

Kern Council of Governments

Regional Transportation Monitoring  
Improvement Plan (RTMIP)

Final Report



January 2008

# Table of Contents

1.0	Introduction .....	1
2.0	Survey of Existing Transportation Data Collection .....	2
2.1	Methodology .....	2
2.2	Summary of Findings .....	2
2.3	Inventory Methods and Equipment.....	13
2.4	Computer Based/Electronic Data Collection .....	14
2.5	Traffic Monitoring and Performance Measures.....	14
2.6	Data Needs .....	15
2.7	Conclusions.....	15
3.0	Needs Assessment .....	16
3.1	Uniform Traffic Count Program .....	16
3.2	Additional Transportation Data .....	41
4.0	Call Box/Motorist Aid Integration Assessment.....	43
4.1	The Existing Call Box System .....	43
4.2	System Needs .....	45
4.3	Experiences of Other Jurisdictions .....	46
4.4	Recommendations .....	49
5.0	Technology and System Integration Options .....	50
5.1	Traffic Count Technology Options .....	50
5.2	ITS Strategies and Solutions.....	53
5.3	Existing and Future Assets.....	54
5.4	Integration of Permanent Count Locations with Call Boxes .....	55
5.5	Integration with TOCs and Traffic Signal Cameras .....	56
5.6	Opportunities to Combine Data Collection Efforts.....	57
6.0	Uniform Traffic Count Program Implementation Plan .....	60
6.1	Traffic Count Schedule .....	60
6.2	Traffic Count Standardization.....	61
6.3	Traffic Count Reporting Procedures .....	61
6.4	Performance Monitoring Program Recommended Applications .....	62
6.5	System Update Recommendations .....	63
7.0	Funding Sources.....	64
8.0	Implementation Matrix .....	67
Appendix A	Survey Instrument	
Appendix B	Recommended Count Locations	
Appendix C	Statewide Call Box Guidelines	

## List of Tables

Table 2.1	Data Coverage and Reporting.....	12
Table 2.2	Permanent Count Stations (Existing and Desired).....	13
Table 2.3	Traffic Data Collection Costs and Funding Sources .....	14
Table 2.4	<b>Kern COG Jurisdictions’ Data Needs</b> .....	15
Table 3.1	Count Location Selection Criteria .....	17
Table 3.2	Control Station Locations .....	20

## List of Figures

Figure 2.1	Average Daily Link/Segment Volume Counts.....	3
Figure 2.2	Peak Hour Segment Volumes .....	4
Figure 2.3	Peak Hour Intersection Turning Movements.....	5
Figure 2.4	Vehicle Classification Data.....	6
Figure 2.5	Speed Surveys/Travel Time Data .....	7
Figure 2.6	Vehicle Delay .....	8
Figure 2.7	Queue Length .....	9
Figure 2.8	Accident Data .....	10
Figure 2.9	Pavement Conditions .....	11
Figure 3.1	Proposed Delano Count Locations.....	21
Figure 3.2	Proposed Lake Isabella Count Locations .....	22
Figure 3.3	Proposed McFarland Count Locations .....	23
Figure 3.4	Proposed Ridgecrest Count Locations.....	24
Figure 3.5	Proposed Wasco Count Locations .....	25
Figure 3.6	Proposed Shafter Count Locations (West).....	26
Figure 3.7	Proposed Shafter Count Locations (East).....	27
Figure 3.8	Proposed Bakersfield Count Locations (NW) .....	28
Figure 3.9	Proposed Bakersfield Count Locations (NE).....	29
Figure 3.10	Proposed Bakersfield Count Locations (SW).....	30
Figure 3.11	Proposed Bakersfield Count Locations (SE) .....	31
Figure 3.12	Proposed Taft and Maricopa Count Locations.....	32
Figure 3.13	Proposed Mettler Count Locations.....	33
Figure 3.14	Proposed Arvin Count Locations.....	34
Figure 3.15	Proposed Tehachapi Count Locations .....	35

Figure 3.16	Proposed California City Count Locations.....	36
Figure 3.17	Proposed Rosamond Count Locations.....	37
Figure 3.18	Proposed Kern County Count Locations (36 x 72).....	CD
Figure 3.19	Proposed Bakersfield Count Locations (36 x 60).....	CD
Figure 3.20	Proposed Master Station Locations.....	40
Figure 4.1	Call Box Locations .....	44
Figure 4.2	Operational Status of San Diego County Smart Call Box Sites.....	47



## **1.0 Introduction**

This report presents the findings and recommendations of an effort undertaken by the Kern Council of Governments (Kern COG) and its member agencies to develop a Regional Transportation Monitoring Improvement Plan (RTMIP). The purpose of the RTMIP is to increase consistency, cooperation, and efficiency across transportation data collection and distribution efforts within Kern County. To that end, the RTMIP described here consists of a unified system of traffic data collection and a methodology to maintain and utilize that system for transportation planning purposes. Included as part of the RTMIP is an electronic database of transportation data that will be maintained by Kern COG and made available to its member agencies, as well as a web-based interface for viewing the data.

The first step in developing the RTMIP was to understand the existing transportation data collection activities taking place in the County. Therefore, the process began with the **distribution of a survey to Kern COG's member agencies, in addition to other transportation agencies serving Kern County.** The survey instrument asked about current transportation data collection efforts by the agencies, as well as perceived needs for improved or additional data collection and management. The survey results are summarized in the first section of this report.

The results of the survey were used to formulate a Needs Assessment for data collection within the County. This Needs Assessment evaluated the availability of various types of transportation data, the uses to which different types of data are put, and the merits of making such data more widely available. The results of the Needs Assessment were recommendations concerning priorities for incorporating various types of transportation data into the RTMIP. The Needs Assessment also included the creation of a set of criteria for establishing locations to be included in an ongoing traffic volume data collection effort, as well as the application of those criteria to identify 1,043 count locations throughout the County. The Needs Assessment is presented in the second section of this report.

Also included in the development of the RTMIP was an assessment of the feasibility and **desirability of integrating traffic data collection with the County's Motorist Aid Call Boxes using "smart call boxes."** This assessment evaluated the status of the Kern County motorist aid call box system, including existing and potential future capabilities. The assessment was based on a review of existing system capabilities, historical usage patterns, and discussions with Kern Motorist Aid Authority (KMAA) staff. The assessment also included a review of the experiences of other jurisdictions with smart call boxes. The assessment of smart call boxes is presented in the third section of this report.

After review and discussion by Kern COG and the jurisdictions within the County of the Needs Assessment and the call box integration analysis, a draft Action Plan was developed to address the identified priorities related to transportation data collection and distribution. The draft Action Plan was again reviewed, including a revisiting of the traffic data collection program. The resulting Action Plan is presented in the final section of this report.



## **2.0 Survey of Existing Transportation Data Collection**

One of the main goals of the RTMIP is to coordinate, centralize and effectively manage traffic data across Kern County. A vast body of traffic data has been collected since the 1970s, and it has been stored in various formats and media in diverse databases at Kern COG and/or its member jurisdictions. An inventory of traffic count/survey methods and reporting formats currently utilized in Kern County was **necessary to assess the County's data collection needs**. The inventory was conducted through a written questionnaire sent to each of the Kern COG jurisdictions.

### **2.1 Methodology**

A total of 13 written questionnaires was distributed: one to each of the appropriate staff of all local jurisdictions, as identified by Kern GOG staff; one to the Kern County Department of Roads; and one to Caltrans District 6. The questionnaire consisted of twenty questions intended to elicit information regarding each jurisdiction's **traffic count methods and reporting capabilities**. A sample of the questionnaire can be found in **Appendix A**. A total of eight questionnaires were completed and returned (response rate of 62.8%).

The following jurisdictions returned completed questionnaires:

- City Of Bakersfield
- City Of California City
- City Of Ridgecrest
- City Of Shafter
- City Of Taft
- City Of Tehachapi
- City Of Wasco
- Kern County

### **2.2 Summary of Findings**

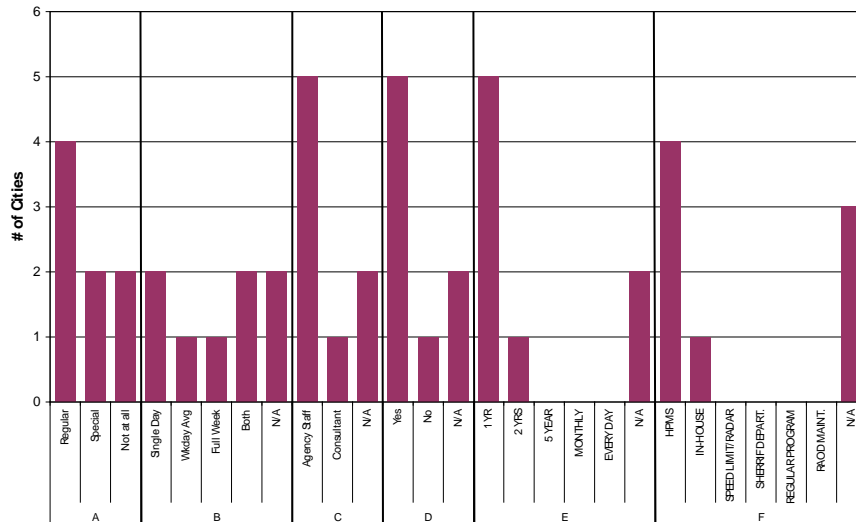
#### **2.2.1 Types of Data Collected**

The first section of the questionnaire dealt with the types of traffic data currently being collected by each jurisdiction. The purpose of this section was to determine what types of data are available within the County, the regularity with which it is collected, and whether it is available in an electronic format.

**Figure 2.1** presents a tabulation of the survey responses concerning **Average Daily Link/Segment Volume Counts**. These data are the most common type of traffic volume data collected on a regular basis by the jurisdictions. Key points related to daily link/segment volume counts are as follows:



**Figure 2.1: Average Daily Link/Segment Volume Counts**



**Question Key**

- (A) Is the data collection done on a regular basis, for special studies, or no collected at all?
- (B) Are the counts, single day, average of 5-day, weekdays or full 7-day weekdays, or both?
- (C) Are the data collected by agency staff, or consultants?
- (D) Are the data maintained in electronic format?
- (E) On average, what is the cycle time between counts?
- (F) Is the data collected to satisfy external reporting needs, which one?

*Regularity of Collection.* Half of the jurisdictions perform these counts on a regular basis; two of them do not perform them at all (Ridgecrest and Wasco), and another two perform them only for special studies.

*Duration.* Tehachapi and California City do week-based counts; Bakersfield and Shafter do single-day counts; Taft and Kern County do both week-based and single-day counts.

*Staff Employed.* The counts are done by in-house staff in five out of the six jurisdictions that do these counts.

*Electronic Availability.* Tehachapi is the only jurisdiction that does not have its counts in electronic format.

*Count Cycle.* All jurisdictions except for Taft do these counts annually. Taft does them every two years.

*External Reporting Capability.* Four out of the six jurisdictions that collect this data have it in HPMS format.



**Figure 2.2** presents a tabulation of the survey responses concerning **Peak Hour Segment Volume Counts**. These data are collected by the greatest number of jurisdictions, but they are not collected as regularly as daily volume counts. Key points related to peak hour segment volume counts are as follows:

*Regularity of Collection.* All but one (Wasco) of the jurisdictions perform these counts, but only two jurisdictions perform them on a regular basis (Shafter and Taft).

*Duration.* Three jurisdictions conduct single-day counts; California City conducts full-week counts. Taft is the only jurisdiction that conducts both types of counts.

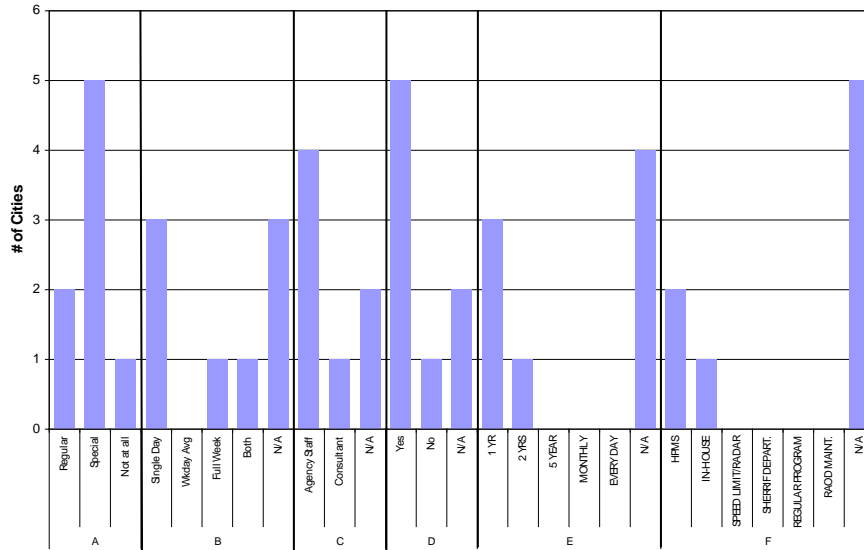
*Staff Employed.* Half of the jurisdictions have in-house staff conduct the counts.

*Electronic Availability.* Kern County is the only jurisdiction that does not have these counts in electronic format.

*Count Cycle.* Three jurisdictions perform these counts annually, and one does so every two years.

*External Reporting Capability.* Ridgecrest and Shafter have these counts in HPMS format.

**Figure 2.2: Peak Hour Segment Volumes**



**Question Key**

- (A) Is the data collection done on a regular basis, for special studies, or no collected at all?
- (B) Are the counts, single day, average of 5-day, weekdays or full 7-day weekdays, or both?
- (C) Are the data collected by agency staff, or consultants?
- (D) Are the data maintained in electronic format?
- (E) On average, what is the cycle time between counts?
- (F) Is the data collected to satisfy external reporting needs, which one?



**Figure 2.3** presents a tabulation of the survey responses concerning **Peak Hour Intersection Turning Movements Counts**. None of the jurisdictions collect this type of data on a regular basis, and only three jurisdictions report collecting intersection turning movement counts at all. Key points related to peak hour turning movement counts are as follows:

*Regularity of Collection.* Only Kern County, Bakersfield, and California City conduct these counts and they all do them for special studies only.

*Duration.* Bakersfield performs these counts for a single day; California City gathers full-week counts.

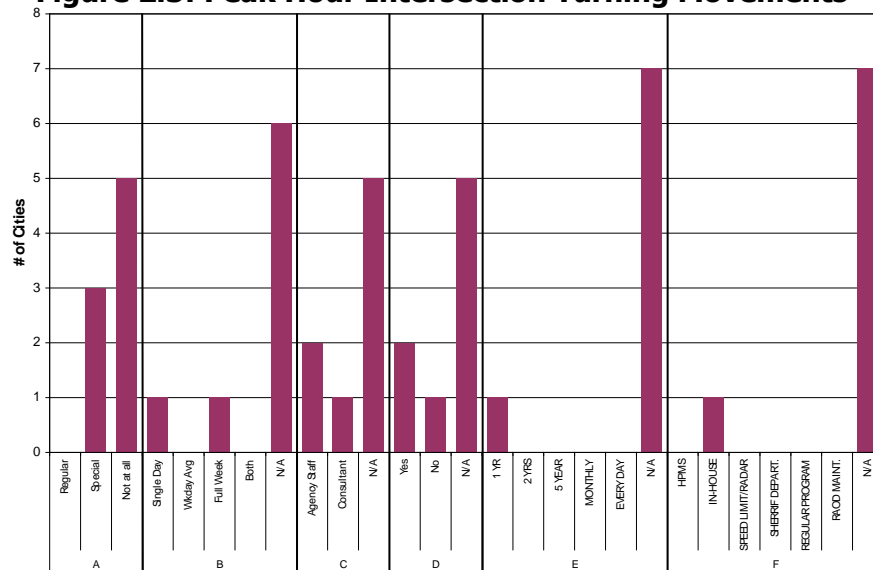
*Staff Employed.* Kern County uses consultants to do these counts; the other jurisdictions use in-house staff.

*Electronic Availability.* Kern County does not have these counts in electronic format. The other two do have them in electronic format.

*Count Cycle.* Only California City reported doing these counts once a year.

*External Reporting Capability.* None of the jurisdictions has the counts in an external reporting format.

**Figure 2.3: Peak Hour Intersection Turning Movements**



**Question Key**

- (A) Is the data collection done on a regular basis, for special studies, or no collected at all?
- (B) Are the counts, single day, average of 5-day, weekdays or full 7-day weekdays, or both?
- (C) Are the data collected by agency staff, or consultants?
- (D) Are the data maintained in electronic format?
- (E) On average, what is the cycle time between counts?
- (F) Is the data collected to satisfy external reporting needs, which one?



**Figure 2.4** presents a tabulation of the survey responses concerning **Vehicle Class Data**. Only one jurisdiction collects this type of data on a regular basis. Key points related to vehicle class counts are as follows:

*Regularity of Collection.* Only Taft performs these counts on a regular basis. Half of the jurisdictions do them for special studies only.

*Duration.* Most jurisdictions did not report the duration of their vehicle class counts.

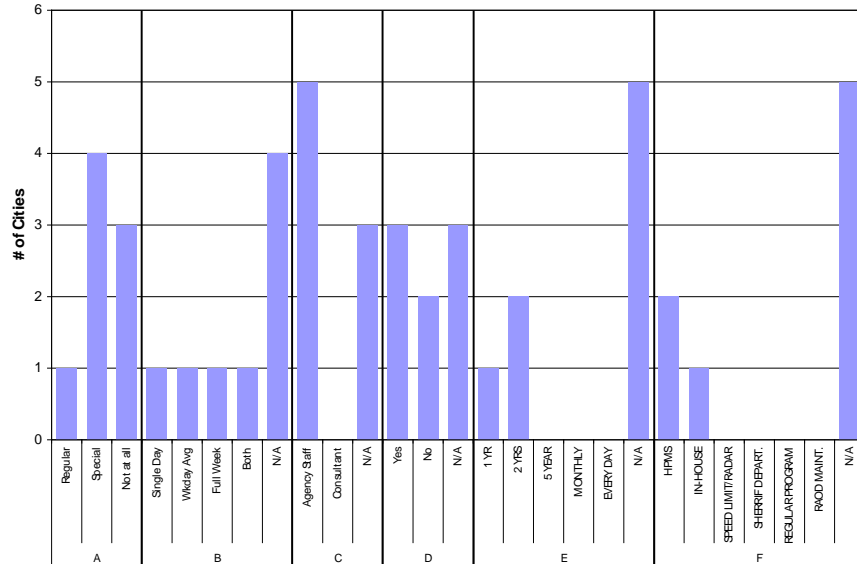
*Staff Employed.* All the jurisdictions that reported the type of staff use to conduct these counts indicated that they used in-house staff.

*Electronic Availability.* Three of the five jurisdictions that conduct these counts have them in electronic format.

*Count Cycle.* Tehachapi conducts these counts every year; California City and Taft conduct them every two years.

*External Reporting Capability.* Only Ridgecrest and Tehachapi have these counts in HPMS format.

**Figure 2.4: Vehicle Classification Data**



**Question Key**

- (A) Is the data collection done on a regular basis, for special studies, or no collected at all?
- (B) Are the counts, single day, average of 5-day, weekdays or full 7-day weekdays, or both?
- (C) Are the data collected by agency staff, or consultants?
- (D) Are the data maintained in electronic format?
- (E) On average, what is the cycle time between counts?
- (F) Is the data collected to satisfy external reporting needs, which one?



**Figure 2.5** presents a tabulation of the survey responses concerning **Speed Survey/Travel Time Data**. The survey found that these data are generally collected only for special studies. Key points related to speed survey data are as follows:

*Regularity of Collection.* Half of the jurisdictions conduct these surveys only for special studies. Only two of the jurisdictions conduct the surveys on a regular basis.

*Duration.* Three jurisdictions conduct these surveys for a single day; California City conducts them for a full-week. Taft is the only jurisdiction that conducts both types of surveys.

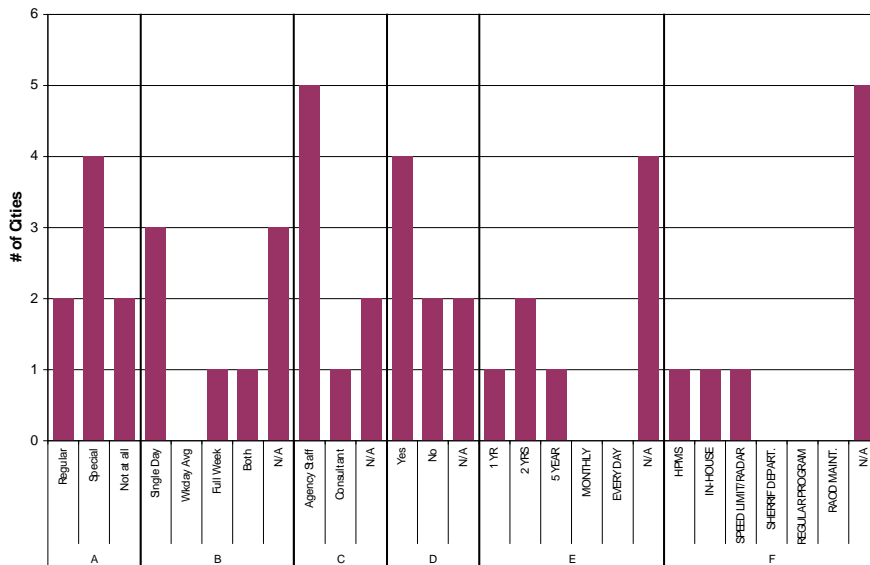
*Staff Employed.* Only Shafter uses consultants to conduct these surveys. The rest of the jurisdictions use their own staff.

*Electronic Availability.* Half of the jurisdictions have the survey results in electronic format.

*Count Cycle.* Ridgecrest conducts these surveys every year, California City and Taft every two years, and Bakersfield every five years.

*External Reporting Capability.* Only Ridgecrest keeps the information in HPMS format.

**Figure 2.5: Speed Surveys/Travel Time Data**



**Question Key**

- (A) Is the data collection done on a regular basis, for special studies, or no collected at all?
- (B) Are the counts, single day, average of 5-day, weekdays or full 7-day weekdays, or both?
- (C) Are the data collected by agency staff, or consultants?
- (D) Are the data maintained in electronic format?
- (E) On average, what is the cycle time between counts?
- (F) Is the data collected to satisfy external reporting needs, which one?



None of the jurisdictions reported collecting data concerning **Vehicle Occupancy**.

**Figure 2.6** presents a tabulation of the survey responses concerning **Vehicle Delay**. The survey found that these data are collected only for special studies. Key points related to vehicle delay data are as follows:

*Regularity of Collection.* Half of the jurisdictions have this type of data, but it is collected only for special studies.

*Duration.* California City has full-week data; the others have single-day data.

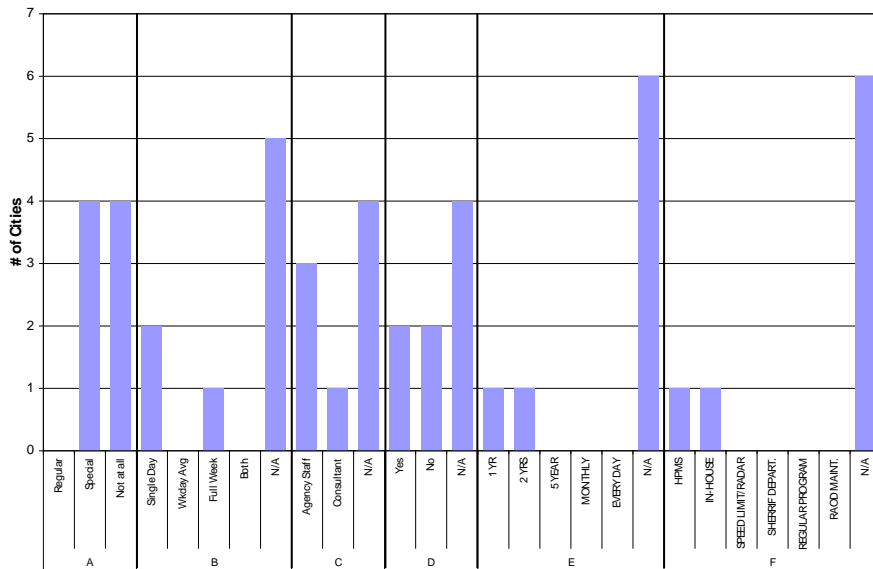
*Staff Employed.* Only Kern County uses consultants to collect this type of data, the other three jurisdictions that have these data use their own staff to collect it.

*Electronic Availability.* Only Bakersfield and California City have this type of data in electronic format.

*Count Cycle.* California City collects this type of data every two years and Ridgecrest does so every year.

*External Reporting Capability.* Only Ridgecrest has the data in HPMS format.

**Figure 2.6: Vehicle Delay**



**Question Key**

- (A) Is the data collection done on a regular basis, for special studies, or no collected at all?
- (B) Are the counts, single day, average of 5-day, weekdays or full 7-day weekdays, or both?
- (C) Are the data collected by agency staff, or consultants?
- (D) Are the data maintained in electronic format?
- (E) On average, what is the cycle time between counts?
- (F) Is the data collected to satisfy external reporting needs, which one?



Figure 2.7 presents a tabulation of the survey responses concerning Queue Length. The survey found that most jurisdictions do not collect this type of data, and those that do collect it only for special studies. Key points related to queue length data are as follows:

Regularity of Collection. Only Ridgecrest and California City have this type of data, and it is collected only for special studies.

Duration. Ridgecrest has this type of data in single-day format, and California City has it in full-week format.

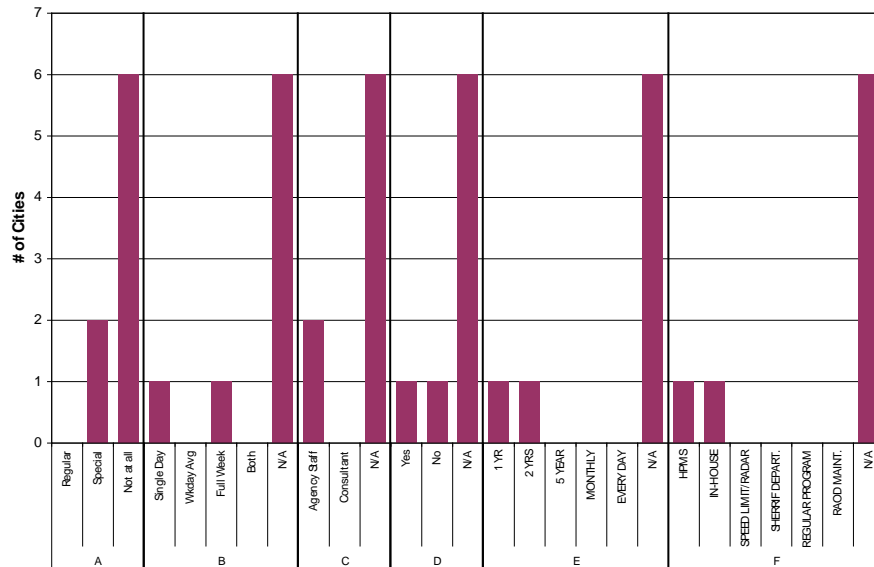
Staff Employed. The type of data is collected by in-house staff in all cases.

Electronic Availability. Only California City has this type of data in electronic format.

Count Cycle. California City collects this type of data every two years; Ridgecrest does so every year.

External Reporting Capability. Only Ridgecrest has the data available in HPMS format.

Figure 2.7: Queue Length



Question Key

- (A) Is the data collection done on a regular basis, for special studies, or no collected at all?
- (B) Are the counts, single day, average of 5-day, weekdays or full 7-day weekdays, or both?
- (C) Are the data collected by agency staff, or consultants?
- (D) Are the data maintained in electronic format?
- (E) On average, what is the cycle time between counts?
- (F) Is the data collected to satisfy external reporting needs, which one?



Figure 2.8 presents a tabulation of the survey responses concerning Accident Data. The survey found that most jurisdictions collect this type of data regularly. Key points related to accident data are as follows:

Regularity of Collection. Six of the eight jurisdictions collect accident data on a regular basis.

Duration. Two of the jurisdictions reported having this type of data in full-week format. Most jurisdictions did not indicate a reporting period.

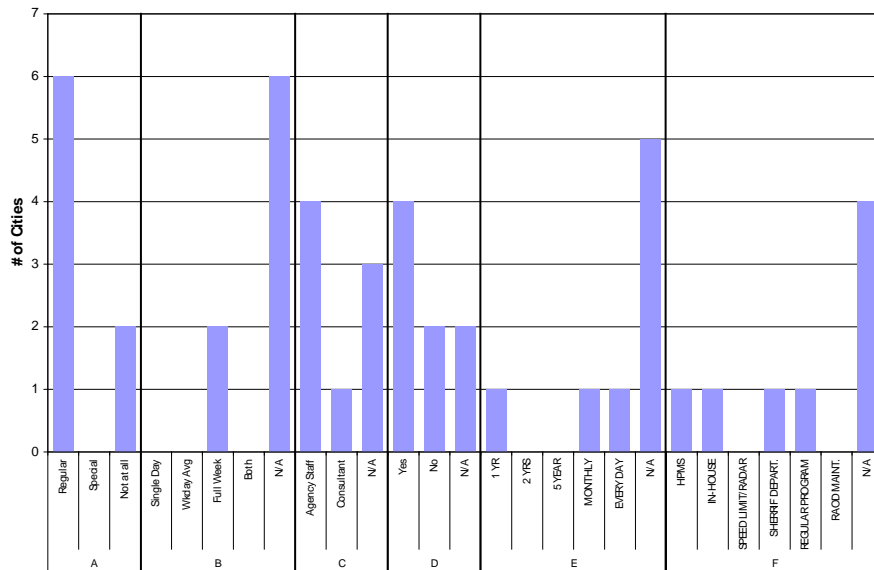
Staff Employed. Only Tehachapi uses consultants to collect this type of data. The rest of the jurisdictions use in-house staff.

Electronic Availability. Only Ridgecrest and Shafter do not have this type of data in electronic format; the rest of the jurisdictions do.

Count Cycle. Bakersfield collects this data daily; Tehachapi collects it monthly; and California City annually.

External Reporting Capability. Only Ridgecrest has this data available in HPMS format.

Figure 2.8: Accident Data



Question Key

- (A) Is the data collection done on a regular basis, for special studies, or no collected at all?
- (B) Are the counts, single day, average of 5-day, weekdays or full 7-day weekdays, or both?
- (C) Are the data collected by agency staff, or consultants?
- (D) Are the data maintained in electronic format?
- (E) On average, what is the cycle time between counts?
- (F) Is the data collected to satisfy external reporting needs, which one?



**Figure 2.9** presents a tabulation of the survey responses concerning **Pavement Conditions**. The survey found that most jurisdictions collect this type of data regularly. Key points related to pavement condition data are as follows:

*Regularity of Collection.* Five of the eight jurisdictions collect this type of data on a regular basis. Ridgecrest and Taft collect it only for special studies.

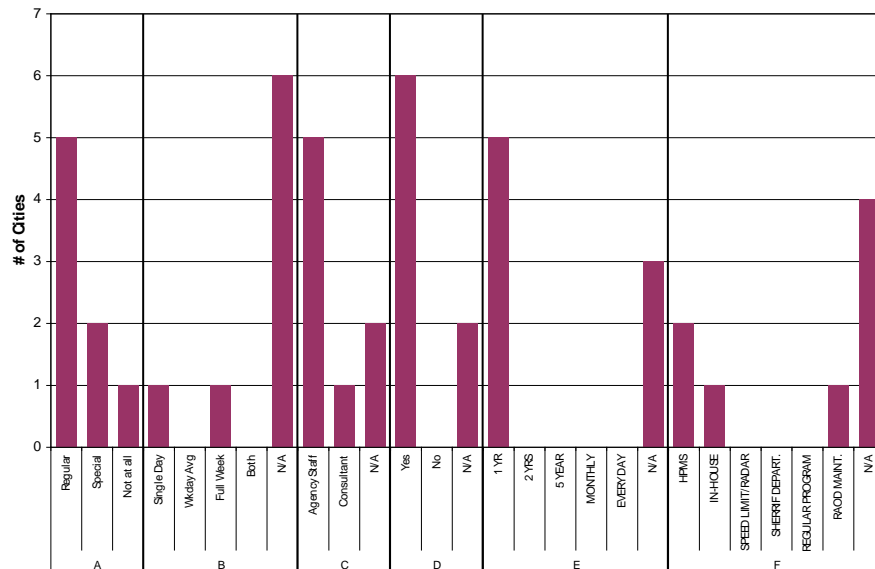
*Staff Employed.* Only Wasco uses consultants to collect this type of data. The rest of the jurisdictions use in-house staff.

*Electronic Availability.* All jurisdictions that have this type of data have it in electronic format.

*Count Cycle.* All jurisdictions that have this type of data collect it on an annual basis.

*External Reporting Capability.* Only Ridgecrest keeps this type of data in HPMS format. The rest maintain it in various other formats.

**Figure 2.9: Pavement Conditions**



**Question Key**

- (A) Is the data collection done on a regular basis, for special studies, or no collected at all?
- (B) Are the counts, single day, average of 5-day, weekdays or full 7-day weekdays, or both?
- (C) Are the data collected by agency staff, or consultants?
- (D) Are the data maintained in electronic format?
- (E) On average, what is the cycle time between counts?
- (F) Is the data collected to satisfy external reporting needs, which one?



### 2.2.2 Data Coverage and Reporting

On average, the Kern COG jurisdictions cover about 33% of their arterials with Daily Traffic Counts that are 3 years old or less. Bakersfield and Kern County have the highest coverage both with 90%. Tehachapi covers only 2%. **Table 1** summarizes the data coverage for each jurisdiction.

**Table 2.1  
Data Coverage and Reporting**

Jurisdiction	% of Arterials covered with Counts 3 years old or less		
	ADT Counts	Peak Hour Volume Counts	Class Counts
City Of Bakersfield	90%	90%	1%
City Of California City	50%	25%	25%
City Of Ridgecrest	10%	10%	0%
City Of Shafter	20%	20%	0%
City Of Taft	0%	0%	0%
City Of Tehachapi	2%	2%	0%
City Of Wasco	0%	0%	0%
Kern County Roads Dept.	90%	5%	2%

On average, the Kern COG jurisdictions cover about 19% of their arterials with Peak Hour Counts that are 3 years old or less. Bakersfield has the highest coverage with 90%. California City has the highest coverage of Class Counts, with 25% of its arterials covered. Only two other jurisdictions have class counts, and their coverage is minimal.

#### Identification of Count Locations

Six of the jurisdictions identify the location of their collected traffic volume information with the main street name and nearest cross street name. Bakersfield uses a unique Link ID number. California City uses the distance from the nearest intersection.

#### Publication of Data

Only Bakersfield and Kern County publish a periodic traffic volume map. Bakersfield has its volumes available in GIS format; Kern County publishes its data in table format only.

#### Availability of Data

Six of the eight jurisdictions make collected data available to the public (only Shafter and Wasco do not have it publicly available). All but one (Wasco) of the jurisdictions has the data available for other jurisdictions upon their request. Only Bakersfield and Kern County have counts available on the Internet. Both Bakersfield and California City have their counts available by e-mail. Five of the eight jurisdictions have the counts available in person at their premises.



### 2.3 Inventory Methods and Equipment

#### Count Stations

Only Ridgecrest and Bakersfield have established permanent count stations. Bakersfield indicated the specific locations of their existing permanent stations. Three other jurisdictions indicated the location of their desired permanent count stations. **Table 2.2** describes each of the jurisdiction’s existing or desired count station locations.

**Table 2.2  
Permanent Count Stations (Existing and Desired)**

<b>Jurisdiction</b>	<b>Status</b>	<b>Roadway Segment</b>
Bakersfield	Existing	Gosford n/o Westwood Dr. H St. n/o Wilson Rd. H St. n/o 14 <sup>th</sup> St. California Ave. e/o King St. Columbus St. sw/o Auburn St. Calloway n/o Meacham
Shafter	Desired	Lerdo Hwy Santa Fe Wy. Seventh Standard Rd. Shafter Ave. Zerker Rd. Poplar Ave. Beech Ave. Los Angeles Ave.
Taft	Desired	10 <sup>th</sup> St. n/o Kern St. 10 <sup>th</sup> St. s/o Kern St. Main St. 4 <sup>th</sup> St. s/o of Kern St. Gardenfield Rd. e/o 119 Airport Rd. near E. Woodrow Center St. e/o 6 <sup>th</sup> St. Cadet Rd. e/o Petroleum Club Rd. Church St. n/o Pilgrim Ave. Hillard St. s/o Kern St.
California City	Desired	3 miles w/o Baron Blvd. on California City Blvd.. California City Blvd. s/o the city boundary Neuralia Rd. at Neuralia Rd. and Lindbergh

#### Seasonal Variation Control Counts

Only Bakersfield and Kern County perform control counts to adjust for seasonal variations in traffic volumes. California City and Tehachapi do counts to measure long-weekend travel.



**Traffic Counting Equipment Availability**

Half the jurisdictions have traffic counting equipment. Bakersfield has Jamar pneumatic tube equipment. California City uses Jamar Trax 1 Counters. Shafter uses Numetrics Model Series 90. Kern County uses Jamar/Timemark.

**Data Collection Costs**

The average annual cost to the jurisdictions to collect traffic data is \$30,000. Most jurisdictions use their general fund to collect routine traffic data. **Table 2.3** summarizes the cost to each jurisdiction.

**Table 2.3  
Traffic Data Collection Costs and Funding Sources**

Jurisdiction	Average Annual Cost	Source of Funding for Routine Data Collection	Source of Funding for Special Data Collection
City Of Bakersfield	\$25,000	General Fund	General Fund
City Of California City	\$60,000	State Funds	State Funds
City Of Ridgecrest	\$10,000	General Fund	Private Sector
City Of Shafter	\$5,000	General Fund	Development Fees
City Of Taft	\$500	Street Dept. Budget	N/A
City Of Tehachapi	\$4,000	General Fund	General Fund
City Of Wasco	N/A	N/A	N/A
Kern County Roads Dept.	\$100,000	Road Fund	Road Fund

**2.4 Computer Based/Electronic Data Collection**

**Signal System**

Only Bakersfield and Kern County have a computer-controlled signal system (BITRANS). Neither jurisdiction can capture and store traffic volume data from their systems, but they both have plans to develop the capability do so in the future.

**Traffic Management**

Only Bakersfield has a traffic management center, and only Tehachapi has a Variable Message Sign system (two movable pieces of equipment).

No other technologies are being used to assist in traffic data collection in the County.

**2.5 Traffic Monitoring and Performance Measures**

**Performance Measure Utilization**

California City, Shafter, and Taft utilize performance measures to monitor traffic conditions or trends on a regular basis. All three jurisdictions use Peak Hour V/C ratios, Daily V/C ratios, and Average Speed. California City also uses Level of Service.



**Radar Speed Surveys**

Bakersfield, Shafter and Kern County perform periodic radar speed surveys for setting speed limits.

**Accident Record Reporting**

Five of the eight jurisdictions have their local police accident records periodically reported to the State. Shafter reports them every week, and Ridgecrest does so annually.

**2.6 Data Needs**

Six of the jurisdictions described what their most pressing data needs were. **Table 2.4** contains each of the jurisdictions’ responses.

**Table 2.4  
Kern COG Jurisdictions’ Traffic Data Needs**

<b>Jurisdiction</b>	<b>Jurisdictions most pressing Data needs</b>
City Of Bakersfield	Volume data
City Of California City	Main road, volume, speed counts
City Of Ridgecrest	N/A
City Of Shafter	Pavement conditions, number of lanes, AADT, road classification
City Of Taft	N/A
City Of Tehachapi	Circulation
City Of Wasco	N/A
Kern County Roads	Integrate our counts into the Kern County model more easily

**2.7 Conclusions**

Jurisdictions in Kern County have varying degrees of traffic data collection capabilities. Therefore, the amount, quantity and quality of traffic data they possess and can produce vary significantly. Also, there are no county-wide traffic data collection standards that they can follow. For the purpose of the RTMIP, traffic data should be available in electronic formats. Only 35-40% of the data is currently available in electronic format. Standardization and digitalization of traffic data are the two most pressing needs in the County.



## **3.0 Needs Assessment**

The results of the surveys of current data collection practices provided a perspective on what level of data collection activities were currently being conducted **by the County's** local jurisdictions and to what extent this process could be used for a potential countywide traffic monitoring system. The lack of county-wide traffic data collection standards for the jurisdictions to follow was one of the most striking results of the survey. Based on the results of the survey and discussions with agency staff, it became clear that the most immediate data collection need in the County was for a thorough and consistent program to gather and distribute traffic volume data, including vehicle classification data, for a geographically dispersed set of locations throughout the County.

Kern COG and its member agencies emphasized that consistency with and incorporation of historical count locations was important for the count program to be developed. As a result, a traffic count program consisting of 14 control stations and 598 total count locations, was outlined in the Draft Needs Assessment report of February 2007. Based on further discussions with Kern COG and the local jurisdictions, the count program was refined to a system with 22 control stations and 1,043 total count locations. As the basis of this program, a GIS database was created that included approximately 1,600 historical traffic counts collected by Kern County, the City of Bakersfield, and other agencies.

This section describes the development of the Uniform Traffic Count program to meet the needs identified within the County. A later section, the Action Plan, describes in detail the implementation of the program.

### **3.1 Uniform Traffic Count Program**

#### **3.1.1 Need for the Program**

Currently, traffic counts are conducted by or on behalf of each of the jurisdictions with the County. Coverage varies widely throughout the County and depends on the resources of each jurisdiction. Many counts are conducted on a one-time basis for special studies, so it is difficult to discern historical patterns. In addition, the data have been collected by different agencies and/or consultants, and are generally not available in a digital format. Kern COG has recently compiled an electronic "**count book**" of approximately 1,600 count locations throughout the County. For each count location, the count book includes only bidirectional total daily traffic volume. Peak hour, vehicle classification, or other types of data are not available electronically.

A uniform count program will accomplish the following goals:

- Improve coverage throughout the County
- Conserve resources by eliminating redundant count locations
- Facilitate analysis of historical trends



- Provide data on goods movement
- Allow for regional extrapolation through the establishment of control stations
- Create an understanding of seasonal variation

### 3.1.2 Scope of the Program

Kern County and the local jurisdictions within the County are responsible for collecting traffic data on roadways within their jurisdiction. Caltrans is responsible for collecting traffic data on State highways, and does so on a schedule and under procedures set at the State level. Traffic counts on State highways conducted by the County or a city would require encroachment permits from Caltrans. Therefore, based on discussions with Kern COG staff, it was determined that this Count program should be limited to roadways under local jurisdiction. Nonetheless, it is recommended that efforts be made to make Caltrans traffic count data available in conjunction with data collected under this program.

### 3.1.3 Development of Count Location Selection Criteria

A set of criteria for proposed, count locations as part of a uniform, on-going count program to accomplish the goals listed above was established. The criteria are summarized in **Table 3.1**. The criteria are intended to achieve coverage throughout the County, satisfy Federal reporting requirements, assist in travel demand model development and refinement, and provide data to assist local agencies, while avoiding redundancy.

**Table 3.1. Count Location Selection Criteria**

	<b>Criteria</b>	<b>Data Source</b>	<b>Discussion/Example</b>	<b># Added</b>
1	HPMS Sample Segments	Caltrans	Federal requirement	249
2	Model Screenlines	Kern COG		91
3	County Entry Points	County Limits	"Cordon"	52
4	Community Entry Points	City/Built Area/ SOI Limits	"Cordon"; entry points includes freeway ramps	130
5	Regional Significance	GIS-Roadway Network		12
6	Local Significance	GIS-Roadway Network Needs Assessment Survey	Includes high growth areas	39
7	Goods Movements	GIS-Industrial Uses		25

Descriptions of the criteria and the role each plays in the proposed count program are as follows:

**HPMS Sample Segments.** Traffic volume data on these segments are required as part of the Federal Highway Performance Monitoring System. Counts at these locations are used by Federal agencies to estimate systemwide travel characteristics, such as total vehicle miles traveled.



**Model Screenlines.** Traffic volume data from these locations are used in the calibration of the Kern COG regional travel demand model. The model is used to forecast future traffic volumes throughout the County. The screenlines are a set of hypothetical lines drawn across the roadway network; the total volume of traffic crossing these lines in the model is compared to the actual volume data.

**County Entry Points.** County entry point locations occur wherever roadways enter the County from neighboring Counties. Traffic volume data from these locations are useful in assessing growth in traffic volumes generated outside of the Kern COG region, as well as in determining the general source of the growth. They can also be useful in calibrating the travel demand model with regard to external generators.

**Community Entry Points.** Community entry point locations are intended to create a rough “cordon” around each of the major communities within the County. Because of the greater interconnectedness within the County, it is not feasible to identify every roadway that a vehicle might use to enter a community. The intent of the community entry point locations is to capture the significant entry points. Because of the rapid geographic growth of many of the communities, the “entry points” have often been set at a considerable distance from the existing developed area, so that the points will continue to represent the geographical extents of the community into the future.

**Regional Significance.** Roadway segments of regional significance were identified as segments that connect two or more areas within the County, but that do not constitute an entry point to a particular community. In practice, this category is limited because most regionally significant roadways also create entry points to one or more communities.

**Local Significance.** Roadway segments of local significance represent locations that are important to the circulation within one community, but that generally do not play a large role in regional circulation. Together with community entry points, these locations collectively provide coverage of an individual community. Locations of local significance also include areas currently experience a high rate of growth.

**Goods Movement.** Roadway segments significant for goods movement provide access to industrial and warehousing hubs within the County. Traffic volume data at these locations are useful because they represent activity within an important and growing section of the County’s economy.

An additional criterion of **Mountain Locations** was initially developed to represent both entry points to the mountain areas of the County, similar to community entry points, as well as destinations within the mountains. Traffic volume data at these locations are useful because they represent tourist and recreational activity. However, in the processing of implementing the criteria, it was determined that all of the identified mountain locations were included within the other criteria. Therefore, this criterion is not included in the final list of selection criteria.



### **3.1.4 Identification of Count Locations**

Before identifying proposed count locations, the approximately 1,600 count locations in the Kern COG count book were geocoded and incorporated into a GIS database. The geocoding of the “historical” count locations allows them to be used to the greatest extent possible in the proposed count program. Using historical count locations as the basis for the count program will provide the greatest degree of continuity and facilitate analysis of trends over the longest time periods possible.

The criteria listed in Table 3.1 were applied in a sequential process, with all locations satisfying each criterion being identified before moving onto the next criterion. For example, all HPMS sample segments were identified in the first step. After HPMS count locations were identified, model screenline count locations were identified. If an HPMS sample segment was also a model screenline, the previously identified count location for the HPMS segment was also used for the model screenline. It should be emphasized **that due to the “additive” nature of the analysis, at each step a substantial portion of the proposed locations that met each criterion was already selected through the previous criteria.**

The application of the criteria resulted in a total of 598 proposed count locations. The final column of Table 3.1 shows the number of count locations added to the initial recommendations by the application of each criterion.

The recommended count locations were distributed to Kern COG and the local jurisdictions. Based on feedback from these agencies, additional count locations of particular concern to the jurisdictions were added to the recommended count locations, and some potentially duplicative locations were consolidated. The resulting recommended count program included a total of 1,043 count locations.

### **3.1.5 Vehicle Classification Count Locations**

Vehicle classification counts provided additional data beyond total vehicle counts. These data are useful for identifying locations where traffic operations and/or pavement conditions may be affected by high levels of truck traffic. They are also useful for planning purposes as a measure of changes in industrial and warehousing activity. However, vehicle classification counts are more expensive to conduct than simple vehicle counts, so in the interest of economy, their application should be limited to locations at which the data they provide will be most useful.

The proposed count locations were reviewed to determine appropriate locations for vehicle classification counts. All locations satisfying criteria 1, 2, and 8 (HPMS, model screenline, and goods movement) were designated as locations for conducting vehicle classification counts. Additional locations for classification counts were selected from the remaining count locations to ensure coverage throughout all regions of the County.



Figures 3.1 to 3.17 show the locations of the proposed count locations in the vicinity of each of the major communities within the County. These figures indicate which locations are proposed for vehicle classification counts, as well as whether each location is a historical count location. In addition, Figure 3.18 on the enclosed CD shows the same information for the entire County, and Figure 3.19 on the CD shows an enlargement of the Bakersfield area. Appendix B includes detailed information on each proposed count location in a tabular format.

3.1.6 Control Station Locations

Control station locations are locations whose traffic volume characteristics are taken to be indicative of a larger region within the County. Data will be collected on a more frequent basis at these locations in order to understand day-of-week, seasonal, or holiday traffic patterns. Factors expressing these variation patterns will be derived from the counts at these locations and applied to typical weekday counts at other locations in order to derive traffic volumes at times other than the typical weekday. The draft Needs Assessment included 14 proposed control station locations. Based on discussion with agency staff, these proposed control station locations have been replaced with the existing 6 control stations within the City of Bakersfield and 16 existing control stations elsewhere in the County. Figure 3.20 shows the locations of these control station locations. Descriptions of the locations are provided in Table 3.2.

Table 3.2. Control Station Locations

Table with 5 columns: ID, Roadway, Direction, Cross Street, and Community. It lists 22 control station locations across Kern County.



**Insert Figures 3.1 to 3.17**



**[Figure 3.18 on CD]**



**[Figure 3.19 on CD]**



**Insert Figure 3.20**



## **3.2 Additional Transportation Data**

In addition to traffic volume data, the jurisdictions in Kern County collect a variety of other transportation data. The needs assessment survey also asked about these data collection efforts in order to develop an understanding of what programs may be useful to the Kern COG jurisdictions. The following sections summarize the findings and conclusions regarding these additional types of data.

### **3.2.1 Speed Survey Data**

Most of the jurisdictions in the County collect speed data, and most use their own staff to do so. Follow-up discussions revealed that speed data are generally collected for the purposes of establishing speed limits under State law. Since the legislative body of each jurisdiction must make findings to establish speed limits, it is appropriate that the responsibility for collecting the relevant data remain at the local level. Therefore, it is not recommended that speed survey data be incorporated into the RTMIP.

### **3.2.2 Pavement Conditions**

Most of the jurisdictions in the County collect pavement condition data. However, the data are stored in a variety of formats and are not generally readily available for inclusion in the HPMS reporting system. One jurisdiction (Shafter) stated that pavement condition data was one of their most pressing needs. With the ongoing urbanization of the County, traffic volumes are increasing on what were formerly rural roads. In addition, the growth of the warehousing industry in the County will likely result in a continued increase in heavy truck traffic throughout the region. Therefore, pavement condition data will become increasingly important for jurisdictions as they plan their capital improvement budgets.

In addition, reliable, quantitative pavement condition data are best collected by means of specialized equipment. This equipment is expensive and will not typically be cost-effective for small or even medium-sized jurisdictions to own. Therefore, the collection of pavement condition data is a logical effort to centralize through the RTMIP. It is of region-wide importance, and often not easily collected at the local level. Therefore, it is recommended that the RTMIP incorporate a program for the collection of these data.

### **3.2.3 Accident Data**

Accident data are collected throughout the County by local police departments, the County Sheriff, and the California Highway Patrol (CHP). However, the tabulation and reporting of such data vary from jurisdiction to jurisdiction. Most of the jurisdictions in the County report the data on a regular basis, although some do not.



A statewide reporting system for accident data, the Statewide Integrated Traffic Records System (SWITRS), has been established and is maintained by the CHP. In order to ensure the most complete and accurate data at the statewide level, it is important to encourage jurisdictions to report data to SWITRS. Once data have been reported to SWITRS, county-wide data can be **extracted and incorporated into Kern COG's GIS** system for local use. Therefore, to avoid duplicative reporting requirements, it is recommended that the RTMIP itself not include reporting of accident data, but that Kern COG work with the local jurisdictions to improve reporting of accident data to SWITRS. These data will then ultimately be available for use by Kern COG and its member agencies.



## 4.0 Call Box/Motorist Aid Integration Assessment

### 4.1 The Existing Call Box System

The Kern Motorist Aid Authority (KMAA) is a regional public agency created in 1988 pursuant to California Streets and Highway Code to install, operate, and maintain a motorist aid call box system in Kern County. The KMAA is part of a group of statewide agencies that are also called Service Authority for Freeway Emergencies (SAFE) which are in charge of approximately 16,000 call boxes in California. These call boxes allow motorists to request roadway assistance in both emergency and non-emergency situations. Call boxes are placed in pairs along highways. When a call is made on a call box, it is directly connected to the California Highway Patrol (CHP).

The following provide a summary of the vital statistics on the Kern County call box system:

- Total number of call boxes: 574
- Coverage: 859 miles of freeways and expressways
- Placement and Installation (see **Figure 4.1**):
  - Installation began in 1991 and was completed in 2000
  - Freeways
  - State Highways
  - Other— only 12 call boxes are on non-state highway County roads
- Average Countywide call box spacing:
  - Urban areas: one mile, a total of 51 boxes (8.9%)
  - Rural areas: two miles, a total of 523 boxes (91.1%)
- Hard-wired or wireless: only one call box in the County is hard-wired the rest are all cellular
- Analog or digital: currently all analog, upcoming contract effort will convert the system to fully digital
- Cellular Carrier: AT&T
- Usage statistics/trends 12-month period FY 05/06 (see **Appendix C**):
  - Total calls—66,533
  - Maintenance calls—61,569
  - Assistance calls—4,964
  - Average calls per month—414
  - Average calls per month, per box—0.72
  - Average calls per day per box—0.03



- **INSERT FIGURE 4.1**



- High month: July—595
- Low month: February—256
- Annual maintenance costs: approximately \$200,000 or \$350/site
- Funding source: through \$1 of registration fee from DMV
- Accessibility: the call boxes are currently not equipped with TTY
- **Compliance with state minimum guideline of 8' shoulder throughout the system** is not known
- The number of 911 calls on the overall emergency system vs. on the call box system: not known
- Freeway Service Patrol (FSP) coverage: there is no FSP program in Kern County
- Availability of #399 Service: none
- Currently there are no other uses of the call box system, including the following:
  - Traffic counts
  - Fog detector
  - CCTV
  - Remote traffic sensors
  - Smart Call Box

## **4.2 System Needs**

- **Desire for inventory**—It is highly desirable to develop and maintain an integrated inventory data base with coordinate system and individual photo logs that can be used for system evaluation.
- **Need or desire for system reduction**—Even with the decline in usage, currently there does not appear to be a need or desire for system reduction. Any more than a 2-mile spacing, which may result from a system reduction, will **not provide a "system"**. **However, Countywide call volume has declined from 25,000 to about 5,000 per year and any further significant decline may result in Board decision to discontinue maintenance and begin funding other programs such as FSP or enhanced sheriff/emergency response**
- **System accessibility**—The initiation of #399 system (cellular phones act as call box directing call to CHP center) will be discussed as part of integration with possible 511 system in upcoming upgrade efforts and TTY.
- **Integration with other uses**—These strategies have been discussed but no action has been taken. Major effort will be required and need for connections to TMC, adding features/devices to poles may alter crash characteristics—traffic counts and fog detection may be most attractive.



### 4.3 Experiences of Other Jurisdictions

In order to achieve a better understanding of the potential issues and benefits of implementing traffic count system utilizing Smart Call Boxes in Kern County, a review of similar programs in other jurisdictions was conducted. Three such programs were identified, all of them in Southern California. (It is not surprising that California is the leader in such programs because the state has much more comprehensive Call Box programs than other states.) The three Smart Call Box programs that were identified have been implemented in San Diego, San Bernardino, and Riverside Counties.

#### 4.3.1 San Diego County

San Diego County began a Field Operational Test (FOT) of a Smart Call Box system in 1992, with implementation and evaluation of the system taking place in 1995-1996. The FOT was carried out by a consortium of Caltrans District 11, the Border Division of the California Highway Patrol (CHP), and the San Diego Service Authority for Freeway Emergencies (SAFE). The FOT was evaluated by San Diego State University (SDSU). Because microprocessor, communication, and solar technologies, as well as ITS protocols, have advanced substantially since 1996, the results of the FOT may be of limited applicability to current circumstances. However, some of the institutional and technical issues are still relevant and instructional.

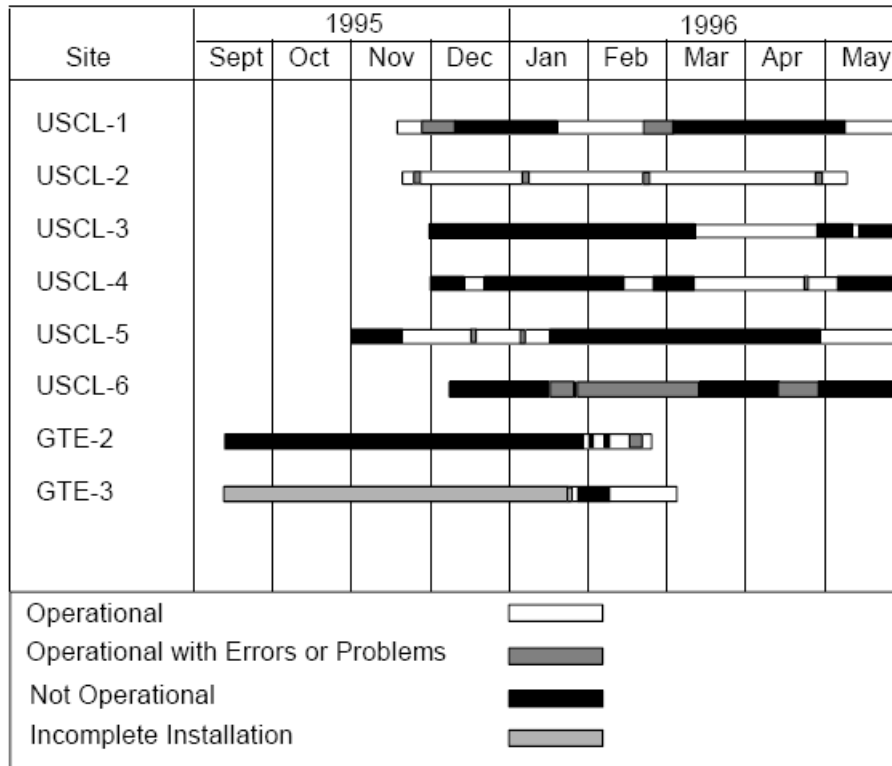
The traffic census component of the FOT included eight Smart Call Box units developed by two vendor teams. Most of the units employed a standard inductive loop traffic counter external to the call box, using existing induction loops. One vendor's installations involved modification of existing call boxes, while the other vendor's call box units were specially installed.

The Smart Call Box units experienced a variety of technical problems that resulted in very poor reliability. All units except one experienced extended periods of down time. Problems included software problems, disruption of external power supplies, failure of the cellular phone, and failure of the traffic counter. **Figure 4.2** shows the periods during which each unit was operational.

In addition to the clear reliability problems, the Smart Call Box FOT also exposed issues related to system integration. All of the Smart Call Box designs involved integration of external field devices such as traffic counters, weather sensors, or video compression units that were not originally designed to work together. The SDSU evaluation noted that, "Traffic counter manufacturers, in particular, introduce improved products from time to time and naturally want to use the latest version when new systems are developed. 'Upgrades' tended to result in software incompatibilities with equipment that had been compatible with the previous version."



**Figure 4.2: Operational Status of San Diego County Smart Call Box Traffic Census Sites**



Source: *Smart Call Box Field Operational Test Evaluation Summary Report*, San Diego State University, 1997

In addition, each component of a Smart Call Box must be integrated with equipment and/or software at the data collection center. System integration failures were a major problem in the performance of the test systems. The SDSU evaluation observed that, "A standard communications protocol for traffic counters and similar devices that recognizes the requirements of wireless communications systems is highly desirable. Given the tendency for counter equipment to evolve, such a standard may be the only way to ensure that smart call box systems will not need to be reinvented every time a new model of counter is introduced."

The SDSU evaluation of the Smart Call Box FOT concluded that, "Where possible, tests should focus on solving problems as they are perceived by potential users of the technology being developed, and not on the exploitation of a particular type of technology. In this case, this would have implied a focus on developing wireless data collection systems rather than on exploiting existing call box technology." In particular, the evaluation noted that the traffic count devices made very limited use of the underlying call box technology. Given the relatively low cost of cellular modems, it may be more cost effective to develop stand-alone count stations with cellular modems to reduce the system integration issues.



### **4.3.2 San Bernardino County**

In 1997, Riverside and San Bernardino Counties jointly undertook a pilot program involving the installation of Smart Call Boxes in the two counties. Their experiences and **results were strikingly different. San Bernardino County's experience is recounted first.** There is no written evaluation of the San Bernardino program; this discussion is based on recent conversations with staff of San Bernardino Associated Governments (SANBAG).

San Bernardino County initially installed 20 Smart Call Boxes. The County experienced maintenance problems with the Smart Call Boxes from the start, and began removing them soon after the program began. Currently, there are 15 remaining Smart Call Boxes in the County. The Smart Call Boxes that were installed use analog cellular telephone technology, and almost as soon as they were installed, carriers started converting to digital transmission technology. Thus, they became obsolete almost upon installation. Reliability was also a major problem.

SANBAG staff also complain that, even with the units that work, the data collected are transmitted directly to Caltrans, so that it is not available for local planning purposes. This highlights the importance of establishing institutional arrangements that best serve the needs of all program participants.

### **4.3.3 Riverside County**

Riverside County installed 20 Smart Call Boxes under two pilot programs in 1997 and 1999. Currently, 17 are still in operation. All are installed on the State highway network. According to a 1999 evaluation of the 1997 pilot program conducted by VRPA technologies, the traffic count data are stored on-site at the Smart Call Box and can be retrieved remotely by an incoming call to the Smart Call Box, using proprietary traffic counting and reporting software. The data retrieved from the Smart Call Boxes are analyzed using another proprietary software program that calculates traffic volume characteristics such as peak hour flows, K and D factors, ADT, and AADT. These data are collected and analyzed by a private contractor on behalf of the Riverside County Transportation Commission (RCTC) and are used for Congestion Management Plan (CMP) reporting purposes, as well as being made available to the County and to local agencies.

**Riverside County's experience with the Smart Call Boxes has been sufficiently positive** that the 2006 CMP describes a proposed significant expansion of the program. Some of the additional locations will be the traditional Smart Call Boxes, while others will be so-called **"black boxes"** that are stand-alone data collection devices with wireless transmission capabilities, but no associated Call Box.



#### **4.4 Recommendations**

- Based on the results of the Call Box Inventory and Evaluation recently conducted by Kern COG, identify locations that are not compliant with State Guidelines (included in **Appendix D**) or certain undesirable call box type installations. **Recommend removal of these call boxes and their “working pairs” or correction of problems.** Potentially consider additional installations on certain identified necessary highway locations (system interchanges, steep grades, inclement weather locations, etc.).
- **Defer deployment of “Smart Call Boxes” until operational issues can be resolved.**
- Consider deployment of the Countywide #399 System and integrate with 511 System and TTY capability.



## 5.0 Technology and System Integration Options

This section evaluates system integration options related to potential components of the RTMIP. For each option, the feasibility of incorporation into the RTMIP, as well as options for doing so, if appropriate, are considered. Subsequent sections elaborate on and refine the Uniform Traffic Count Program outlined in the previous Needs Assessment report, as well as review possible funding sources for RTMIP components.

### 5.1 Traffic Count Technology Options

A variety of technological options exist for conducting traffic counts, and innovations continue at a fairly rapid rate as new technologies are developed and existing technologies are improved. The options range from the low-tech methodology of having a person observing a location and recording traffic volumes with a manual counting device to high-tech methodologies involving video or microwave detection of vehicles. In general, the low-tech methodologies require a lower capital investment but higher labor costs, and are more easily adaptable to changing circumstances. The high-tech methodologies require greater capital investments, but lower on-going labor costs, and can be less adaptable to changing circumstances, typically because they are installed at fixed locations and are limited by their initial design parameters.

As noted above, traffic counting technologies continue to evolve. Those that are currently commercially available include the following:

- a. Pneumatic tubes
- b. Magnetic imaging
- c. Inductive loops
- d. Video detection
- e. Microwave detection

The advantages and disadvantages of each of these technologies are discussed below.

**a. Pneumatic tubes.** Pneumatic tubes represent an established technology that is in widespread use. They consist of a rubber tube, or set of tubes, that is placed across the roadway and that uses pressure changes to detect the number of axle movements. A counter placed by the side of the road records the axle movements and, using algorithms to detect axle spacing, can convert axle counts and axle spacing into vehicle classification counts. They are typically used for temporary (i.e., one week or less) installations.

Pneumatic tubes have several advantages. First, they are very inexpensive, with contractors providing count services for as little as \$50 - \$100 per day per location. Second, they can easily be installed and relocated as necessary. They are a familiar technology, and many suppliers are available.

The main disadvantage of pneumatic tubes is that they may become displaced, especially on high-volume roadways or roadways with many heavy vehicles.



Although the algorithms used to convert axle counts to vehicle counts are constantly being improved, they are far from perfect, particularly in congested conditions. However, they are generally adequate for measuring passenger car equivalent flows.

**b. Magnetic imaging.** Magnetic imaging is an alternative to pneumatic tubes. The technology consists of a giant magnetoresistance (GMR) magnetic sensor that is placed in the travel lane that uses changes in the magnetic field to determine vehicle length. The GMR sensor can either be installed permanently in the pavement or placed on top of the pavement as part of a temporary installation. An associated counter converts vehicle length into vehicle classification counts. They can be used for temporary (i.e., one week or less) or permanent installations.

Relocatable magnetic imaging devices are also relatively inexpensive. They can also easily be installed and relocated as necessary. However, relocatable magnetic imaging devices are in relatively limited use, and few suppliers are available. Like pneumatic tubes, they may become displaced, especially on high-volume roadways or roadways with many heavy vehicles. Because of their limited use, their accuracy has not been as thoroughly evaluated as pneumatic tubes. However, they are likely adequate for measuring passenger car equivalent flows.

Permanently installed magnetic imaging devices are more durable but more expensive, with a typical cost being \$1,000 per lane, plus approximately \$3,000 for a controller cabinet. They must be installed near a power source, or else dedicated power (e.g., solar) must be provided. Optionally, communications infrastructure can also be provided to transmit the data collected to a central location. Otherwise, each location must be visited by a technician on a regular basis to download the data.

**c. Inductive Loops.** Inductive loops are another established technology that is in widespread use. They consist of a wire loop, or set of loops, that is permanently installed in the pavement of the roadway. An alternating electric current through the loop creates a magnetic field that is disturbed by the presence of a conductive object (e.g., a vehicle). A sensor records the presence of the vehicle and, using algorithms to detect vehicle length and spacing, can convert vehicle length and spacing into vehicle classification counts. As noted above, inductive loops are typically used for permanent installations.

Inductive loops have several advantages. They are an established technology, and their design and maintenance are well understood. Commercially available equipment is available for relatively easy installation. They are far more durable than the technologies intended for temporary installations, although they may still suffer damage on roadways with many heavy vehicles.



The cost of inductive loops is similar to that of permanently installed magnetic imaging devices, with a typical cost being \$1,000 per lane, plus approximately \$3,000 for a controller cabinet. They also must be installed near a power source, or else dedicated power (e.g., solar) must be provided. Optionally, communications infrastructure can also be provided to transmit the data collected to a central location. Otherwise, each location must be visited by a technician on a regular basis to download the data.

**d. Video detection.** Video detection uses a video camera and specialized software to detect the presence of vehicles at fixed locations in the road. A video camera is permanently installed on a pole adjacent to the roadway. A single camera can count several lanes simultaneously. Algorithms convert vehicle length and spacing into vehicle classification counts. Video detection is typically used for permanent installations.

Video detection equipment is commercially available. Installation is relatively easy, although site-specific design plans must be generated for each location. Because they are not installed in or on the roadway surface, the video cameras are not damaged by heavy traffic volumes.

The primary disadvantage of video detection compared to inductive loops is cost. The detectors require substantial design and installation effort. The detectors typically incorporate cellular telephone technology for transmitting data. Thus, they require associated communications infrastructure to receive the data at a central location. A complete installation of a video detection station costs approximately \$20,000 to \$25,000. Installation costs can be considerably reduced if a mounting pole (e.g., a luminaire pole) is already available at the desired location.

**e. Microwave detection.** Microwave detection is a relatively new technology that has recently been adopted by Caltrans. A microwave detector is permanently installed on a pole adjacent to the roadway. A microwave frequency is used to detect the presence of an object in the travel lane. A single detector can count several lanes simultaneously. Algorithms convert vehicle length and spacing into vehicle classification counts. Microwave detection is typically used for permanent installations.

Like video detection, microwave detection equipment is commercially available. Installation is relatively easy, although site-specific design plans must be generated for each location. Because they are not installed in or on the roadway surface, the microwave detectors are not damaged by heavy traffic volumes.

Microwave detection is a new technology, and its maintenance needs are not well understood. The primary disadvantage of microwave detection compared to inductive loops is cost. As with video detection, the detectors require substantial design and installation effort. The detectors typically incorporate cellular telephone technology for transmitting data. Thus, they require associated



communications infrastructure to receive the data at a central location. A complete installation of a microwave detection station costs approximately \$20,000 to \$25,000. Installation costs can be considerably reduced if a mounting pole (e.g., a luminaire pole) is already available at the desired location.

In reviewing and evaluating the traffic count technology options available, it is important to keep in mind that the RTMIP is a *regional* effort covering an area of over 8,000 square miles. The data collected are to be used for regional planning efforts, such as identifying growth rates and developing future traffic forecasts. The Needs Assessment identified a traffic count program with nearly 600 individual count locations and more surely to be added as the region continues to grow.

Based on the large number of count locations, the cost of permanent installations such as inductive loops or microwave detection would be prohibitive. Furthermore, such permanent installations are not appropriate to the needs of the program, which are primarily short-term traffic counts. The short-term nature of the counts does not justify the large capital investment that would be required for these methodologies.

The City of Bakersfield currently uses inductive loops for the six City control stations established as part of its existing traffic count program. These locations are counted continuously, with the data recorded locally. There is no communications with a central **location, such as the City's Traffic Operations Center. Instead, a technician visits each** location approximately monthly to download the data from the recorders. Kern COG may want to consider a similar procedure for the Master Stations identified in the proposed RTMIP.

Two technologies are best suited for short-term installations: pneumatic tubes and magnetic imaging. As discussed earlier, pneumatic tubes are an established technology available from numerous suppliers. Magnetic imaging is in much less widespread use, **and Kern COG's experience with it has been disappointing. A limited number of suppliers** results in infrequent and expensive upgrades and maintenance. As the equipment ages, it has become more and more problematic to maintain it.

Taking into consideration the advantages and disadvantages of the available technologies, as well as the needs of the RTMIP traffic count program, it is recommended that Kern COG use pneumatic tube counting technology as the basis for its count program. This technology is inexpensive, flexible, and provided by numerous suppliers. In addition, Kern COG may want to consider using inductive loop technology for master station locations, with or without communications capabilities.

## **5.2 ITS Strategies and Solutions**

Kern COG has undertaken a study to investigate the implementation of Intelligent Transportation Systems (ITS) in Kern County. Kern County is also a participant in the San Joaquin Valley Intelligent Transportation Systems Strategic Deployment Plan (SDP).



These studies investigated appropriate ITS technologies for the unique urban/rural mix found in Kern County. The SDP identified the following priority projects in Kern County:

- Smart Call Box System Deployment
- Smart Studs Demo Project
- Incident Management Procedures
- Communication Network, Phase II
- Kern County Regional Communication Links
- RWIS with CCTV System
- Bakersfield TOC Expansion
- GET Fare Equipment Deployment

It is not the purpose of the RTMIP to reexamine the ITS priorities established by the SDP. Rather, the purpose of the current effort is to evaluate means to integrate the ITS strategies with RTMIP activities. The Smart Studs Demo Project and the Roadside Weather Information System (RWIS) are components of a system to detect and alert drivers about hazardous weather conditions. The Incident Management Procedures would comprise a set of interagency agreements concerning use and sharing of resources during major incidents. The GET Fare Equipment Deployment covers the installation of electronic fare collection equipment on transit vehicles. Thus, none of these programs is directly related to the data collection and distribution goals of the RTMIP.

Of the remaining programs, Smart Call Box System Deployment and the communication network programs are discussed below in Section 5.4, "Integration of Permanent Count Locations with Call Boxes." The Bakersfield TOC Expansion is discussed below in Section 5.5, "Integration with Traffic Operations Centers and Traffic Signal Cameras."

### **5.3 Existing and Future Assets**

Kern COG currently has an inventory of magnetic imaging portable traffic analyzers, Nu-Metrics Hi-Star models NC90a and NC97. In the past, these traffic counting devices were lent to member agencies upon request. Currently, the devices have suffered a failure rate of approximately 50 percent, and Kern COG does not have funding to exchange or replace them.

In recent years, Kern COG has contracted with a traffic data collection firm to conduct traffic counts throughout the County. As part of this program, the contracted firm is responsible for providing its own traffic counting equipment. Thus, the capital expense has been transferred to a contractor. Since this program has been in place, the demand by member agencies for the equipment owned by Kern COG has virtually disappeared.

Kern COG is a Metropolitan Planning Organization and a Regional Transportation Planning Agency whose core functions are in policy formulation, data analysis, and regional coordination. Raw traffic data collection is not a core functionality of Kern COG, and it would seem to make little sense for the agency to maintain a substantial capital



investment in traffic data collection equipment. This is especially true given that there are numerous private sector suppliers who are able and willing to provide data collection services at competitive rates.

As described earlier, traffic data collection technologies continue to evolve, both in terms of hardware and software. For the foreseeable future, the technologies employed in the RTMIP count program will involve devices that are physically placed in the roadway, where they are subject to damage from the traffic volumes that they are intended to count. Inevitably, there will be ongoing maintenance and replacement costs associated with such equipment. Given this context, it is recommended that Kern COG no longer seek to maintain its own inventory of traffic counting equipment and instead rely on private sector contractors to provide and operate such equipment. These firms use the equipment on a continuous basis and are in a better position to amortize maintenance and replacement costs, reducing overall costs to the agency.

#### **5.4 Integration of Permanent Count Locations with Call Boxes**

Integrating permanent count locations with call boxes can take advantage of the clustering of multiple capabilities at a single field location to reduce program costs. In the case of the RTMIP, the cost of a permanent count location can be substantially reduced and its capabilities can be increased by taking advantage of the infrastructure in place for the call box system. Call box locations can be equipped with traffic detection devices, most likely inductive loops, and utilize the communication capability of the call box to transmit traffic volume data to a central location. In addition, as an ITS communications infrastructure is implemented, data can easily be transmitted throughout the network. Thus, the cost of providing power to the count location is eliminated, and data collection costs are reduced because a technician no longer needs to travel to the field to retrieve the data.

Because of the additional cost associated with a permanent count installation (discussed earlier in Section 5.1), such installations should be limited to only those locations where data collection is needed on a frequent or continuous basis. As the RTMIP is conceived, these would likely be only the Control Station locations. Given a typical cost of \$4,000 to add data collection capabilities to a call box versus a conservative estimate of \$100 per location for a temporary count installation, the same funds could provide either a single permanent installation or 40 years of annual counts.

The existing call boxes in Kern County use an analog cellular signal. This technology is not suitable for data transmission, so data collection efforts could not be integrated with the existing call box system. However, the Kern Motorist Aid Authority is undertaking an effort to replace the entire call box system with one that uses digital technology. As the system is converted to digital, permanent count locations could be integrated with the call box system.

The possibility of integrating Control Station locations with call boxes raised an important question concerning the siting of Control Stations. The existing Control



Stations within the County are located off the State highway system. This simplifies temporary data collection installations by eliminating the need for local agencies to obtain an encroachment permit from Caltrans for data collection activities. However, the call box system is largely (but not entirely) installed on State highways. Therefore, if Control Station Locations were to be integrated with call boxes, new Control Station locations would need to be identified, and continuity with historical data at the existing Control Stations would be lost. **Given the reliability issues with "Smart Call Boxes"** and the loss of continuity with historical data, After discussion among Kern COG and its member agencies, it was decided to maintain the Control Stations at their current locations.

## **5.5 Integration with Traffic Operations Centers and Traffic Signal Cameras**

The City of Bakersfield maintains a Traffic Operations Center (TOC) whose purpose is to collect, manage, and distribute traffic operations data for the City. Currently, the TOC has hard-wired connections to traffic signals at approximately 220 intersections throughout the City. Of these, approximately 80 intersections have video detection capabilities. The video detection capabilities at these locations could provide the ability for continuous traffic data collection, although this capability is not currently being utilized.

Because of the large proportion of traffic count locations that are located in the City of Bakersfield, the use of data collected directly by existing equipment in the City could reduce the scope of the ongoing traffic count program. However, several steps would need to take place for this to happen:

- a) Video detection would have to be implemented at more locations
- b) Vehicle classification abilities would have to be incorporated into the video detection software
- c) A format and protocol for transferring data from the TOC to the RTMIP count program would have to be established

Expansion of the Bakersfield TOC is included in the ITS Strategic Deployment Plan. As the TOC is expanded, these additional capabilities could be added. In the short term, however, the Bakersfield TOC is likely to focus on other efforts more directly related to its central mission, such as establishing communication with all City signals for monitoring signal status and updating timing, as well as installing cameras to monitor traffic flow and congestion.

The County of Kern currently operates a TOC on a smaller scale, with dial-up connections to approximately 70 traffic signals. As more traffic signals are tied into the system and detection capabilities are strengthened, similar efforts could be undertaken to provide data collection capabilities.



## 5.6 Opportunities to Combine Data Collection Efforts

The RTMIP has established a plan for on-going traffic count data collection. This section evaluates opportunities for combining other types of data collection efforts with the traffic count program.

**a. Speed Survey Data.** As discussed in the Needs Assessment, most of the jurisdictions in the County collect speed data, and most use their own staff to do so. Follow-up discussions revealed that speed data are generally collected for the purposes of establishing speed limits under State law. Since the legislative body of each jurisdiction must make findings to establish speed limits, it is appropriate that the responsibility for collecting the relevant data remain at the local level. Therefore, it is not recommended that speed survey data be incorporated into the RTMIP.

However, the pneumatic tube equipment used to provide traffic counts are also capable of producing speed information at the same time. Since the speed information is derived from the same raw data, there is little additional cost to collecting and reporting speed information. The accuracy of this type of speed information is not sufficient for establishing speed limits. It may, however, be of interest in monitoring congestion on particular roads or for route coordination. Therefore, it is recommended that Kern COG discuss with its member agencies whether such data would be useful.

**b. Pavement Condition Data.** As discussed in the Needs Assessment, pavement condition data is becoming increasingly important for jurisdictions as they plan their capital improvement budgets. Reliable, quantitative pavement condition data are best collected by means of specialized equipment that is expensive and will not typically be cost-effective for small or even medium-sized jurisdictions to own, such as falling weight deflectometers or video or laser pavement profilers that are connected to computerized data collection systems. Therefore, the collection of pavement condition data is a logical effort to centralize through the RTMIP. It is of region-wide importance, and often not easily collected at the local level. Therefore, it is recommended that Kern COG initiate a program for the collection of these data on the model of the traffic count data program.

**c. Freeway Service Patrol.** There is currently no Freeway Service Patrol (FSP) in the Kern COG region. However, implementation of an FSP is included in the San Joaquin Valley ITS Strategic Deployment Plan. At such time as an FSP is implemented, it would be logical to incorporate its data collection into that of the Call Box system, since FSP calls are often made through the Call Box system.

**d. Accident Reporting.** Unlike traffic count data, which are collected on a regular basis at recurring locations, accident data must be collected wherever and whenever accidents occur. Therefore, they are a fundamentally different type of data than traffic counts.



Currently, accident data are collected throughout the County by local police departments, the County Sheriff, and the California Highway Patrol (CHP). The data are supposed to be submitted to the statewide reporting system for accident data, the Statewide Integrated Traffic Records System (SWITRS), which has been established and is maintained by the CHP. However, it has been the experience of local jurisdictions that only fatal and injury accidents, which constitute less than one half of all accidents, are reported in SWITRS.

In response to this situation, the City of Bakersfield maintains its own accident database, in addition to SWITRS. City staff comb Bakersfield Police Department accident reports and enter the accident data into the database, including geocoding to the nearest intersection with linear referencing. Approximately 300-400 accidents within the City of Bakersfield are recorded this way each month.

Accident data are highly sensitive because of the potential for litigation. Therefore, agencies are reluctant to share these data with any external **organization. Furthermore, to establish a program similar to Bakersfield's on a County-wide basis would require the dedication of at least one full time equivalent position to the task.** Therefore, it is not recommend that the RTMIP include such an effort at this time. Rather, it is recommended that Kern COG work with the local jurisdictions to improve reporting of accident data to SWITRS.

In addition, it is recommended that Kern COG work with the CHP and on-going efforts such as that at the University of California at Berkeley to improve geocoding capabilities of SWITRS data.

**e. Transit Boardings.** The two largest transit providers in the County, Golden Empire Transit (GET) and Kern Regional Transit, currently collect their own data on transit boardings. GET buses are equipped with infra-red devices to count passenger boardings at each stop. However, these devices are generally not used because of malfunctions and lack of accuracy. Therefore, the only data collected on a regular basis by GET are farebox counts by routes, which reveal only total ridership. These data are summarized monthly in an Excel spreadsheet.

Kern Regional Transit ridership data are collected manually by bus drivers. Total ridership is tabulated monthly and summarized in an Excel spreadsheet.

Thus, at this time, location specific data (i.e., boarding locations) are not collected for the major transit systems in Kern County. Only summary ridership data are collected. While these data are useful to the transit agencies, they do not play a major role in the planning efforts of other member agencies. Therefore, integrating these data collection efforts into the RTMIP does not appear to be a priority.



**f. Call Box Usage Data.** Call box usage data are currently collected by Kern COG in its capacity as the Kern Motorist Aid Authority. Call boxes are assigned unique identifiers, and their locations have already been geocoded. Therefore, call box usage data could be added to the RTMIP database should Kern COG and its member agencies choose to do so.



## 6.0 Uniform Traffic Count Program Implementation Plan

A major component of the RTMIP is to establish a Uniform Traffic Count program that will provide useful and accurate data to jurisdictions within the County in an economical fashion. An additional important function of this program is to comply with state and federal reporting requirements, such as those associated with the Highway Performance Monitoring System (HPMS).

### 6.1 Traffic Count Schedule

The Draft Needs Assessment described a count program with 14 Control Station locations and an additional 584 count locations. Based on discussions with Kern COG and its member agencies, the program was revised to include 22 Control Station locations and an additional 1,021 count locations, for a total of 1,043 count locations. The Draft Needs Assessment also recommended that:

- Count data be collected at each identified location for a 24-hour period once every year on a weekday (Tuesday, Wednesday, or Thursday) while local schools are in session.
- Each location should be counted at approximately the same time each year in order to facilitate analysis of changes over time.
- Control stations should be counted for a 7-day period four times each year.

The Federal Highway Administration's *Traffic Monitoring Guide* (TMG) suggests that statistical analyses indicates that increasing the length of each count is more important to improving data reliability than increasing the frequency of the counts. The TMG recommends counting each location at least once every six years, with high growth or other special needs locations counted more frequently. In addition, HPMS sample segments must be counted at least once every three years. Some cost savings could also be achieved by counting some locations on a less than annual basis.

Discussion with Kern COGs member agencies revealed that a high value was placed on having annual counts throughout the larger jurisdictions. Therefore, it was decided that the count schedule should remain as originally proposed, one 24-hour period each year for each location. However, to achieve more reliable AADT volumes, discussed below, it was decided that the following element of the count schedule should be modified as follows:

- Control stations should be counted for a 7-day period each month.



## **6.2 Traffic Count Standardization**

Currently, the primary source of traffic counts in Kern County is Kern COG itself, by means of a contract with a traffic count provider. These counts are provided in a format defined by Kern COG, including latitude and longitude data to facilitate integration into a GIS database. The GIS database created as part of this RTMIP imports and plots these count data.

The City of Bakersfield and the County of Kern still conduct some traffic count activities independent of the Kern COG count program. To date, these counts continue to use software that produces reports in a proprietary format that is not readily incorporated into a larger database. It is possible to continue to investigate means of transferring these data into a format that can be imported into GIS. It is recommended that a better solution would be to establish a limited number of standard formats for traffic count reporting and to conduct all future counts using technology and software that can produce reports in those formats.

Traffic volume data for Caltrans facilities exist in two systems, the Freeway Performance Measurement System (PeMS) and the Transportation System Network (TSN). As its name implies, PeMS only collects data on freeways, not other state highways. At this time, there is no PeMS data collection in Kern County. In the future, it may be possible to make use of PeMS data. TSN data are accessible only to Caltrans personnel, but they can be converted to a spreadsheet format. With appropriate interagency procedures in place, it would be possible for Kern COG to obtain TSN data on a regular basis from Caltrans. However, it will require some effort to incorporate those data into a GIS database because of the difficulty in goecoding the count locations. In TSN, count locations are identified by route number, postmile, and type of roadway segment (e.g., mainline or ramp). It will be necessary to develop a linear referencing system to identify locations along extremely long roadway sections, and then to identify the appropriate ramp or mainline segment.

## **6.3 Traffic Count Reporting Procedures**

**On an ongoing basis, traffic count data may be collected by any of Kern COG's member agencies, although it is anticipated that the majority of data collection efforts will be conducted under contract to Kern COG itself.** As described above for the RTMIP traffic count program to be successful, it will be necessary for all counts to be reported in a format that is compatible with the RTMIP database, including the provision of latitude/longitude coordinates.

All traffic counts should be submitted to Kern COG in the established electronic format. Kern COG should designate one person to receive and process submitted counts. Counts should be processed and added to the database on a monthly basis. Prior to adding individual counts to the database, Kern COG should perform a reasonableness check on the data, including latitude/longitude coordinates.



Traffic count locations are identified in the database by their latitude/longitude coordinates. **Therefore, it is critical that all future counts are identified by the latitude/longitude of the counts currently in the database, not by an actual GPS reading taken with the new count.** The latitude/longitude coordinates must be specified in decimal form, not degrees/minutes/seconds.

#### **6.4 Performance Monitoring Program Recommended Applications and Procedures**

As the traffic data is collected, the information will be used to calculate and develop various performance monitoring relationships and applications. The following describes some key applications and analyses using the collected data as well as typical traffic monitoring and performance measurement methods that may be employed.

- ADT volumes by direction—measures the magnitude of traffic using the roadway segment in 24 hours
- Peak period/hour by direction—shows the magnitude of traffic using the roadway segment in the peak period or hour
- Peaking factors (peak volume/ADT)—shows the sharpness of the peak hours/periods on the roadway segment
- Generalized arterial volumes/capacity (V/C) ratio by direction for ADT or peak hour/periods—shows generalized capacity availability or deficiency
- Vehicle classification data—shows truck volumes and truck percentages in each corridor
- Traffic growth trends and change in travel patterns—by compiling and analyzing the data for several years, traffic growth trends, modal shift and goods movement trend changes and capacity utilization/performance of the system can be established Countywide, by corridor, or by subregion

The RTMIP database includes a module that calculates Average Annual Daily Traffic (AADT) volumes from the raw count data. This module identifies the day of week and the month of each count, and the appropriate control station for each raw count. It then applies appropriate factors based on the control station to calculate an AADT from the raw count. Updated day-of-week and monthly adjustment factors must be entered into the database for each count year.



## **6.5 System Update Recommendations**

The Uniform Traffic Count Program and its monitoring process are intended to be a **system which will change over the years based on the County's changing travel patterns** and Kern COG and local agency planning needs, requirements and regulations. It is expected that all component of the Uniform Traffic Count Program may be modified in the future based on these changing requirements.

It is recommended that the Uniform Traffic Count Program be evaluated once every two years, and that the count location selection criteria be used to modify the list of count locations. The process to determine potential changes to the count locations or monitoring schedule should be initiated by Kern COG staff sending a change request notice to local jurisdictions. Upon receipt of the notice, local jurisdictions will have an opportunity to recommend additions and/or deletions to the system based on documented and supporting data for the selection criteria.

Upon receipt of the requested changes, Kern COG staff will compile the requests and make recommendations for new count locations to be added, or existing ones to be deleted, to bring the system into compliance with the selection criteria.

In addition, the frequency of counts and the technology used to conduct them should be reviewed as part of the biannual evaluation. In particular, the installation of permanent counting equipment at the master station locations should be considered.

The Control Stations in the count program are located in the City of Bakersfield and unincorporated Kern County. Staff of each of these agencies should provide Kern COG updated day-of-week and monthly adjustment factors for the AADT calculation by March 1 of the following year.



## 7.0 Funding Sources

Procuring funding for data collection and planning activities is always challenging. Most State and Federal funding sources are intended for capital projects, primarily capacity enhancements of the surface transportation system. A few are intended for transit capital investments or operating activities. There are few funding sources that allow the flexibility to use funds for planning activities. Data collection is mandated by the Federal government as part of the Highway Performance Monitoring System (HPMS), and the HPMS program has recently emphasized the importance of ensuring data quality. However, no funding source exists for the improvement or data collection activities.

The existing Kern COG traffic count program is funded by Regional Surface Transportation Program (RSTP) funds. In addition, Kern COG's member agencies are contributing funds for the program under a Memorandum of Understanding in effect through 2010.

The following potential funding sources were investigated for purposes of this evaluation:

- AB 2766 (Air Quality Vehicle Registration Fee) Funds
- Carl Moyer Memorial Air Quality Standards Attainment Program
- Congestion Mitigation and Air Quality (CMAQ)
- Environmental Enhancement and Mitigation (EEM)
- Federal Statewide Transportation Improvement Program (FSTIP)
- Federal Transportation Improvement Program (FTIP)
- Intelligent Transportation Systems (ITS) Research and Development
- Local Transportation Fund (LTF) of the Transportation Development Act (TDA)
- Motor Vehicle Emission Reduction Program (MVERP)
- Regional Surface Transportation Program (RSTP)
- State Transportation Improvement Program (STIP)
- State Highway Operation and Protection (SHOPP)
- Transportation Enhancement Activities (TEA)

Based on a review of the eligibility criteria for each of the above programs, it appears that the following programs are *potential* funding sources for future projects under the RTMIP:

**AB 2766 (Air Quality Vehicle Registration Fee) Funds**—Assembly Bill 2766, adopted in 1990, authorizes the Department of Motor Vehicles to collect a registration surcharge of \$4 per vehicle to fund programs that reduce air pollution from motor vehicles and for related planning monitoring, enforcement and technical studies. Forty percent of these funds are returned to Cities and Counties to fund transportation-related projects that reduce air pollution. Projects that are funded with AB2766 funds must meet the criteria and guidelines in the California Air Resources Board's (CARB) *Criteria & Guidelines*, which state:



The primary purpose of the funds is to reduce emissions from the use of motor vehicles. However, state law also recognizes the need to develop clean air plans that identify the strategies for meeting air quality standards. Ambient air monitoring and technical studies needed to implement the California Clean Air Act are other eligible uses of the funds.

...

The allocation of motor vehicle fees for district planning and technical work should be detailed in district budgets and approved by governing boards. These technical activities should not be funded entirely by motor vehicle fees; at most, the funding should be proportionate to the relative contribution of mobile source emissions.

Thus, to the extent that reliable and accessible transportation data are necessary for the development of plans to carry out Clean Air Act activities, it would appear that AB 2766 funds could be used for RTMIP activities.

**Congestion Mitigation and Air Quality (CMAQ)**—The CMAQ program was created under the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, continued under the Transportation Equity Act for the 21st Century (TEA-21), and reauthorized by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The purpose of the CMAQ program is to fund transportation projects or programs that will contribute to attainment or maintenance of the national ambient air quality standards for ozone, carbon monoxide (CO), and particulate matter (PM).

**According to the CMAQ program's** Interim Program Guidance (October 31, 2006):

Activities in support of eligible projects also may be appropriate for CMAQ investments. Studies that are part of the project development pipeline (e.g., preliminary engineering) under the National Environmental Policy Act (NEPA) are eligible for CMAQ support, **are FTA's Alternatives Analyses**. General studies that fall outside specific project development do not qualify for CMAQ funding. Examples of such efforts include major investment studies, commuter preference studies, modal market polls or surveys, transit master plans, and others. These activities are eligible for Federal planning funds.

Thus, to be eligible for CMAQ funding, an RTMIP activity would have to be tied to a specific CMAQ-eligible project, such as regional multi-modal traveler information systems, traffic signal control systems, transit management systems,



incident management programs, or transportation demand management programs.

**Local Transportation Fund (LTF) of the Transportation Development Act (TDA)**—Under the Transportation Development Act (TDA) of 1971, funding is allocated to transit and non-transit related purposes that comply with regional transportation plans. The TDA provides two funding sources: 1) Local Transportation Fund (LTF), which is derived from a ¼ cent of the general sales tax collected statewide, and 2) State Transit Assistance fund (STA), which is derived from the statewide sales tax on gasoline and diesel fuel. The State Board of Equalization, based on sales tax collected in each county, returns the general **sales tax revenues to each county's LTF**. According to the TDA regulations, up to 3 percent of annual program revenues can be allocated for the conduct of the transportation planning and programming process.

Thus, to the extent that reliable and accessible transportation data are an important part of Kern COG's **planning and programming process, LTF revenues** could be used to fund RTMIP activities.

**Regional Surface Transportation Program (RSTP)**— The Regional Surface Transportation Program (RSTP) was established by California State Statute utilizing Surface Transportation Program Funds apportioned under SAFETEA-LU. Of the Surface Transportation Program funds, 10% are allocated to Transportation Enhancements, 27.5% are retained by the State for its use, and the remaining 62.5% constitutes the RSTP, which is divided among Cities and Counties based on population. Surface transportation planning programs are explicitly identified as an acceptable use of RSTP funds. Thus, to the extent that reliable and accessible transportation data are an important part of Kern COG's planning activities, RSTP revenues can be used to fund RTMIP activities.



## 8.0 Implementation Matrix

<b>Recommendation</b>	<b>Timeframe</b>	<b>Responsible Agency</b>	<b>Potential Funding Source</b>
Implement Uniform Traffic Count Program			
<ul style="list-style-type: none"> <li>Establish count frequencies as described in Action Plan</li> </ul>	Immediate	Kern COG & member agencies	RSTP/LTF
<ul style="list-style-type: none"> <li>Employ pneumatic tube technology</li> </ul>	Immediate	Kern COG	
<ul style="list-style-type: none"> <li>Counts provided by private sector contractor</li> </ul>	Immediate	Kern COG / contractor	RSTP/LTF
<ul style="list-style-type: none"> <li>Counts supplemented by local agencies</li> </ul>	Ongoing	Member agencies	Local Agencies
<ul style="list-style-type: none"> <li>Establish uniform data reporting format(s)</li> </ul>	Immediate	Kern COG	RSTP/LTF
<ul style="list-style-type: none"> <li>Investigate permanent installations at Master Station locations</li> </ul>	Short-term	Kern COG	RSTP/LTF
<ul style="list-style-type: none"> <li>Develop AADT calculation module</li> </ul>	Complete	Kern COG / contractor	
<ul style="list-style-type: none"> <li>Biannual review of program</li> </ul>	Ongoing	Kern COG	RSTP/LTF
Data Integration			
<ul style="list-style-type: none"> <li>Determine whether Master Stations will be co-located with Call boxes; relocate Master Stations if necessary</li> </ul>	Complete; Re-evaluate as necessary	Kern COG	
<ul style="list-style-type: none"> <li>Implement video detection at traffic signals</li> </ul>	Long-term	Local agencies	AB2766 CMAQ
<ul style="list-style-type: none"> <li>Enable vehicle counting abilities at locations with video detection</li> </ul>	Long-term	Local agencies	AB2766 CMAQ
<ul style="list-style-type: none"> <li>Develop protocol for transfer of video detection count data to RTMIP count program</li> </ul>	Long-term	Kern COG and local agencies	RSTP/LTF
<ul style="list-style-type: none"> <li>Include speed data with vehicle count program</li> </ul>	Short-term	Kern COG and local agencies	RSTP/LTF
<ul style="list-style-type: none"> <li>Initiate a program for collection of pavement condition data</li> </ul>	Short-term	Kern COG and local agencies	RSTP/LTF; Local agencies
<ul style="list-style-type: none"> <li>Improve reporting of accident data to SWITRS</li> </ul>	Short-term	Kern COG and local agencies	RSTP/LTF; Local agencies



<b>Recommendation</b>	<b>Timeframe</b>	<b>Responsible Agency</b>	<b>Potential Funding Source</b>
<ul style="list-style-type: none"><li>Investigate new approaches for geocoding SWITRS data</li></ul>	Long-term	Kern COG	RSTP/LTF; PATH
<ul style="list-style-type: none"><li>Do not include speed surveys for establishing speed limits</li></ul>			
<ul style="list-style-type: none"><li>Do not include accident data in RTMIP count program</li></ul>			
<ul style="list-style-type: none"><li>Investigate future use of PeMS data</li></ul>	Long-term	Kern COG and Caltrans	PATH
<ul style="list-style-type: none"><li>Investigate linear referencing system for TSN data</li></ul>	Long-term	Kern COG and Caltrans	PATH



# **Appendix A**

## **Survey Instrument**



## **Appendix B**

### **Recommended Count Locations**



## **Data Dictionary**

**JURIS = Jurisdiction of count location**

**ROADWAY = Roadway on which count is located**

**DIR = Direction from cross street**

**CROSS\_STRE = Cross street of count location**

**ADT\_ID = City of Bakersfield unique ID**

**LON = Longitude of count location**

**LAT = Latitude of count location**

**HPMS = Whether location is on an HPMS segment**

**ENTRY = Whether location is a community/county entry point**

**COMM = If location is an entry point, community to which it is an entry**

**LOC\_SIG = Whether location was selected based on local significance**

**REG\_SIG = Whether location was selected based on regional significance**

**SCREEN = Whether segment containing count location is a model screenline**

**CONTROL = Whether location is a proposed control station**

**GM = Whether location was selected based on goods movement activity**

**CRIT = Criterion number that resulted in addition of point to list (from Table 3.1)**

**CLASS = Whether location is recommended for vehicle classification count**

**ROUTENO = Kern County route number**

**HPMS\_ID = HPMS segment ID**



## **Appendix C**

### **Call Box Usage Statistics**



## **Appendix D**

# **Statewide Call Box Guidelines**



## Statewide Call Box Guidelines

A set of motorist aid guidelines were originally developed by California Highway Patrol (CHP) and Caltrans to guide statewide consistency of the call box systems, which are developed and operated on a county-by-county basis. Updated guidelines developed by CHP, Caltrans and the various SAFE agencies from around the state are currently contained in **the document titled "CHP/Caltrans Call Box and Motorist Aid Guidelines"**, dated May 2005.

The guidelines outline the roles and responsibilities of the various agencies involved in providing motorist aid services in California. The guidelines also provide guidance on the physical aspects –spacing and design of call box systems and individual call box sites. Several sections pertinent to this analysis are extracted from the Statewide Guideline and are presented below with some key words underlined.

### ***Site Requirement***

- Within spacing requirements, call box locations will be selected to have minimal impact on normal highway operation. A call box will not be located where there is less than an eight (8) foot shoulder. Any exceptions shall be reviewed and approved by the local district at Caltrans.

### ***Call Box Spacing***

- Within the guidelines, call box spacing should ensure motorist safety by providing the closest feasible spacing to reduce both pedestrian and vehicle exposure time. Closer spacing also contributes to congestion relief by providing faster notification and clearing of disabled vehicles from the roadway.
- Variation in terrain, available revenue, urban/rural characteristics, and proximity for roadside services are factors in the decision of spacing between call boxes. In order to allow flexibility and still maintain consistency in these installations, the county SAFEs should adhere to the following suggested spacing guidelines:

<b>ADT</b>	<b>SUGGESTED SPACING</b>
Lower than 40,000	3.2 km or more (2.00 mi or more)
40,000 to 75,000	1.6 km to 3.2 km (1.00 mi to 2.00 mi)
75,000 to 100,000	0.8 km to 1.6 km (0.50 mi to 1.00 mi)
Higher than 100,000	0.8 km or less (0.50 mi or less)

- A reasonable spacing on rural highways with low ADTs may be based on geometric and economic needs. Other factors may include the cellular



coverage area and isolation. Spacing does not constitute a system of call boxes but rather a service. These call boxes should only be placed in an area where adequate safe clearance from the roadway is available.

- On Caltrans toll bridges, call boxes should be spaced between 600 to 1,200 feet, depending on whether or not adequate shoulders are provided. Special situations and deviations from this should be discussed with the district liaison.

### ***Call Box Removal, Relocation and Repairs***

- There may be factors, including, but not limited to, significant decreases in annual call volume, administrative issues, and operational issues, that warrant the need to remove call boxes on a systemwide basis. The SAFE will develop a systemwide call box removal plan that shall include a list of recommended call box sites to be removed, the resulting spacing between remaining adjacent sites, and justification for removal. If call boxes are being removed as a result of low call box usage, call box usage data for each call box shall also be provided. However, it should be noted that a call box may be removed due to systemwide decrease in call volume. The SAFE shall submit the call box removal plan to the CHP and Caltrans for review and approval. With the exception of removals for construction, a removal that is planned or in existence for more than six months is considered a permanent removal and requires an approved removal plan.
- A SAFE does not need to submit a removal plan to the CHP and Caltrans for the removal of individual call boxes. However, removals greater than 10% of the number of installed call boxes on any one corridor does require a removal plan.
- Should a call box be taken out of service for repair or temporarily removed due to roadway construction, its pair shall be bagged or temporarily removed. Any exceptions shall be reviewed and approved by the local district at Caltrans.
- Along freeways, expressways, and divided conventional highways, call boxes shall be removed from both sides of the roadway to maintain call box pairing.