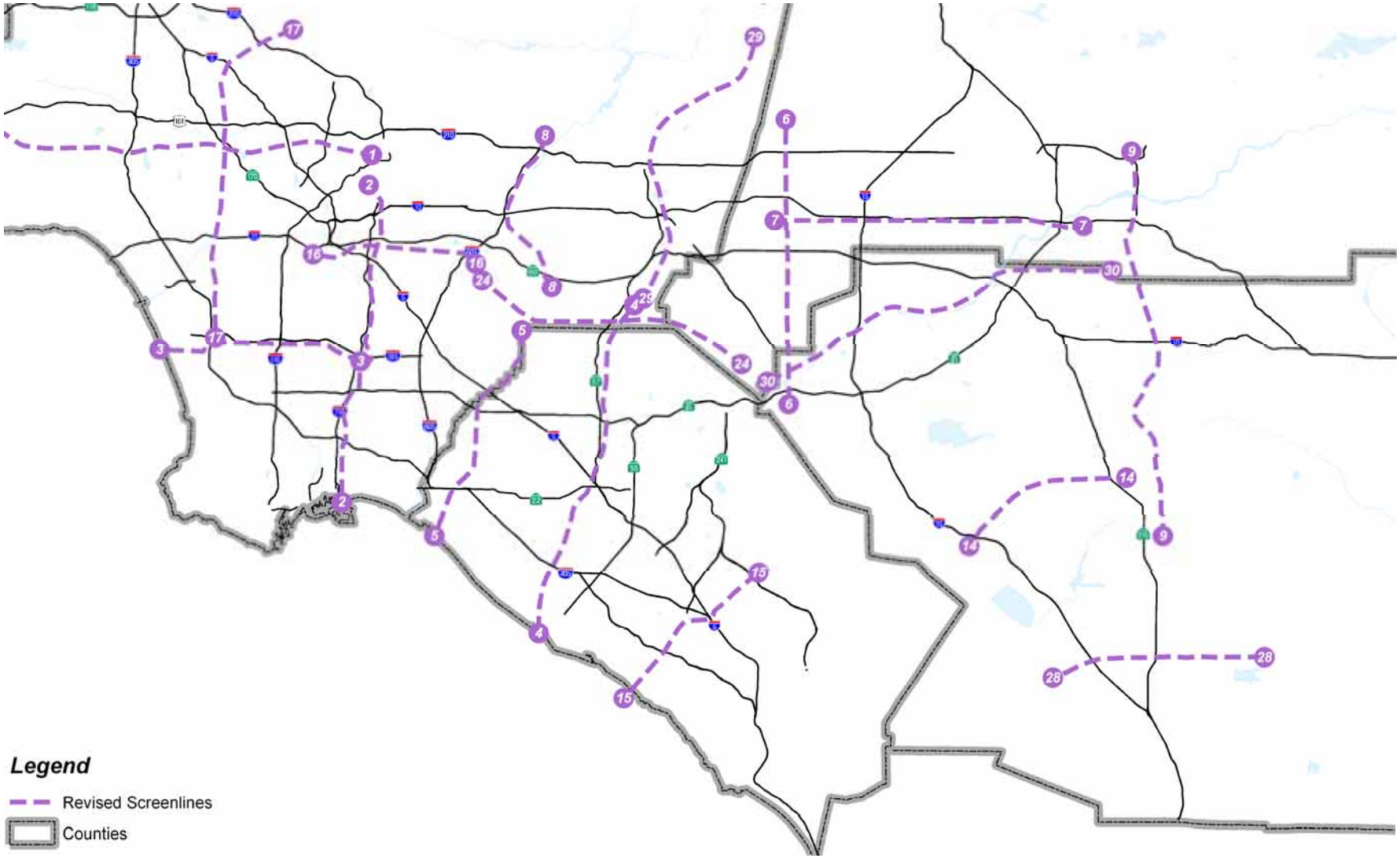


Figure 2B: Screenlines (Detail)



Quality Control Plan

The SCAG Regional Travel Demand Model has been developed and updated over many years with significant resources. It represents a substantial investment made by the southern California region, and it provides valuable information for testing and improving the transportation system in the region. The Regional Screenline Traffic Count data is the primary source of information for validating the regional model to existing base year 2008 conditions. As such, it is extremely important for the traffic counts used for model validation be of the highest quality, accuracy, and reliability.

In the course of the development of the Regional Screenline Traffic Count data, care was taken at every step to ensure that the resulting data was of a high quality. The data managed through this effort varies to a significant extent in terms of format, detail, data collection equipment, personnel, and many other ways. The Quality Control Plan was developed to be sensitive to these differences while still providing for high quality data in all circumstances.

The focuses of the quality control review include logical consistency, attribute accuracy, completeness, locational accuracy, and data source lineage. For the purposes of this analysis, traffic counts were separated into: 1) arterial street counts that tend to be collected for short durations and 2) freeway and HOV counts that included both short-term data and continuous counts collected using permanent traffic recorder (PTR) stations, weigh-in-motion (WIM) equipment, radar devices, and other means.

Arterial Street Counts

The arterial street count data that was obtained from local governments or collected specifically for this program was almost exclusively available only as short-term counts collected using tube counters. There are some minor exceptions, most notably some Caltrans PTR vehicle class counts on state highways that are now arterial streets in urbanized areas. However, most of the arterial counts are short-term in nature.

Counts on arterials were graciously provided by local governments and agencies in both hardcopy and electronic formats. The electronic counts, in some cases, included detailed information that was brought into the count database using automated macros customized to the specific formatting provided. In other cases, the electronic data were simply PDF files of hardcopy printouts. This data, along with the other hardcopy information on screenlines, were entered manually into the database. While this was a tedious process, it allowed the technician to review the traffic count data as it was entered.

In some cases, detailed vehicle classification data was provided, in others it was not. Similarly, in some cases, time-of-day information was provided at either the hourly or 15-minute increments while in other cases only 24-hour data was available. In most cases, the count data was provided directionally, but in a few cases even that was not available. The quality control procedures were designed to allow for varying levels of review depending on the detail provided, so some of the steps discussed below are not applicable to all of the counts provided. Where it was possible, the quality review was conducted at the level of detail provided, including at the directional per lane level. Traffic counts collected as part of this program were collected by vehicle classification and in 15-minute increments.

The quality control procedures conducted for incoming arterial street traffic counts from local governments and stakeholder agencies are as follows:

1. **Data Source** - Verify that the source for the traffic counts is a known, trusted entity and that the traffic counts were collected using proper methods. For counts that were provided by either local governments or agencies such as Caltrans, it was decided that these entities had used reasonable means to collect and review the traffic count data. In some cases, it was apparent that local traffic counting firms had collected the data, which provided a degree of confidence that quality control procedures were implemented by these professional counting firms during both data collection and review/analysis. Counts from an unknown source or with limited documentation were assigned a lower priority than other counts that could be verified to a higher degree.

2. **Directional Distribution** – The count data was reviewed by direction at each location to verify that the daily directional totals were relatively consistent. For example, the daily total volumes by direction should be relatively similar unless explained by differing design considerations or other issues that would affect the directional balance. The directional volumes were not necessarily expected to be similar by time-of-day due to peaking travel characteristics, although general directional trends by time-of-day should yield characteristic peaking patterns. For example, if one direction shows a high morning peak period flow, then a corresponding evening peak period flow should be evident in the reverse direction.

3. **Temporal Distribution** – Time-of-day data, where available, was generally provided either for hourly or 15-minute increments. In both cases, the data can quickly be reviewed by a technician looking for trends that indicate very light volumes in the early morning hours that grow to a peak in the morning commute, drop off to some degree in the middle of the day, rise again for the evening peak, then fall throughout the evening until their lowest levels in the early morning hours. Some exceptions to these trends are allowed to account for arterials that serve atypical activities.

4. **Vehicle Classification** – Where detailed vehicle class information was provided, the data was reviewed for reasonable trends and unreasonable outliers. Since these counts were taken on arterial streets throughout the region, truck and bus activity was expected to be relatively low.

5. **Missing Values** – Zero values were closely scrutinized by time-of-day, vehicle class, and direction. This test searches for zero volumes in any hour or 15-minute period of the day. Its application is site specific and time

specific since zero values can be expected. For example, zero values for some heavy vehicle classes are expected as are zero volumes during the overnight time period.

6. **Complementary Count Data** – For some screenline count locations, redundant traffic counts were available. In these cases, the multiple counts were reviewed for reasonability. This process was augmented by the availability of traffic counts upstream and downstream of many screenline count locations. This allows for a robust review of traffic volumes along a corridor for example. With these counts plotted on a map, a technician can very quickly visually review the trends along a corridor and identify inconsistent data.

7. **Traffic Flow and Machine Errors** – Traffic counter equipment, although correctly functioning, may generate machine errors if several vehicles trip the counter at the same time, if vehicles are in a stop and go condition at the location of the counting equipment, and when the road surface is significantly deteriorated. Since the existing counts were collected previous to this effort, it is difficult to identify if these conditions occur in any of the existing counts.

8. **Day of Week / Time of Year** – Counts were reviewed where possible in terms of the date on which the count was taken. Counts taken on or near holidays were not used. Also, weekend counts were not included. In some cases, summer counts were the only data available and were used where a reliable seasonal adjustment could be made. Generally, counts taken on Fridays were not used and counts collected on Mondays were assigned a lower priority.

Freeway Counts

The majority of freeway counts included in the database were obtained from the California Performance Monitoring System (PeMS). This dataset provides detailed time-of-day count data at many locations throughout the region. However, the data is not always reliable. Count sensors occasionally go offline or produce invalid data, such as data that double-counts traffic. The PeMS dataset was filtered using the criteria listed below.

- Only Tuesday, Wednesday, and Thursday were used.
- Only mainline and HOV data only were used (i.e., no ramp data).
- Days in which one hour or more showed zero volume were eliminated.
- Days with an average volume outside of one standard deviation of the monthly average were eliminated.

Once data had been filtered, an average of all remaining 2008 records was included in the count database. PeMS data does not include vehicle classification information, but does include data by time-of-day.

In outlying locations where PeMS data is not available, supplementary Caltrans count data was used. Caltrans provided data in hourly increments for multiple days each year. Because data was provided in this manner, an average of all 2008 weekday counts has been included in the database for Caltrans count stations on screenlines.

Data Adjustment and Expansion

The SCAG 2008 Traffic Count Database includes arterial and freeway traffic count data collected by local jurisdictions as well as data collected as part of this program. Arterial traffic count data collected for this program includes 15-minute detail and vehicle classification data and will need to be adjusted from 2009 to 2008 conditions. Data provided by local jurisdictions did not typically include this level of detail. Furthermore, some of the data that was provided by local jurisdictions was collected in previous calendar years or outside of the desired season. The database includes an adjustment process that expands and adjusts count data to provide 15-minute detail with vehicle class information and to represent an average April/May/June weekday in 2008.

Seasonal, Annual, and Weekday Adjustments

Where resources allowed, SCAG collected supplemental traffic count data on screenlines where the only available pre-existing data was more than three years out of date (2005 and earlier) or was collected on an otherwise undesirable date. Because it was not possible to collect supplemental data at all screenline locations, resources were allocated to collect data on the highest volume facilities. Seasonal and annual adjustment factors are applied to counts as applicable. Weekday counts were present on all screenline locations, so day of week adjustment factors were not developed.

Seasonal and annual adjustment factors are based on an analysis of the California Performance Monitoring System (PeMS). For annual growth, PeMS data was limited to data from stations with at least five days of acceptable data in each month for all years included in the analysis. For seasonal growth, data was limited to stations with at least five days of acceptable data in each month for the year under consideration. Because sufficient data was not available for Imperial County, seasonal and annual adjustment factors for Imperial County are based on the adjustment factors for Riverside and San Bernardino Counties.

Annual Adjustment Factors

Annual adjustment factors were developed to allow for the adjustment of any traffic count taken within the SCAG region between 2002 and 2009 to represent 2008 conditions. Initially, PeMS data from April of each year from 2002 through 2009 was analyzed to develop adjustment factors. This data, shown in Figure 3, was not satisfactory and showed an unexplained dip in values for 2005. A review of Gross National Product (GNP), Gross State Product (GSP), average gas prices, and employment data raises concerns with the 2005 data point. Since very few screenline counts in the database were taken prior to 2006, further analysis of PeMS data prior to 2006 was not warranted. Instead, the annual adjustment factors were estimated based on straight-line interpolation between 2002 and 2006 for each county.

The PeMS data from 2006 to 2009 was further analyzed by county in order to reflect the specific temporal changes in each county as the economic conditions worsened in 2007 and 2008. The annual adjustment factors estimated for each county from 2006 to 2009 are shown in Figure 4. Figure 4 also includes a representation of the interpolated factors estimated for years prior to 2006. This data was used to develop composite annual adjustment factors for each county. The resulting adjustment factors are shown in Table 1.

Figure 3: Annual Growth Factoring (2002 – 2009)

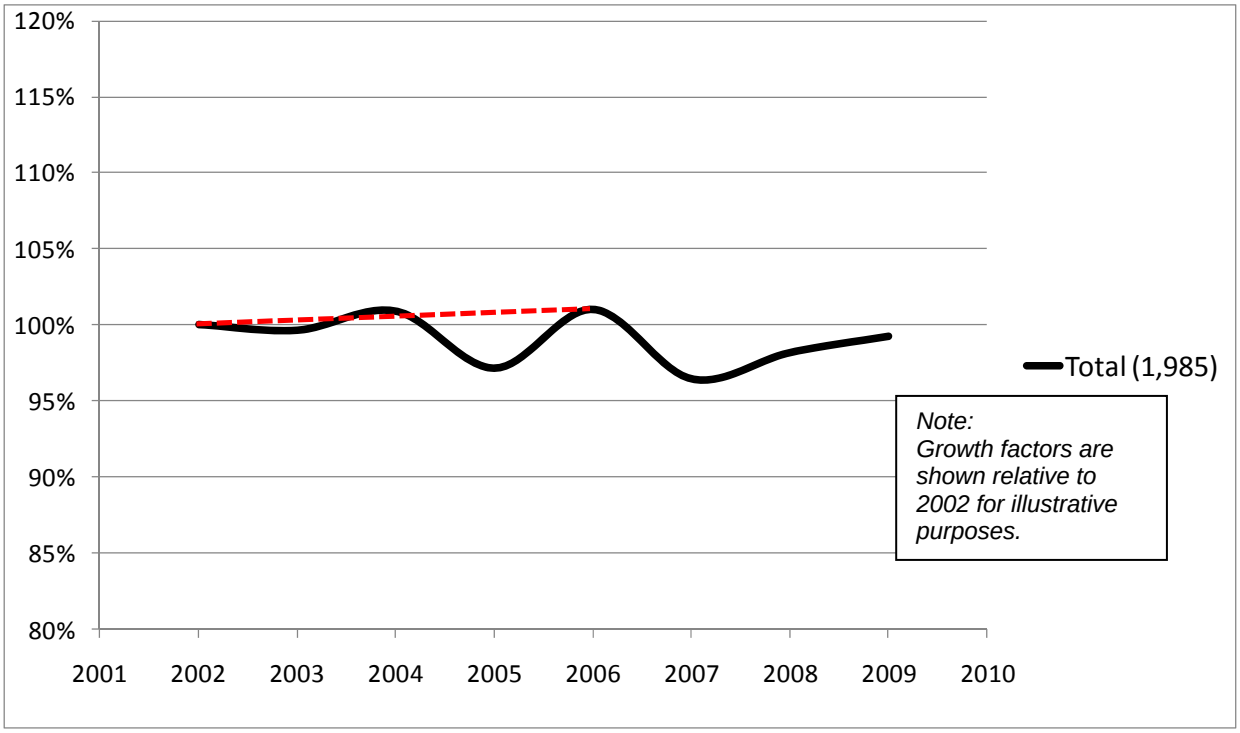


Figure 4: Composite Annual Growth by County (2002 – 2009)

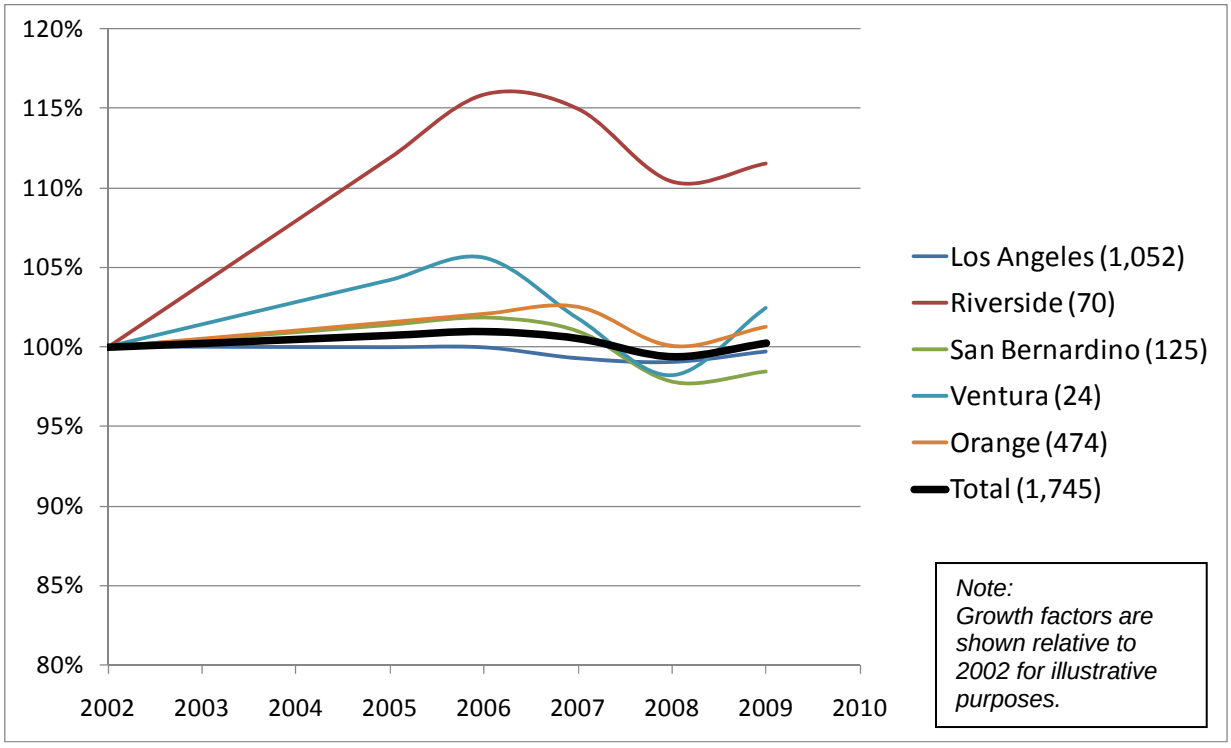


Table 1: Annual Adjustment Factors

County	2002	2003	2004	2005	2006	2007	2008	2009
Los Angeles	0.990	0.991	0.991	0.991	0.991	0.998	1.000	0.993
Orange	1.001	0.995	0.990	0.985	0.980	0.976	1.000	0.988
Riverside	1.104	1.062	1.023	0.987	0.953	0.960	1.000	0.990
San Bernardino	0.978	0.974	0.969	0.965	0.961	0.969	1.000	0.994
Ventura	0.982	0.968	0.955	0.942	0.930	0.965	1.000	0.959
Imperial	1.029	1.010	0.992	0.975	0.958	0.966	1.000	0.992

Source: Analysis of PeMS data for freeways in April of 2002 through 2006 and all months in 2006 through 2009.

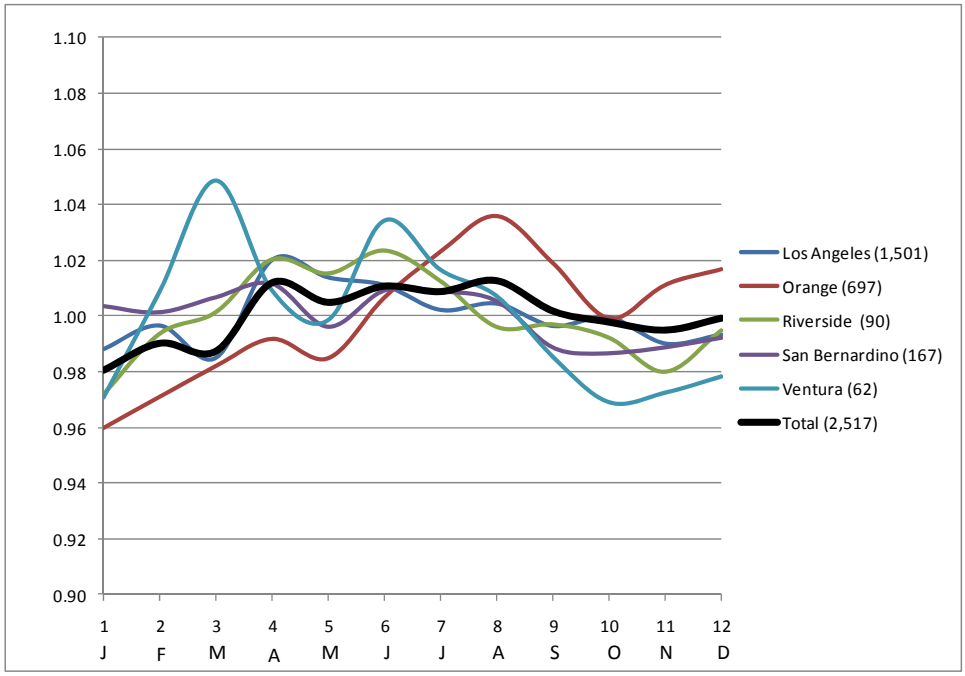
SEASONAL FACTORS

Seasonal factors were developed based on a detailed analysis of PeMS data for the years 2006 to 2009. PeMS data is generally available for all months in each year but is limited to freeways. Although it would be desirable to adjust arterial and collector counts based on data collected on surface streets, this was not feasible given the available data and resources. This analysis resulted in the graphs shown in Figures 5A through 5D. Factors shown in the charts are shown for each month relative to annual average weekday traffic (AAWT) based on an analysis using PeMS stations with valid data.

The graphs have been used to create factors that result in adjusted traffic count data representing the April/May/June timeframe. For all counties except for Ventura, factors are applied separately by year and county. This is because there are sufficient data points in those counties to provide for reliable estimates of seasonal factors for each year. Furthermore, the economic conditions in 2007, 2008, and 2009 were determined to be of such a nature as to affect normal seasonal travel patterns in each year.

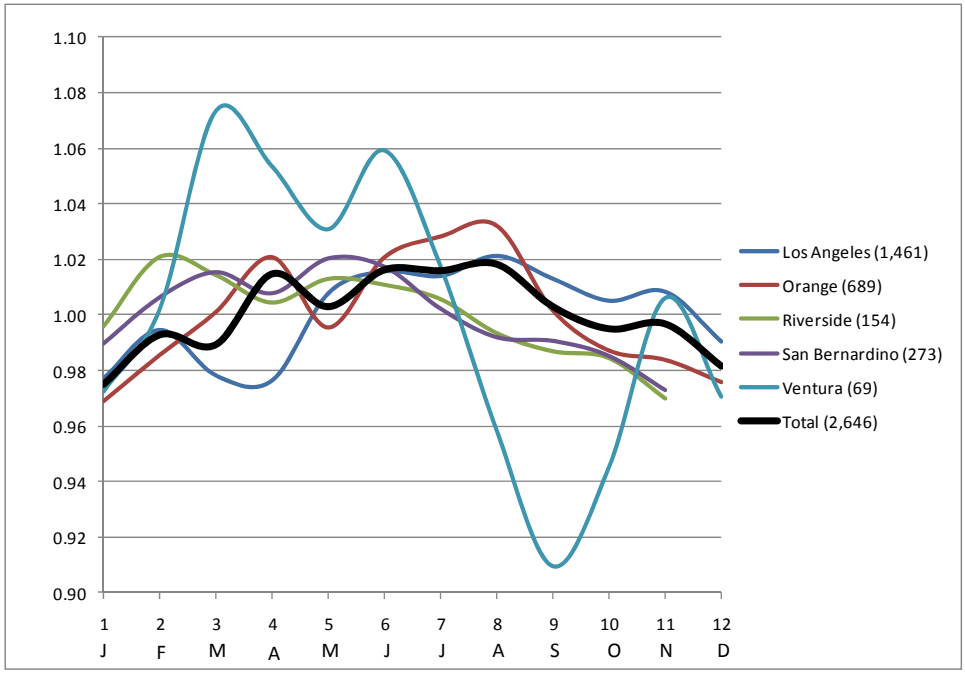
For Ventura County, an average of the factors for all years from 2006 through 2008 is used because of the low number of PeMS station data and the highly variable nature of the seasonal data across the years. The resulting factors are shown in Table 2.

Figure 5A: 2006 Seasonal Traffic Volume Data



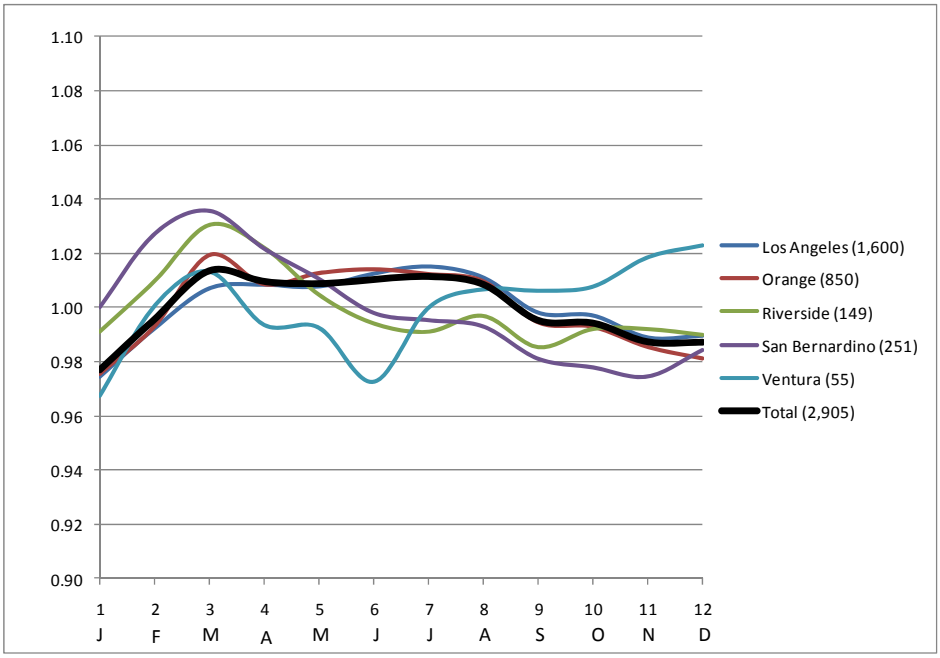
**Note: Seasonal traffic volume data is shown relative to Average Annual Weekday Traffic (AAWT)*
Source: PeMS

Figure 5B: 2007 Seasonal Traffic Volume Data



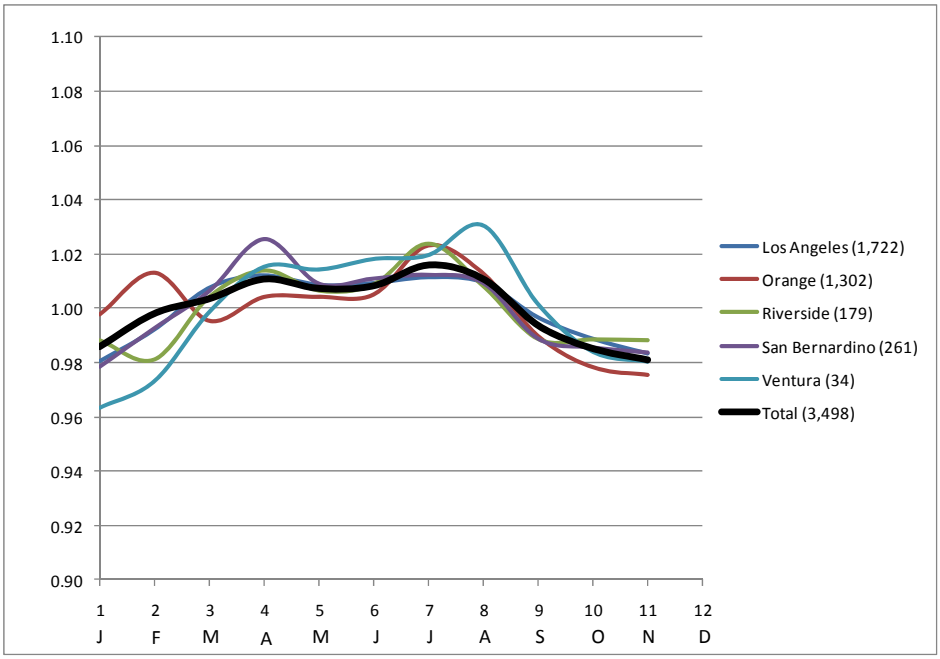
**Note: Seasonal traffic volume data is shown relative to Average Annual Weekday Traffic (AAWT)*
Source: PeMS

Figure 5C: 2008 Seasonal Traffic Volume Data



**Note: Seasonal traffic volume data is shown relative to Average Annual Weekday Traffic (AAWT)*
Source: PeMS

Figure 5D: 2009 Seasonal Traffic Volume Data



**Note: Seasonal traffic volume data is shown relative to Average Annual Weekday Traffic (AAWT)*
Source: PeMS

Table 2: Seasonal Adjustment Factors by County and Year

Month	County	2002	2003	2004	2005	2006	2007	2008	2009
January	Los Angeles	1.027	1.027	1.027	1.027	1.027	1.023	1.036	1.030
	Orange	1.036	1.036	1.036	1.036	1.036	1.045	1.037	1.007
	Riverside	1.049	1.049	1.049	1.049	1.049	0.675	1.016	1.022
	San Bernardino	1.002	1.002	1.002	1.002	1.002	0.683	1.010	1.038
	Ventura	1.045	1.045	1.045	1.045	1.045	1.045	1.045	1.045
	Imperial	1.026	1.026	1.026	1.026	1.026	1.019	1.013	1.030
February	Los Angeles	1.019	1.019	1.019	1.019	1.019	1.005	1.017	1.018
	Orange	1.024	1.024	1.024	1.024	1.024	1.027	1.019	0.992
	Riverside	1.026	1.026	1.026	1.026	1.026	0.659	0.997	1.029
	San Bernardino	1.004	1.004	1.004	1.004	1.004	0.672	0.983	1.023
	Ventura	1.023	1.023	1.023	1.023	1.023	1.023	1.023	1.023
	Imperial	1.016	1.016	1.016	1.016	1.016	0.998	0.990	1.026
March	Los Angeles	1.031	1.031	1.031	1.031	1.031	1.022	1.002	1.002
	Orange	1.013	1.013	1.013	1.013	1.013	1.011	0.993	1.009
	Riverside	1.018	1.018	1.018	1.018	1.018	0.663	0.977	1.006
	San Bernardino	0.999	0.999	0.999	0.999	0.999	0.666	0.975	1.009
	Ventura	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997
	Imperial	1.009	1.009	1.009	1.009	1.009	0.997	0.976	1.007
April	Los Angeles	0.995	0.995	0.995	0.995	0.995	1.024	1.001	0.998
	Orange	1.003	1.003	1.003	1.003	1.003	0.992	1.003	1.000
	Riverside	0.999	0.999	0.999	0.999	0.999	0.000	0.985	0.996
	San Bernardino	0.994	0.994	0.994	0.994	0.994	0.000	0.989	0.990
	Ventura	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996
	Imperial	0.997	0.997	0.997	0.997	0.997	0.000	0.987	0.993
May	Los Angeles	1.001	1.001	1.001	1.001	1.001	0.992	1.002	1.001
	Orange	1.010	1.010	1.010	1.010	1.010	1.017	0.999	1.000
	Riverside	1.004	1.004	1.004	1.004	1.004	0.669	1.002	1.003
	San Bernardino	1.010	1.010	1.010	1.010	1.010	0.671	1.000	1.006
	Ventura	1.004	1.004	1.004	1.004	1.004	1.004	1.004	1.004
	Imperial	1.007	1.007	1.007	1.007	1.007	1.005	1.001	1.005
June	Los Angeles	1.004	1.004	1.004	1.004	1.004	0.985	0.997	1.001
	Orange	0.988	0.988	0.988	0.988	0.988	0.992	0.998	0.999
	Riverside	0.996	0.996	0.996	0.996	0.996	0.664	1.013	1.001
	San Bernardino	0.997	0.997	0.997	0.997	0.997	0.663	1.012	1.004
	Ventura	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Imperial	0.996	0.996	0.996	0.996	0.996	0.995	1.012	1.003

Table 2: Seasonal Adjustment Factors by County and Year (continued)

Month	County	2002	2003	2004	2005	2006	2007	2008	2009
July	Los Angeles	1.013	1.013	1.013	1.013	1.013	0.986	0.995	0.999
	Orange	0.972	0.972	0.972	0.972	0.972	0.985	0.999	0.982
	Riverside	1.007	1.007	1.007	1.007	1.007	0.665	1.016	0.986
	San Bernardino	0.997	0.997	0.997	0.997	0.997	0.664	1.015	1.003
	Ventura	1.003	1.003	1.003	1.003	1.003	1.003	1.003	1.003
	Imperial	1.002	1.002	1.002	1.002	1.002	0.997	1.015	0.994
August	Los Angeles	1.011	1.011	1.011	1.011	1.011	0.979	0.998	1.000
	Orange	0.960	0.960	0.960	0.960	0.960	0.981	1.002	0.992
	Riverside	1.024	1.024	1.024	1.024	1.024	0.669	1.010	1.002
	San Bernardino	1.000	1.000	1.000	1.000	1.000	0.675	1.017	1.006
	Ventura	1.012	1.012	1.012	1.012	1.012	1.012	1.012	1.012
	Imperial	1.012	1.012	1.012	1.012	1.012	1.007	1.014	1.004
September	Los Angeles	1.019	1.019	1.019	1.019	1.019	0.987	1.011	1.013
	Orange	0.976	0.976	0.976	0.976	0.976	1.011	1.017	1.015
	Riverside	1.023	1.023	1.023	1.023	1.023	0.677	1.022	1.021
	San Bernardino	1.017	1.017	1.017	1.017	1.017	0.682	1.030	1.027
	Ventura	1.034	1.034	1.034	1.034	1.034	1.034	1.034	1.034
	Imperial	1.020	1.020	1.020	1.020	1.020	1.019	1.026	1.024
October	Los Angeles	1.016	1.016	1.016	1.016	1.016	0.995	1.012	1.021
	Orange	0.995	0.995	0.995	0.995	0.995	1.026	1.019	1.027
	Riverside	1.028	1.028	1.028	1.028	1.028	0.681	1.015	1.022
	San Bernardino	1.019	1.019	1.019	1.019	1.019	0.683	1.033	1.030
	Ventura	1.031	1.031	1.031	1.031	1.031	1.031	1.031	1.031
	Imperial	1.024	1.024	1.024	1.024	1.024	1.023	1.024	1.026
November	Los Angeles	1.025	1.025	1.025	1.025	1.025	0.992	1.021	1.027
	Orange	0.983	0.983	0.983	0.983	0.983	1.029	1.027	1.030
	Riverside	1.040	1.040	1.040	1.040	1.040	0.683	1.015	1.022
	San Bernardino	1.017	1.017	1.017	1.017	1.017	0.686	1.036	1.032
	Ventura	1.014	1.014	1.014	1.014	1.014	1.014	1.014	1.014
	Imperial	1.029	1.029	1.029	1.029	1.029	1.027	1.026	1.027
December	Los Angeles	1.022	1.022	1.022	1.022	1.022	1.010	1.020	n/a
	Orange	0.978	0.978	0.978	0.978	0.978	1.038	1.031	n/a
	Riverside	1.025	1.025	1.025	1.025	1.025	0.693	1.017	n/a
	San Bernardino	1.014	1.014	1.014	1.014	1.014	0.695	1.026	n/a
	Ventura	1.016	1.016	1.016	1.016	1.016	1.016	1.016	n/a
	Imperial	1.020	1.020	1.020	1.020	1.020	1.041	1.022	n/a

SEASONAL ADJUSTMENTS FOR THE COACHELLA VALLEY

Seasonal travel characteristics in the Coachella Valley are significantly different than the rest of the SCAG region. Caltrans maintains four permanent traffic counters in the area providing data that was used to create seasonal adjustment factors specific to the Valley. All four of these counters were operational for the duration of 2007 and one was operational for the duration of 2008. Together, this results in five data-points that have been used to develop Coachella Valley seasonal adjustment factors. Seasonal adjustment factors based on monthly traffic volumes relative to AAWT are shown in Figure 6.

The Coachella Valley experiences a winter/spring peak season and a summer off-peak season as shown in Figure 6. The data was used to create peak season factors representing average February/March/April traffic and off-peak factors that represent average July/August/September traffic. These factors are shown in Table 3.

Figure 6: Coachella Valley AAWT Adjustment Factors (2007-2008)

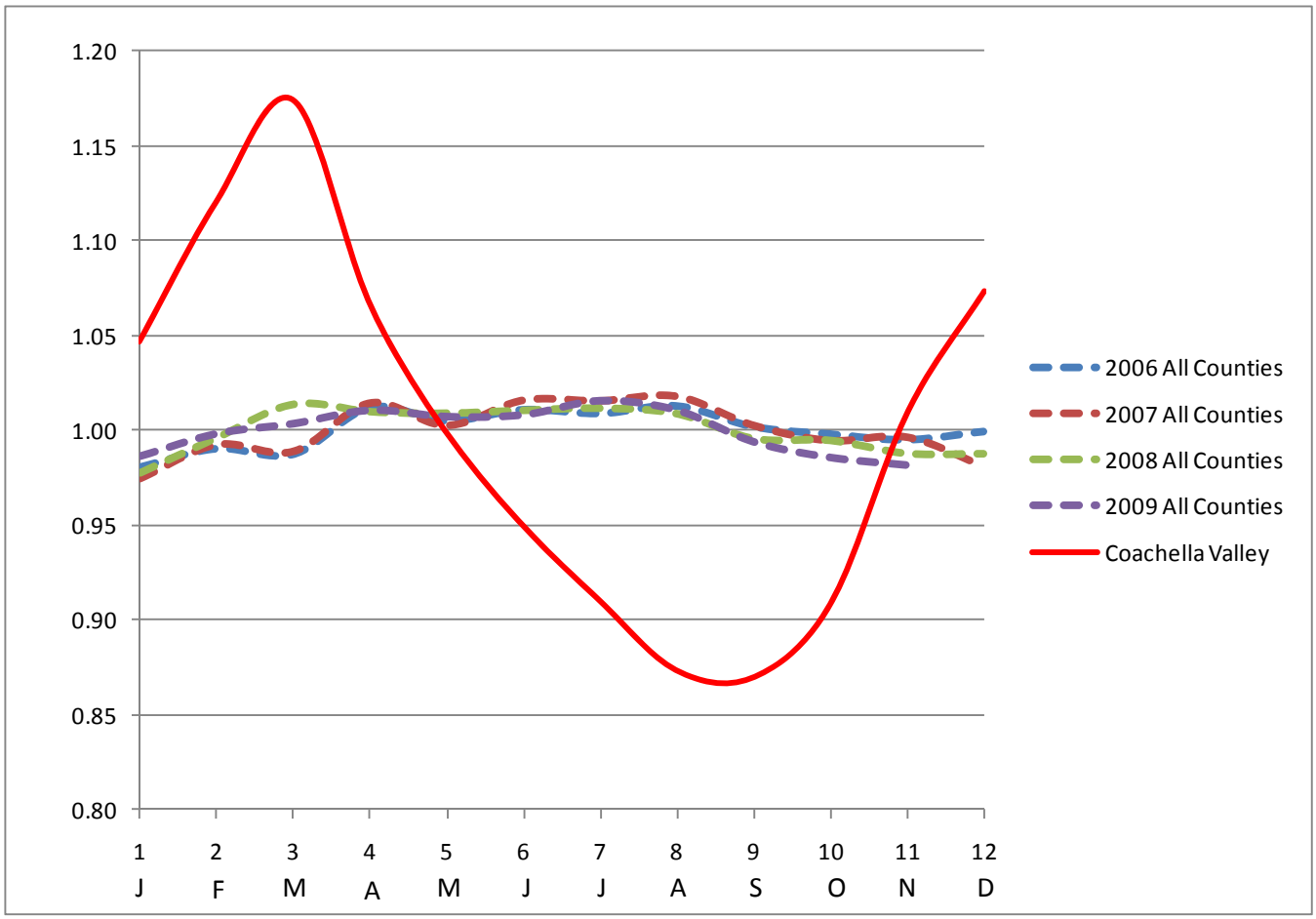


Table 3: Coachella Valley Seasonal Adjustment Factors

	January	February	March	April	May	June	July	August	September	October	November	December
Peak	0.934	1.000	1.048	0.952	0.891	0.847	0.812	0.779	0.776	0.811	0.901	0.958
Off-Peak	1.184	1.268	1.329	1.207	1.130	1.074	1.029	0.987	0.984	1.028	1.142	1.214

COMPOSITE ADJUSTMENT FACTORS

To adjust traffic counts in the Screenline Count Database, each count is multiplied by a composite adjustment factor that includes both annual and seasonal considerations. The factors adjust counts to represent the average model-season (e.g., April/May/June) volume in the year 2008. For the Coachella Valley, the factors can be applied to adjust to the February/March/April peak season or the July/August/September off-peak season. All other areas are adjusted to represent an average April/May/June volume. Composite adjustment factors are shown in Table 4.

Table 4: Composite Seasonal/Annual Adjustment Factors

Month	County	2002	2003	2004	2005	2006	2007	2008	2009
January	Los Angeles	1.017	1.018	1.018	1.018	1.018	1.021	1.036	1.023
	Orange	1.037	1.031	1.026	1.021	1.016	1.020	1.037	0.995
	Riverside	1.158	1.114	1.073	1.035	0.999	0.648	1.016	1.012
	San Bernardino	0.980	0.976	0.971	0.967	0.963	0.662	1.010	1.031
	Ventura	1.026	1.012	0.998	0.985	0.972	1.008	1.045	1.002
	Imperial	1.056	1.037	1.018	1.000	0.983	0.983	1.013	1.022
	Coachella Valley (Peak)	1.182	1.137	1.095	1.056	1.020	1.028	1.071	1.060
	Coachella Valley (Off-Peak)	0.932	0.897	0.864	0.833	0.805	0.811	0.844	0.836
February	Los Angeles	1.009	1.009	1.009	1.009	1.009	1.003	1.017	1.011
	Orange	1.025	1.020	1.014	1.009	1.004	1.003	1.019	0.980
	Riverside	1.133	1.090	1.050	1.012	0.978	0.632	0.997	1.019
	San Bernardino	0.982	0.978	0.974	0.969	0.965	0.651	0.983	1.016
	Ventura	1.005	0.991	0.977	0.964	0.951	0.987	1.023	0.981
	Imperial	1.045	1.026	1.008	0.990	0.973	0.963	0.990	1.018
	Coachella Valley (Peak)	1.104	1.062	1.023	0.987	0.953	0.960	1.000	0.990
	Coachella Valley (Off-Peak)	0.871	0.838	0.807	0.778	0.752	0.757	0.789	0.781
March	Los Angeles	1.021	1.021	1.021	1.021	1.021	1.020	1.002	0.996
	Orange	1.013	1.008	1.003	0.998	0.993	0.987	0.993	0.997
	Riverside	1.124	1.081	1.042	1.005	0.970	0.637	0.977	0.995
	San Bernardino	0.977	0.973	0.968	0.964	0.960	0.645	0.975	1.002
	Ventura	0.979	0.965	0.952	0.939	0.927	0.962	0.997	0.956
	Imperial	1.038	1.019	1.001	0.983	0.966	0.962	0.976	0.999
	Coachella Valley (Peak)	1.054	1.013	0.976	0.941	0.909	0.916	0.954	0.944
	Coachella Valley (Off-Peak)	0.831	0.799	0.770	0.743	0.717	0.723	0.753	0.745
April	Los Angeles	0.985	0.986	0.986	0.986	0.986	1.022	1.001	0.991
	Orange	1.003	0.998	0.993	0.988	0.983	0.968	1.003	0.988
	Riverside	1.104	1.061	1.022	0.986	0.952	0.000	0.985	0.986
	San Bernardino	0.972	0.968	0.964	0.959	0.955	0.000	0.989	0.984
	Ventura	0.978	0.965	0.952	0.939	0.927	0.961	0.996	0.955
	Imperial	1.026	1.007	0.989	0.972	0.955	0.000	0.987	0.985
	Coachella Valley (Peak)	1.160	1.116	1.075	1.036	1.001	1.009	1.050	1.040
	Coachella Valley (Off-Peak)	0.915	0.880	0.848	0.818	0.790	0.796	0.829	0.820
May	Los Angeles	0.992	0.992	0.992	0.992	0.992	0.990	1.002	0.995
	Orange	1.010	1.005	1.000	0.995	0.990	0.993	0.999	0.988
	Riverside	1.109	1.067	1.027	0.991	0.957	0.643	1.002	0.993
	San Bernardino	0.988	0.983	0.979	0.974	0.970	0.650	1.000	1.000
	Ventura	0.986	0.972	0.959	0.946	0.934	0.969	1.004	0.962
	Imperial	1.036	1.017	0.999	0.981	0.964	0.971	1.001	0.997
	Coachella Valley (Peak)	1.239	1.192	1.148	1.107	1.069	1.077	1.122	1.111
	Coachella Valley (Off-Peak)	0.977	0.940	0.905	0.873	0.843	0.850	0.885	0.876
June	Los Angeles	0.994	0.994	0.995	0.995	0.995	0.982	0.997	0.994
	Orange	0.988	0.983	0.978	0.973	0.968	0.968	0.998	0.987
	Riverside	1.100	1.058	1.019	0.983	0.949	0.637	1.013	0.991
	San Bernardino	0.975	0.970	0.966	0.962	0.957	0.642	1.012	0.998
	Ventura	0.982	0.968	0.955	0.942	0.930	0.965	1.000	0.959
	Imperial	1.025	1.007	0.988	0.971	0.954	0.961	1.012	0.995
	Coachella Valley (Peak)	1.303	1.253	1.207	1.164	1.124	1.133	1.180	1.168
	Coachella Valley (Off-Peak)	1.028	0.989	0.952	0.919	0.887	0.894	0.931	0.922

Table 4: Composite Seasonal/Annual Adjustment Factors (continued)

Month	County	2002	2003	2004	2005	2006	2007	2008	2009
July	Los Angeles	1.003	1.003	1.003	1.004	1.004	0.984	0.995	0.992
	Orange	0.972	0.967	0.962	0.958	0.953	0.961	0.999	0.970
	Riverside	1.112	1.069	1.030	0.994	0.959	0.639	1.016	0.976
	San Bernardino	0.975	0.971	0.966	0.962	0.958	0.644	1.015	0.996
	Ventura	0.985	0.971	0.958	0.945	0.933	0.968	1.003	0.962
	Imperial	1.031	1.012	0.994	0.977	0.960	0.963	1.015	0.987
	Coachella Valley (Peak)	1.360	1.308	1.260	1.215	1.174	1.183	1.232	1.219
	Coachella Valley (Off-Peak)	1.073	1.032	0.994	0.959	0.926	0.933	0.972	0.962
August	Los Angeles	1.001	1.001	1.001	1.001	1.001	0.977	0.998	0.994
	Orange	0.960	0.955	0.950	0.946	0.941	0.957	1.002	0.980
	Riverside	1.130	1.087	1.047	1.010	0.975	0.642	1.010	0.991
	San Bernardino	0.978	0.974	0.970	0.965	0.961	0.654	1.017	0.999
	Ventura	0.994	0.980	0.967	0.954	0.941	0.976	1.012	0.970
	Imperial	1.042	1.023	1.004	0.987	0.970	0.973	1.014	0.996
	Coachella Valley (Peak)	1.418	1.363	1.313	1.267	1.223	1.233	1.284	1.271
	Coachella Valley (Off-Peak)	1.118	1.075	1.036	0.999	0.965	0.972	1.013	1.002
September	Los Angeles	1.009	1.009	1.009	1.009	1.009	0.985	1.011	1.007
	Orange	0.976	0.971	0.966	0.961	0.956	0.986	1.017	1.003
	Riverside	1.129	1.086	1.046	1.009	0.974	0.650	1.022	1.011
	San Bernardino	0.995	0.990	0.986	0.982	0.977	0.660	1.030	1.020
	Ventura	1.016	1.002	0.988	0.975	0.962	0.998	1.034	0.992
	Imperial	1.050	1.030	1.012	0.994	0.977	0.984	1.026	1.016
	Coachella Valley (Peak)	1.423	1.369	1.318	1.271	1.228	1.237	1.289	1.276
	Coachella Valley (Off-Peak)	1.123	1.080	1.040	1.003	0.969	0.976	1.017	1.006
October	Los Angeles	1.006	1.006	1.006	1.006	1.006	0.992	1.012	1.015
	Orange	0.996	0.991	0.986	0.981	0.976	1.001	1.019	1.014
	Riverside	1.135	1.091	1.051	1.014	0.979	0.654	1.015	1.011
	San Bernardino	0.997	0.993	0.988	0.984	0.979	0.661	1.033	1.024
	Ventura	1.012	0.998	0.985	0.971	0.959	0.994	1.031	0.988
	Imperial	1.053	1.034	1.016	0.998	0.980	0.988	1.024	1.018
	Coachella Valley (Peak)	1.362	1.310	1.262	1.217	1.175	1.185	1.234	1.221
	Coachella Valley (Off-Peak)	1.075	1.033	0.995	0.960	0.927	0.934	0.973	0.963
November	Los Angeles	1.015	1.016	1.016	1.016	1.016	0.989	1.021	1.020
	Orange	0.984	0.979	0.974	0.969	0.964	1.004	1.027	1.017
	Riverside	1.149	1.105	1.064	1.026	0.991	0.656	1.015	1.012
	San Bernardino	0.995	0.990	0.986	0.982	0.977	0.665	1.036	1.025
	Ventura	0.996	0.982	0.969	0.956	0.943	0.979	1.014	0.972
	Imperial	1.059	1.040	1.021	1.003	0.986	0.992	1.026	1.019
	Coachella Valley (Peak)	1.226	1.179	1.136	1.095	1.058	1.066	1.110	1.099
	Coachella Valley (Off-Peak)	0.967	0.930	0.896	0.864	0.834	0.841	0.876	0.867
December	Los Angeles	1.012	1.012	1.012	1.012	1.013	1.007	1.020	n/a
	Orange	0.978	0.973	0.968	0.963	0.959	1.013	1.031	n/a
	Riverside	1.132	1.088	1.048	1.011	0.976	0.666	1.017	n/a
	San Bernardino	0.991	0.987	0.983	0.978	0.974	0.673	1.026	n/a
	Ventura	0.997	0.984	0.970	0.957	0.945	0.980	1.016	n/a
	Imperial	1.049	1.030	1.011	0.994	0.976	1.005	1.022	n/a
	Coachella Valley (Peak)	1.153	1.109	1.068	1.030	0.995	1.002	1.044	1.033
	Coachella Valley (Off-Peak)	0.909	0.875	0.842	0.812	0.785	0.791	0.824	0.815

Data Expansion

Most of the data provided by local jurisdictions contained some level of detail but did not typically include both 15-minute detail and vehicle classification data. As a result, data is present in the database in the levels of detail shown in Table 5. Screenline counts by level of detail are shown in Figures 7A and 7B.

Table 5: Levels of Traffic Count Detail

Data Format		Expansion of Data	Limitations of Expanded Data
1	15-Minute with Vehicle Classification	Not necessary	None
2	15-Minute	By vehicle type at 15-minute level	Potential for atypical truck splits
3	Hourly with Vehicle Classification	Expand each hour to 15 minutes Retain hourly vehicle class splits for sub-hours	None
4	Hourly (directional data)	Expand each hour to 15 minutes Apply vehicles classes at 15 minute level	Potential for atypical truck splits
5	24-Hour (no directional data)	Expand 24 hours to each hour then to 15 minutes (generalized peaking) Apply vehicles classes at 15 minute level	Potential for atypical truck splits Directional peaking characteristics are not likely correct

An algorithm is used to approximate time-of-day characteristics and vehicle classification distributions at all traffic count locations. Traffic count data is expanded to simulate time-of-day and vehicle class characteristics using the highest level of detail available at each location. Missing data is synthesized based on average characteristics from detailed traffic count data. Data expansion characteristics are based only on data collected specifically for this database and are applied by groups of Regional Service Areas (RSAs). For each RSA group, a set of *expansion counts* has been selected. These expansion counts consist of arterial count data that has been collected specifically for the SCAG Traffic Count Database and is located within the same RSA group as the count to be expanded. RSA Groups are shown in Figures 8A and 8B.

Through the expansion process, most counts will exhibit proper directional peaking characteristics, although counts expanded from 24-hour data will have average peaking characteristics but not directional accuracy.

Figure 7A: Count Type on Screenlines (Region)

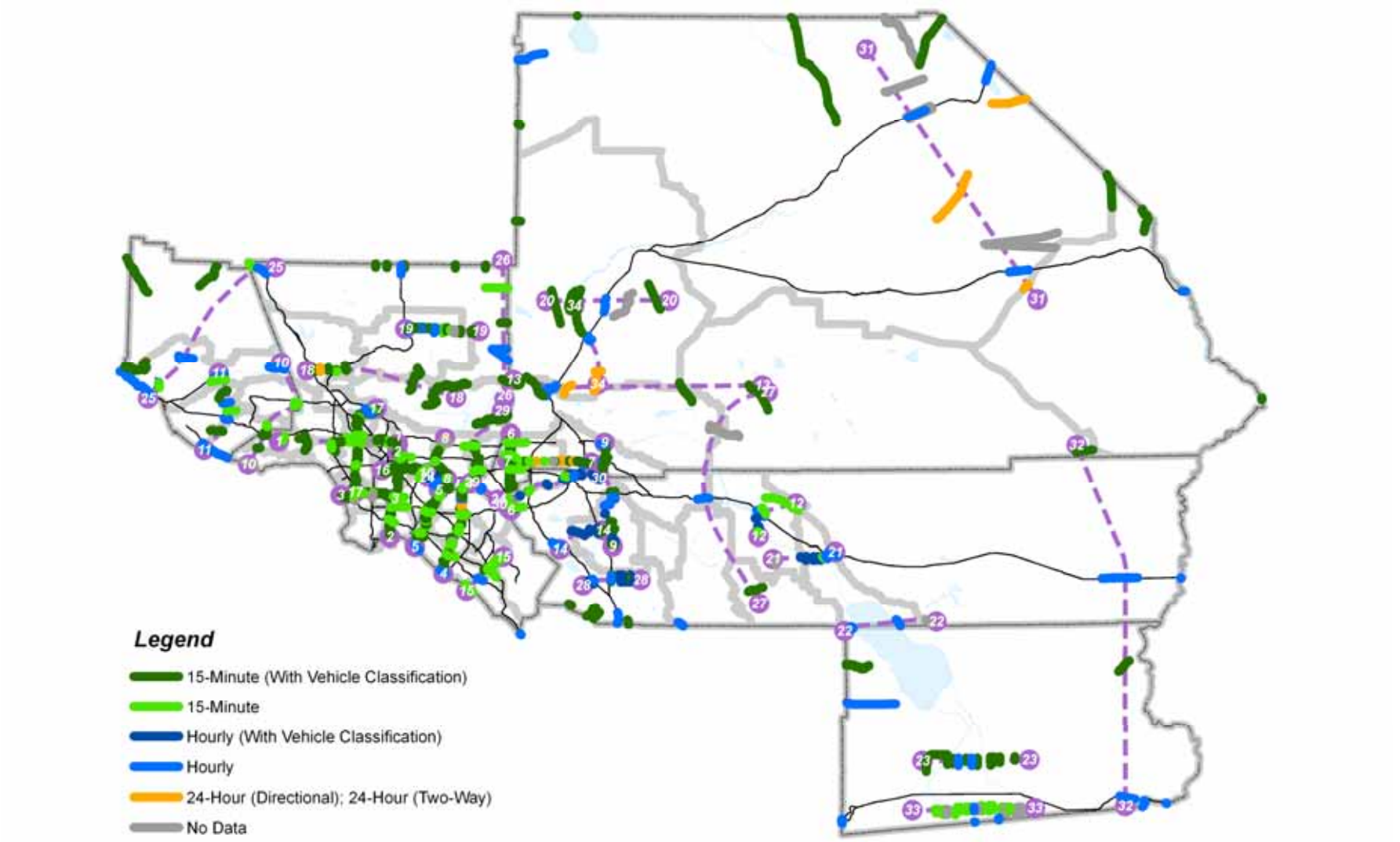


Figure 7B: Count Type on Screenlines (Detail)

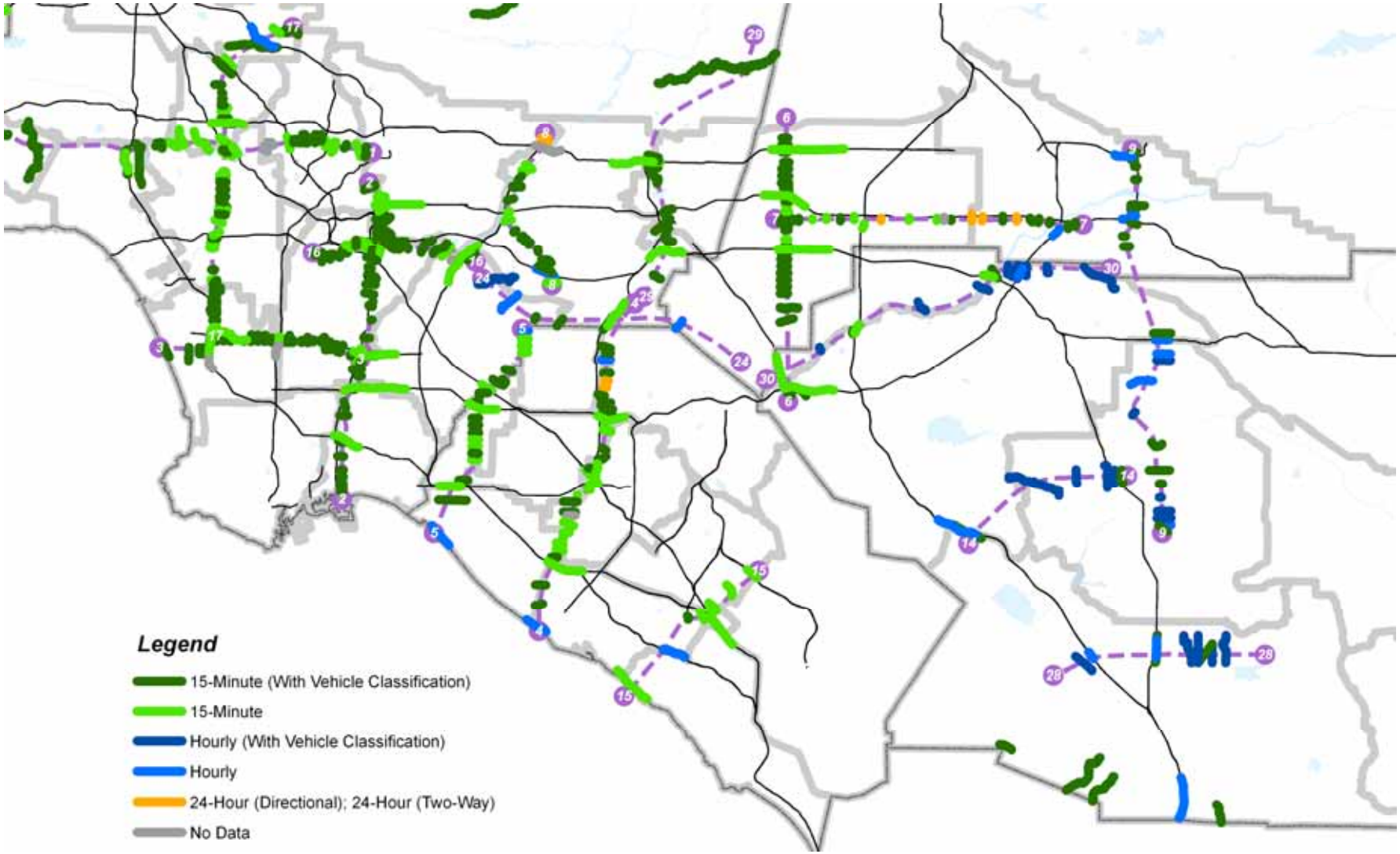


Figure 8A: RSA Groups (Region)

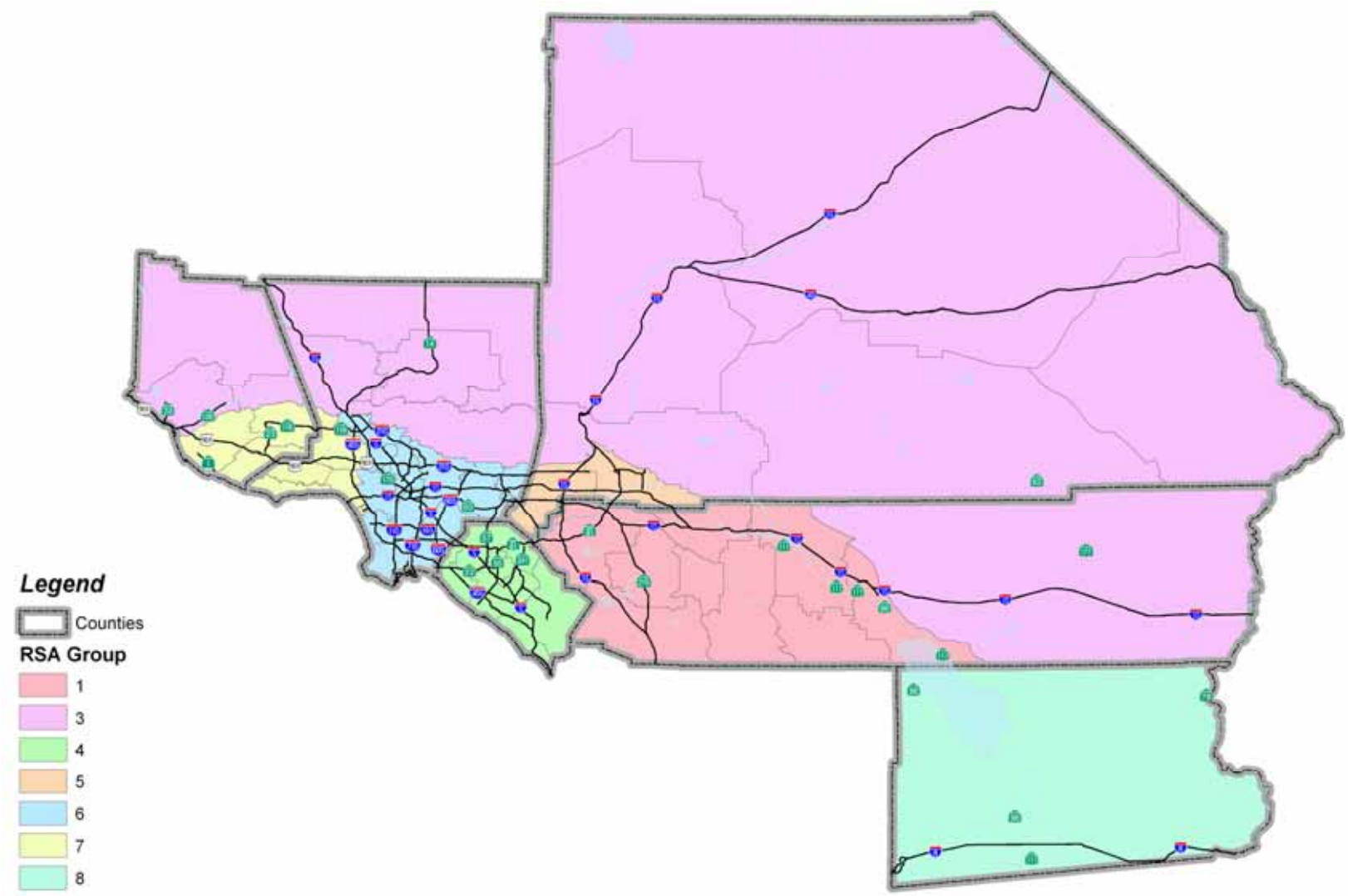
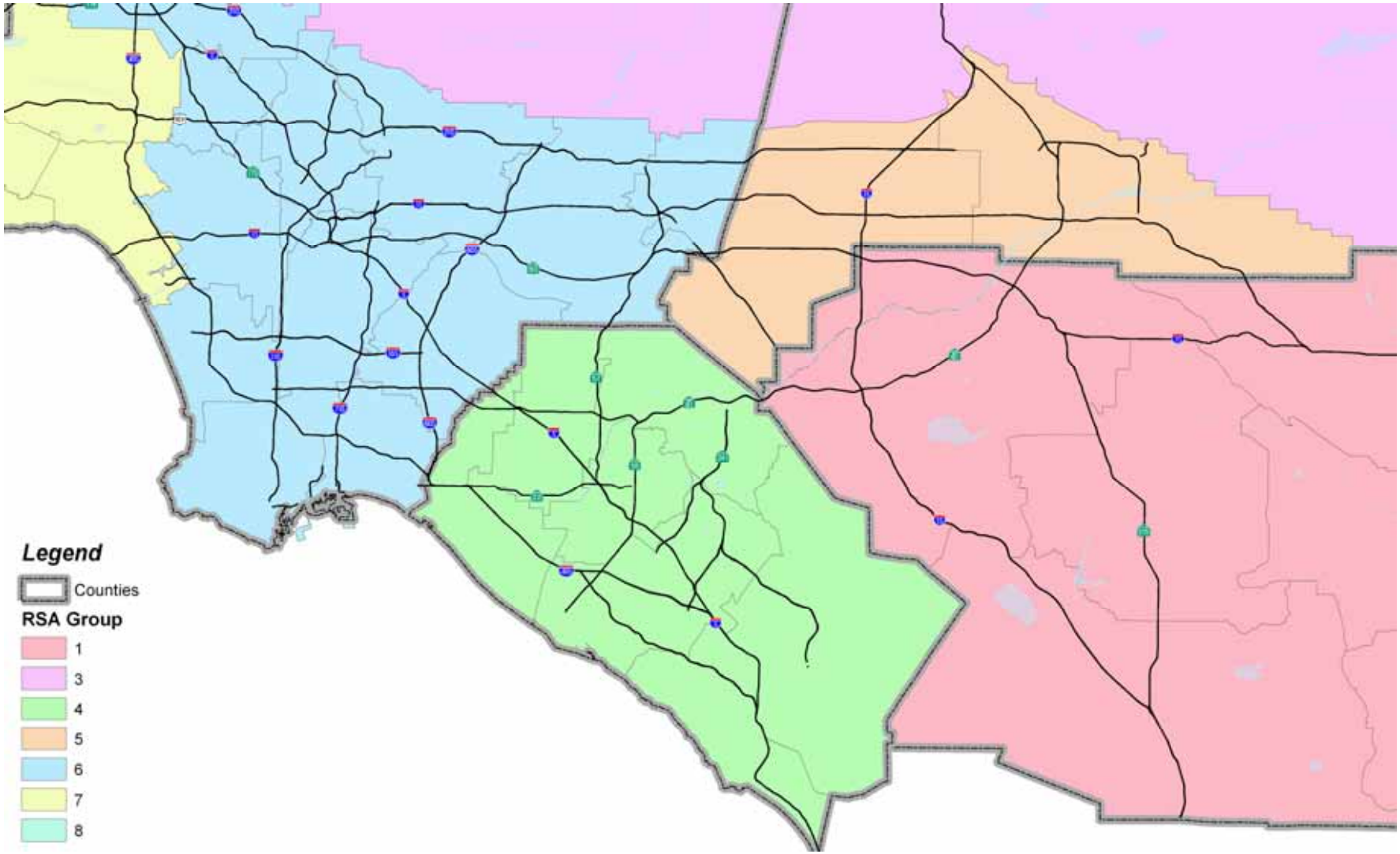


Figure 8B: RSA Groups (Detail)



EXPANSION TO 15-MINUTE DETAIL

First, all count data is expanded to simulate traffic volumes in 15-minute increments. The particular expansion methodology is dependent on the amount of data available with each traffic count as described in Table 6.

Table 6: Time-of-Day Expansion Methodology

Initial Data Availability	Expansion Methodology
15-minute data	No expansion necessary.
Hourly Data	Each hour is independently expanded to four time segments based on the average distribution within the hour for expansion counts. For each 15-minute period, the expanded traffic volume is computed as follows: $$EV_i = V_H \frac{\sum_{\text{Expansion Counts}} V_i}{\sum_{\text{Expansion Counts}} V_H}$$ Where: EV_i = Estimated volume for 15-minute period *i* V_i = Traffic volume for 15-minute period *i* V_H = Traffic volume for hour *H* If vehicle classification data is present, volumes by vehicle class are uniformly expanded from hourly to 15-minute detail.
24-Hour Data	The data is expanded to 15-minute time segments based on the average daily distribution based on expansion counts. The expanded traffic volume is computed as follows: $$EV_i = V_D \frac{\sum_{\text{Expansion Counts}} V_i}{\sum_{\text{Expansion Counts}} V_D}$$ Where: EV_i = Estimated volume for 15-minute period *i* V_i = Traffic volume for 15-minute period *i* V_D = Daily traffic volume

EXPANSION TO 13 VEHICLE CLASSIFICATIONS

After each count is processed to include 15-minute data, they are then expanded to represent the 13 vehicle classes defined by the Federal Highway Administration (FHWA). This expansion is applied independently for each 15-minute period. Where vehicle classification data is already available, no further expansion is necessary. Where vehicle classification data is not available, the expanded traffic volume is computed as follows:

$$EV_{i,c} = V_i \frac{\sum_{\substack{Expansion \\ Counts}} V_{i,c}}{\sum_{\substack{Expansion \\ Counts}} V_i}$$

Where:

$EV_{i,c}$ = Estimated volume for 15-minute period *i* and vehicle class *c*

$V_{i,c}$ = Traffic volume for 15-minute period *i* and vehicle class *c*

V_i = Traffic volume for 15-minute period *i* (all vehicle classes)

DIRECTIONAL CONSIDERATIONS

Expansion to 15-minute detail and to include vehicle classification is performed on directional traffic count data where available. Specifically, the same methodology is applied to directional eastbound, westbound, northbound, or southbound traffic and also to two-way traffic counts without any directional detail. However, two-way count data is exceedingly rare in the database and occurs in locations where only 24-hour data is available. Once the above expansions and adjustments have been made, all two-way count data is separated into two directions using a simple 50% / 50% split. As a result, counts with directional detail would retain traditional directional peaking characteristics. Counts without directional data will include traditional peaking characteristics for each direction but the directional peaking will not necessarily be correct.

Expansion Groups – Increasing Specificity

As currently implemented, the SCAG 2008 Traffic Count Database adjusts and expands all traffic data but is limited by the amount of specificity in the selection of count expansion groups. SCAG may desire to further refine the traffic count expansion groups by limiting this exercise to screenline locations. This has the following potential benefits:

- Localized characteristics could be more accurately applied based on similar traffic patterns on links crossing a particular screenline.
- Expansion groups could be made sensitive to facility type as well as geographic location.
- Expansion groups could be made sensitive to direction of flow, allowing for separate expansion of data by inbound/outbound or northbound/southbound.

Further refinement can be achieved using the database as currently designed and implemented. To accomplish this, the user would need to follow the steps listed below.

1. Remove non-screenline traffic counts from the database (*aCountData* and *aCountDescription* tables).
2. Re-specify the RSA_GROUP attribute in the *aCountDescription* table.

Traffic Count Database

The SCAG 2008 Traffic Count Database (the database) contains traffic count data collected in an effort to provide complete traffic count coverage on all SCAG Model screenlines. This technical documentation provides details about the tables, relationships, queries, and subroutines present in the database. The methodology used to expand data to provide 15-minute detail and vehicle classification at each location is also detailed.

In addition to the data in its raw form, the database provides tools that allow more convenient interaction with the traffic counts. Tools include reporting mechanisms that allow review of individual traffic count data points, the ability to synthesize 15-minute data where only hourly or 24-hour data exists, the ability to approximate vehicle classification data on arterial links, and the capability to generate simplified screenline reports for use in the model validation process.

Contents Summary

The database as originally delivered to SCAG contains over 5,500 individual traffic counts. Of this data, 743 traffic counts are located on screenlines. Table 7 summarizes the number of screenline links and the associated traffic count data. Because new screenlines were added to the model, the number of links on original screenlines is included for comparison.

Approximately 4,800 traffic counts contained in the database have been geocoded to a latitude and longitude. All geocoded traffic counts contained in the database are shown in Figure 9, with PeMS and Caltrans count locations also shown in Figure 10. Counts that were matched to links in the model network are shown in Figure 11, with those on screenlines noted in Figure 12.

Table 7: Screenline and Cordon Coverage

Data Format	Original Screenlines	Revised Screenlines	Database
Arterial and Collector (Existing Data)	423	534 (+26%)	135
Arterial and Collector (Collected Data)			344
Arterial and Collector (Low Priority with pre-existing Counts)			29
Arterial and Collector (No Count)			26*
Freeways	120	182 (+52%)	182**
HOV	45	53 (+18%)	53
Total	**588**	**769 (+31%)**	**769**

** 26 locations were unpaved (17), posted with "No trespassing" signs (2), were removed from the screenline (2), or were not counted for other reasons (5).*
*** 11 freeway locations could benefit from updated count data collected as part of SCAG's Goods Movement Program.*

Figure 9: Geocoded Traffic Count Locations

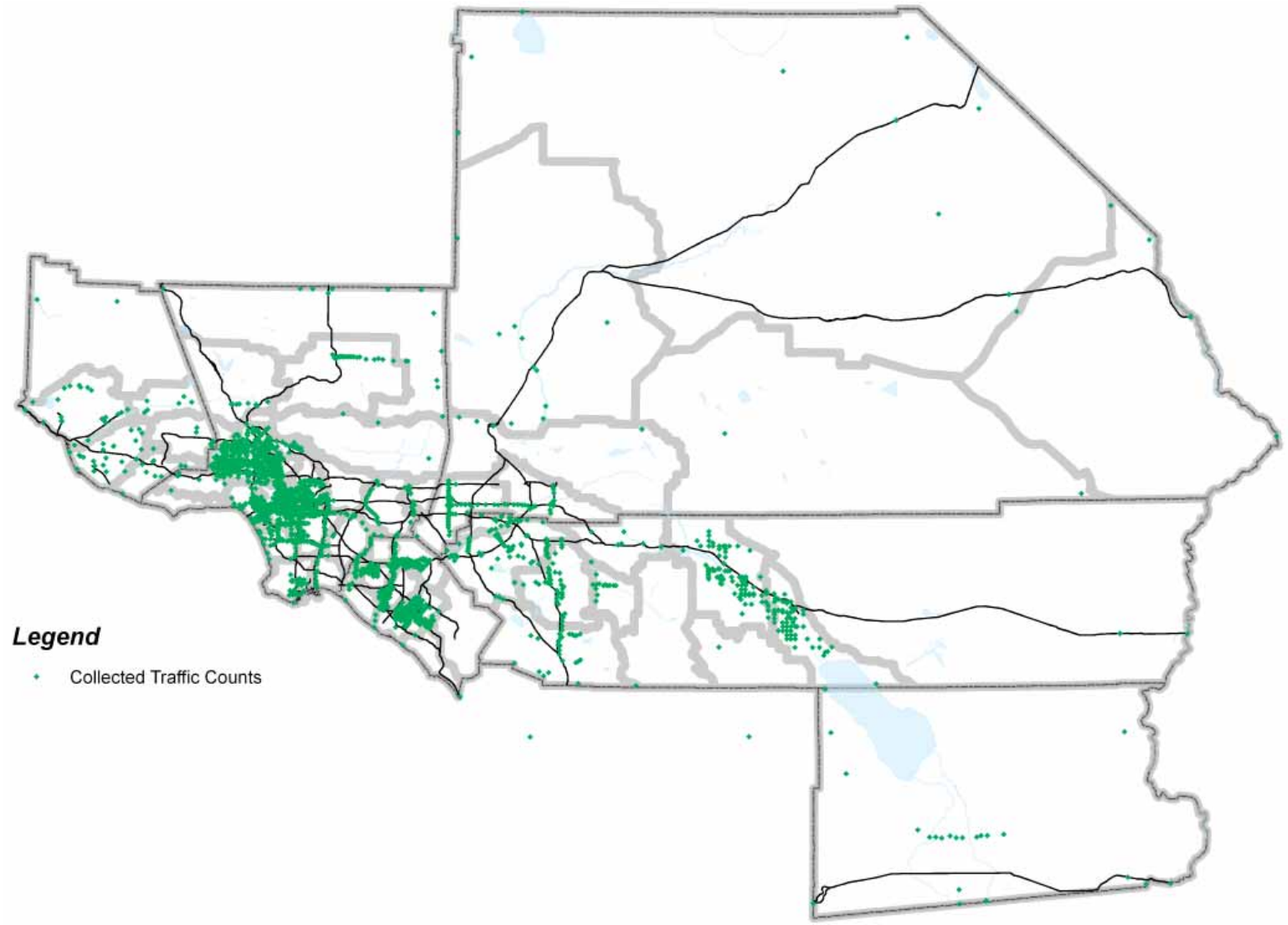


Figure 10: Geocoded Traffic Count Locations with PeMS and Caltrans Count Locations

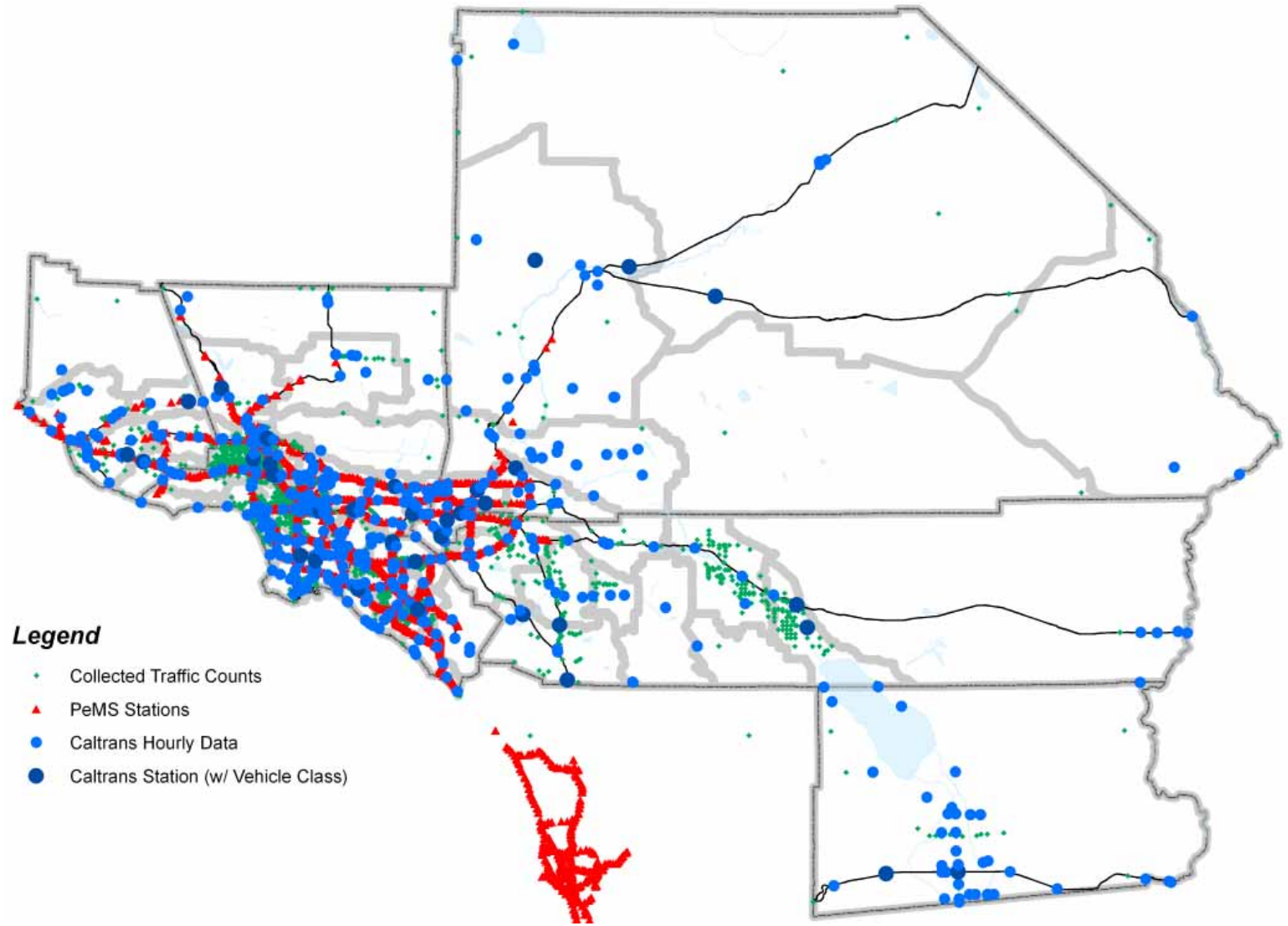


Figure 11: Count Locations Matched to Links

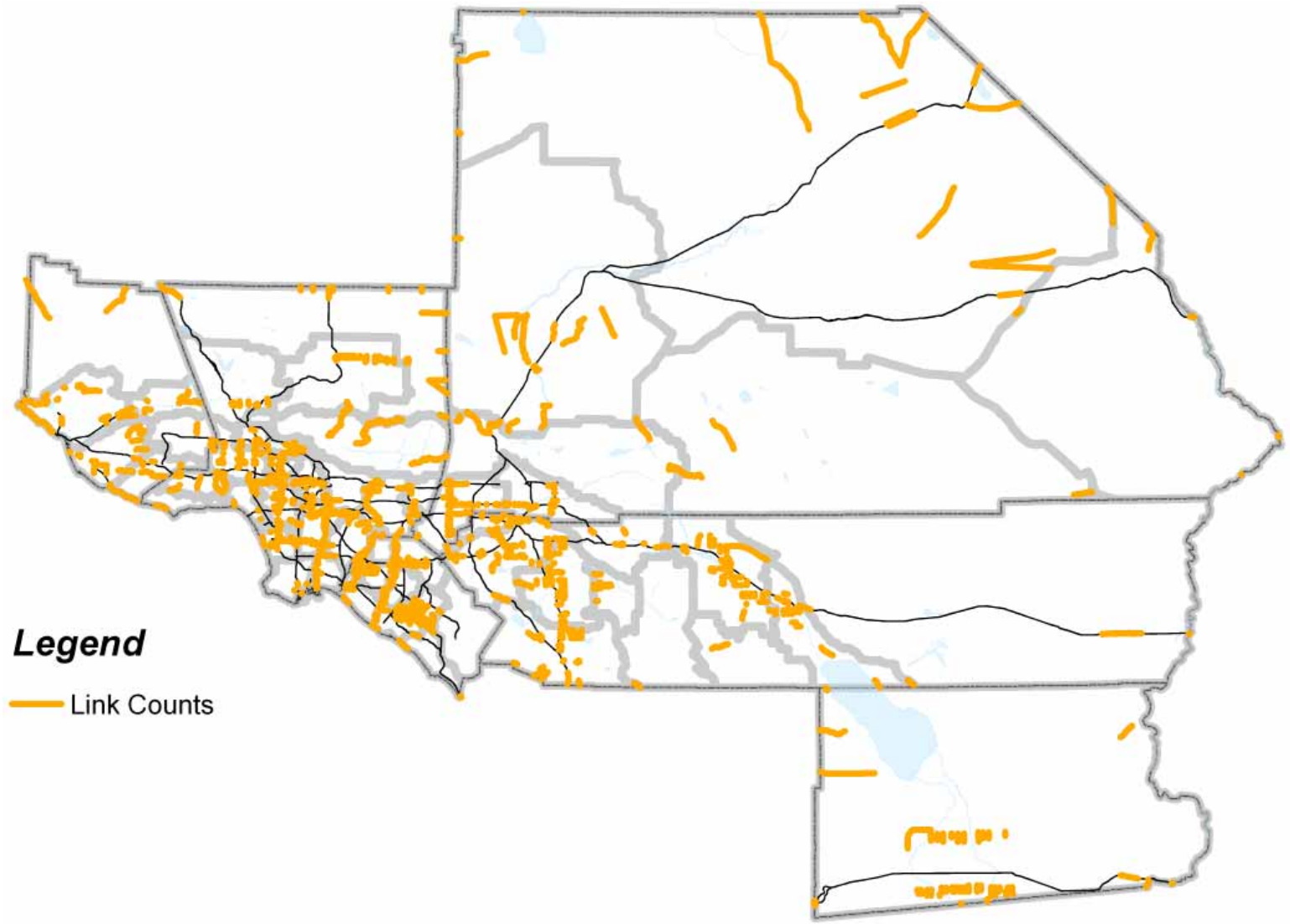
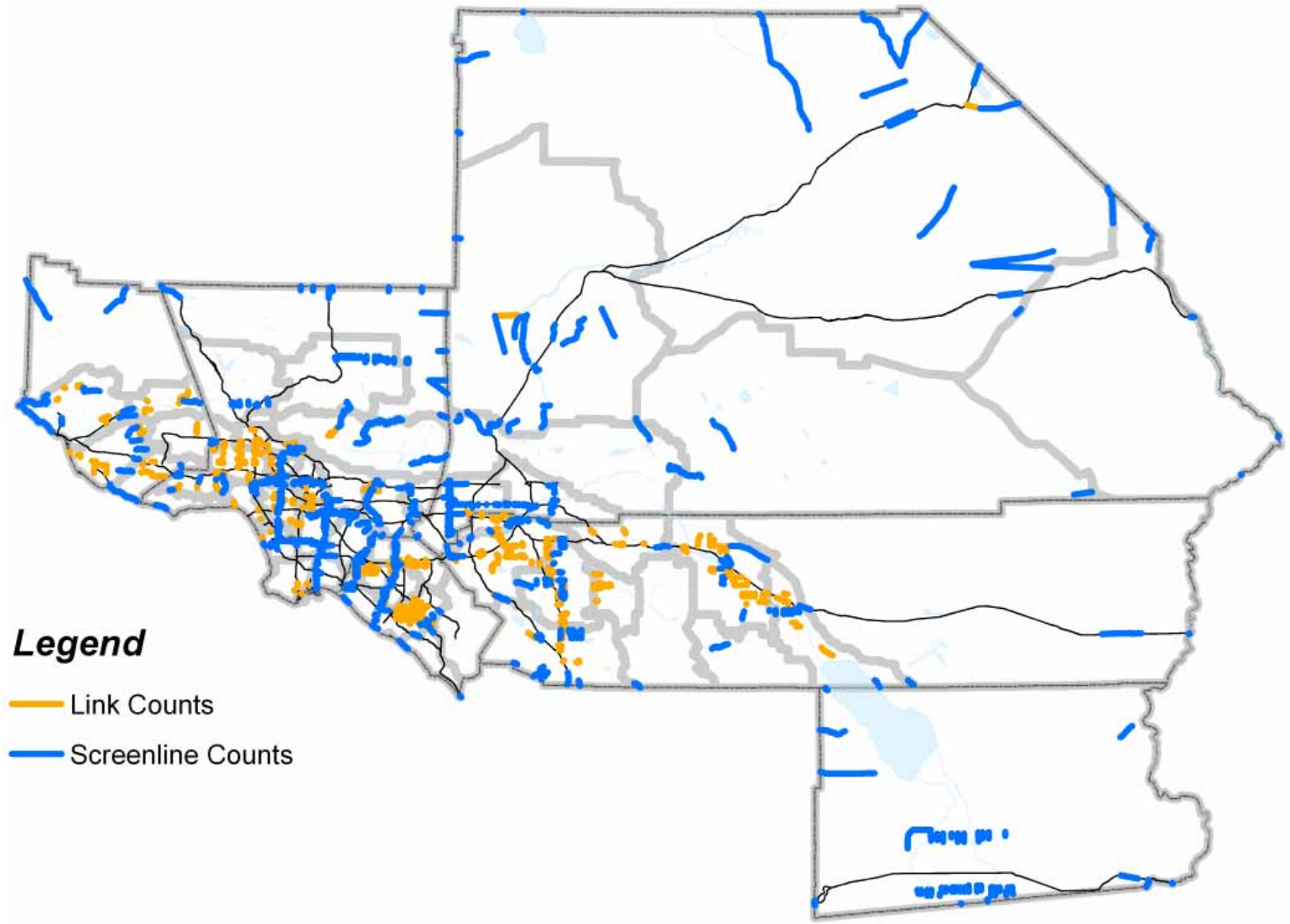


Figure 12: Count Locations Matched to Links, with Identification of Screenline Locations



Tables

Tables in the database contain information about screenline locations, count locations, and contain traffic count data. The database includes three primary data tables, as well as several definition tables. The primary tables contain traffic count descriptions and data, as well information about the model screenlines. They are:

- *aCountDescription,*
- *aCountData*,
- *aScreenlineLinks, and*
- *aSummarizeLinks.*

Several definition tables are also included in the database. These tables include:

- *bAdjustmentFactors*
- *bCountyDefinition*
- *bDataType,*
- *bDirectionDefinition,*
- *bScreenlineList,*
- *bSourceDefinition,*
- *bTimePeriodDefinition,* and
- *bVehicleClassDefinition.*

Each definition table contains a list of numeric codes (used to populate data tables) and corresponding text descriptions. For ease of use, all data tables are named with a prefix of “a,” while all definition tables are named with a “b” prefix.

TABLE RELATIONSHIPS

Relationships are used to identify matching data in different tables. For example, the CountID field is used to identify records in the *aCountData* table that match a particular record in the *aCountDescription* table. This is represented in the database through table relationships. The relationships present in the database are shown in Figure 13, with one-to-many relationships connected by a line that is designated with a one (1) and a many (∞) side. The table on the “one” side of the join can only have one record for each unique value, while the table on the “many” side of the join may have any number of records with the matched value.

One-to-many relationships are set up to enforce referential integrity. This prevents a user from accidentally entering an invalid value into a field in the “many” table. When editing the data, an error will occur if a user attempts to enter an invalid value in any field that is part of a one-to-many relationship. If such an action was not in error, the user must first add a corresponding record in the related table before proceeding.

The relationship between *aCountData* and *aCountDescription* is also set to cascade field updates and deletes. This means that if a count description record is deleted, all related data records will also be deleted. Also, if CountID is changed for a description record, the count ID for all related records will be automatically updated to match.

Figure 13: Database Table Relationships

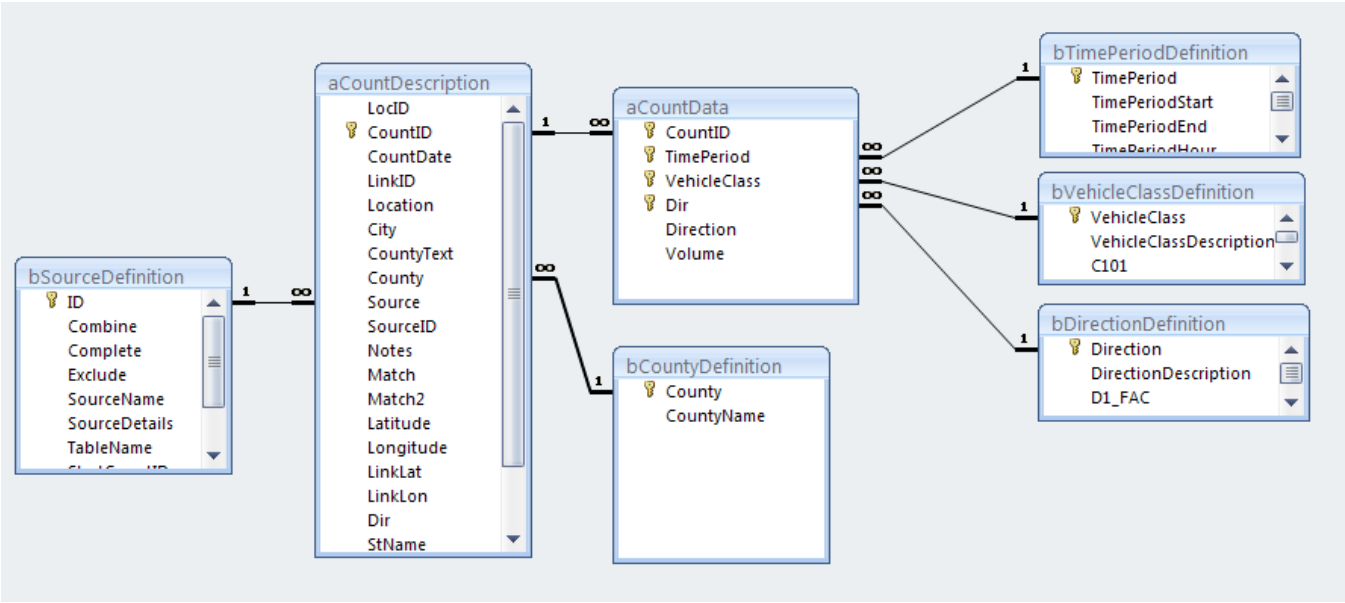


TABLE LISTING

The tables and their contents are listed in Tables 8 through 19. Fields or groups of fields forming each table's primary key are denoted with a key icon (🔑).

Table 8: Contents of aScreenlineLinks

Field	Type	Contents	
SCRL	Integer	Screenline ID Number (88 = Cordon location)	
SCRL_LOC	Real	Screenline link location. This value increases from north to south or east to west. Decimal values are allowed to facilitate insertion of additional links.	
SCRL_WRK	Text	Initial working screenline name (uses letters for new screenlines)	
NAME	Text	Original screenline link location name: Screenline ID followed by a, b, aa, ab, … etc.	
LINK_ID	Integer	TransCAD link ID used during database development. This ID matches the LinkID in the included geodatabase network link layer.	
LINK_DIR	Integer	Indicates if TransCAD topology is consistent with database topology using the following values: 1: Link is AB from south to north or west to east (consistent database and network topology) -1: Link is AB from north to south or east to west (inconsistent database and network topology)	
STREET	Text	The street crossed by the screenline	
FT	Text	Link facility type	
JURIS	Text	City or county in which the screenline link is located	
AVAIL	Text	Count availability determined through initial review of data	
NEEDED	Text	Initial notes regarding the need for count collection. Not updated in final database	
STATUS	Text	Field denoting status of count data on the screenline link	
		OK	Count data is present, either through existing count data or Low Priority count data collection.
		OK – Occupancy Counts	Count data is present, Occupancy counts were collected (These are not included in the main database)
		Set1, Set2, Set3	Count collected. Set number indicates the batch in which locations were included. Set1 and Set 2 were initially counted. Set 3 was counted to fill in low priority locations.
		Imperial	Counts were collected for the Imperial county model.
		LowPriority	Count exists, but was identified for low priority collection. Counts were not taken at these locations because existing counts were deemed sufficient.
		DELETE LINK	Link is no longer crossed by a screenline and should be deleted from the analysis. Records are retained for data continuity.
		UNPAVED	Unpaved roadway. Count data is not available.
		SKIP	Count data is not available on this link
DATE	Date/Time	Initial notes regarding the date a pre-existing count was taken	
DAY	Text	Initial notes regarding the day of the week a pre-existing count was taken	
FT_DTL	Text	Link facility type	
Lanes	Text	Number of lanes, _, and (T)wo vs. (O)ne way designation	
Cross_St1	Text	Count location is between the two listed cross streets. In some cases, the two values can be combined directly to form a description such as “East of Main St.”	
Cross_St2	Text		

This table contains a listing of all travel model links on screenlines.

Table 9: Contents of aCountDescription

Field	Type	Contents	
CountID	Integer	Unique traffic count identifier (Arbitrary, matches the ID in a*CountData*). Each record in this table must have a unique value of CountID.	
CountDate	Date/Time	Date on which count was taken	
LinkID	Text	TransCAD link ID used during database development.	
Location	Text	Location description from count source	
City	Text	City in which traffic count is located	
County	Text	County in which traffic count is located (numerical)	
County	Text	County name	
Source	Text	Traffic count data source	
SourceID	Text	Count ID information from the data source	
Notes	Text	Optional freeform notes	
Match	Text	Result of automated geocoding process (geocoding was performed using maps.google.com).	
		M	Matched to intersection or address
		R	Regional accuracy (e.g., city, county, zip code)
		P	Street or building level accuracy
		H	Matched to intersection or address, but information is not sufficient to explicitly define count location. For example: • "1st at Main" does not specific on which side of main, or • "1st between Main and Elm," but with only one of the two intersections was found.
		F	Address not found
		L	Manually entered – not geocoded using automated process
		G	Located using GPS
Match2	Text	Result of network link identification	
		M	Match – automated process identified a link with the appropriate street name *These counts were not manually verified except on screenlines.*
		P	Partial identification – automated process identified a link, but the link may be incorrect. These have not been manually verified.
		N	Not in network – Partial match has been manually checked, link is not in network.
		L	Manual – Matched to link manually or partial match has been verified and updated if necessary.
		C	Collected – Traffic count was collected specifically for this location.
			<Blank> No attempt has been made to match to links.
Latitude	Double	Geocoding results	
Longitude	Double		
Dir	Text	Direction of traffic count from geocoded coordinates:	
		N/S/E/W	Indicates the count is north, south, east, or west of the coordinates. Results from location descriptions such as "East of First and Main"
		A	Indicates the count is at the identified location. Results from location descriptions such as "1st between Main and Elm" or "1st at Main"
StName	Text	Street name used in the geocoding process (for verification with original location description)	

This table contains a description of each traffic count included in the database.

Table 10: Contents of aCountData

Field	Type	Contents	
CountID	Integer	Unique traffic count identifier (Arbitrary, matches the ID in *aCountDescription*). There are often multiple records in this table with the same CountID value.	
TimePeriod	Integer	Data item time period (related to *bTimePeriodDefinition*)	
		1-96	15 minute period where 1 = 12:00 AM through 12:15 AM, etc.
		101 - 124	1-hour time period where 1 = 12:00 AM through 1:00 AM, etc.
		999	24-hour data
VehicleClass	Integer	Data item vehicle class (related to *bVehicleClassDefinition*)	
		1-13	13 FHWA Vehicle classifications
		14	5 axle (3 axle tractor pulling a full 2 axle trailer) – from Caltrans data only
		15	Unclassified – from Caltrans data only
		99	All vehicle classes
Dir	Text	Direction of flow (related to *bDirectionDefinition*)	
		1	Northbound or Eastbound
		-1	Southbound or Westbound
		0	Two-way data
Direction	Text	Direction of flow: NB, SB, EB, WB, or TW (two-way)	
Volume	Integer	Traffic volume	

This table contains data for each traffic count included in the database. All available detail, such as vehicle classification counts and time-of-day data, are included in this table. The table does not contain redundant data. For example, if data is included in 15-minute increments, a 24-hour value is not present.

Table 11: Contents of aSummarize Counts

Field	Type	Contents
CountID	Integer	Unique traffic count identifier (Arbitrary, matches the ID in *aCountDescription*). There are often multiple records in this table with the same CountID value.

This table is used to select counts for inclusion in a very detailed summary report.

Table 12: Contents of bAdjustmentFactors

Field	Type	Contents
YR	Integer	Adjustment factor year
MO	Integer	Adjustment factor month
County	Integer	Adjustment factor for specified county
FACTOR	Double	Composite adjustment factor to adjust count to a model validation count

Table 13: Contents of bCountyDefinition

Field	Type	Contents
County	Integer	County numeric ID
CountyName	Text	County name

Table 14: Contents of bDataType

Field	Type	Contents
RECORD_CN	Integer	Number of records present in data of this type
Data Type	Text	Description of data type

Table 15: Contents of bDirectionDefinition

Field	Type	Contents
Direction	Integer	Direction code
DirectionDescription	Text	Direction description

Table 16: Contents of bScreenlineList

Field	Type	Contents
ID	Integer	Screenline ID
TMP_ID	Text	Working ID (includes letter IDs for new screenlines)
Desc	Text	Descriptive screenline name

Table 17: Contents of bSourceDefinition

Field	Type	Contents
ID	Integer	Unique source ID
SourceName	Text	Descriptive source name
SourceDetail	Text	Ancillary source information or source subset information
StartCountID	Integer	Lowest count ID for count records in the dataset
EndCountID	Integer	Maximum count ID for count records in the dataset
Notes	Text	Working notes or comments regarding the data source

Table 18: Contents of bTimePeriodDefinition

Field	Type	Contents
TimePeriod	Integer	Listing of valid time period codes
TimePeriodStart	Date/Time	Start of time period
TimePeriodEnd	Date/Time	End of time period
AM_PEAK	Integer	1 for 15-minute time periods included in the appropriate peak, 0 for all other time periods – including all hourly time periods.
PM_PEAK	Integer	
MD_PER	Integer	
EV_PER	Integer	
NT_PER	Integer	

Table 19: contents of bVehicleClassDefinition

Field	Type	Contents
VehicleClass	Integer	Vehicle class code
VehicleClassDescription	Text	Vehicle class description

Queries

The database contains a number of queries that process and format data for inspection and use. Queries include working queries, GIS-related queries, and results queries. For easy identification, all queries are named with a prefix as defined in Table 20.

Table 20: Query Prefixes

Prefix	Query Type
gis_	Query used to assist GIS mapping.
c	Intermediate calculation queries. These will often include a number suffix indicating the order in which they are applied.
r	Results query used to produce summary information. These queries are often used to create other queries.
f	Formatted data that is designed for direct use in database inspection and review. These queries are often based on results queries.
i	Interface queries used to facilitate addition of data using the interface.
tmp_	Temporary query used in database development, review, or management.
w	Working queries used to inspect data.

QUERY RESULTS

Some queries are time consuming to process, but are accessed frequently. Results from these queries have been “saved” to tables for speedy access. This is particularly useful for queries used in GIS mapping, as the GIS software repeatedly accesses data. Each time the GIS software accesses query data from the database, the query must be re-run. Query results that have been saved to tables have a name that matches the query, but also includes the suffix *_tbl*.

When information in the input data and description tables is expanded or modified, the query result tables must be regenerated. This is accomplished by running action queries with the same name as the desired query, but with the suffix *_create.* Running these queries will replace the corresponding data table. In some cases, a third query containing the appendix *_index* is included to automatically generate an index for the created table. Creation of the index speeds up access to the data.

CALCULATION QUERIES

A description of each of the calculation queries is included in the sections below. The descriptions are organized according to the calculation functions performed by the queries.

TIME DISTRIBUTION

These queries compute synthesized 15-minute count data for records where only hourly or daily data is available. Vehicle class data and directional data are retained as available.

Query Name	Notes / Sub-queries	
cDailyVolume	Computes daily total volume for each count location, based on the aCountData table. This table is used by several queries.	
cTimeDistribution_15min	Contains total daily distribution of traffic for each RSA group in 15-minute increments.	
cTimeDistribution_15min_1hr	Contains total daily distribution of traffic for each RSA group in 1-hour increments, but only for traffic count data sources where 15-minute data is available. Based on *cTimeDistribution_15min.*	
cTimeDistribution_15min_day	Contains total daily traffic for each RSA group, but only for traffic count data sources where 15-minute data is available. Based on *cTimeDistribution_15min.*	
cTimeDistributionLookup *See Notes 1 and 2, and 3*	This union query creates a time distribution lookup table that can be used to expand all data to 15-minute detail. It is a combination of the following three sub-queries:	
	1	Lookup table for records that already have 15-minute data (dummy values).
	2	Lookup table for records that have hourly data.
	3	Lookup table for records that only have daily data.
rCountData_15min *See Notes 1, 2, and 3*	This query contains count data for each location by 15-minute time periods. The data is in the same format as the aCountData table. When consolidated to show 24-hour data, this table is consistent with the original aCountData table. However, this table contains synthesized 15-minute data for locations where only hourly or 24-hour data is available.	

VEHICLE CLASS DISTRIBUTION

These queries compute synthesized count data by 13 vehicle classes for records where only hourly or daily data is available. This query requires data by 15-minute periods and therefore is dependent on the 15-minute data produced by the queries listed above. Directional data is retained as available.

Query Name	Notes / Sub-queries	
cVehicleDistribution_15min	This query produces total volumes by vehicle distributions in 15-minute increments for each RSA group, but only using counts where both 15-minute data and vehicle class data is available.	
cVehicleDistribution_15min_Totals	This query produces total volumes in 15-minute increments for each RSA group, but only using counts where both 15-minute data and vehicle class data is available.	
cVehicleDistributionLookup *See Notes 1 and 2, and 3*	This union query creates a vehicle class distribution lookup table that can be used to expand all data to 13 vehicle classes. It is a combination of the following two queries:	
	1	Lookup table for records that already have vehicle class data (dummy values).
	2	Lookup table for records that do not have vehicle class data.
rCountData_15min_veh *See Notes 1, 2, and 3*	This query contains count data for each location by 15-minute time periods and by vehicle class. The data is in the same format as the aCountData table. When consolidated to show 24-hour data, this table is consistent with the original aCountData table. However, this table contains synthesized 15-minute data for locations where only hourly or 24-hour data is available and contains synthesized vehicle class data for locations where vehicle class data is not available.	

DIRECTIONAL DISTRIBUTION

A limited number of count data does not contain information directionally. For these records, all data is simply split using a 50% / 50% assumption. No attempt is made to generate differing directional characteristics by time-of-day.

Query Name	Notes / Sub-queries
cTwoWayData	This query selects data for records where only two-way data is available.
cTwoWayData_split	This query contains two-way count data split into separate directions.
cTwoWayExcluded	This query contains count data, excluding two-way data.
rCountData_Estimated *See Notes 1 and 2*	This union query combines count data contained in *cTwoWayExcluded* along with both directions contained in *cTwoWayData_split*. The data is in the same format as the aCountData table. When consolidated to show 24-hour data, this table is consistent with the original aCountData table. However, this table contains synthesized 15-minute data for locations where only hourly or 24-hour data is available, synthesized vehicle class data for locations where vehicle class data is not available, and two-way data has been adjusted to show a 50%/50% split. The following additional fields are created: D1_Volume: volume only where Dir = 1 D2_Volume: volume only where Dir = -1

Note 1: This query is computationally intensive and is used in subsequent queries. Therefore, a *_create* query is available to create a table containing the results. All queries that are based on the results of this query refer to the table rather than the query.

Note 2: To increase database speed, the resulting *_tbl* version of the query contains one or more indexes. To recreate these after updating the table, run the appropriate *_index* query. This is not required, but will cause subsequent queries to run faster.

Note 3: This query creates a table with intermediate values and is used to increase processing speed. The results are temporary, so the table is created in a separate database file called "C:\TEMP\TEMP.MDB. This file must be present for this query to run. For subsequent queries to run, a link must be created to this table.

GIS QUERIES

GIS queries are designed to be joined to a GIS layer for display in mapping software such as ArcGIS or TransCAD. All GIS queries are accompanied by a *_create* query and an *_index* query to increase the speed of access.

Query Name	Notes / Sub-queries
gis_MatchedLinks	This query includes one record for each link in the roadway network for which at least one traffic count is present. If multiple counts are available, only information for the first count is displayed.
gis_MatchedPoints	This query includes one record for each count in the database that has not been matched to a specific link, but for which accurate Latitude and Longitude data is included. Latitude and longitude data is included to facilitate creation of a GIS layer based on the data.
gis_MatchedCounts	This query includes a combination of the MatchedLinks and MatchedPoints queries. However, for matched links, the latitude and longitude of the link is included rather than a link ID. For counts matched to links, the link location rather than the count location is returned. Counts that are not spatially located are not included.
gis_ScrlMatchedLinks	This query contains one record for each screenline link. Information on the traffic count selected for the screenline analysis is included in the table.

Note: Counts that were geocoded with a low level of detail (e.g., zip code or county) are not included in the gis_MatchedLinks query, but are included in the gis_MatchedCounts query.

Updating Calculations

The database has been designed in a manner such that 15-minute and vehicle class data can be generated for all traffic counts included in the database through use of a set of queries. However, it is necessary to save and index intermediate results in order to achieve reasonable processing times. These intermediate results are quite large in size and contain redundant information. Therefore, intermediate create table queries create a new table in a temporary working database. Running this process manually is time consuming, so a Visual Basic subroutine was developed to automatically run queries and create links.

Any time traffic count data is updated, it is necessary to update the synthesized 15-minute, vehicle class, and directional data. The discussion above details a set of queries that can be used to generate count data at the 15-minute and vehicle class level. In order to apply the calculations using the queries, it is necessary to first create a working directory to store intermediate tables. The following process can be used to update synthesized count data:

1. **Create a working file:** This file must be called C:\TEMP\TEMP.mdb.
2. **Compact the Database.**
3. **Run:** cTimeDistributionLookup_create, then link to the resulting table.
4. **Run:** cTimeDistributionLookup_index after copying it into the working file.

5. **Run:** rCountData_15min_create, then link to the resulting table.
6. **Run:** rCountData_15min_index after copying it into the working file.
7. **Run:** cVehicleDistributionLookup_create, then link to the resulting table.
8. **Run:** cVehicleDistributionLookup_index after copying it into the working file.
9. **Run:** rCountData_15min_veh_create, then link to the resulting table.
10. **Run:** rCountData_15min_veh_index after copying it into the working database.
11. **Run:** rCountData_Estimated_create
12. **Run:** rCountData_Estimated_index

Optionally, all linked tables can be deleted once the process is complete, then C:\TEMP\TEMP.mdb can be deleted.

To update the database automatically, run the UpdateData subroutine from Visual Basic. This routine effectively follows the steps described above. However, instead of creating working tables in C:\TEMP\TEMP.MDB, a temporary file is created in the same directory as the current database. The macro will prompt the user to either keep or delete links to the working file and the working file itself. In addition, the following result queries that create new tables are run: *cCountDataType* and *rCountVolume1*.

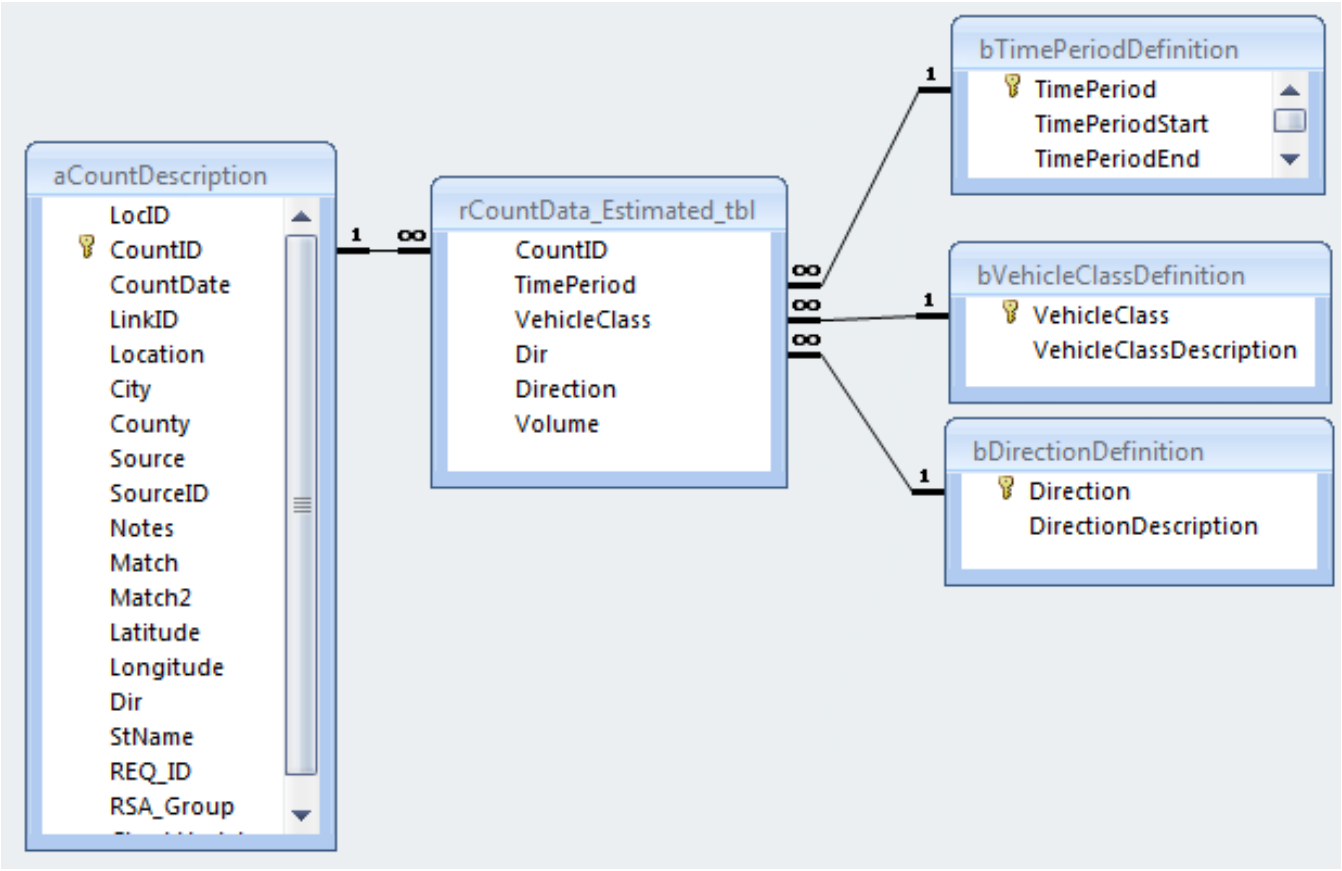
Note: The Visual Basic subroutine UpdateData directly references queries stored in the access database. If changes are made to any queries that are used in the update process, care must be taken to follow these conventions.

1. All temporary tables must be placed in C:\TEMP\TEMP.MDB.
    a. Alternately, the visual basic macro can be modified to accommodate a different location.
2. New queries must be named as follows:
    a. Queries that create tables must end in "_create"
    b. Queries that create an index must end in "_index"
3. If new queries are added to the process, they must be added to the runQueries list in the visual basic macro.

REPAIRING RELATIONSHIPS

When the steps above are performed, any relationships that have been defined between rCountData_Estimated_tbl and other tables in the database are deleted. The database has been set up so that the estimated count data is related to other data in the database in a manner similar to aCountData, as shown in Figure 14.

Figure 14: Relationships that Must be Recreated After the Update Process



Note: Only tables directly related to rCountDataEstimated_tbl are shown. Other relationships also exist in the database, but are not affected by the update process.

When the Visual Basic subroutine UpdateData is run, the relationships shown above are automatically recreated. When manually updating the database, these relationships should be re-defined after the new estimated data table has been created.

Data Review and Output Queries

Data review and output queries summarize traffic count data to facilitate review of data and comparison of model results to traffic count data. The tables named fCountVolume and fScreenlineVolume are formatted as described below.

All seasonal and annual adjustment factors are applied in the final summarization step, typically in tables beginning with the "f" prefix.

Query Name	Notes / Sub-queries
cCountDataType *(creates a table)*	This query determines the number of records present in the original data source and returns the type of data originally provided. The month and year the count were taken are converted to independent integers and included in the table for purposes of joining seasonal and annual adjustment factors to this table.
rCountVolume1 (*creates a table)*	This query creates a summary of daily and period volumes by direction.
rScreenlineVolume1 (*creates a table)*	This query creates a summary of daily and period volumes by direction and by vehicle classification (3 categories). Data is only processed for counts matched to screenline links.
rSelectedVolume1	This query creates a summary of daily and period volumes by direction and by vehicle classification (13 categories). Data is only processed for counts listed in the aSummarizeCounts table. *This query takes a very long time to run if a large number of counts are included, but will run quickly for a few counts.*
fCountVolume	This query contains summarized and adjusted count data for all counts in the database. Period and daily directional volumes are included.
fScreenlineVolume	This query contains summarized and adjusted count data for all screenline counts in the database. Period and daily directional volumes are included.
fScreenlineVolumeClass	This query contains summarized and adjusted count data for all screenline counts in the database. Period and daily directional volumes, as well as 3 vehicle classification categories are included.
fSelectedVolumeClass	This query contains summarized and adjusted count data for counts listed in the aSummarizeCounts table. Period and daily directional volumes, as well as 13 vehicle classification categories and "unclassified" are included.

RCOUNTVOLUME1

This query creates a summary of daily and period volumes by direction. Because this query is time consuming, a table called rCountVolume1_table is created. This table is referenced by the two formatted queries described below.

fCountVolume

This query contains the following data for *all* counts contained in the database:

- **24-Hour Volume:** The 24-hour volume for each traffic count, as well as the total number of data points present for each count (e.g., 2 data points for a 24-hour 2-way count or 48 data points for an hourly 2-way count).
- **Directional Period Volume:** Directional period volumes are summarized for each count location. Two-way totals are also provided. ***Note:*** *Data summarized in this query includes both actual data and estimated data.*
- **Input Type:** the type of input data is provided for reference, so the user can be aware of the level of estimation that was used with any particular traffic count.

fScreenlineVolume

This query contains the same information as rCountVolume, but only for screenline links. A unique link identifier is provided for each location.

Table 21: Fields in the fCountVolume and fScreenlineVolume Queries

Field	Contents
CountID	Unique traffic count identifier. One record will be created for each CountID present in the database.
SCRL	Screenline ID *(fScreenlineVolumes only)*
SCRL_LOC	Screenline location ID *(fScreenlineVolumes only)*
SCRL_LINK	Screenline location ID
LINK_ID	Link ID from TransCAD network
Street	Screenline link street name *(fScreenlineVolumes only)*
CROSS_ST1	Screenline link cross-streets *(fScreenlineVolumes only)*
CROSS_ST2	
Location	Descriptive count location
SourceName	Traffic count data source
CountDate	Traffic count date
WkDay	Traffic count day of week
AdjFac	Traffic count adjustment factor. Data has been multiplied by this factor to adjust traffic count data by season and year.
AB_VOL	Directional 24-hour traffic volume
BA_VOL	
TOT_VOL	
AB_xx_VOL	Directional* AM, PM, Mid-day, evening, and inght peak period traffic volume. In field names, “xx” is replaced by a two-digit abbreviation for each period.
BA_xx_VOL	
TOT_xx_VOL	
AB_DIR	AB and BA direction
BA_DIR	
DATA_TYPE	Level of actual traffic count detail available
Lat	Count latitude and longitude *(present in fCountVolume but not fScreenlineVolume)*
Lon	
LinkLat	Latitude and longitude of matched count link *(present in fCountVolume but not*

Field	Contents
LinkLon	*fScreenlineVolume)*

** On non-screenline links, AB represents northbound or eastbound travel, while BA represents southbound or westbound travel. On screenline links, directionality is consistent with links in the TransCAD network. Network and database topology are consistent in most cases, but have only been verified on screenline links.*

FSCREENLINEVOLUMECLASS

This query contains the same information as fScreenlineVolume, but also includes vehicle classification information.

Table 22: Additional Fields in the fScreenlineVolumeClass Query

Field	Contents
XX_HH_PASS_VOL	Passenger car volume, as defined in the table bVehicleClassDefinition for class 101
XX_HH_STRK_VOL	Small (non-combo) truck volume, as defined in the table bVehicleClassDefinition for class 102
XX_HH_LTRK_VOL	Large (combo) truck volume, as defined in the table bVehicleClassDefinition for class 103
XX_HH_UNCL_VOL	Unclassified volume, as defined in the table bVehicleClassDefinition for class 104

Where:
XX = AB, BA or TOT
HH = AM or PM, or is omitted for all-day volume

FSELECTEDVOLUMECLASS

This query contains the same information as fScreenlineVolume, but also includes volumes by detailed vehicle classifications where available. For data where only consolidated class definitions are present, no data is provided for the detailed vehicle classifications in this table.

This query is stored in the front-end database and is not used to create a table. It is intended to allow close inspection of detailed count data for a limited number of counts. If the table is set to create data for a large number of count locations – by adding a long list of count IDs to the aSummarizeCounts table – this query will take a very long time to run.

Table 23: Additional Fields in the fSelectedVolumeClass Query

Field	Contents
XX_HH_CYY_VOL	Passenger car volume, as defined in the table bVehicleClassDefinition for class 101

Where:
XX = AB, BA or TOT
HH = AM or PM, or is omitted for all-day volume
YY = 1 through 15, as defined in bVehicleClassDefinition

GIS Mapping System

The SCAG 2008 Traffic Count Database has been provided along with a GIS mapping system that can be used to view traffic count locations and data. This mapping system is integrated with the traffic count database, allowing new data to appear in the mapping system when added to the database. The primary features of this GIS mapping system are as follows:

- ***Revised Screenlines:*** Screenlines in graphical format, including screenlines as lines and node endpoints for labeling purposes.
- ***Screenline Counts:*** Each network link identified as a screenline link is shown along with information related to the type of screenline count data that is available.
- ***Non-Screenline Link Counts:*** Counts that were assembled in the course of this project that are not on screenline links are included in this layer.
- ***Caltrans Count Stations:*** Displays Locations where Caltrans count data was provided. Locations where vehicle classification counts are available are noted.
- ***PeMS Stations:*** Locations where PeMS count data is available are shown.
- ***Network:*** The roadway network used to develop the traffic count database (several sub-layers are included).
- ***ccStreets:*** A regional street centerline (retrieved from the TransCAD dataset).
- ***RSA:*** SCAG's RSA boundaries.
- ***Other:*** Background layers, such as City limits, lakes, and rivers are included.
- ***Microsoft Virtual Earth:*** A layer that accesses Microsoft's Virtual Earth server and displays in ArcMAP.

The GIS system accesses data from two primary sources. Geographic features are included in a personal database, named SCAGCountGeodatabase.mdb. All layers included in this database can be exported to shapefiles for further distribution if desired. Traffic count data is accessed from the SCAG back-end traffic count database and is linked to features contained in the personal geodatabase.

To access the GIS system, the user can open the project file named SCAG_ScreenlineData.mxd in ArcMAP. The document is set to use relative path names, so data ***should*** be properly linked if the files are placed in any location, as long as the provided directory structure is maintained.

Data User's Guide

The SCAG 2008 Traffic Count Database contains a great deal of very detailed data, along with algorithms that process and query the data. However, most users will be interested in the summarized output that can be produced by the system. In addition, some users may want to review individual traffic counts or add traffic count data to the system. For these common tasks, a user interface has been provided. This interface is accessible from the front-end database and eliminates the need to directly access the back-end database in most cases. Instructions for use of this interface are provided in this section.

This database was developed using Access 2007. While it will operate in Access 2003, functionality will be reduced.

File Locations

The database and GIS mapping system are provided in a series of four files, listed below. These files were prepared and packaged for use in the C:\SCAGLOCAL directory.

Path and Filename	Description
C:\SCAGLOCAL\SCAGCountDatabase.mdb	Count database front-end
C:\SCAGLOCAL\SCAGCountDatabase_BE.mdb	Count database back-end
C:\SCAGLOCAL\SCAGCountGeodatabase.mdb	Personal geodatabase containing GIS layers
C:\SCAGLOCAL\Projects\SCAG_ScreenlineData.mxd	ArcMap Project File containing traffic count data reference layers

It may be desirable to store the database in an alternate location. If files are moved, it is important to utilize the "Update Link" feature that can be accessed from the front-end database interface.

For improved speed, the database should be stored on a local drive. In addition, a copy of the database should be stored in a location that is regularly backed up.

The Main Interface

When the database is opened, an interface is displayed. This interface provides access to frequent tasks and is annotated below.

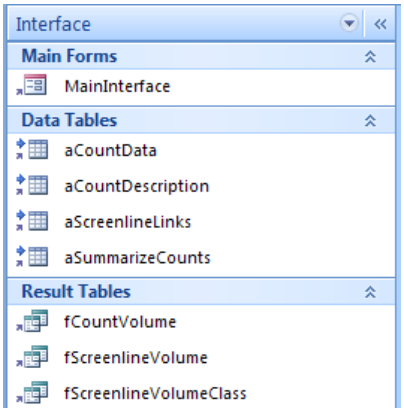
This section can be used to review data in an interactive form-based mode.

This section can be used to export a summary of data to an Excel File or a DBASE file.

This section can be used to add additional count data to the system.

This section can be used to modify the back-end database that has been associated with the front-end database.

The Navigation Pane

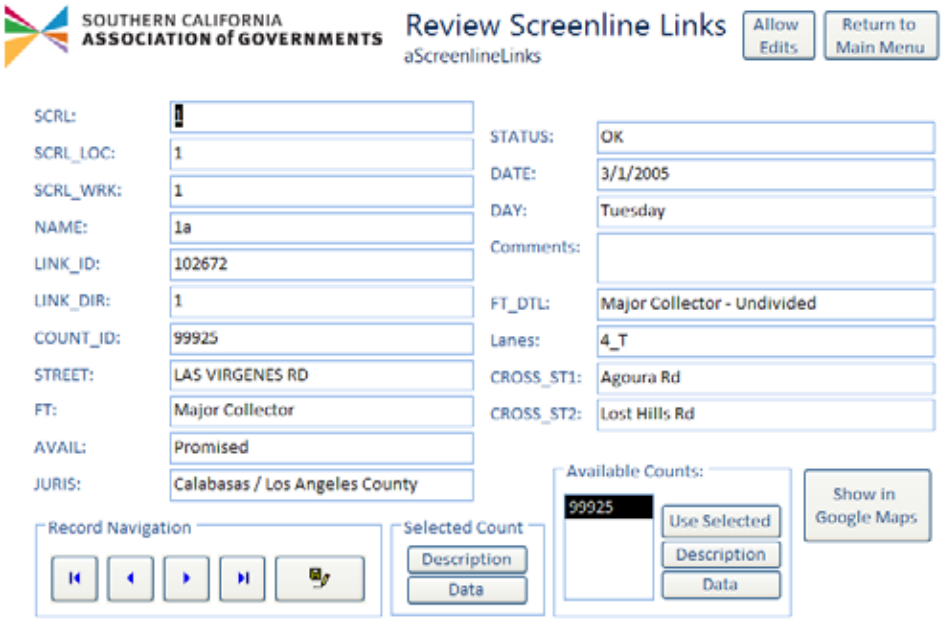


When opened, the database will display contents in a navigation pane on the left-hand side of the screen. (Note: the navigation pane is not supported in Access 2003). The navigation pane has been organized into groups by topic, including the main interface form, data tables, result tables, definition tables, and GIS tables. Tables, forms and, queries that are not commonly accessed are included in the Mechanics section.

A detailed description of the individual tables and queries is contained elsewhere in this report.

Reviewing Data

The data review section of the interface provides access to data review forms. When opened, these forms display in split screen mode (not available in Access 2003). The layout of the screenline link review form is displayed below. All data review forms use a similar format. Note that by default, the users cannot edit data from the form view. To make edits, the user must first click the *Allow Edits* button. Some navigation buttons will open a new form to display data related to the current record. When the new form is closed, the user will be returned to the previous screen.



Header: A description of the dataset, the name of the associated table or query, and system buttons are included here.

Data: Information for the current record is displayed here.

Navigation: These tools allow navigation to other records, and to related datasets.

Exporting Data

Data can be exported from the database for use in spreadsheet programs. Data can be exported for all counts or for screenline counts only. When exporting screenline count data, it is also possible to export vehicle classification data. Due to the large processing requirements to summarize all data for all counts, this option is not available for all counts. To view vehicle classification information for non-screenline links, see the discussion of the fSelectedVolumeClass table provided elsewhere in this report.

Data Maintenance

When delivered to SCAG, the count database contained over 5,000 individual traffic counts. As new traffic count data is obtained or collected, this data can be added to the main database. This can be accomplished for individual counts through the interface, or can be accomplished in large "batches" of data using a manual procedure.

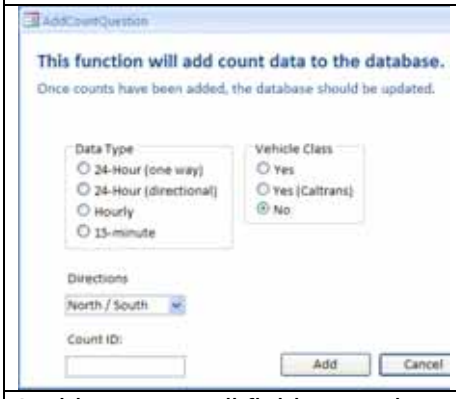
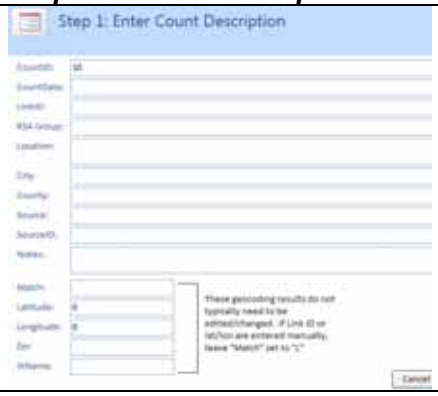
Adding Count Data – Interface

The interface can be used to add one traffic count to the database at a time. The steps are as follows:

1. Select a Traffic count ID number. This must be a unique ID that has not already been used by an existing count.
   Recommended: See the table *bSourceDefinition* to help select an appropriate ID.

2. Identify the traffic count source. If an appropriate record is not yet present in the *bSourceDefinition* table, add a record to this table.

3. From the main interface, choose *Add Count Data*. Next, follow the on-screen instructions.

Initial Screen: Count ID	***Step 1: Count Description***	***Step 2: Count Data***
		
In this screen, all fields must be completed.	Enter as much data as possible. Required fields are shown in red.	Enter data for each record, then click *Finish* to save the data.

ADDING COUNT DATA – MANUAL PROCESS

Use of the interface is not practical for entry of large amounts of data. To add a large amount of new count data to the database, the steps below can be followed instead.

1. Select a set of Traffic count ID numbers. A unique ID must be generated for each count that has not already been used by an existing count.
   Recommended: See the table *bSourceDefinition* to help select an appropriate ID.

2. Identify the traffic count source. If an appropriate record is not yet present in the *bSourceDefinition* table, add a record to this table.

3. Import count descriptions using macros, spreadsheets, or other tools into a format consistent with the definition of *aCountDescription* included elsewhere in this document. The data should be imported into a working table. The table can be located in either the front-end or back-end database.

4. Import count data using macros, spreadsheets, or other tools into a format consistent with the definition of *aCountData* included elsewhere in this document. The data should be imported into a working table. The table can be located in either the front-end or back-end database, but should be located in the same database as the working description table.

5. Use an append query to add records to the *aCountDescription* table. Alternately, data can be copied and pasted into this table.
   Troubleshooting: If this step fails, the CountID numbers to be added may be invalid. If no invalid count IDs are present, carefully review the data types in the aCountDescription table and ensure consistency with the new dataset.

6. Use an append query to add records to the *aCountData* table. Alternately, data can be copied and pasted into this table.
   Troubleshooting: If this step fails, count IDs may not be consistent with those in the *aCountDescription* table; it is required that description records are added first and that data is consistent with description records. If all Count IDs are valid, verify that the primary key (CountID, TimePeriod, VehicleClass, and DIR) is not duplicated for any record.

Updating the Traffic Count Expansion

After adding or editing data, the traffic count database must be updated. This can be done using the *Update Traffic Count Expansion* button. Next, the user is advised to update GIS tables using the associated button.

The traffic count expansion process is time consuming. This should be performed from a local drive where the user has full read and write access. Also, the user is advised to make a backup copy of the database prior to updating the database.