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16. Abstract
The Louisiana Department of Transportation and Development (LADOTD) is interested in applying the Federal Highway Administration=s (FHWA) life cycle cost analysis procedures and model to large roadway construction, maintenance, and rehabilitation projects within the state. The purpose of this study was to validate the application of one component of this model-estimation of user delay costs-to projects in Louisiana. The main objective of this research is to determine if the results given for the user delay costs by the FHWA model are sufficiently accurate for use in determining user delay costs for the Louisiana system. A procedure for the study is specified in the body of the report. The study evaluated the delay times incurred by users on interstate highway projects on I-10 in the LaPlace area and I-10 near Lake Charles. The delay times were calculated from the data collected at the site, and compared to the values obtained from the FHWA model.

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Analysis of User Waiting Costs for Construction Projects on Louisiana's Interstate Highway System

FINAL REPORT

By

Fereydoun Aghazadeh, Ph.D., P.E.
Gerald M. Knapp, Ph.D., P.E.
Thomas G. Ray, Ph.D., P.E.
Industrial and Manufacturing Systems Engineering Department
Louisiana State University
Baton Rouge, Louisiana 70803

Sponsored by
Louisiana Transportation Research Center
Baton Rouge, Louisiana

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ABSTRACT

The Louisiana Department of Transportation and Development (LA DOTD) is interested in applying the Federal Highway Administration's (FHWA) life cycle cost analysis procedures and model to large roadway construction, maintenance, and rehabilitation projects within the state. The purpose of this study was to validate the application of one component of this model – estimation of user delay costs – to projects in Louisiana. The main objective of this research is to determine if the results given for the user delay costs by the FHWA model are sufficiently accurate for use in determining user delay costs for the Louisiana system.

A procedure for the study is specified in the body of the report. The study evaluated the delay times incurred by users on interstate highway projects on I-10 in the La Place area and I-10 near Lake Charles. The delay times were calculated from the data collected at the site, and compared to the values obtained from the FHWA model.

For the LaPlace construction project, an in-depth analysis of the LA DOTD's Life Cycle Cost Analysis (LCCA) model performance was conducted. The model overestimated delay time by 10% (with a confidence interval of ~3%..17%) largely due to reduction in queue related delays resulting from diversion around the work zone. The Lake Charles model underestimated delay time by 11% primarily due to an error in the assumed Average Daily Traffic (ADT).

For both sites, the validity of the model input values used and the sensitivity of the model results to errors in the inputs were examined.

Based on the results of the analysis, recommendations were made concerning data collection and modeling procedures, as well as modifications in the model itself in order to improve accuracy of the delay time prediction:

- Care needs to be taken in specification of work zone vehicle speeds, work zone lengths, ADT hourly traffic distribution, and cost rates for the LA DOTD's LCCA model. Traffic distributions should be based on more than one day's worth of

traffic count data collected prior to construction. The traffic counts should also be used to confirm the validity of the assumed ADT. Cost rates derived in earlier years should be extrapolated to the present using a Consumer Price Index (CPI) expansion factor.

- Weekends should be modeled separately from weekdays when applying the LA DOTD's LCCA model, as traffic demand and distribution changed substantially.

- If there are known construction work phases, and work zone length will change during each phase, the phases should be modeled separately.

- The LA DOTD LCCA model has several fundamental weaknesses that should be addressed:

    - The model should be modified to account for the effect of diversion on queue-related delays. This was the dominant source of error in the LA DOTD's model for the LaPlace location.

    - The model should be modified to account for reduced speeds through the work zone during peak traffic hours (regardless of queuing).

    - Further investigation should be made to develop a reliable predictor of road capacity during construction for Louisiana roadways.

IMPLEMENTATION STATEMENT

The following recommendations should be followed in order to implement the results of this study:

- Care needs to be taken in specification of work zone vehicle speeds, work zone lengths, ADT hourly traffic distribution, and cost rates for the LA DOTD's LCCA model. Traffic distributions should be based on more than one day's worth of traffic count data collected prior to construction. The traffic counts should also be used to confirm the validity of the assumed ADT. Cost rates derived in earlier years should be extrapolated to the present using a CPI expansion factor.

- Weekends should be modeled separately from weekdays when applying the LA DOTD's LCCA model, as traffic demand and distribution changed substantially.

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INTRODUCTION

Life cycle cost analysis (LCCA) is an analysis technique for economically evaluating the complete lifetime costs of competing project alternatives. It considers not only initial construction costs, but also ongoing maintenance costs over the lifetime of the project as well as other user costs, such as lost productivity due to traffic delays. Projects are then chosen not just on lowest initial costs, but are also based on whether they minimize costs over the entire project lifetime for all users.

The Federal Highway Administration (FHWA) has published guidelines for conducting LCCA in its *Life-Cycle Cost Analysis in Pavement Design* technical bulletin *[1]*, hereafter referred to as the FHWA LCCA manual. While LCCA is not yet required on state transportation projects using federal dollars, it is likely to be required in the near future.

The FHWA LCCA guidelines provide a methodology and model for calculation of both agency costs (construction, maintenance, and management costs) and user costs. User costs are the costs borne by cars and trucks using the roadway. For maintenance, construction, and rehabilitation projects, user costs are primarily due to capacity reductions in the form of lane reductions such as two lanes on an interstate having to merge into to one lane. From a driver's point of view, the impact of congestion is longer travel times with associated lost productivity, higher fuel costs, increased pollution, increased accident rates, and less easily quantified costs due to user dissatisfaction and frustration.

The Louisiana Department of Transportation and Development (LA DOTD) is interested in evaluating the use of the FHWA LCCA user cost model. This model predicts estimated user costs due to congestion resulting from a planned construction, maintenance, or rehabilitation project. The estimate is then used as part of an overall cost-benefits analysis of the projects feasibility that also considers direct construction costs (labor, materials, and equipment) and future maintenance cost changes.

The FHWA LCCA user cost model is based on results from several national studies. The LA DOTD is concerned, however, about the accuracy of the model as applied to roadwork projects in Louisiana. This study investigates the model's validity as applied to two major construction projects within the state (one on I-10 in LaPlace, and another on I-10 in Lake Charles). The study also investigates the models sensitivity to errors in its input parameters, many of which must be estimated.

OBJECTIVES

The objective of this study was to evaluate the accuracy of the FHWA LCCA user delay cost model in estimating user delay costs for roadwork projects in Louisiana.

SCOPE

This research addressed only the user delay cost component of the FHWA LCCA model. Evaluation of the FHWA LCCA model was further limited to its application to two state roadwork projects in progress at the time of this study (one at I-10 at LaPlace, and another on I-10 at Lake Charles). The evaluation performed consisted of 1) analysis of the accuracy of model inputs, 2) analysis of the model outputs as compared to actual delay times observed, and 3) sensitivity analysis of the model's user delay cost estimates to errors in model inputs.

METHODOLOGY

Delay times were observed and analyzed at two different construction zones — I-10 at LaPlace and I-10 at Lake Charles. The LaPlace construction occurred between mileposts 194 and 209 on I-10 (between Sorrento and LaPlace – see boxed area in Figure 1). The construction zone was approximately 4.3 miles long in each direction, although this varied slightly in length on different days. The posted speed limit in the construction zone was 45 mph, and 70 mph outside the zone (it is normally 70 mph within the work zone). The primary alternate route was US-61 between the Sorrento and LaPlace interchanges.

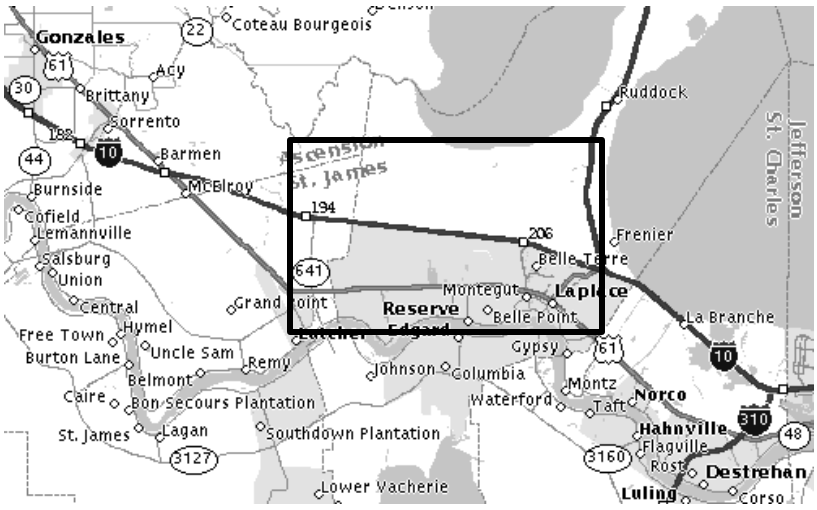

Figure 1
LaPlace construction area

The Lake Charles construction occurred in both directions between mileposts 44 and 64 on I-10 (between Iowa and Jennings, See Figure 2). The construction zone was approximately 6.5 miles in length in the westbound direction, although this varied slightly on different days. The eastbound construction zone was initially about 1.25 miles when observations were collected in November, but was about 6.5 miles in length when observations were later collected in December. The posted speed limit in the construction zone was 40 mph, and 70 mph outside the zone (it is normally 70 mph within the work zone). No alternate route was designated.

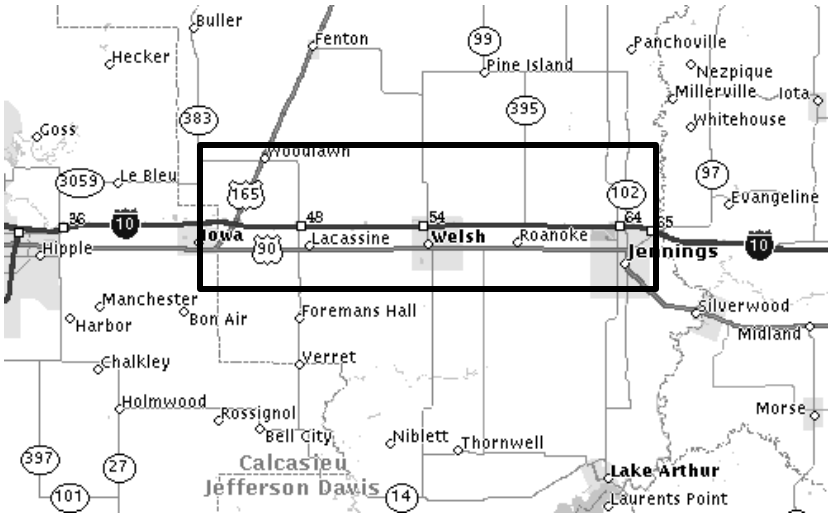

Figure 2
Lake Charles construction area

For each site, the methodology detailed in the following sections was applied.

Data Collection

Delay Time Data

Trip time data was collected on six days during the construction period for the LaPlace location, and on seven days during construction at the Lake Charles location. On each of these days, several trips were made by car through the construction zone in each direction. Table 1 summarizes the trips made.

The vehicle was equipped with a Magellan 330 global positioning system (GPS). The speed of the car, travel distance, and travel time were measured every minute from the GPS device and recorded continuously. The driver was instructed to drive at an "average" rate of speed for the cars around them. In addition, the driver noted at what point within the traffic zone congestion began and what the length of the queue was preceding the start of the work zone. The raw data collected from these trips for LaPlace and Lake Charles may be found in Appendix I and II respectively.

Table 1
Data collection trips

Location	Date	Direction	Starting time - Hour of the Day
LaPlace	Wed 10/24/01	East	4pm, 5pm, 6pm, 7pm
		West	4pm, 6pm
	Thu 10/25/01	East	4pm, 5pm
		West	4pm, 6pm, 7pm
	Fri 10/26/01	East	7am, 7am, 4pm, 5pm
		West	5pm, 6pm
	Sat 10/27/01	East	3pm, 4pm
		West	3pm, 4pm
	Fri 11/2/01	East	4pm
		West	6pm
	Sat 11/3/01	East	12pm, 1pm
		West	1pm
Lake Charles	11/30/01	East	3pm, 5pm
		West	3pm, 4pm
	12/1/01	East	1pm
		West	1pm
	12/6/01	East	4pm, 6pm
		West	4pm, 5pm
	12/7/01	East	12pm, 1pm
		West	12pm, 12pm
	12/14/01	East	6pm
		West	5pm
	12/19/01	East	4pm
		West	3pm
	12/20/01	East	4pm
		West	4pm
	12/21/01	East	2pm
		West	2pm

At LaPlace, a trip was also made through the primary alternate route on Thursday, Oct 25, 2001, during the 5 p.m. hour. This data can be found in Appendix I.

Trip times and distance were recorded either from the start of queuing, or from the start of the work zone, whichever was sooner. Distance and time were recorded through the end of the work zone.

Several trips were also made during peak evening hours outside the construction period (in Oct 2002) at both of the sites. No congestion was noted at either site, and the average vehicle speed was approximately 75 mph. The trip time outside the construction period will be referred to as the *normal trip time*, and is the time to make the trip at the posted 70mph (i.e., trip distance / 70 mph).

Trips during the construction period will be referred to as *construction trip times*. Each trip time is associated with the hour of the day at which the trip was made. Where trips were made at the same time of day on different days, the trip times were averaged together for that time of day.

The *delay time* for a particular time of day was calculated as the difference between the normal (non-construction) trip time and the construction trip time for the same hour of the day. The difference is assumed to be due to the reduced speed caused by construction.

Vehicle count data was also collected by the LA DOTD at both sites within the construction zones using a pneumatic traffic-counting tube, and provided for use in the study.

For the LaPlace location, vehicle counts were collected during the construction period from Monday, October 22, 2001, through Monday, October 29, 2001, for both directions. No counts were collected from 7 p.m. Friday to 11 a.m. Saturday due to the counter having to be moved for paving. The traffic count data for LaPlace is given in Appendix III. Post-construction vehicle count data was also collected at the LaPlace location. Hourly traffic counts were collected from noon Thursday, January 22, 2002, through Saturday evening, January 26, 2002, and again from Friday, February 1, 2002, through Tuesday, February 5, 2002. The post-construction vehicle count data for LaPlace is included in Appendix IV.

For the Lake Charles site, vehicle counts were unfortunately not collected during the construction period. However, post-construction vehicle counts were collected from

Monday, June 24 2002, through Wednesday, June 26, 2002, in the East bound direction, and from noon Thursday, July 20, 2002, through Sunday, June 30, 2002, in the westbound direction. The vehicle count data for Lake Charles is included in Appendix V.

Model Data

LA DOTD engineers had performed the FHWA LCCA user cost analysis for both the LaPlace and Lake Charles locations. The FHWA LCCA user cost model has been implemented by LA DOTD staff using an Excel spreadsheet. The model's input and output values from their analysis were collected from the LA DOTD for both locations. A printout of the spreadsheet for the LaPlace and Lake Charles locations may be found in Appendix VI and VII respectively.

Evaluation of the FHWA User Delay Costs Model

The FHWA LCCA user cost model estimates the difference between normal (non-construction) user costs and user costs during construction within a work zone. These costs are composed of three cost components:

- Vehicle operating costs (VOC), which include fuel usage and vehicle wear due to idling and slowdowns in work zones.

- User delay costs, which include lost productivity due to users being unproductively delayed in work zone traffic.

- Crash costs, deriving from increased accident rates in and around construction zones.

Following is a brief summary of the steps of the FHWA user cost analysis:

1. Estimate traffic demand for the work zone in the year(s) of construction.

2. Calculate normal (non-construction) work zone directional hourly demand:

Hourly Demand = ADT x Hourly Distribution Factor x Hourly Direction Factor (2)

3. Determine the normal (non-construction) work zone capacity and the expected work zone capacity during construction

4. Calculate the daily queuing and delay time due to demand exceeding capacity during normal operations.

5. Calculate the daily queuing and delay time due to demand exceeding capacity during construction.

6. Calculate the daily delay time as the difference between steps 4 and 5.

7. Select unit VOC and user delay cost rates, and calculate VOC and user costs based on these rates and the result of step 6. The total daily delay time can be determined by multiplying the delay time per vehicle each hour by the number of vehicles affected each hour, and adding all hours of the day. The daily delay time can then be multiplied by the project length (in days) to get the total project delay time. The total project delay time is then multiplied by a cost rate per hour to get the total project delay time cost. This process may be done for all users in aggregate, or by different user classes (for example, cars versus trucks) that may have different cost rates.

8. Estimate and add crash costs.

Our concern in this study is strictly with evaluating the accuracy of the user delay costs component. After completing the data collection and summary, the results of the FHWA model were evaluated for each location and compared to the actual delay times observed. There were several components to this analysis:

- Analysis of Model Input Values. Where possible, model input values (such as average daily traffic (ADT) and hourly traffic distribution) were compared against empirical data collected from the construction zones.

- Analysis of Model Outputs. The user delay time predicted by the model was compared against the empirical data collected from the construction zone. In addition, intermediate model results, such as prediction of congestion for each hour of the day, were also compared against the actual data collected.

- Sensitivity Analysis. The sensitivity of the model results based on incorrect model assumptions were also analyzed in order to provide guidelines as to what values should be most carefully estimated.

ANALYSIS AND RESULTS

Summary and Discussion of Collected Data

Tables 2 and 3 summarize the trip delay times for LaPlace and Lake Charles respectively for each hour of the day and in total. The slots where no trip time observations were taken were outside peak hours, and from vehicle counts it appears there was no queuing-related congestion (i.e., user delays were strictly due to speed reduction through the work zone). An average speed of approximately 50 mph was observed through the work zone during non-queuing periods. However, the posted speed of 45 mph was used to determine the normal trip time. Trip delay time equals construction trip time minus the normal trip time. The number of users affected is based on the average traffic counts outside the construction period for the specified time of day. The traffic counts are averaged over five weekday observations for both locations in each direction. The total delay time is equal to the trip delay time multiplied by the number of users affected. This value is then summed over all 24 hours to give a daily delay time for each location. Observations are aggregated across both eastbound and westbound traffic.

For Lake Charles, the delay times for eastbound and westbound were substantially different, and were averaged separately. The posted speed limit of 45 mph was used in determining trip delay times for times having no observations.

Evaluation of the FHWA Model – LaPlace Location

In this section, we evaluate the accuracy of the delay-time model provided for the LaPlace location.

LaPlace Model Inputs

The model requires a number of inputs, which come from observation by LA DOTD technical staff, pavement design information determined by LA DOTD engineers, and from the FHWA LC manual. A printout of the spreadsheet model is shown in Appendix VI.

Table 2
Delay time summary (LaPlace)

Start Time	Number of Obs.	Trip Delay Time (in min)	Number of Users Affected (W | E | Total)	Total Delay Time (W | E | Total) (in hours)
12am	0	2.04 min	267 | 191 | 458	9.08 | 6.49 | 15.57
1am	0	2.04 min	159 | 148 | 307	5.41 | 5.03 | 10.44
2am	0	2.04 min	138 | 149 | 287	4.69 | 5.07 | 9.76
3am	0	2.04 min	145 | 192 | 337	4.93 | 6.53 | 11.46
4am	0	2.04 min	220 |304 | 524	7.48 | 10.34 | 17.82
5am	0	2.04 min	483 | 757 | 1240	16.42 | 25.74 | 42.16
6am	0	2.04 min	793 | 1241 | 2034	26.96 | 42.19 | 69.16
7am	1	2.04 min	907 | 1230 | 2137	30.84 | 41.82 | 72.66
8am	0	2.04 min	958 | 1074 | 2032	32.57 | 36.52 | 69.09
9am	0	2.04 min	970 | 1076 | 2046	32.98 | 36.58 | 69.56
10am	0	2.04 min	845 | 996 | 1841	28.73 | 33.86 | 62.59
11am	0	2.04 min	1004 | 990 | 1994	34.14 | 33.66 | 67.8
12pm	0	2.04 min	972 | 957 | 1929	33.05 | 32.54 | 65.59
1pm	0	2.04 min	1003 | 1030 | 2033	34.1 | 35.02 | 69.12
2pm	0	2.04 min	1092 | 1051 | 2143	37.13 | 35.73 | 72.86
3pm	2	4.41 min	1179 | 1196 | 2375	86.66 | 87.91 | 174.56
4pm	7	9.00 min	1342 | 1185 | 2527	201.3 | 177.75 | 379.05
5pm	2	7.89 min	1392 | 1190 | 2582	183.05 | 156.49 | 339.53
6pm	3	2.41 min	1033 | 1039 | 2072	41.49 | 41.73 | 83.23
7pm	2	2.14 min	698 | 707 | 1405	24.9 | 25.22 | 50.11
8pm	0	2.04 min	542 | 510 | 1052	18.43 | 17.34 | 35.77
9pm	0	2.04 min	538 | 422 | 960	18.29 | 14.35 | 32.64
10pm	0	2.04 min	428 | 352 | 780	14.55 | 11.97 | 26.52
11pm	0	2.04 min	335 | 261 | 596	11.39 | 8.87 | 20.26
Total Daily Delay Time (in hours):				**1,867**

Table 3
Delay time summary (Lake Charles)

Start Time Hour of Day	Number of Obs.	Trip Delay Time (W | E) (in min.)	Number of Users Affected (W | E | Total)	Total Delay Time (W | E | Total) (in hours)
12am	0	2.68	422 | 492 | 914	18.85 | 21.98 | 40.83
1am	0	2.68	415 | 427 | 842	18.54 | 19.07 | 37.61
2am	0	2.68	385 | 374 | 759	17.2 | 16.71 | 33.9
3am	0	2.68	415 | 401 | 816	18.54 | 17.91 | 36.45
4am	0	2.68	560 | 392 | 952	25.01 | 17.51 | 42.52
5am	0	2.68	784 | 536 | 1320	35.02 | 23.94 | 58.96
6am	0	2.68	996 | 703 | 849	44.49 | 31.4 | 37.92
7am	0	2.68	1032 | 905 | 1937	46.1 | 40.42 | 86.52
8am	0	2.68	1072 | 1061 | 2113	47.88 | 47.39 | 94.38
9am	0	2.68	1170 | 1102 | 2272	52.26 | 49.22 | 101.48
10am	0	2.68	1288 | 1154 | 2442	57.53 | 51.55 | 109.08
11am	0	2.68	1341 | 1243 | 2584	59.9 | 55.52 | 115.42
12pm	2	2.68 | 5.95	1331 | 1326 | 2657	59.45 | 131.5 | 190.95
1pm	4	2.68 | 8.06	1358 | 1402 | 2760	60.66 | 188.34 | 248.99
2pm	1	2.68 | 7.98	1347 | 1322 | 2669	60.17 | 175.83 | 235.99
3pm	2	2.68 | 26.51	1385 | 1410 | 2795	61.86 | 622.99 | 684.85
4pm	5	10.26 | 14.46	1444 | 1561 | 3005	246.92 | 376.2 | 623.13
5pm	3	12.37 | 44.97	1329 | 1640 | 2969	274 | 1229.18 | 1503.18
6pm	2	2.68 | 10.29	1121 | 1280 | 2401	50.07 | 219.52 | 269.59
7pm	0	2.68	1050 | 1098 | 2148	46.9 | 49.04 | 95.94
8pm	0	2.68	883 | 901 | 1784	39.44 | 40.24 | 79.69
9pm	0	2.68	742 | 839 | 1581	33.14 | 37.48 | 70.62
10pm	0	2.68	649 | 655 | 1304	28.99 | 29.26 | 58.25
11pm	0	2.68	521 | 558 | 1079	23.27 | 24.92 | 48.2
Total Daily Delay Time (in hours):				**2,550**

Average Daily Traffic (ADT). The LaPlace model used an ADT of 34,000 (combined for both directions). This number was derived from LA DOTD records for the control sections within the construction zone. It is unknown when the ADT had last been updated.

From the post-construction vehicle counts (Appendix IV) plus one day of data collected by the LA DOTD prior to construction (on January 11, 2001 – a vehicle count of 35,285), the 3-sigma (99.7%) confidence interval for the 24-hour count (combined for both directions) was 35,362 ± 4,834 (based on eight days of observation). The assumed ADT falls well within this confidence interval and is within 4% of the observed mean. The assumption appears reasonable.

Data on traffic counts collected during the work zone implementation, however, varies substantially from the assumed ADT. Table 1 shows vehicle counts for three different weekdays during the construction period.

Table 4
Daily vehicle counts (LaPlace)

Date	Daily Vehicle Counts
10/23/01	29,100
10/24/01	27,167
10/25/01	25,200
Average=27,156 Standard Deviation=1950 +/-3stdev confidence interval = [21,305..33,005]	

The 3-day average represents a 19% reduction from the assumed ADT. This indicates that a significant diversion of traffic (due to alternate routes or avoided trips) is occurring around the work zone during construction.

The LA DOTD's spreadsheet model does not consider diversion. It assumes that the full ADT moves through the work zone each day in calculating user delay costs. As a result, there is an implicit assumption that diverted traffic will have user costs equal to traffic moving through the work zone. The validity of this assumption is addressed later in this report.

Hourly Traffic Distribution in Each Direction. The values used in the LA DOTD's user costs model were derived by observation of one day in the year (two days are noted but they have identical data). A sample over several days (preferably taken over several weeks) would be preferable to insure the distribution was representative.

It has already been noted that traffic counts during the construction period were substantially less than during the non-construction period. The percentage distribution will be addressed here.

Figure 3 shows the overall traffic distribution by hour as a percentage of the total daily traffic. The model distribution was based on data collected January 11, 2001, at which time there was no construction. The other three series were collected during construction. The distribution shows that traffic was considerably more constant (spread out) throughout the workday than was assumed in the model distribution on all three days during construction. This might again be due in part to avoidance behaviors (e.g., time-shifting).

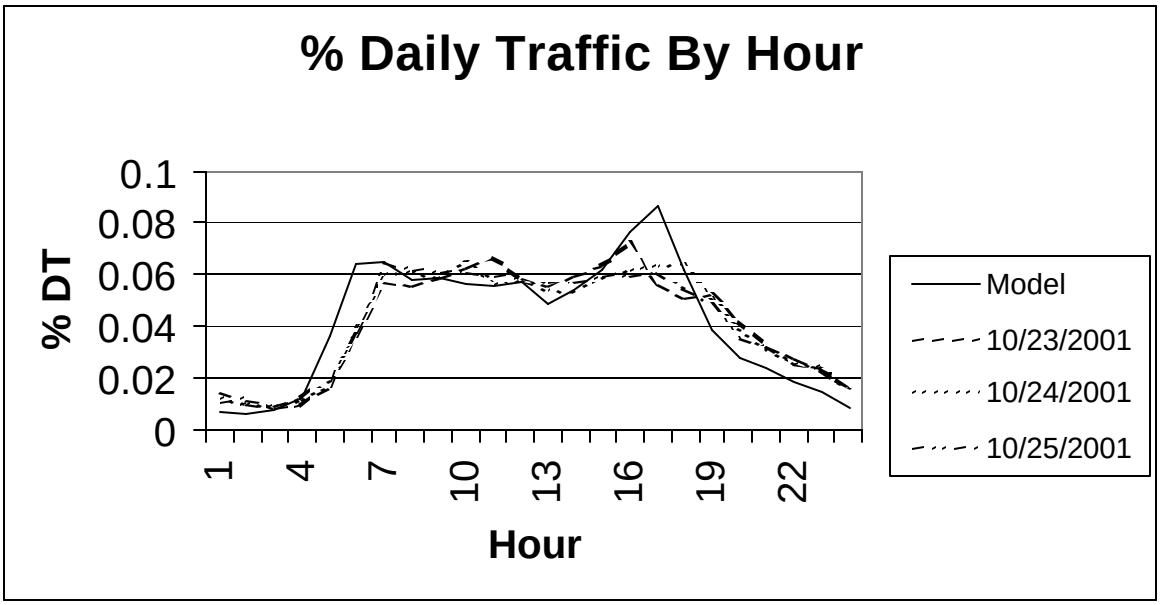

Figure 3
LaPlace traffic distribution by hour as a percentage of total daily traffic

Figures 4 and 5 show the percent of traffic flowing in each direction by hour. Again, the model assumption (based on January 11, 2001 data) is shown against the three workdays during construction. Also included is a half day of data from a weekend date (Saturday, October 27, 2001). This data shows that eastbound traffic was 5-10% higher throughout most of the day than was assumed in the model calculations.

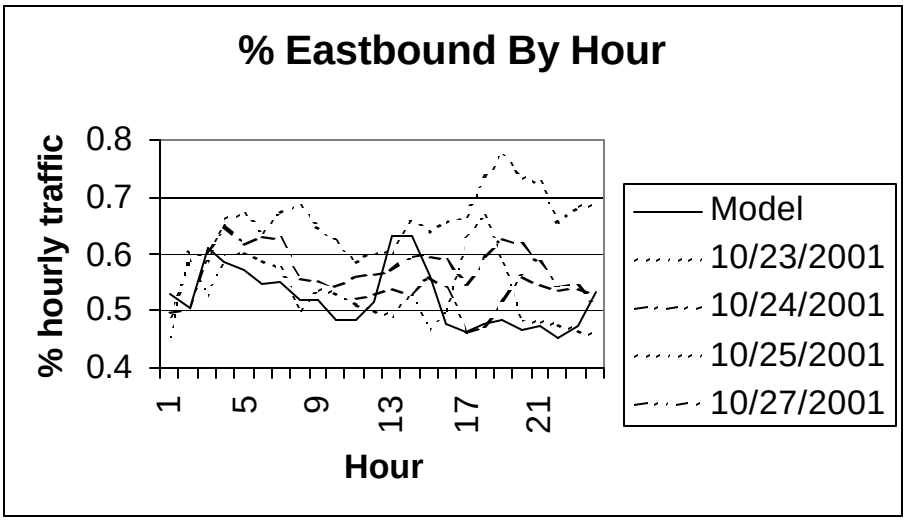

Figure 4
Percent of traffic flowing eastbound by hour (LaPlace)

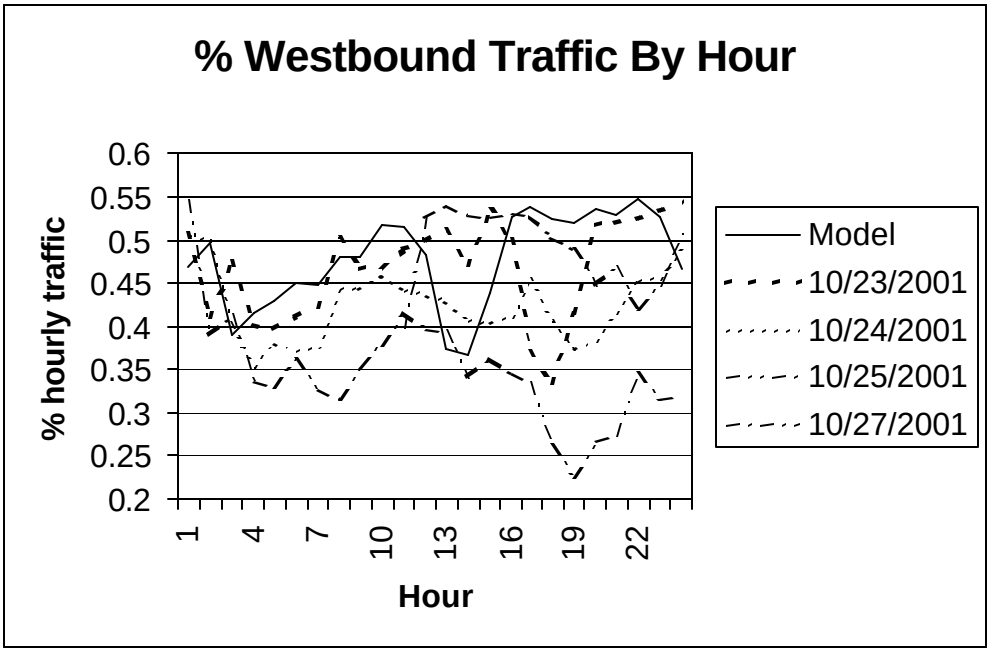

Figure 5
Percent of traffic flowing westbound by hour (LaPlace)

Figures 6 and 7 show the actual traffic count distributions for these east and westbound traffic. As noted previously, traffic was considerably lower than assumed during the construction workdays. Note however that a considerably different pattern of traffic occurred on the weekends (as well as considerably higher peak traffic). On the

weekend day (Saturday, October 27, 2001), traffic was much lower than projected during the morning hours, but stayed high throughout the afternoon and into the evening hours (later than the normal peak hours). Due to the substantial differences in traffic patterns observed over the weekend, it is recommended that weekends and holiday periods be modeled separately.

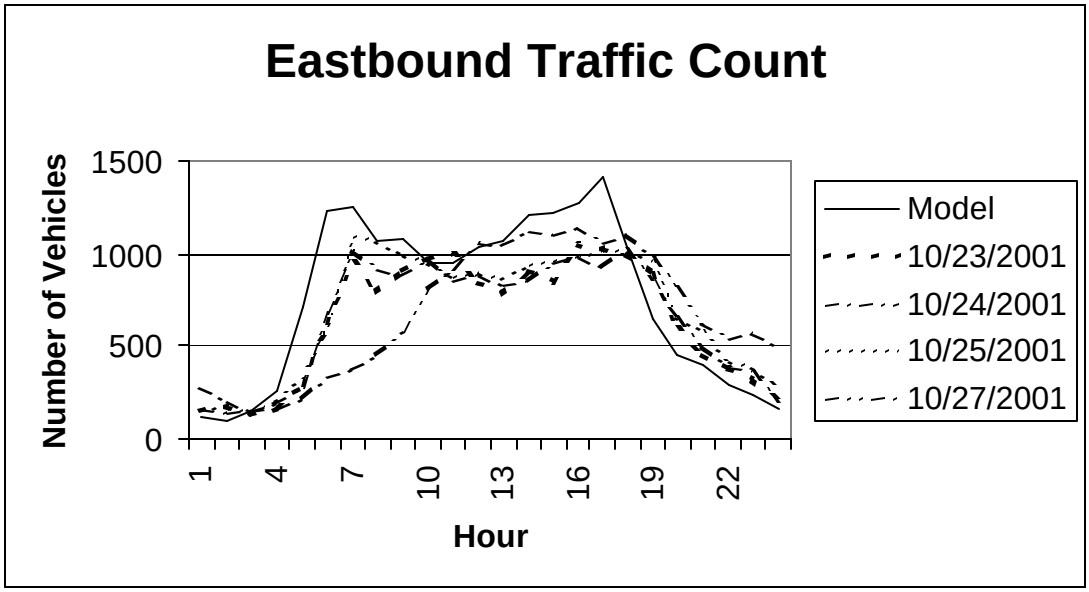

Figure 6
Actual traffic count distributions for eastbound direction (LaPlace)

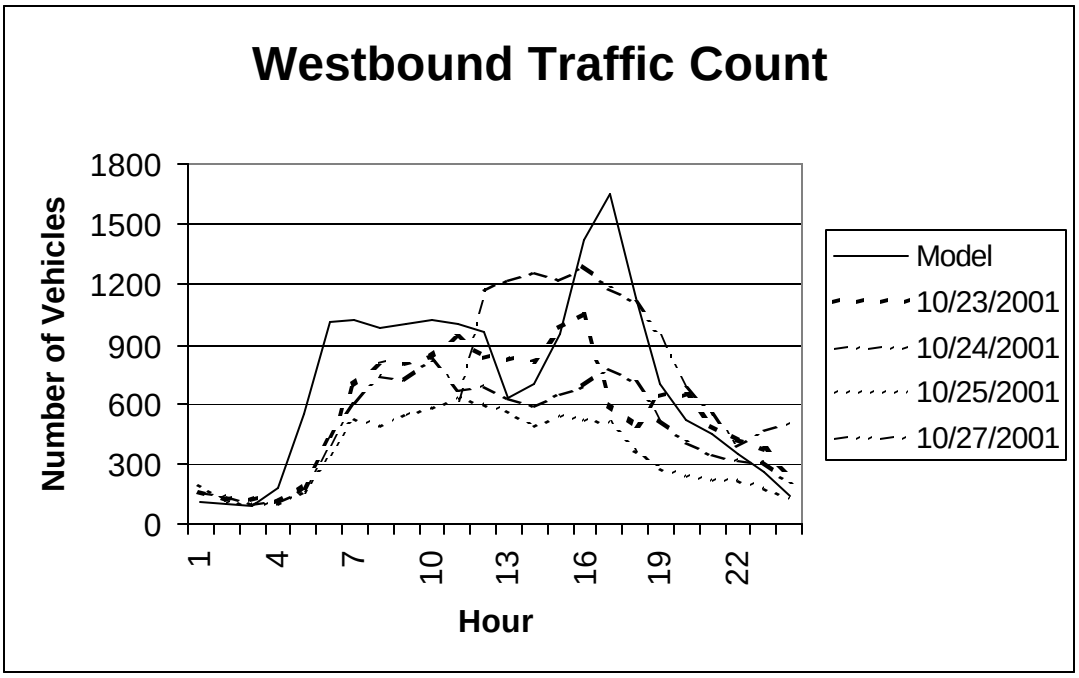

Figure 7
Actual traffic count distributions for westbound direction (LaPlace)

Percent of cars, single unit trucks, combination trucks. The values used in the model appear to have been derived by observation. These values have a significant effect on the cost calculations, and were examined for validity in this study.

The percentage of cars versus trucks was substantially different than that assumed in the model during the work zone period. The model assumed 81.4% cars, and 18.6% trucks (combined single and combination trucks). Table 5 presents the car count readings for four days during the construction period, during peak traffic periods (~3-5pm).

Table 5
Car counts at peak traffic during construction (LaPlace)

Date	Cars	Trucks	% Cars	% Trucks
Wed. 10/24/2001	879	111	88.8	11.2
Thur. 10/25/01	146	6	96.1	3.9
Fri. 10/26/01	1242	72	94.5	5.5
Sat. 10/27/01	1124	38	96.7	3.3

It appears that the percentage of cars in the work zone is considerably higher than assumed (and conversely, the percentage of trucks is considerably lower). This has important consequences for the model accuracy, as unit delay time costs are substantially higher (~2x) for trucks than for passenger cars.

Assuming the percentages used in the model accurately represented traffic during non-construction periods, the discrepancy may be due to higher diversion rates among trucks than cars. Truck drivers tend to be better versed in alternate routes, have more control over timing, and have good communication regarding developing traffic problems.

Work zone length for each work zone. The model assumed a work zone length of 5.121 miles in each direction. During observations, the work zone length was only 4.3 miles in length. The impact of the extra length on the model prediction was largely cancelled out by the fact that the model assumed a 60 mph speed limit throughout most of the zone, while in fact the speed limit was posted 45 mph throughout the entire zone (see the following paragraph).

Speed assumptions. Work zone speeds used in the model (45 and 60 mph) were based on assumed posted limits for different sections of the construction zone; however, the actual posted speed within the entire work zone was 45 mph. An upstream speed of 70 mph is based on the posted speed limit for this section of the interstate. Queue speed (6 mph) was based on judgment. The validity of these assumptions was examined. Table 6 summarizes the average upstream, work zone, and queue speeds for trips over several days.

The average values show that the assumptions were reasonably accurate, with an upstream average speed of 74 mph (versus 70 mph assumed in the model), and a queue speed of 7 mph (versus 6 mph assumed in the model). The work zone average speed of 41-44 mph was in line with the 45mph used in modeling part of the work zone; however, 60mph was assumed for the bulk of the work zone in the model, and this is not consistent with the vehicle speeds observed.

Table 6
Average observed upstream, work zone, and queue speeds (LaPlace)

	Eastbound			Westbound	
	Upstream	Work Zone	Queue	Upstream	Work Zone
10/24/2001	72	30.44			44.79
		57.07			43.6
		49.07			
		49.18			
10/25/2001		51.66			46.19
		36.46			46.89
					59.47
10/26/2001		54.98	5.95		57.03
		29.12	9.93		55.16
		24.57			35.75
10/27/2001	76.7	52.76			25.66
	73.6	56.72			21.58
11/2/2001		26.9	4.77		36.6
11/3/2001		31			52.4
		23.5			
AVERAGE	74.1	41.0	6.9	-	43.8
STDEV	2.4	13.1	2.7	-	12.0

A significant difference was noted between work zone speeds in the presence or absence of a queue ahead of the work zone. This is significant as queues appear during peak hours, and thus a large number of vehicles are affected. Table 7 summarizes the difference in work zone speeds between queue and non-queue time periods.

Table 7
Difference in work zone speeds during queue and non-queue periods (LaPlace)

	During Queuing (mph)	**No Queuing (mph)**
Average	25.6mph	47.4mph
Std Dev	2.8mph	9.1mph

In fact, even when there was no queuing, work zone traffic speeds during peak traffic hours were less than during non-peak hours. The model does not consider these speed reductions.

Unit Delay Time Dollar Values (Car, Single Truck, and Combination Truck). This input obviously has a significant impact on the final estimates of delay time cost. The FHWA LCCA manual (pp. 22-23) provides several sources of data, and the values used in the LA DOTD's model are consistent with these sources. The relevant FHWA tables have been included in Appendix VII. However, the FHWA values are for 1996 dollars, and it is unclear as to whether any Consumer Price Index (CPI) expansion factor was applied to bring the values up to 2001. We did not have a means of validating these cost rates further.

Capacity. Figure 3.4 (p. 50) in the FHWA LCCA manual provides a graph used to derive the road capacity at an 80% reliability level (i.e., the minimum capacity available at least 80% of the time). This value was used in the LA DOTD's model. A copy of Figure 3.4 from the FHWA LCCA manual may be found in Appendix VII.

The assumed capacity of 1,270 at the 80% reliability level was compared against the demand levels at which saturation (i.e., queuing) developed. It appears that the actual capacity was lower than Figure 3.4 in the FHWA LCCA manual would indicate. Table 8 presents traffic counts during periods of queue development on the eastbound work zone. Vehicle counts are given for 1-4 p.m. on October 26, 2001 and 1-3 p.m. on October 27, 2001.

Table 8
Traffic counts during queue development in the eastbound work zone (LaPlace)

Date	Time	Vehicle Count	Queue
Oct 26th	1pm	948	(No observation)
(Eastbound)	2pm	1093	(No observation)
	3pm	1220	(No observation)
	4pm	1167	(No observation)
	5pm	1221	4:15pm - 1.37mile queue
	6pm	1139	5:32pm - 2.48mile queue
Oct 27th	1pm	1225	(No observation)
(Westbound)	2pm	1259	(No observation)
	3pm	1225	(No observation)
	4pm	1294	3:41pm - 0.79mile queue
	5pm	1183	4:36pm - 0.87mile queue

As can be seen, a substantial queue developed on October 26 although the highest traffic count was 1,221 and was preceded by a count of 1,167 in the prior hour. On October 27, traffic did exceed capacity and there was a queue; however, observations were not available from earlier in the day to see when they developed. On days when queues did not develop (October 23-25), the highest traffic counts never exceeded 1,080. It appears the actual work zone capacity is in the range of 1,100-1,200 vehicles per hour.

Added Time Rates For Work Zone. This represents the additional trip time through the work zone due to stopping from an initial speed for the work zone and then returning to the regular posted speed after the work zone. These values were determined from Table 2.3 (p. 18) of the FHWA LC manual. The values are from 1996. Only passenger car values are given for 70 mph in this table; the truck speeds were presumably determined by extrapolation from values at lower speeds. We have no means of validating these specific values directly.

Added Vehicle Operating Costs (VOC) for Work Zone. The added VOC are additional costs borne by the user due specifically from stopping from an initial speed, and then resuming that speed after the work zone. These values were determined from Table 2.3 (p. 18) of the FHWA LC manual. The model calculations used the values from this table, which are stated in 1996 dollars. The values should have been brought to equivalent 2001 dollar values using a CPI expansion factor. Only passenger car values are given for 70 mph in this table; presumably the truck speeds were determined by extrapolation from values at lower speeds. We have no means of validating these specific values directly.

Added Time Rates for Queuing. This is added time due to stopping and resuming speed when entering and exiting a queue ahead of a work zone. These values were determined from Table 2.3 (p. 18) of the FHWA LC manual. The values used are from 1996. Only passenger car values are given for 70 mph in this table; presumably the truck speeds were determined by extrapolation from values at lower speeds. We have no means of validating these specific values directly.

Added VOC for Queuing. This is added VOC associated with stopping and resuming speed when entering and exiting a queue ahead of a work zone. These values were determined from Table 2.3 (p. 18) of the FHWA LC manual. The model calculations used the cost values from this table, which are stated in 1996 dollars. The values should be brought to equivalent 2001 dollar values using a CPI expansion factor. Only passenger car values are given for 70 mph in this table; presumably the truck speeds were determined by extrapolation from values at lower speeds. We have no means of validating these specific values directly.

LaPlace Model Outputs

Following is discussion on the major model outputs and their validation. The main intermediate output value produced by the model is *queue size and length.* Final output values from the model include:

- *Reduced speed delay and cost:*
  - *In work zone.*
  - *In queue.*
- *Added time delay and cost:*
  - *For slowing down and speeding up at start and end of work zones.*
  - *For slowing down and speeding up at start and end of queues.*
- *Added VOC:*
  - *due to reduced speed in work zone.*
  - *due to stop/start for queue.*
  - *Due to idling in the queue.*
- *Total daily work zone delay time (in hours) and cost.* This is simply the sum of the above components.

Table 9 provides the comparison of queue lengths predicted by the spreadsheet model versus actual (averaged) observed queue lengths at different dates and times. Queue length is a direct determinant of queue-related waiting costs, and therefore an indicator of accuracy of the model. Queue lengths are given in miles. Model queue lengths are the average lengths used for cost calculations.

Table 9
Actual versus predicted queue lengths, in miles (LaPlace)

Hour of Day	Direction	Number of Obs	Predicted Avg	Actual Avg
12-1	E	1	0	0
	W	1	0	0
1-2	E	1	0	0
	W	1	0	0
3-4	E	1	0	0
	W	1	0	0.79
4-5	E	5	0	0.98
	W	3	1.09	0.29
5-6	E	3	0.24	0.80
	W	2	1.10	0
6-7	E	1	0.22	0
	W	3	1.06	0
7-8	E	1	0	0

The summary indicates that the model overestimated the average queuing taking place. Again, this is likely due to traffic diversion. Surprisingly, larger queues were predicted for the westbound lanes in the evening, but the reverse was found during queue observations. There are apparently additional dynamics occurring in the work zone that may need to be studied further.

Table 10 presents a summary of queue delays by hour of the day. It is apparent that queue delays were considerably lower than predicted by the model.

Table 11 summarizes the delay time results of the LA DOTD LCCA model as compared to our empirical results. Because the observed data is sampled from a stochastic population, it was necessary to construct a statistical confidence interval around the point observation in order to provide a sufficient basis for comparison between the observed and predicted values. To construct this interval, empirical distributions were developed for the delay time in each hour based on the observations collected. Using these distributions, a Monte Carlo simulation was then run to generate 1,000 daily delay observations. From these observations, an overall 95% confidence

interval on the total daily delay was constructed. The 95% confidence interval estimate is 1,867±149, or 1718..2016.

Table 10
Comparison of predicted versus actual average queue delays (LaPlace)

Hour	Direction	# of Obs.	Actual (hr)	Predicted (hr)
7-8AM	E	1	0	0
	W	1	0	0
12-1	E	1	0	0
1-2	E	1	0	0
	W	1	0	0
3-4	E	1	0	0
	W	1	0.032	0
4-5	E	5	0.181	0
	W	3	0.013	0.182
5-6	E	2	0.104	0.040
	W	2	0	0.183
6-7	E	2	0	0.037
	W	2	0	0.177
7-8	E	1	0	0
	W	1	0	0.092

Table 11
Comparison of observed versus predicted total daily delay time (LaPlace)

	Observed (point estimate & 95% CI)	Predicted	% Diff From Obs. (point estimate & 95% CI)
Daily Total Delay Time (in hours)	1,867 (1718..2016)	2,074	9.98% (2.9%..17.2%)

There is a significant, although not large difference, between the observed and predicted values, with the point estimate of the difference showing the predicted value approximately 10% greater than the observed. The difference was traced largely to the model overestimation of queuing delays versus observed delays. The cause of this overestimation is based in the assumption that traffic will not divert to alternate routes, or change behaviors (earlier or later travel times and avoided trips). As was previously

noted, traffic volume was substantially lighter than normal through the work zone during the construction period, and also demonstrated "spreading" of the peak traffic volume.

Queue Length and Delay Analysis Using Actual Daily Traffic Counts

It was previously indicated that the ADT values used in the Laplace model were substantially higher than the observed total daily traffic counts. The investigators were asked to explore whether the model would have been more accurate in its queue length and queue delay predictions had more accurate total daily traffic values been used.

The LA DOTD traffic count data collected at LaPlace overlapped with queue length and delay data collected by the investigators on four days – Wednesday, October 24, 2001 through Saturday October 27, 2001. Traffic count data was missing for part of Friday afternoon and Saturday morning due to a malfunction with the collector so we used the average weekday traffic for Wednesday and Thursday to complete the Friday data, and the average morning traffic from Wednesday through Friday to complete the Saturday morning traffic.

Each of the four days was analyzed separately. The total daily traffic count was used in place of the original ADT for each of the four days in the spreadsheet model. However, the original traffic distribution data was used, as the hourly counts during construction would be distorted by the reduced capacity and not necessarily reflect true demand in each hour.

Table 12 provides a summary of actual queue lengths (AQL) versus predicted max (PQL-Max) and average (PQL-Avg) queue lengths in number of vehicles for hours during which observations were taken. It also summarizes actual queue delay (AQD) in minutes versus predicted average queue delay (PQD). The times indicate the end of the hour in which the observations were taken (e.g., an observation at 3:10 p.m. would be recorded as 4 p.m.) in order to be consistent with the model.

Queuing was observed on two of the four days for which traffic count data was available (Friday, October 26, 2001 and Saturday. October 27, 2001). For the other two days (Wednesday, October 25 – Thursday, October 26) no queuing was predicted and no queuing was observed. No queuing was predicted or observed in the westbound lane on Friday, October 26 or in the eastbound lane on Saturday, October 27 as well.

Substantial queuing was observed for the eastbound lane on Friday, October 26, 2001. Between 4 and 5 p.m., a queue of 1.37 miles in length was observed with a delay time of 12 minutes. Between 5 and 6 p.m., a queue of 2.48 miles as observed, with a delay time of 14.5 minutes. For both of these time periods, the model did not predict any queueing.

Queuing was both observed and predicted by the model for the westbound lane on Saturday, October 27, 2001. Significant queuing (0.8 miles, 2.25 minutes delay) was observed between 3 and 4 p.m. although the model predicted no queuing. The model estimated of queue length was only half that observed between 4 and 5 p.m., but the observed delay time was actually smaller than the estimate by approximately 15%. Although we don't have observations, the traffic counts were actually higher during the hours 1-2 p.m. and 2-3 p.m. than from 3-4, so it is likely that there was queuing then as well. The model did not predict any queuing during those time periods. As previously noted, traffic distributions were substantially different on the weekends, and the LA DOTD should consider modeling weekends separately.

Based on these observations, it appears that the model is still inaccurately estimating queue delay and lengths even when very accurate daily total traffic count data is used.

The same analysis was performed using the average total daily traffic (=27,156) for all days during construction that traffic count data was collected. In this case, the model did not predict any queue or queue delays at all for any hour of the day or either direction, which conflicts with this study's observations. Of six days observed, queuing was observed on 3 of the days. Therefore, it appears that simply lowering the ADT to

account for traffic diversions during the construction does not improve the quality of the estimate.

Table 12
Predicted versus actual queue length and delay based on actual daily traffic counts (LaPlace)

Wed 10/24/01					
Time of Day	**West Bound**				
	AQL	**PQL-Max**	**PQL-Avg**	**AQD**	**PQD**
5pm	0	0	0	0	0
7pm	0	0	0	0	0
Time of Day	**East Bound**				
	AQL	**PQL-Max**	**PQL-Avg**	**AQD**	**PQD**
5pm	0	0	0	0	0
6pm	0	0	0	0	0
7pm	0	0	0	0	0
8pm	0	0	0	0	0
Thu 10/25/01					
Time of Day	**West Bound**				
	AQL	**PQL-Max**	**PQL-Avg**	**AQD**	**PQD**
5pm	0	0	0	0	0
7pm	0	0	0	0	0
8pm	0	0	0	0	0
Time of Day	**East Bound**				
	AQL	**PQL-Max**	**PQL-Avg**	**AQD**	**PQD**
5pm	0	0	0	0	0
6pm	0	0	0	0	0
Fri 10/26/01					
Time of Day	**West Bound**				
	AQL	**PQL-Max**	**PQL-Avg**	**AQD**	**PQD**
6pm	0	0	0	0	0
7pm	0	0	0	0	0
Time of Day	**East Bound**				
	AQL	**PQL-Max**	**PQL-Avg**	**AQD**	**PQD**
5pm	0	0	0	0	0
6pm	0	0	0	0	0
Sat 10/27/01					
Time of Day	**West Bound**				
	AQL	**PQL-Max**	**PQL-Avg**	**AQD**	**PQD**
4pm	.79	0	0	2.25	0
5pm	.87	.4	.07	3.15	3.68
Time of Day	**East Bound**				
	AQL	**PQL-Max**	**PQL-Avg**	**AQD**	**PQD**
4pm	0	0	0	0	0
5pm	0	0	0	0	0

Evaluation of the FHWA Model – Lake Charles Location

In this section, we evaluate the accuracy of the delay-time model provided for the Lake Charles location. It should be noted that this model was developed after completion of the construction project.

Lake Charles Model Inputs

Average Daily Traffic (ADT). The Lake Charles model used an ADT of 34,650 (combined for both directions). This number was derived from LA DOTD records for the control sections within the construction zone. It is unknown when the ADT had last been updated.

From the post-construction vehicle counts (Appendix V), the 3-sigma (99.7%) confidence interval for the 24-hour count (combined for both directions) was 45,798 ± 4,846 (based on seven days of observation). This is well above the ADT assumed by the model, and is the primary reason that the model did not predict any queuing.

Unfortunately, no traffic counts were collected by the LA DOTD during construction, so it was not possible to determine if there was any reduction in traffic.

Hourly Traffic Distribution in Each Direction. The values used in the LA DOTD's user costs model were derived by observation using traffic counts from two weekdays after construction had ended. The count data used is the same post-construction count data provided to us for this study (Appendix V). Because no count data is available from the construction period, there is no means of determining whether the traffic distribution changed during the construction period.

Percentage of cars, single unit trucks, combination trucks. The values used in the model appear to have been derived by observation. These values have a significant effect on the cost calculations, and were examined for validity in this study.

In contrast to LaPlace, the percentage of cars versus trucks did not change substantially during the work zone period from the percentages assumed in the model. The model assumed 75.5% cars, and 24.5% trucks (combined single and combination trucks). Table 13 presents the car count readings from five days during the construction period, during peak traffic periods (~3-5 p.m.). The percentages observed were almost exactly the same as those assumed for the model.

Table 13
Car counts at peak traffic during construction (Lake Charles)

Date	% Cars	% Trucks
11/30/01	75.6	24.4
12/06/01	75.8	24.2
12/19/01	73.6	26.4
12/20/01	71.3	28.7
12/21/01	67.0	33.0

Work zone length for each work zone. The LA DOTD model assumed a work zone length of 11.68 miles in both directions. This differed substantially from the observed work zone lengths. The eastbound construction remained at approximately 5.3 miles in length over the two months data was collected. The westbound construction zone, however, was only 1.3 miles in length during the November observations, and then lengthened to approximately 6.3 miles in length for the December observations.

The impact on the model's delay time prediction due to the difference in lengths assumed by the model and observed is partially offset by the model's assumption that the speed limit was 60 mph throughout almost the entire work zone. In fact, the work zone was posted 40 mph throughout.

Speed assumptions. Work zone speeds used in the model (45 and 60 mph) were based on assumed posted limits for different sections of the construction zone; however, the actual posted speed within the entire work zone was 40 mph. An upstream speed of 70 mph is based on the posted speed limit for this section of the interstate. The models assumed queue speed was not relevant, as the model did not predict queue development

in either direction. Table 14 summarizes the average upstream, work zone, and queue speeds for trips over several days.

Table 14
Average observed work zone and queue speeds (Lake Charles)

	Eastbound		Westbound	
	Work Zone	**Queue**	**Work Zone**	**Queue**
11/30/2001	18.7	7.0	18.37	11.04
	20.87	6.43	11.41	8.11
12/01/2001	20.58	14.50	46.02	
12/06/2001	18.77	11.59	44.46	
	30.60	10.61	48.60	
12/07/2001	36.78	8.28	48.35	41.54
	49.26		57.98	
12/14/2001	36	11.08	17.27	13.02
12/19/2001	38.9	11.4		
12/20/2001	30.5	5.2		
12/21/2001	40.5	12.9		
AVERAGE	**31.0**	**9.9**	**36.6**	**18.4**
STDEV	**10.3**	**3.0**	**17.8**	**15.5**

The average values show that the assumed work zone speed was inaccurate, particularly during queuing periods. As in LaPlace, a significant difference was noted between work zone speeds in the presence or absence of a queue ahead of the work zone. This is significant as queues appear during peak hours, and thus a large number of vehicles are affected. In fact, even when there was no queuing, work zone traffic speeds during peak traffic hours were less than during non-peak hours. The model does not consider these speed reductions.

Capacity. Figure 3.4 (p. 50) in the FHWA LCCA manual provides a graph used to derive the road capacity at an 80% reliability level (i.e., the minimum capacity available at least 80% of the time). This value was used in the LA DOTD's model. A copy of Figure 3.4 from the FHWA LCCA manual may be found in Appendix VII. Due to the lack of traffic count data from the construction period, the capacity assumption could not be validated.

Other Input Factors. Values used for unit delay time dollar values (for cars, single trucks, and combination trucks), added time for the work zone and queuing, and added VOC for the work zone and queuing were the same as for the LaPlace model.

Lake Charles Model Outputs

Following is discussion about the major model outputs and their validation for the Lake Charles model. The types of model outputs were previously described in the "LaPlace Model Outputs" section.

Table 15 provides the comparison of queue lengths predicted by the spreadsheet model versus actual observed queue lengths at different dates and times. Queue length is a direct determinant of queue-related waiting costs, and therefore is an indicator of accuracy of the model. Queue lengths are given in miles. Model queue lengths are the average lengths used for cost calculations.

Table 15
Actual versus predicted queue lengths, in miles (Lake Charles)

Hour of Day	Direction	Number of Obs	Predicted Avg	Actual Avg
12-1	E	1	0	0.23
	W	1	0	0.15
1-2	E	2	0	.43
	W	2	0	0
2-3	E	1	0	0.81
3-4	E	1	0	0.89
	W	1	0	0.41
4-5	E	3	0	1.37
	W	2	0	0.88
5-6	E	1	0	3.74
	W	2	0	0.81
6-7	E	2	0	1.07

The summary indicates that the model seriously underestimated the average queue length – in fact, the model did not predict any queuing. This was the result of an assumed ADT that was significantly below the observed ADT.

Table 16 summarizes the delay time results of the LA DOTD LCCA model for Lake Charles as compared to our empirical results. As with the LaPlace site, because the observed data is sampled from a stochastic population it was necessary to construct a statistical confidence interval around the point observation in order to provide a sufficient basis for comparison between the observed and predicted values. To construct this interval, empirical distributions were developed for the delay time in each hour based on the observations collected. Using these distributions, a Monte Carlo simulation was then run to generate 1,000 daily delay observations. From these observations, an overall 95% confidence interval on the total daily delay was constructed. The 95% confidence interval estimate is 2,550±93, or 2457..2643.

Table 16
Comparison of observed versus predicted total daily delay time (Lake Charles)

	Observed (point estimate & 95% CI)	**Predicted**	**% Diff. From Observed (point estimate & 95% CI)**
Daily Total Delay Time (in hours)	2,550 (2457..2643)	2,252	-11.69% (-8.3%..-14.8%)

The Lake Charles model significantly underestimated the actual delay times encountered. This can primarily be attributed to use of an ADT in the model that was either based on outdated data or improperly entered.

Summary of User Delay Time Cost Model Performance

For the LaPlace case, the predicted daily delay time was approximately 10% higher than the observed daily delay time. The dominant source of error was traffic reductions from diversions and other traffic behavior modifications, resulting in smaller than expected queuing-related delays. For the Lake Charles case, the model substantially underestimated the daily delay time (-11%). The error was due primarily to an incorrect ADT value.

Several other sources of errors were noted, but when aggregated largely cancelled each other out:

- Vehicle speeds assumed for most of the work zones in the model were higher than posted and observed. This tended to underestimate user delay time. Care must be taken in specifying these values as they directly impact calculation of reduced speed delays.

- Lengths assumed in the models did not match observed work zone lengths (the model lengths were longer), and the work zone lengths also changed during the project. These assumptions led to the overestimation of user delay time. Care must be taken in specifying these values as they directly impact calculation of reduced speed delays. In addition, if there are known phases, the model should be calculated for each phase and the work zone lengths expected in those phases.

- Observed work zone speeds during peak hours were considerably lower than assumed. Since during the peak period many cars are affected by the lower speeds, the user delay time is underestimated. The model should be modified to account for these speed changes during peak traffic hours.

- The actual capacity of the work zone during construction at the LaPlace site appeared to be substantially lower than that projected by the FHWA LCCA manual. As a result, the user delay costs were overestimated. Since vehicle count data was not collected during construction, capacity at the Lake Charles site was not evaluated.

- The spreadsheet model does not consider changes in traffic count and distribution for weekends, holidays, and seasonal or special event considerations. Weekend distributions for the LaPlace site had a substantially different distribution than weekdays, with heavy demand sustained over the entire afternoon and into the evening, resulting in long queues. Weekend

delay costs should be modeled separately, and traffic distribution data and ADT should be collected separately for weekends as well.

- Many of the cost rates used in the spreadsheet model were for 1996, and should be extrapolated to the current year using the CPI index. This does not impact the delay time estimates, but does tend to underestimate the associated cost of the delay time.

- The spreadsheet model does not consider any form of diversions of traffic from the work zones. It appears from the traffic count data that up to 20% of the ADT may be diverting around the zone. Those diverting around the zone may have different delay and VOC costs than those delayed in the work zone. In conducting this study, it was assumed that diverted users had equal costs to those traveling through the work zone. The validity of this assumption was not confirmed.

- Related to the previous observation, in LaPlace the car vs. truck distribution differed significantly during construction from what was found in the work zone. This indicates that trucks appear to be diverting in larger numbers than cars. It is not likely that this has a substantial impact on user costs, as trucks would not generally be diverting if the alternate route was not at least as fast as the work zone.

Sensitivity Analysis

An analysis of the sensitivity of the estimated user delay costs was performed with respect to the model inputs. Each input was evaluated with respect to the impact of a ±10% error in the input value on the user delay cost.

Table 17
Sensitivity analysis

Input Variable	Error in Estimated Daily Delay Time In Response to ±10% Error in Input Value	Comments
Work zone length	±5%	Directly affects reduced speed delay. Reduced speed accounted for close to 50% of the delay time at both LaPlace and Lake Charles.
Work zone speed	±5-7%	Direct inverse effect on reduced speed delay. Also impacts added time and costs, so effect is not exactly 1:1. Reduced speed accounted for close to 50% of the delay time at both LaPlace and Lake Charles.
ADT	±5-30%	If the ADT is low and no queuing is anticipated, then error in the ADT only affects reduced speed delay (on a 1:1 basis). If queues are expected, the impact of the ADT depends on the hourly traffic distribution (greater concentration of traffic at peak hours will yield substantially higher queuing delays)
Diversion	±0-30%	Diversion reduces traffic flow through the work zone and thus queuing. The exact impact of diversion depends on the hourly traffic distribution. The model currently assumes no diversion.
Hourly traffic distribution	Peak hour, ±0-10% Non-peak hour, ±0-5%	We are only looking at 10% error in 1 hour here (with the remaining hour percentages being adjusted evenly to maintain a sum of 100%). Only influences queue delay times. See discussion on ADT above.
Capacity	±0-30%	Only influences queue delay times.
Queue speed	±0-5%	Directly affects queue delay calculations. Queue delay accounted for ~50% of the delay time at both LaPlace and Lake Charles.
% of cars, single unit trucks, combination trucks	For delay time: ±0.5-1% For delay costs: ±1-8%	Effect on delay time is primarily through change in added time and costs, which is relatively minor. Effect on delay costs is more pronounced, since cost rates are significantly different between the user classes.
Unit delay time cost rate – cars, truck, combination truck	No bearing on delay time ±10% on delay cost	Only used in cost calculations.
Added time & cost – work zone	±0.5-1%	Only accounts for 10-20% of reduced time delay, which in turn is approximately 50% of total delay time.
Added time & cost – queuing	±0-3%	Only accounts for 10-20% of queuing time delay & cost, which in turn is approximately 50% of total delay time.

CONCLUSIONS AND RECOMMENDATIONS

For the LaPlace construction project, we were able to conduct an in-depth analysis of the LA DOTD's LCCA model performance. The model overestimated delay time by 10% (with a confidence interval of ~3%..17%) due largely to reduction in queue related delays resulting from diversion around the work zone. We were not able to draw significant conclusions from the Lake Charles model as a result of apparent errors in the model inputs, as well as the lack of traffic count data being collected during the construction period.

Based on the analysis, the following items are recommended:

- Care needs to be taken in specification of work zone vehicle speeds, work zone lengths, ADT, hourly traffic distribution, and cost rates. Traffic distributions should be based on more than one day's worth of traffic count data collected prior to construction. The traffic counts should also be used to confirm the validity of the assumed ADT, if the ADT is not known to be current. Cost rates derived in earlier years should be extrapolated to the present using CPI factors.

- Weekends should be modeled separately from weekdays, as traffic demand and distribution changed substantially.

- If there are known construction work phases, and work zone length will change during each phase, the phases should be modeled separately.

- The LA DOTD model has several fundamental weaknesses that should be addressed:

- The model should be modified to account for the effect of diversion on queue-related delays. This was the dominant source of error in the LaPlace model.

- The model should be modified to account for reduced speeds through the work zone during peak traffic hours (regardless of queuing).

- At the LaPlace site, it was observed that the actual capacity of the work zone during construction at the LaPlace site appeared to be substantially lower than that projected by the FHWA LCCA manual and used in the LA DOTD model. Further investigation should be made to develop a reliable predictor of road capacity during construction for Louisiana roadways.

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APPENDIX I: Data Collection and Delay Time at LaPlace

DATA COLLECTION AT LA PLACE SECTION
Wednesday, Oct. 24, 2001

East Bound
Time: 4:00 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	3:00:35	60	0
2	3:02:54	50	
3	3:03:57	46	
4	3:04:14	40	
5	3:04:25	35	
6	3:05:41		4.18

Average speed: 49.18 MPH

East Bound
Time: 5:10 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	4:10:44		0
2	4:12:05	68	
3	4:12:30	42.5	
4	4:12:40	48	
5	4:13:00	46.6	
6	4:13:52	47	
7	4:14:30	50.3	
8	4:14:53	40.7	
9	4:15:47		4.13

Average Speed: 49.07 MPH

East Bound
Time: 6:22 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	5:22:25	72.1	0.08
2	5:23:25	54.28	1.8
3	5:24:25	63.3	2.21
4	5:25:25	52.3	3.16
5	5:26:25	51.2	3.95
6	5:26:55	54.6	4.36

Note: Headway + 6 car length
Average Speed: 57.07 MPH

East Bound
Time: 7:06 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	6:05:45	42	0.1
2	6:06:30	0	0.62
3	6:08:59	32.5	0.74
4	6:09:59	50.2	1.32
5	6:10:59	50.9	2.18
6	6:11:59	46.6	2.96
7	6:12:59	42.6	3.52
8	6:14:04	50.7	4.32

Average Speed: 30.44 MPH

DATA COLLECTION LA PLACE SECTION
Thursday, Oct. 25, 2001

East Bound
Time: 4:03 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	3:03:43		0
2	3:04:43	42.7	0.97
3	3:05:43	51.2	1.78
4	3:06:43	51.1	2.63
5	3:07:43	50.5	3.5
6	3:08:35	51.8	4.19

Average speed: 51.66 MPH

East Bound
Time: 5:26 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	5:26:40	18.3	0
2	5:27:40	17.1	0.53
3	5:28:40	25.4	0.82
4	5:29:40	29.5	1.21
5	5:30:40	28	1.75
6	5:31:40	53.2	2.4
7	5:32:40	49.1	3.33
8	5:33:12	55.6	3.97

Average speed: 36.46 MPH

Alternative Road
Time: 5:13 PM

No.	GPS Time	Dist. (Mile)	Remark
1	4:13:14	0	
2	4:17:40	2.44	Entering 61 South
3	4:37:25	16.47	Exit to 310 South

Car Count on alternative road:
Time: 5:10 - 6:22 PM
Cars: 175
Trucks: 7

Cars: 146 per hour
Trucks: 6 per hour

DATA COLLECTION AT LA PLACE SECTION
Wednesday, Oct. 24, 2001

West Bound
Time: 4:41 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	3:41:00		0
2	3:41:28	45	
3	3:41:50	31.3	
4	3:42:26	46.2	
5	3:44:12	41.2	
6	3:45:40	42.9	
7	3:46:30	51.2	
8	3:46:48		4:33

Average Speed: 44.79 MPH

West Bound
Time: 6:07 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	5:07:35	1.6	0.01
2	5:08:35	32.8	0.08
3	5:09:35	60.9	0.72
4	5:10:35	70.9	1.82
5	5:11:35	46.2	2.78
6	5:12:35	58.5	3.67
7	5:12:38	58.3	3.68

Note: Headway + 6 car length
Average Speed: 43.6 MPH

Car counter:
I-10 East 4-5 PM = 111 trucks and 879 cars.
* 2.26 trucks and 18 cars per mile
* 111 trucks and 879 cars per hour

Estimate car per day: 12890.887

I-10 West 6:15-7:00 PM = 67 trucks and 693 cars.
* 2 trucks and 21 cars per mile
* 89 trucks and 924 cars per hour

Estimate car per day: 15070.961

DATA COLLECTION LA PLACE SECTION
Thursday, Oct. 25, 2001

West Bound
Time: 4:41 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	3:41:08	55.5	0
2	3:42:08	42.5	0.78
3	3:43:08	44.6	1.57
4	3:44:08	51.3	2.32
5	3:45:08	53.5	3.21
6	3:46:08	47.7	3.89
7	3:46:40	57.9	4.26

Note: Headway ± 5 car length.
Average speed: 46.19 MPH

West Bound
Time: 6:10 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	5:10:01	39.1	0
2	5:11:01	59	0.86
3	5:12:01	49.2	1.73
4	5:13:01	42.6	2.52
5	5:14:01	44.5	3.16
6	5:15:01	53.5	3.87
7	5:15:25	58.1	4.22

Note: Headway ± 7 cars
Average speed: 46.89 MPH

West Bound
Time: 7:04 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	6:04:28	58.5	0
2	6:05:28	65.8	1.09
3	6:06:28	59.8	2.09
4	6:07:28	49.2	2.99
5	6:08:28	61.2	3.98
6	6:08:38	64.7	4.13

Average speed: 59.47 MPH

DATA COLLECTION AT LA PLACE SECTION
Friday, Oct. 26, 2001

East Bound
Time: 7:07 AM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	6:07:15	63	0
2	6:08:15	44.2	1.11
3	6:09:15	54.7	1.92
4	6:10:15	51.3	2.89
5	6:11:15	57.5	3.77
6	6:11:50	53.6	4.2

Note: Headway $\pm$ 6 cars
Average speed: 54.98 MPH

West Bound
Time: 7:36 AM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	6:36:36	65.3	0
2	6:37:36	59.5	1.17
3	6:38:36	68.1	2.11
4	6:39:36	41.1	3.15
5	6:40:36	46.3	3.84
6	6:41:03	55.8	4.23

Average speed: 57.03 MPH

DATA COLLECTION AT LA PLACE SECTION
Friday, Oct. 26, 2001

East Bound
Time: 4:17 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
1	3:17:45	16.7	0.18	Queue starts
2	3:18:45	22.3	0.32	
3	3:19:45	8.5	0.53	
4	3:20:45	0	0.62	
5	3:21:45	0	0.64	
6	3:22:45	3.7	0.66	
7	3:23:45	0	0.68	
8	3:24:45	9.8	0.78	
9	3:25:45	4.1	0.93	
10	3:26:45	11.4	1.04	
11	3:27:45	6.6	1.18	
12	3:28:45	4.7	1.3	
13	3:29:45	1.6	1.37	Const. Starts
14	3:30:45	18.9	1.5	
15	3:31:45	33	1.84	
16	3:32:45	8.6	2.18	
17	3:33:45	21.7	2.45	
18	3:34:45	46.5	2.97	
19	3:35:45	49.4	3.86	
20	3:36:45	15.1	4.42	
21	3:37:45	41	4.98	
22	3:38:23	49.5	5.56	

Note: Headway during queue ± 1 car length
Average speed:
in queue: 5.95 MPH
in construction: 29.12 MPH

East Bound
Time: 5:32 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
1	4:32:12	0.5	0.07	Queue starts
2	4:33:12	2.4	0.13	At queue:
3	4:34:12	5.1	0.19	1.5 - 2 car length
4	4:35:12	4.8	0.28	
5	4:36:12	14.6	0.46	
6	4:37:12	19.3	0.78	
7	4:38:12	5.6	0.97	
8	4:39:12	19.6	1.2	
9	4:40:12	15.5	1.57	
10	4:41:12	14.8	1.72	
11	4:42:12	5.7	1.88	
12	4:43:12	0	1.98	
13	4:44:12	6.7	2.05	
14	4:45:12	14.5	2.27	
15	4:46:12	6.8	2.43	
16	4:46:46	0	2.48	Const. Starts
17	4:47:47	19.1	2.49	
18	4:48:47	14.7	2.72	
19	4:49:47	11.4	2.99	
20	4:50:47	12.6	3.26	
21	4:51:47	15.4	3.46	
22	4:52:47	24.3	3.83	
23	4:53:47	39.2	4.4	
24	4:54:47	47.1	5.1	
25	4:55:47	48.7	5.89	
26	4:56:47	38.8	6.51	
27	4:57:00	50.9	6.67	

Average speed:
in queue: 9.93 MPH
in construction: 24.57 MPH

DATA COLLECTION AT LA PLACE SECTION
Friday, Oct. 26, 2001

West Bound
Time: 5:17 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	4:17:50	38.2	0
2	4:18:50	63.1	1.36
3	4:19:50	52.5	1.85
4	4:20:50	55.3	2.67
5	4:21:50	55.4	3.65
6	4:22:30	63.7	4.29

Average speed: 55.16 MPH

West Bound
Time: 6:31 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	5:31:18	46.2	0
2	5:32:18	15.7	0.51
3	5:33:18	24.9	0.85
4	5:34:18	32.4	1.29
5	5:35:18	34.5	1.92
6	5:36:18	36.7	2.53
7	5:37:18	47.7	3.25
8	5:38:18	53	4.06
9	5:38:31	50.9	4.3

Average speed: 35.75 MPH

Note:
1. Car counter at I-10 East 4:35 - 5:50 PM: 90 trucks and 1,552 cars
   a. In queue: 7 trucks and 125 cars per mile
      In construction road: 3 trucks and 51 cars per mile

   b. 72 trucks and 1242 cars per hour.

   Estimate car per day: 19506.82716

DATA COLLECTION AT LA PLACE SECTION
Saturday, Oct. 27, 2001

East Bound
Time: 3:03 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	2:03:37	76.7	0
2	2:04:37	44	1.21
3	2:05:37	52.4	2.04
4	2:06:37	52.2	3.17
5	2:07:37	33.5	3.66
6	2:08:27	43.2	4.25

Average speed: 52.76 MPH

East Bound
Time: 4:09 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)
1	3:09:45	73.6	0
2	3:10:45	67.2	1.14
3	3:11:45	58.1	2.19
4	3:12:45	54.1	3.08
5	3:13:45	45.9	3.88
6	3:14:16	47.8	4.27

Average speed: 56.72 MPH

DATA COLLECTION AT LA PLACE SECTION
Saturday, Oct. 27, 2001

West Bound
Time: 3:41 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
1	2:41:05	5.7	0	Queue starts
2	2:42:05	26.7	0.38	
3	2:43:11	6.6	0.79	
4	2:43:39	14.2	0.79	Const. Starts
5	2:44:39	15	0.93	
6	2:45:39	15.6	1.23	
7	2:46:39	18	1.37	
8	2:47:39	33.2	1.81	
9	2:48:39	28	2.14	
10	2:49:39	21.4	2.61	
11	2:50:39	19.3	2.88	
12	2:51:39	42.5	3.5	
13	2:52:39	47.7	4.25	
14	2:53:38	51.5	5.06	

Average speed:
in queue: 18.47 MPH
in construction: 25.66 MPH

West Bound
Time: 4:36 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
1	3:36:01	17.2	0	Queue starts
2	3:37:01	33.1	0.47	
3	3:37:45	5.4	0.87	
4	3:39:11	0	0.87	Const. Starts
5	3:40:11	0	0.87	
6	3:41:11	0.3	0.9	
7	3:42:11	18.9	1	
8	3:43:11	17	1.21	
9	3:44:11	20	1.5	
10	3:45:11	36.1	2.07	
11	3:46:11	17.7	2.28	
12	3:47:11	28	2.7	
13	3:48:11	17.9	2.97	
14	3:49:11	50.6	3.35	
15	3:50:11	61.6	4.32	
16	3:51:00	62.8	5.12	

Average speed:
in queue: 16.48 MPH
in construction: 21.58 MPH

Note:
1. Car counter at I-10 West 3:51 - 4:39 PM: 30 trucks and 899 cars
   a. In queue: 2 trucks and 61 cars per mile.
      In construction: 1.5 trucks and 44 cars per mile.

   b. 38 trucks and 1124 cars per hour.

Estimate car per day: 15843.98268

DATA COLLECTION LA PLACE SECTION
Friday, Nov. 2nd, 2001

East Bound
Time: 4:36 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
1	4:36:44	7.6	0.04	Queue starts
2	4:37:44	0	0.05	
3	4:38:44	0.5	0.07	
4	4:39:44	0	0.07	
5	4:40:44	1.5	0.08	
6	4:41:44	5.8	0.27	
7	4:42:44	0	0.4	
8	4:43:44	4.5	0.41	
9	4:44:44	0	0.46	
10	4:45:44	8.6	0.53	
11	4:46:44	4.4	0.82	
12	4:47:44	7.7	0.95	
13	4:48:44	6.8	1.11	
14	4:49:44	9.1	1.2	
15	4:50:44	6.1	1.27	
16	4:51:44	8.7	1.35	
17	4:52:44	2.1	1.4	
18	4:53:44	4.3	1.44	
19	4:54:44	2.6	1.5	
20	4:55:44	0.8	1.54	
21	4:56:44	0	1.58	
22	4:57:44	4.4	1.64	
23	4:58:44	5.4	1.76	
24	4:59:44	13.8	1.88	
25	5:00:44	7.1	2.15	
26	5:01:44	3.4	2.19	
27	5:02:44	0	2.24	
28	5:03:44	3.9	2.29	
29	5:04:44	1.4	2.35	
30	5:05:44	6.4	2.44	
31	5:06:44	5.7	2.48	
32	5:07:44	0	2.54	
33	5:08:44	3.6	2.61	
34	5:09:44	6.8	2.67	
35	5:10:44	3.3	2.74	
36	5:11:44	3	2.8	
37	5:12:44	0	2.86	
38	5:13:44	3.2	2.88	
39	5:14:44	0	2.9	
40	5:15:44	2.2	2.95	
41	5:16:44	1	2.99	
42	5:17:44	6.2	3.07	
43	5:18:44	12.2	3.22	
44	5:19:44	17.4	3.44	
45	5:20:44	0	3.49	
46	5:21:44	8	3.57	
47	5:22:44	4	3.63	
48	5:23:09	8.5	3.73	Const. Starts
49	5:24:09	14	3.89	
50	5:25:09	16.5	4.09	
51	5:26:09	8.9	4.26	
52	5:27:09	11.3	4.48	
53	5:28:09	29.1	4.76	
54	5:29:09	47.6	5.4	
55	5:30:09	47.9	6.23	
56	5:31:09	39	6.96	
57	5:32:09	42.1	7.57	
58	5:32:23	50.2	7.87	

Note:
1. Average speed in the queue: 4.77 MPH.
2. Average speed in the road construction: 26.9 MPH.

West Bound
Time: 5:59 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
1	5:59:57	65.2	0	
2	6:00:57	32.2	0.57	
3	6:01:57	32.3	1.13	
4	6:02:57	35.4	1.75	
5	6:03:57	42.2	2.38	
6	6:04:57	20.7	3.03	
7	6:05:57	52.9	3.56	
8	6:06:54	56.1	4.24	

DATA COLLECTION LA PLACE SECTION
Saturday, Nov. 3rd, 2001

East Bound
Time: 12:26 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
1	12:26:01	60.5	0	
2	12:28:30	35.8	1.78	
3	12:29:30	2.1	2.09	
4	12:30:30	27.4	2.45	
5	12:31:30	30.4	3.17	
6	12:32:30	7.9	3.4	
7	12:33:30	20.6	3.65	
8	12:34:15	50.1	4.26	

Note:
Average speed: 31 MPH

West Bound
Time: 1:08 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
1	1:08:31	59.7	0	
2	1:09:31	54	1.25	
3	1:10:31	45.5	1.9	
4	1:11:31	46.2	2.58	
5	1:12:31	41.6	3.38	
6	1:13:25	52.4	4.28	

Note:
Average speed: 52.4 MPH

East Bound
Time: 1:35 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
1	1:35:27	56.2	0	
2	1:36:27	17.1	0.66	
3	1:37:27	15.2	0.86	
4	1:38:27	12.1	1.05	
5	1:39:27	26.4	1.27	
6	1:40:27	38.5	1.81	
7	1:41:27	33.8	2.54	
8	1:42:27	12.8	2.67	
9	1:43:27	36.1	3.05	
10	1:44:27	25.2	3.45	
11	1:45:27	14.8	3.72	
12	1:46:15	38.7	4.23	

Note:
Average speed: 23.5 MPH

APPENDIX II: Data Collection and Delay Time at Lake Charles

DATA COLLECTION AT LAKE CHARLES SECTION
I-10 WEST AND EAST

West Bound
Nov. 30, 2001 2:57 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	2:57:56	3.0	-	Queue
2	2:58:56	29.1	0.41	
3	2:59:56	11.9	0.82	
4	3:00:56	0.7	0.85	
5	3:01:56	7.9	0.96	
6	3:02:56	15.0	1.16	
7	3:03:56	9.4	1.31	
8	3:04:56	5.9	1.39	
9	3:05:56	16.0	1.57	
10	3:06:56	8.7	1.83	
11	3:07:56	7.1	2.00	
12	3:08:56	3.7	2.03	
13	3:09:01	8.2	2.04	Construction
14	3:10:01	2.3	2.41	
15	3:11:01	12.7	2.55	
16	3:12:01	3.1	2.80	
17	3:13:01	24.1	2.92	
	3:14:02	46.2	3.27	

Average Speed:
In queue: 11.04 MPH
In Construction: 18.37 MPH

Car Counts Between 4:30 - 4:50 pm
cars: 186
trucks: 60

East Bound
Nov. 30, 2001 3:37 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	3:37:00	-	-	Queue
2	3:38:00	2.1	0.05	
3	3:39:00	7.8	0.15	
4	3:40:00	11.9	0.30	
5	3:41:00	9.6	0.57	
6	3:42:00	12.7	0.65	
7	3:43:00	7.5	0.76	
8	3:44:00	7.0	0.84	
9	3:44:38	6.0	0.89	Construction
10	3:45:38	10.3	1.02	
11	3:46:38	7.5	1.16	
12	3:47:38	23.8	1.44	
13	3:48:38	8.6	1.62	
14	3:49:38	3.5	1.74	
15	3:50:38	6.2	1.83	
16	3:51:38	4.0	1.92	
17	3:52:38	11.4	2.01	
18	3:53:38	6.0	2.17	
19	3:54:38	16.7	2.45	
20	3:55:38	8.2	2.55	
21	3:56:38	9.9	2.66	
22	3:57:38	26.6	2.90	
23	3:58:38	48.6	3.60	
24	3:59:38	49.1	4.48	
25	4:00:38	43.8	5.29	
26	4:01:38	39.8	5.77	
27	4:02:38	49.5	6.43	
28	4:02:42	50.8	6.52	

Average Speed:
In Queue: 7.0 MPH
In Construction: 18.7 MPH

DATA COLLECTION AT LAKE CHARLES SECTION
I-10 WEST AND EAST

West Bound
Nov. 30, 2001 4:15 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	4:15:14	18.2	-	Queue
2	4:16:14	10.7	0.29	
3	4:17:14	20.3	0.52	
4	4:18:14	8.1	0.70	
5	4:19:14	5.8	0.77	
6	4:20:14	7.6	0.86	
7	4:21:14	6.3	1.00	
8	4:22:14	22.9	1.29	
9	4:23:14	3.8	1.42	
10	4:24:14	4.0	1.50	
11	4:25:14	-	1.54	
12	4:26:14	5.0	1.59	
13	4:27:14	1.3	1.65	
14	4:28:15	7.8	1.76	Construction
15	4:29:15	11.5	1.87	
16	4:30:15	7.4	1.96	
17	4:31:15	4.4	2.06	
18	4:32:15	6.7	2.29	
19	4:33:15	8.8	2.44	
20	4:34:15	14.3	2.66	
21	4:34:59	47.2	3.04	

Average Speed:
In Queue: 8.11 MPH
In Construction: 11.41 MPH

East Bound
Nov. 30, 2001 5:08 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	05:08:56	8.6	-	Queue
2	05:09:56	3.0	0.04	
3	05:10:56	8.0	0.11	
4	05:11:56	32.3	0.42	
5	05:12:56	18.2	0.93	
6	05:13:56	-	1.08	
7	05:14:56	4.6	1.11	
8	05:15:56	6.5	1.17	
9	05:16:56	4.0	1.24	
10	05:17:56	5.9	1.35	
11	05:18:56	5.6	1.47	
12	05:19:56	5.2	1.59	
13	05:20:56	3.0	1.69	
14	05:21:56	3.9	1.76	
15	05:22:56	6.4	1.83	
16	05:23:56	1.2	1.90	
17	05:24:56	3.0	1.95	
18	05:25:56	-	1.98	
19	05:26:56	-	1.98	
20	05:27:56	4.6	2.04	
21	05:28:56	24.8	2.29	
22	05:29:56	13.5	2.55	
23	05:30:56	3.9	2.70	
24	05:31:56	3.9	2.75	
25	05:32:56	10.2	2.89	
26	05:33:56	5.6	3.05	
27	05:34:56	9.7	3.24	
28	05:35:56	5.1	3.30	
29	05:36:56	-	3.38	
30	05:37:56	-	3.38	
31	05:38:56	1.4	3.40	
32	05:39:56	-	3.40	
33	05:40:56	2.2	3.42	
34	05:41:56	3.1	3.46	
35	05:42:56	4.7	3.59	
36	05:43:50	17.6	3.74	Construction
37	05:44:50	22.4	4.02	
38	05:45:50	14.6	4.39	
39	05:46:50	12.1	4.50	
40	05:47:50	3.9	4.61	
41	05:48:50	17.0	4.74	
42	05:49:50	13.7	4.99	
43	05:50:50	3.4	5.23	
44	05:51:50	8.4	5.35	
45	05:52:50	8.4	5.48	
46	05:53:50	17.7	5.71	
47	05:54:50	11.4	5.96	
48	05:55:50	39.7	6.36	
49	05:56:50	46.5	7.14	
50	05:57:50	40.8	7.90	
51	05:58:50	43.2	8.66	
52	06:00:01	46.2	9.37	

Average Speed:
In Queue: 6.43 MPH
In Construction: 20.87 MPH

DATA COLLECTION AT LAKE CHARLES SECTION
I-10 WEST AND EAST

West Bound
Dec. 1, 2001 1:07 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	1:07:42	47.4	0	
2	1:08:42	43.6	0.79	
3	1:09:19	54.0	1.24	

Average Speed: 46.02

East Bound
Dec. 1, 2001 1:27 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	1:27:41	4.9	-	Queue
2	1:28:41	7.3	0.11	
3	1:29:41	14.0	0.35	
4	1:30:41	29.0	0.66	
5	1:31:12	21.7	0.85	Construction
6	1:32:12	32.0	1.22	
7	1:33:12	46.1	1.85	
8	1:34:12	-	2.02	
9	1:35:12	-	2.02	
10	1:36:12	-	2.02	
11	1:37:12	12.5	2.13	
12	1:38:12	4.2	2.21	
13	1:39:12	4.4	2.29	
14	1:40:12	4.3	2.37	
15	1:41:12	10.7	2.49	
16	1:42:12	31.8	2.96	
17	1:43:12	45.8	3.48	
18	1:44:12	46.0	4.26	
19	1:45:12	33.9	4.94	
20	1:46:12	34.3	5.44	
21	1:47:12	44.1	6.19	
22	1:47:35	50.7	6.47	

Average Speed:
In Queue: 14.50
In Construction: 20.58 MPH

DATA COLLECTION AT LAKE CHARLES SECTION
I-10 WEST AND EAST

West Bound
Dec. 6, 2001 4:25 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	4:25:16	28.0	-	
2	4:26:16	35.3	0.63	
3	4:27:16	37.7	1.28	
4	4:28:16	47.8	2.10	
5	4:29:16	54.3	2.88	
6	4:30:16	44.1	3.64	
7	4:31:16	44.5	4.37	
8	4:32:16	44.0	5.16	
9	4:33:16	42.4	5.94	
10	4:33:51	50.7	6.36	

Average Speed: 44.46 MPH

East Bound
Dec. 6, 2001 4:50 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	4:50:32	3.4	-	Queue
2	4:51:32	24.7	0.26	
3	4:52:32	9.9	0.45	
4	4:53:32	2.7	0.61	
5	4:54:32	16.8	0.78	
6	4:55:32	17.4	1.03	
7	4:55:55	2.4	1.04	Construction
8	4:56:55	37.1	1.53	
9	4:57:55	65.6	2.34	
10	4:58:55	-	2.86	
11	4:59:55	12.8	2.97	
12	5:00:55	13.8	3.15	
13	5:01:55	14.5	3.33	
14	5:02:55	24.4	3.60	
15	5:03:55	54.1	4.31	
16	5:04:55	1.7	4.78	
17	5:05:55	7.4	4.87	
18	5:06:55	17.2	5.12	
19	5:07:55	16.9	5.41	
20	5:08:55	-	5.62	
21	5:09:55	8.9	5.66	
22	5:10:55	22.2	5.93	
23	5:11:55	13.4	6.15	
24	5:12:55	12.4	6.42	
25	5:13:55	35.1	6.67	

Average Speed:
In Queue: 11.59 MPH
In Construction: 18.77 MPH

West Bound
Dec. 6, 2001 5:34 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	5:34:19	44.7	0	
2	5:35:19	60.2	0.95	
3	5:36:19	55.2	1.87	
4	5:37:19	47.3	2.66	
5	5:38:19	54	3.47	
6	5:39:19	48	4.26	
7	5:40:19	41.8	4.97	
8	5:41:19	46.9	5.7	
9	5:42:16	53.9	6.44	

Average Speed: 48.60 MPH

East Bound
Dec. 6, 2001 6:05 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
	6:05:06	20.3	0	Queue
	6:06:06	8.1	0.36	
	6:07:06	4.5	0.48	
	6:08:06	4.7	0.54	
	6:09:06	9.5	0.63	
	6:10:28	12.8	0.96	
	6:10:35	6	0.97	Construction
	6:11:35	8.9	1.1	
	6:12:35	8.4	1.22	
	6:13:35	9.4	1.37	
	6:14:35	27.1	1.62	
	6:15:35	46.8	2.25	
	6:16:35	44.4	3.03	
	6:17:35	46.2	3.79	
	6:18:35	45.4	4.58	
	6:19:35	43.3	5.32	
	6:20:35	41.8	6.05	
	6:21:35	46	6.58	

Average Speed:
In Queue: 10.61 MPH
In Construction: 30.60 MPH

Car Counts Between 5:10 - 6:20 pm
cars: 769
trucks: 246

DATA COLLECTION AT LAKE CHARLES SECTION
I-10 WEST AND EAST

West Bound
Dec. 7, 2001 12:15 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	12:15:22	38.2	-	Queue
2	12:15:35	42.7	0.15	Construction
3	12:16:35	48.6	0.92	
4	12:17:35	57.4	1.76	
5	12:18:35	49.5	2.56	
6	12:19:35	47.0	3.34	
7	12:20:35	50.1	4.16	
8	12:21:35	47.9	4.99	
9	12:22:35	43.1	5.81	
10	12:23:30	48.9	6.53	

Average Speed:
In Queue: 41.54 MPH
In Construction: 48.35 MPH

East Bound
Dec. 7, 2001 12:30 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	12:30:45	2.4	-	Queue
2	12:31:45	8.6	0.17	
3	12:32:25	7.7	0.23	Construction
4	12:33:25	13.2	0.47	
5	12:34:25	41.7	0.89	
6	12:35:25	20.9	1.43	
7	12:36:25	41.4	2.07	
8	12:37:25	43.9	2.76	
9	12:38:25	42.2	3.45	
10	12:39:25	45.6	4.20	
11	12:40:25	45.3	4.93	
12	12:41:25	45.1	5.70	
13	12:41:39	47.2	5.89	

Average Speed:
In Queue: 8.28 MPH
In Construction: 36.78 MPH

West Bound
Dec. 7, 2001 12:54 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	12:54:40	55.9	0	
2	12:55:40	59.7	0.95	
3	12:56:40	60.9	2.35	
4	12:57:40	57.0	3.41	
5	12:58:40	57.6	4.36	
6	12:59:40	61.5	5.31	
7	13:01:18	5.4	6.41	

Average Speed: 57.98

East Bound
Dec. 7, 2001 1:07 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	1:07:40	53.0	0	
2	1:08:40	47.7	0.86	
3	1:09:40	53.1	1.67	
4	1:10:40	49.3	2.49	
5	1:11:40	50.7	3.27	
6	1:12:40	52.2	4.12	
7	1:13:40	47.3	4.92	
8	1:14:38	51.0	5.72	

Average Speed: 49.26 MPH

DATA COLLECTION AT LAKE CHARLES SECTION
I-10 WEST AND EAST

West Bound
Dec.14, 2001 5:11 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	5:11:10	4.7	-	Queue
2	5:12:10	6.6	0.12	
3	5:13:10	3.7	0.21	
4	5:14:10	7.3	0.30	
5	5:15:10	24.2	0.52	
6	5:16:10	20.6	0.89	
7	5:17:10	18.3	1.17	
8	5:18:10	15.0	1.41	
9	5:18:38	15.0	1.62	Construction
10	5:19:38	20.2	1.98	
11	5:20:38	-	2.16	
12	5:21:38	-	2.16	
13	5:22:38	2.4	2.18	
14	5:23:38	-	2.19	
15	5:24:38	-	2.19	
16	5:25:38	0.1	2.20	
17	5:26:38	-	2.20	
18	5:27:38	-	2.20	
19	5:28:38	16.8	2.32	
20	5:29:38	32.8	2.69	
21	5:30:38	45.7	3.38	
22	5:31:38	47.2	4.09	
23	5:32:38	-	4.53	
24	5:33:38	9.0	4.65	
25	5:34:38	13.6	4.86	
26	5:35:38	12.0	5.08	
27	5:36:38	19.5	5.33	
28	5:37:38	29.8	5.80	
29	5:38:38	52.2	6.51	
30	5:39:38	50.2	7.37	
31	5:40:08	44.4	7.81	

Average Speed:
In Queue: 13.02 MPH
In Construction: 17.27 MPH

East Bound
Dec. 14, 2001 5:58 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	5:58:11	16.3	-	Queue
2	5:59:11	-	0.36	
3	6:00:11	15.3	0.50	
4	6:01:11	21.1	0.72	
5	6:02:11	-	0.84	
6	6:03:11	6.4	0.91	
7	6:04:11	7.3	1.11	
8	6:04:28	16.3	1.16	Construction
9	6:05:28	22.3	1.57	
10	6:06:28	41.2	2.00	
11	6:07:28	7.8	2.36	
12	6:08:28	50.8	2.75	
13	6:09:28	39.6	3.52	
14	6:10:28	42.2	4.21	
15	6:11:28	45.6	4.95	
16	6:12:28	45.4	5.77	
17	6:13:28	44.8	6.51	
18	6:13:47	47.0	6.75	

Average Speed:
In Queue: 11.08 MPH
In Construction: 36 MPH

COLLECTION AT LAKE CHARLES SECTION
'EST AND EAST

3ound
), 2001 3:25 PM

GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
NO CONSTRUCTION			

East Bound
Dec. 19, 2001 3:57 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	3:57:55	17.0	-	Queue
2	3:58:55	11.5	0.32	
3	3:59:55	9.8	0.66	
4	4:00:55	7.3	0.73	
5	4:01:55	14.0	0.82	Construction
6	4:02:55	18.3	0.83	
7	4:03:55	26.1	1.22	
8	4:04:55	57.2	1.88	
9	4:05:55	42.7	2.76	
10	4:06:55	50.6	3.52	
11	4:07:55	44.6	4.28	
12	4:08:55	44.0	5.04	
13	4:09:55	45.2	5.71	
14	4:10:10	46.1	6.44	

Average Speed:
In Queue: 11.4 MPH
In Construction: 38.9 MPH

Car Counts Between 4:00 - 5:00 pm
cars: 940
trucks: 338

COLLECTION AT LAKE CHARLES SECTION
EST AND EAST

ound
, 2001 3:55 PM

GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
NO CONSTRUCTION			

East Bound
Dec. 20, 2001 4:29 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	4:30:18	5.2	-	Queue
2	4:31:18	2.7	0.02	
3	4:32:18	8.6	0.22	
4	4:33:18	3.3	0.28	
5	4:34:18	4.7	0.33	
6	4:35:18	7.2	0.41	
7	4:36:18	1.5	0.48	
8	4:37:18	-	0.53	
9	4:38:18	1.2	0.66	
10	4:39:18	4.5	0.79	
11	4:40:18	6.8	0.87	
12	4:41:18	9.6	1.02	
13	4:42:18	10.3	1.37	
14	4:43:18	11.4	1.55	
15	4:44:18	3.9	1.82	
16	4:45:18	2.2	1.93	
17	4:46:18	5.6	2.11	
18	4:47:18	18.3	2.24	Construction
19	4:48:18	29.2	2.97	
20	4:49:18	18.6	3.34	
21	4:50:18	14.4	3.76	
22	4:51:18	21.8	4.28	
23	4:52:18	30.2	5.01	
24	4:53:18	39.7	5.52	
25	4:54:18	41.6	6.23	
26	4:55:18	44.0	7.12	
27	4:55:32	46.7	7.75	

Average Speed:
In Queue: 5.2 MPH
In Construction: 30.5 MPH

Car Counts Between 4:30 - 5:30 pm
cars: 1018
trucks: 409

COLLECTION AT LAKE CHARLES SECTION
EST AND EAST

ound
, 2001 2:15 PM

GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
NO CONSTRUCTION			

East Bound
Dec. 21, 2001 2:43 PM

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	2:47:28	15.7	-	Queue
2	2:48:28	3.9	0.21	
3	2:49:28	18.7	0.67	
4	2:50:28	13.1	0.81	Construction
5	2:51:28	21.8	0.84	
6	2:52:28	38.6	1.25	
7	2:53:28	41.1	2.01	
8	2:54:28	39.4	2.93	
9	2:55:28	28.7	3.35	
10	2:56:28	50.7	4.12	
11	2:57:28	45.3	4.88	
12	2:58:28	44.2	5.31	
13	2:59:28	44.8	5.77	
14	3:00:28	43.9	6.32	
15	3:00:51	46.8	6.44	

Average Speed:
In Queue: 12.9 MPH
In Construction: 40.5 MPH

Car Counts Between 2:40 - 3:40 pm
cars: 614
trucks: 302

APPENDIX III: LaPlace Traffic Counts From LA FOTD (During Construction)

LA DOTD DISTRICT 62
TRAFFIC ENGINEERING STUDY

10-29-2001 Volume by Lane Report - D102200

Sta: EAST00000000 Id: I0100WB00000 CId: 01
Start: Mon - Oct 22, 2001 at 10:00
City/Town: LAPLACE
Location: I-10 WB
Ln1-East

Mon - Oct 22, 2001

Lane	1
11:00	1056
12:00	936
13:00	846
14:00	953
15:00	929
16:00	1049
17:00	1076
18:00	629
19:00	703
20:00	950
21:00	523
22:00	408
23:00	339
24:00	240

Tue - Oct 23, 2001

01:00	155
02:00	120
03:00	116
04:00	106
05:00	190
06:00	435
07:00	701
08:00	802
09:00	795
10:00	850
24 Hour Totals	14907
11:00	956
12:00	839
13:00	823
14:00	814
15:00	986
16:00	1058
17:00	598
18:00	497
19:00	640
20:00	633
21:00	485
22:00	420
23:00	366
24:00	243

Wed - Oct 24, 2001

22:00	220
23:00	179
24:00	126
Fri - Oct 26, 2001	
01:00	97
02:00	84
03:00	76
04:00	82

Fri - Oct 26, 2001 Lane	1
05:00	125
06:00	229
07:00	250
08:00	252
09:00	227
10:00	274
24 Hour Totals	7162
11:00	332
12:00	287
13:00	273
14:00	289
15:00	318
16:00	430
17:00	413
18:00	265
19:00	0
20:00	0
21:00	0
22:00	0
23:00	0
24:00	0
Sat - Oct 27, 2001	
01:00	0
02:00	0
03:00	0
04:00	0
05:00	0
06:00	0
07:00	0
08:00	0
09:00	0
10:00	0
24 Hour Totals	2607
11:00	612
12:00	1178
13:00	1225
14:00	1259
15:00	1225

01:00	161
02:00	136
03:00	97
04:00	107
05:00	173

LA DOTD DISTRICT 62
TRAFFIC ENGINEERING STUDY

10-29-2001 Volume by Lane Report - D102200

Wed - Oct 24, 2001

Lane	1
06:00	401
07:00	611
08:00	732
09:00	712
10:00	827
24 Hour Totals	13315
11:00	671
12:00	691
13:00	631
14:00	587
15:00	648
16:00	689
17:00	778
18:00	702
19:00	515
20:00	407
21:00	351
22:00	318
23:00	307
24:00	198

Thu - Oct 25, 2001

01:00	197
02:00	109
03:00	97
04:00	104
05:00	161
06:00	344
07:00	530
08:00	491
09:00	542
10:00	581
24 Hour Totals	10649
11:00	622
12:00	595
13:00	566
14:00	487
15:00	541
16:00	519
17:00	511
18:00	363
19:00	278
20:00	239
21:00	220

16:00	[illegible]
17:00	1183
18:00	1116
19:00	942
20:00	675
21:00	551
22:00	387
23:00	464
24:00	502
Sun - Oct 28, 2001	
01:00	581
02:00	352
03:00	212

Sun - Oct 28, 2001

Lane	1
04:00	156
05:00	128
06:00	142
07:00	184
08:00	279
09:00	407
10:00	632
24 Hour Totals	15686
11:00	840
12:00	1248
13:00	1288
14:00	1203
15:00	1188
16:00	1146
17:00	1044
18:00	1348
19:00	1231
20:00	1098
21:00	760
22:00	609
23:00	461
24:00	396
Mon - Oct 29, 2001	
01:00	254
02:00	167
03:00	168
04:00	130
05:00	110
06:00	203
07:00	441
08:00	775
09:00	793
10:00	897

24 Hour Totals

17798

?1:00	
?2:00	419
?3:00	388
?4:00	271
?ri - Oct 26, 2001	
)1:00	205
)2:00	146
)3:00	157
)4:00	202

Fri - Oct 26, 2001

Lane	1
05:00	313
06:00	617
07:00	907
08:00	974
09:00	882
10:00	968
24 Hour Totals	16229
11:00	908
12:00	899
13:00	948
14:00	1093
15:00	1220
16:00	1167
17:00	1221
18:00	1139
19:00	1139
20:00	1228
21:00	1098
22:00	618
23:00	617
24:00	511
Sat - Oct 27, 2001	
01:00	277
02:00	207
03:00	152
04:00	157
05:00	212
06:00	331
07:00	370
08:00	453
09:00	582
10:00	813
24 Hour Totals	17360
11:00	918
12:00	1059
13:00	1045
14:00	1122

5:00	1102
6:00	1145
7:00	1065
8:00	1099
9:00	985
0:00	827
1:00	623
2:00	533
3:00	571
4:00	492

Sun - Oct 28, 2001

01:00	1057
02:00	1156
03:00	366

Sun - Oct 28, 2001

Lane	1
04:00	102
05:00	96
06:00	111
07:00	169
08:00	210
09:00	275
10:00	361
24 Hour Totals	16489
11:00	582
12:00	828
13:00	980
14:00	943
15:00	935
16:00	914
17:00	1041
18:00	1183
19:00	1180
20:00	1176
21:00	1049
22:00	788
23:00	433
24:00	488

Mon - Oct 29, 2001

01:00	346
02:00	147
03:00	110
04:00	101
05:00	128
06:00	229
07:00	675
08:00	1060
09:00	1030
10:00	792

4 Hour Totals 17138

WEST BOUND

Oct. 23rd
Tuesday

		HEF
1:00	155	87.92258
2:00	120	113.5667
3:00	116	117.4828
4:00	106	128.566
5:00	190	71.72632
6:00	435	31.32874
7:00	701	19.4408
8:00	802	16.99252
9:00	795	17.14214
10:00	850	16.03294
11:00	956	14.25523
12:00	839	16.24315
13:00	823	16.55893
14:00	814	16.74201
15:00	986	13.8215
16:00	1058	12.88091
17:00	598	22.7893
18:00	497	27.42052
19:00	640	21.29375
20:00	633	21.52923
21:00	485	28.09897
22:00	420	32.44762
23:00	366	37.23497
24:00	243	56.0823
	13628	

EAST BOUND

Oct. 23rd
Tuesday

		HEF
1:00	150	103.1467
2:00	172	89.95349
3:00	128	120.875
4:00	157	98.54777
5:00	289	53.53633
6:00	622	24.8746
7:00	956	16.1841
8:00	801	19.31586
9:00	912	16.96491
10:00	970	15.95052
11:00	994	15.56539
12:00	842	18.3753
13:00	792	19.53535
14:00	910	17.0022
15:00	860	17.9907
16:00	1055	14.6654
17:00	1029	15.03596
18:00	997	15.51856
19:00	895	17.28715
20:00	589	26.26825
21:00	447	34.61298
22:00	380	40.71579
23:00	320	48.35
24:00	205	75.47317
	15472	

WEST BOUND

Oct. 24th
Wednesday

		HEF
1:00	161	71.11801
2:00	136	84.19118
3:00	97	118.0412
4:00	107	107.0093
5:00	173	66.18497
6:00	401	28.55362
7:00	611	18.73977
8:00	732	15.64208
9:00	712	16.08146
10:00	827	13.84522
11:00	671	17.06408
12:00	691	16.57019
13:00	631	18.1458
14:00	587	19.50596
15:00	648	17.66975
16:00	689	16.61829
17:00	778	14.71722
18:00	702	16.31054
19:00	515	22.23301
20:00	407	28.13268
21:00	351	32.62108
22:00	318	36.00629
23:00	307	37.29642
24:00	198	57.82828
	11450	

EAST BOUND

Oct. 24th
Wednesday

		HEF
1:00	159	98.84906
2:00	136	115.5662
3:00	146	107.6507
4:00	197	79.78173
5:00	279	56.33333
6:00	683	23.01171
7:00	1020	15.40882
8:00	921	17.06515
9:00	890	17.65955
10:00	972	16.16975
11:00	853	18.42556
12:00	889	17.67942
13:00	838	18.75537
14:00	859	18.29686
15:00	954	16.47484
16:00	989	15.89181
17:00	932	16.86373
18:00	1027	15.3038
19:00	867	18.12803
20:00	654	24.03211
21:00	494	31.81579
22:00	383	41.03655
23:00	367	42.82561
24:00	208	75.5625
	15717	

WEST BOUND

Oct. 25th
Thursday

		HEF
1:00	197	43.7665
2:00	109	79.10092
3:00	97	88.8866
4:00	104	82.90385
5:00	161	53.5528
6:00	344	25.06395
7:00	530	16.26792
8:00	491	17.56008
9:00	542	15.90775
10:00	581	14.83993
11:00	622	13.86174
12:00	595	14.49076
13:00	566	15.23322
14:00	487	17.70431
15:00	541	15.93715
16:00	519	16.61272
17:00	511	16.8728
18:00	363	23.75207
19:00	278	31.01439
20:00	239	36.07531
21:00	220	39.19091
22:00	220	39.19091
23:00	179	48.1676
24:00	126	68.42857
	8622	

EAST BOUND

Oct. 25th
Thursday

		HEF
1:00	164	101.0854
2:00	170	97.51765
3:00	137	121.0073
4:00	206	80.47573
5:00	328	50.54268
6:00	608	27.26645
7:00	1093	15.16743
8:00	1067	15.53702
9:00	995	16.66131
10:00	952	17.41387
11:00	876	18.92466
12:00	897	18.48161
13:00	868	19.09908
14:00	946	17.52431
15:00	962	17.23285
16:00	991	16.72856
17:00	1020	16.25294
18:00	1019	16.26889
19:00	961	17.25078
20:00	657	25.23288
21:00	583	28.43568
22:00	419	39.56563
23:00	388	42.7268
24:00	271	61.17343
	16578	

WEST BOUND

Oct. 26th
Friday

		HEF
1:00	97	44.36082
2:00	84	51.22619
3:00	76	56.61842
4:00	82	52.47561
5:00	125	34.424
6:00	229	18.79039
7:00	250	17.212
8:00	252	17.0754
9:00	227	18.95595
10:00	274	15.70438
11:00	332	12.96084
12:00	287	14.99303
13:00	273	15.7619
14:00	289	14.88927
15:00	318	13.53145
16:00	430	10.00698
17:00	413	10.41889
18:00	265	16.23774
19:00		
20:00		
21:00		
22:00		
23:00		
24:00		
	4303	

EAST BOUND

Oct. 26th
Friday

		HEF
1:00	205	93.54634
2:00	146	131.3493
3:00	157	122.1465
4:00	202	94.93564
5:00	313	61.26837
6:00	617	31.08104
7:00	907	21.14333
8:00	974	19.68891
9:00	882	21.74263
10:00	968	19.81095
11:00	908	21.12004
12:00	899	21.33148
13:00	948	20.2289
14:00	1093	17.54529
15:00	1220	15.71885
16:00	1167	16.43273
17:00	1221	15.70598
18:00	1139	16.8367
19:00	1139	16.8367
20:00	1228	15.61645
21:00	1098	17.46539
22:00	618	31.03074
23:00	617	31.08104
24:00	511	37.52838
	19177	

WEST BOUND

			HEF
Oct. 27th Saturday	11:00	612	20.60948
	12:00	1178	10.70713
	13:00	1225	10.29633
	14:00	1259	10.01827
	15:00	1225	10.29633
	16:00	1294	9.747295
	17:00	1183	10.66188
	18:00	1116	11.30197
	19:00	942	13.3896
	20:00	675	18.68593
	21:00	551	22.89111
	22:00	387	32.59173
	23:00	464	27.18319
	24:00	502	25.1255
		12613	

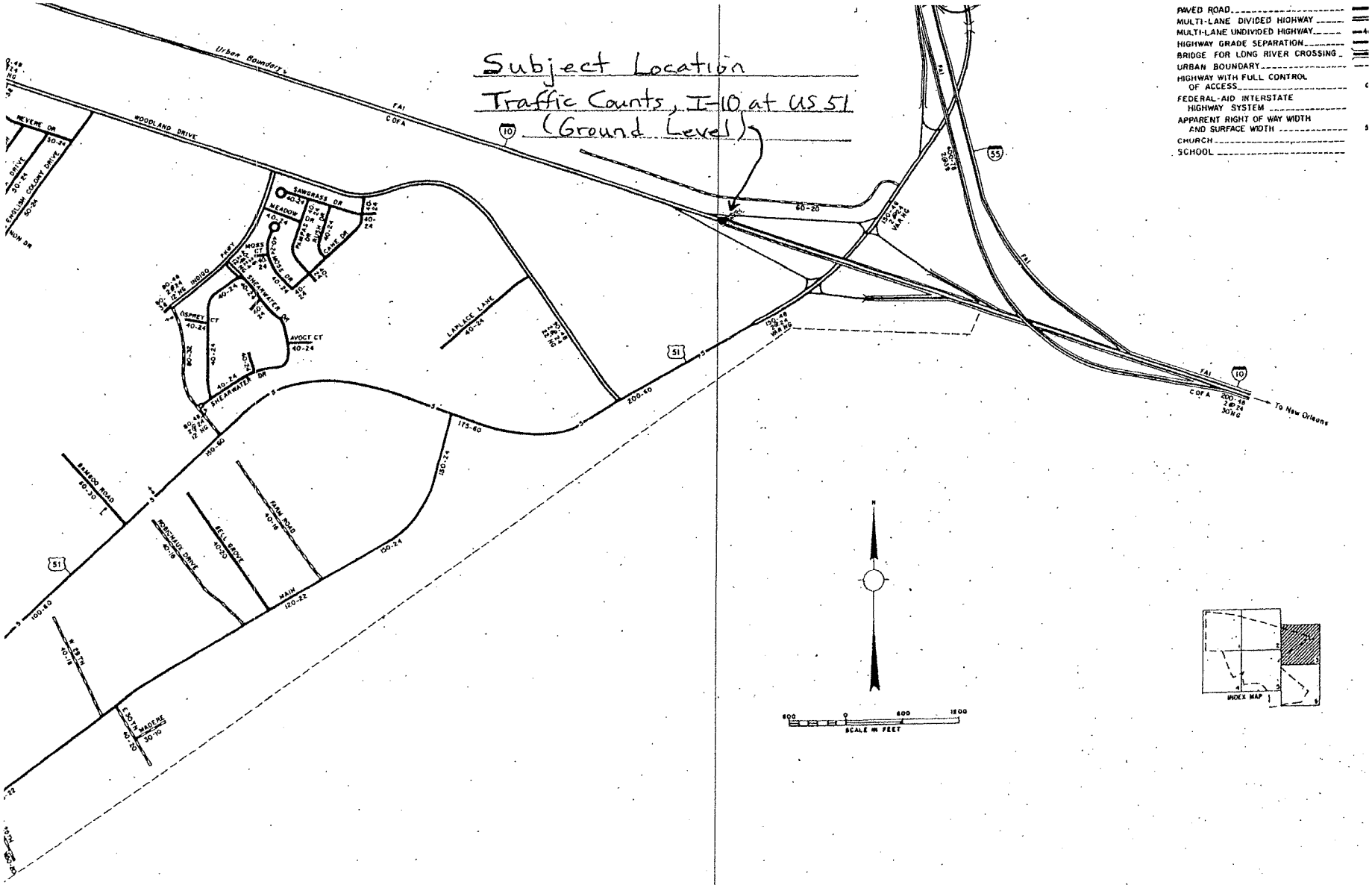
EAST BOUND

			HEF
Oct. 27th Saturday	1:00	277	58.26715
	2:00	207	77.97101
	3:00	152	106.1842
	4:00	157	102.8025
	5:00	212	76.13208
	6:00	331	48.76133
	7:00	370	43.62162
	8:00	453	35.62914
	9:00	582	27.73196
	10:00	813	19.8524
	11:00	918	17.5817
	12:00	1059	15.24079
	13:00	1045	15.44498
	14:00	1122	14.38503
	15:00	1102	14.6461
	16:00	1145	14.09607
	17:00	1065	15.15493
	18:00	1099	14.68608
	19:00	985	16.38579
	20:00	827	19.51632
	21:00	623	25.9069
	22:00	533	30.28143
	23:00	571	28.2662
	24:00	492	32.80488
		16140	

APPENDIX IV: LaPlace Traffic Counts From LA DOTD (Post Construction)

Date/Time Schedule for Traffic Counts, Construction Delay Research Study
I-10 in LaPlace

Day of Week	Day of Month, Jan-Feb 2002	Westbound I-10 at US 51	Eastbound I-10 at US 51
Tuesday	Jan 22	Count begins at12 noon (12:00-13:00)	Count begins at 12 noon (12:00-13:00)
Wednesday	Jan 23	Count	Count
Thursday	Jan 24	Count	Count
Friday	Jan 25	Count	Count
Saturday	Jan 26	Count	Count ends at 21:00 hours
Sunday	Jan 27	Count	No count
Monday	Jan 28	Count	No count
Tuesday	Jan 29	Count ends at 12:00 noon (11AM-12noon)	No count
Wednesday	Jan 30		
Thursday	Jan 31		
Friday	Feb 1		Count begins at 12 noon (12:00-13:00)
Saturday	Feb 2		Replacement count begins at 21:00 hours
Sunday	Feb 3		Count
Monday	Feb 4		Count
Tuesday	Feb 5		Count ends at 12 noon (11:00-12:00 hours)



REVISION SCHEDULE	
Basic Information 1990	

The Louisiana Departme
TRANSPORTATION and DEVE
TRAFFIC and PLANNING D

UNINCORPORATED URBA

LA PLACE,
ST. JOHN THE BAPTIST
1980 POPULATION

LA DOTD DISTRICT 62
TRAFFIC ENGINEERING STUDY
01-29-2002 Volume by Lane Report - D012200

Sta: EAST00000000 Id: I-1000000000 CId: 01
Start: Tue - Jan 22, 2002 at 11:00
City/Town: LAPLACE
Location: I-10 WESTBOUND
Ln1-East

Tue - Jan 22, 2002	
Lane	1
12:00	1008
13:00	1010
14:00	947
15:00	1071
16:00	1131
17:00	1305
18:00	1329
19:00	946
20:00	660
21:00	522
22:00	557
23:00	377
24:00	248
Wed - Jan 23, 2002	
01:00	172
02:00	135
03:00	155
04:00	127
05:00	199
06:00	465
07:00	753
08:00	894
09:00	936
10:00	987
11:00	1016
24 Hour Totals	16950
12:00	956
13:00	858
14:00	933
15:00	1081
16:00	1200
17:00	1277
18:00	1353
19:00	993
20:00	690
21:00	544
22:00	503
23:00	446
24:00	267
Thu - Jan 24, 2002	
01:00	202

02:00	161
03:00	118
04:00	124
05:00	206
06:00	504

Thu - Jan 24, 2002

Lane	1
07:00	822
08:00	928
09:00	945
10:00	962
11:00	1045
24 Hour Totals	17118
12:00	980
13:00	923
14:00	991
15:00	989
16:00	1165
17:00	1305
18:00	1360
19:00	965
20:00	699
21:00	522
22:00	541
23:00	404
24:00	503

Fri - Jan 25, 2002

01:00	584
02:00	221
03:00	172
04:00	163
05:00	244
06:00	429
07:00	744
08:00	842
09:00	935
10:00	919
11:00	1069
24 Hour Totals	17669
12:00	1044
13:00	1062
14:00	1162
15:00	1250
16:00	1287
17:00	1448
18:00	1491
19:00	1173
20:00	767
21:00	591
22:00	585

23:00	517
24:00	433
Sat - Jan 26, 2002	
01:00	310
02:00	223
03:00	178
04:00	162
05:00	164

Sat - Jan 26, 2002 Lane	1
06:00	296
07:00	401
08:00	559
09:00	695
10:00	765
11:00	876
24 Hour Totals	17439
12:00	909
13:00	784
14:00	992
15:00	996
16:00	1089
17:00	1268
18:00	1175
19:00	1017
20:00	839
21:00	741
22:00	600
23:00	611
24:00	514
Sun - Jan 27, 2002	
01:00	336
02:00	275
03:00	228
04:00	179
05:00	190
06:00	205
07:00	258
08:00	371
09:00	530
10:00	686
11:00	887
24 Hour Totals	15680
12:00	1051
13:00	1025
14:00	1074
15:00	1210
16:00	1247

17:00	1468
18:00	1550
19:00	1353
20:00	1168
21:00	764
22:00	610
23:00	473
24:00	292

Mon - Jan 28, 2002

01:00	195
02:00	139
03:00	129
04:00	153

Mon - Jan 28, 2002

Lane	1
05:00	231
06:00	539
07:00	868
08:00	925
09:00	1032
10:00	1012
11:00	1097
24 Hour Totals	19605
12:00	1032
13:00	1005
14:00	982
15:00	1071
16:00	1113
17:00	1377
18:00	1427
19:00	1086
20:00	674
21:00	533
22:00	504
23:00	394
24:00	226

Tue - Jan 29, 2002

01:00	180
02:00	140
03:00	114
04:00	156
05:00	220
06:00	478
07:00	780
08:00	944
09:00	973
10:00	941
11:00	969

24 Hour Totals

17319

LA DOTD DISTRICT 62
TRAFFIC ENGINEERING STUDY
Volume by Lane Report - D0122006

01-29-2002

Sta: WEST00000000 Id: I-1000000000 CId: 01
Start: Tue - Jan 22, 2002 at 11:00
City/Town: LAPLACE
Location: I-10 EASTBOUND
Ln1-West

Tue - Jan 22, 2002 Lane	1
12:00	915
13:00	914
14:00	948
15:00	920
16:00	1024
17:00	1083
18:00	1057
19:00	881
20:00	514
21:00	470
22:00	338
23:00	299
24:00	245
Wed - Jan 23, 2002	
01:00	188
02:00	146
03:00	121
04:00	163
05:00	347
06:00	758
07:00	1239
08:00	1219
09:00	1049
10:00	1126
11:00	881
24 Hour Totals	16845
12:00	903
13:00	952
14:00	917
15:00	961
16:00	1152
17:00	1093
18:00	1011
19:00	943
20:00	542
21:00	440
22:00	400
23:00	313
24:00	229
Thu - Jan 24, 2002	
01:00	173

02:00	137
03:00	157
04:00	200
05:00	281
06:00	755

LA DOTD DISTRICT 62
TRAFFIC ENGINEERING STUDY
Volume by Lane Report - D012200

01-29-2002

Thu - Jan 24, 2002

Lane	1
07:00	1211
08:00	1211
09:00	1065
10:00	1104
11:00	950
24 Hour Totals	17100
12:00	951
13:00	879
14:00	1010
15:00	1083
16:00	1198
17:00	1221
18:00	1280
19:00	1080
20:00	835
21:00	486
22:00	420
23:00	393
24:00	255

Fri - Jan 25, 2002

01:00	185
02:00	145
03:00	167
04:00	200
05:00	293
06:00	710
07:00	1138
08:00	1195
09:00	1064
10:00	1079
11:00	1090
24 Hour Totals	18357
12:00	1171
13:00	1105
14:00	1264
15:00	1207
16:00	1606
17:00	1415
18:00	1538
19:00	1417
20:00	1048
21:00	722
22:00	579

23:00	439
24:00	378
Sat - Jan 26, 2002	
01:00	283
02:00	211
03:00	162
04:00	185
05:00	256

Sat - Jan 26, 2002 Lane	1
06:00	377
07:00	411
08:00	553
09:00	908
10:00	1155
11:00	1149
24 Hour Totals	19539
12:00	1200
13:00	1185
14:00	1119
15:00	1038
16:00	1088
17:00	1125
18:00	1210
19:00	1019
20:00	115
21:00	0
22:00	0
23:00	0
24:00	0
Sun - Jan 27, 2002	
01:00	0
02:00	0
03:00	0
04:00	0
05:00	0
06:00	0
07:00	0
08:00	0
09:00	0
10:00	0
11:00	0
24 Hour Totals	9099
12:00	0
13:00	0
14:00	0
15:00	0
16:00	0

17:00	0
18:00	0
19:00	0
20:00	0
21:00	0
22:00	0
23:00	0
24:00	0

Mon - Jan 28, 2002

01:00	0
02:00	0
03:00	0
04:00	0

Mon - Jan 28, 2002

Lane	1
05:00	0
06:00	0
07:00	0
08:00	0
09:00	0
10:00	0
11:00	0
24 Hour Totals	0
12:00	0
13:00	0
14:00	0
15:00	0
16:00	0
17:00	0
18:00	0
19:00	0
20:00	0
21:00	0
22:00	0
23:00	0
24:00	0

Tue - Jan 29, 2002

01:00	0
02:00	0
03:00	0
04:00	0
05:00	0
06:00	0
07:00	0
08:00	0
09:00	0
10:00	0
11:00	0

24 Hour Totals	0

LA DOTD DISTRICT 62
TRAFFIC ENGINEERING STUDY
02-05-2002 Volume by Lane Report - D0201004

Sta: WEST00000000 Id: I-110EB00000 CId: 01
Start: Fri - Feb 01, 2002 at 11:00
City/Town: LAPLACE
Location: I-10 EASTBOUND
Ln1-West

Fri - Feb 1, 2002	1
Lane	
12:00	1188
13:00	1210
14:00	1423
15:00	1537
16:00	1615
17:00	1430
18:00	1597
19:00	1427
20:00	1066
21:00	981
22:00	681
23:00	588
24:00	513
Sat - Feb 2, 2002	
01:00	348
02:00	233
03:00	184
04:00	225
05:00	260
06:00	366
07:00	442
08:00	606
09:00	871
10:00	1045
11:00	1257
24 Hour Totals	21093
12:00	1310
13:00	1207
14:00	1261
15:00	1253
16:00	1285
17:00	1430
18:00	1437
19:00	1156
20:00	971
21:00	767
22:00	692
23:00	704
24:00	501
Sun - Feb 3, 2002	
01:00	327

02:00	225
03:00	155
04:00	192
05:00	162
06:00	255

Sun - Feb 3, 2002

Lane	1
07:00	277
08:00	369
09:00	521
10:00	776
11:00	878
24 Hour Totals	18111
12:00	909
13:00	816
14:00	843
15:00	883
16:00	877
17:00	965
18:00	826
19:00	654
20:00	490
21:00	430
22:00	582
23:00	604
24:00	391

Mon - Feb 4, 2002

01:00	221
02:00	155
03:00	131
04:00	199
05:00	284
06:00	787
07:00	1341
08:00	1279
09:00	1109
10:00	1052
11:00	1002
24 Hour Totals	16830
12:00	1008
13:00	935
14:00	1018
15:00	1085
16:00	999
17:00	1111
18:00	1063
19:00	873
20:00	598
21:00	434
22:00	371

23:00	318
24:00	200
Tue - Feb 5, 2002	
01:00	187
02:00	158
03:00	169
04:00	199
05:00	314

LA DOTD DISTRICT 62
TRAFFIC ENGINEERING STUDY
Volume by Lane Report - D0201004

02-05-2002

Tue - Feb 5, 2002 Lane	1
06:00	776
07:00	1275
08:00	1248
09:00	1084
10:00	1017
11:00	1056
24 Hour Totals	17496

APPENDIX V: Lake Charles Traffic Counts from LA DOTD (Post Construction)

LA DOTD
5827 HWY 90 EAST
LAKE CHARLES
LOUISIANA 70602

WEATHER:
PARISH: JEFFERSON DAVIS
CITY: NEAR LACASSINE
LOCATION : EAST BOUND I-10 AT M.P. 50

Site Code: 333333333333

Start Time	Mon 24-Jun-02	Tue 25-Jun-02	Wed 26-Jun-02	Thu 27-Jun-02	Fri 28-Jun-02	Average Day	Sat 29-Jun-02	Sun 30-Jun-02	Week Average
12:00 AM	*	461	523	**517**	0	375	*	*	375
01:00	*	429	426	319	0	294	*	*	294
02:00	*	386	363	5	**1**	189	*	*	189
03:00	*	421	381	2	0	201	*	*	201
04:00	*	408	377	0	1	196	*	*	196
05:00	*	520	553	0	0	268	*	*	268
06:00	*	691	715	0	0	352	*	*	352
07:00	*	930	880	0	*	603	*	*	603
08:00	*	1084	1038	2	*	708	*	*	708
09:00	1034	1122	1151	5	*	828	*	*	828
10:00	1088	1181	1195	1	*	866	*	*	866
11:00	**1142**	**1283**	**1306**	3	*	**934**	*	*	**934**
12:00 PM	1199	1351	1430	3	*	996	*	*	996
01:00	1259	1492	1455	**4**	*	1052	*	*	1052
02:00	1112	1434	1420	2	*	992	*	*	992
03:00	1371	**1561**	1299	0	*	1058	*	*	1058
04:00	1570	1483	**1631**	1	*	1171	*	*	1171
05:00	**1861**	1435	1624	2	*	**1230**	*	*	**1230**
06:00	1312	1283	1247	3	*	961	*	*	961
07:00	1186	1028	1080	0	*	824	*	*	824
08:00	935	923	847	2	*	677	*	*	677
09:00	813	890	815	2	*	630	*	*	630
10:00	673	635	659	1	*	492	*	*	492
11:00	549	538	589	3	*	420	*	*	420
Day Total	17104	22969	23004	877	2	16317	0	0	16317
% Avg. WkDay	104.8%	140.8%	141.0%	5.4%	0.0%				
% Avg. Week	104.8%	140.8%	141.0%	5.4%	0.0%	100.0%	0.0%	0.0%	
AM Peak	11:00	11:00	11:00	00:00	02:00	11:00			11:00
Volume	1142	1283	1306	517	1	934			934
PM Peak	17:00	15:00	16:00	13:00		17:00			17:00
Volume	1861	1561	1631	4		1230			1230
Grand Total	17104	22969	23004	877	2	16317	0	0	16317

ADT Not Calculated

LA DOTD
5827 HWY 90 EAST
LAKE CHARLES
LOUISIANA 70602

WEATHER:
PARISH: JEFFERSON DAVIS
CITY: NEAR LACASSINE
LOCATION: WEST BOUND I-10 AT M.P. 50

Site Code: 111111111111

Start Time	Mon 17-Jun-02	Tue 18-Jun-02	Wed 19-Jun-02	Thu 20-Jun-02	Fri 21-Jun-02	Average Day	Sat 22-Jun-02	Sun 23-Jun-02	Week Average
12:00 AM	*	*	*	*	452	452	488	336	425
01:00	*	*	*	*	434	434	342	295	357
02:00	*	*	*	*	422	422	334	229	328
03:00	*	*	*	*	428	428	362	256	349
04:00	*	*	*	*	538	538	456	270	421
05:00	*	*	*	*	813	813	419	319	517
06:00	*	*	*	*	916	916	655	379	650
07:00	*	*	*	*	1128	1128	750	549	809
08:00	*	*	*	*	1096	1096	948	735	926
09:00	*	*	*	*	1301	1301	1223	1042	1189
10:00	*	*	*	*	**1445**	**1445**	**1281**	1229	1318
11:00	*	*	*	*	1435	1435	1235	**1470**	**1380**
12:00 PM	*	*	*	1411	1414	1412	1274	1586	1421
01:00	*	*	*	1405	1509	1457	1333	1653	1475
02:00	*	*	*	1446	1460	1453	1326	1702	1484
03:00	*	*	*	1364	**1637**	1500	**1369**	**1901**	1568
04:00	*	*	*	**1575**	1524	**1550**	1339	1840	**1570**
05:00	*	*	*	1426	1602	1514	1175	1826	1507
06:00	*	*	*	1112	1383	1248	1295	1581	1343
07:00	*	*	*	1140	1259	1200	1037	1322	1190
08:00	*	*	*	945	1089	1017	772	1112	980
09:00	*	*	*	812	775	794	667	875	782
10:00	*	*	*	721	733	727	568	706	682
11:00	*	*	*	565	614	590	480	537	549
Day Total	0	0	0	13922	25407	24870	21128	23750	23220
% Avg. WkDay	0.0%	0.0%	0.0%	56.0%	102.2%				
% Avg. Week	0.0%	0.0%	0.0%	60.0%	109.4%	107.1%	91.0%	102.3%	
AM Peak Volume					10:00 1445	10:00 1445	10:00 1281	11:00 1470	11:00 1380
PM Peak Volume				16:00 1575	15:00 1637	16:00 1550	15:00 1369	15:00 1901	16:00 1570

LA DOTD
5827 HWY 90 EAST
LAKE CHARLES
LOUISIANA 70602

WEATHER:
PARISH: JEFFERSON DAVIS
CITY: NEAR LACASSINE
LOCATION: WEST BOUND I-10 AT M.P. 50

Site Code: 111111111111

Start Time	Mon 24-Jun-02	Tue 25-Jun-02	Wed 26-Jun-02	Thu 27-Jun-02	Fri 28-Jun-02	Average Day	Sat 29-Jun-02	Sun 30-Jun-02	Week Average
12:00 AM	422	409	405	0	*	309	*	*	309
01:00	465	348	413	1	*	307	*	*	307
02:00	355	359	406	0	*	280	*	*	280
03:00	434	371	430	0	*	309	*	*	309
04:00	608	541	553	0	*	426	*	*	426
05:00	834	723	768	0	*	581	*	*	581
06:00	985	1017	1069	0	*	768	*	*	768
07:00	1005	996	1001	0	*	750	*	*	750
08:00	1013	1086	1093	0	*	798	*	*	798
09:00	1115	1120	1147	1	*	846	*	*	846
10:00	1280	1215	1214	0	*	927	*	*	927
11:00	1324	1264	622	1	*	803	*	*	803
12:00 PM	1268	1234	28	*	*	843	*	*	843
01:00	1201	1320	5	*	*	842	*	*	842
02:00	1196	1287	0	*	*	828	*	*	828
03:00	1203	1336	0	*	*	846	*	*	846
04:00	1311	1368	1	*	*	893	*	*	893
05:00	1094	1195	0	*	*	763	*	*	763
06:00	1018	973	6	*	*	666	*	*	666
07:00	839	962	0	*	*	600	*	*	600
08:00	707	791	0	*	*	499	*	*	499
09:00	615	768	0	*	*	461	*	*	461
10:00	570	575	0	*	*	382	*	*	382
11:00	441	467	0	*	*	303	*	*	303
Day Total	21303	21725	9161	3	0	15030	0	0	15030
% Avg. WkDay	141.7%	144.5%	61.0%	0.0%	0.0%				
% Avg. Week	141.7%	144.5%	61.0%	0.0%	0.0%	100.0%	0.0%	0.0%	
AM Peak	11:00	11:00	10:00	01:00		10:00			10:00
Volume	1324	1264	1214	1		927			927
PM Peak	16:00	16:00	12:00			16:00			16:00
Volume	1311	1368	28			893			893
Grand Total	21303	21725	9161	13925	25407	39900	21128	23750	38250

ADT Not Calculated

APPENDIX VI: LaPlace LA DOTD LCCA Model Spreadsheet

Laplace

Hour	YEAR 0 E.Bound 1/11/2000	E.Bound 1/12/2000	W.Bound 1/11/2000	W.Bound 1/12/2000	E.Bound	W.Bound	Total	PCT of ADT, %	Dir. Factor E.Bound	Dir. Factor W.Bound	ADT E.Bound	34000 W.Bound
1	123	123	109	109	246	218	464	0.006575	0.530172	0.469828	118	105
2	100	100	99	99	200	198	398	0.00564	0.502513	0.497487	96	95
3	147	147	94	94	294	188	482	0.00683	0.609959	0.390041	142	91
4	255	255	181	181	510	362	872	0.012357	0.584862	0.415138	248	174
5	723	723	544	544	1446	1088	2534	0.035908	0.570839	0.429361	697	524
6	1237	1237	1014	1014	2474	2028	4502	0.063795	0.549534	0.450466	1192	977
7	1253	1253	1021	1021	2506	2042	4548	0.064447	0.551011	0.448989	1207	984
8	1074	1074	989	989	2148	1978	4126	0.058467	0.520601	0.479399	1035	953
9	1081	1081	1000	1000	2162	2000	4162	0.058977	0.519462	0.480538	1042	964
10	957	957	1021	1021	1914	2042	3956	0.056058	0.483822	0.516178	922	984
11	953	953	1008	1008	1906	2016	3922	0.055576	0.485977	0.514023	918	971
12	1036	1036	967	967	2072	1934	4006	0.056765	0.517224	0.482776	998	932
13	1068	1068	631	631	2136	1262	3398	0.048151	0.628605	0.371395	1029	608
14	1208	1208	699	699	2416	1398	3814	0.054046	0.633456	0.366544	1164	674
15	1218	1218	952	952	2436	1904	4340	0.061499	0.56129	0.43871	1174	917
16	1280	1280	1419	1419	2560	2838	5398	0.076491	0.47425	0.52575	1233	1367
17	1414	1414	1650	1650	2828	3300	6128	0.086836	0.461488	0.538512	1363	1590
18	1035	1035	1138	1138	2070	2276	4346	0.061584	0.4783	0.5237	997	1097
19	646	646	698	698	1292	1396	2688	0.03809	0.480655	0.519345	622	673
20	448	448	516	516	896	1032	1928	0.02732	0.46473	0.53527	432	497
21	400	400	447	447	800	894	1694	0.024005	0.472255	0.527745	385	431
22	291	291	353	353	582	706	1288	0.018251	0.451863	0.548137	280	340
23	232	232	258	258	464	516	980	0.013887	0.473469	0.526531	224	249
24	159	159	139	139	318	278	596	0.008446	0.533557	0.466443	153	134
					35878	33894	70570				17670	16330

Work Zone Length (miles)	Time at 45 mph (hours)	Time at 70 mph (hours)	Work Zone Delay/Veh (hours)
1	0.022222	0.014286	0.007937

	Pass Cars	Single Unit Truck	Combination Truck	
PCT (%)	81.4	3.8	14.8	
Reduced Speed Delay (hours)	220	10	40	
Added Time (hours)	65	5	94	
Total Time Delay	285	15	134	
Cost for Delay ($)	3274	268	3017	
Added Cost ($)	1703	119	2364	
Total Cost for Base Case ($)	4977	387	5381	$ 10,745

Added Time (Hr/1000 Stops) (Excludes Idling Time)

Speed (mph)	Pass Cars	Single Unit Truck	Combination Truck
70	7.25	10.19	32.1
45	4.9	5.6	13.39
70-45-70	2.35	3.59	18.71

Added Cost ($/1000 Veh) (Excludes Idling Time)

Pass Cars	Single Unit Truck	Combination Truck
123.61	222.05	1032
62.07	130.08	562.14
61.54	91.97	469.86

Work Zone Length (miles)	Time at 60 mph (hours)	Time at 70 mph (hours)	Work Zone Delay/Veh (hours)
4.121	0.068683	0.058871	0.009812

	Pass Cars	Single Unit Truck	Combination Truck	
PCT (%)	81.4	3.8	14.8	
Reduced Speed Delay (hours)	272	13	49	
Added Time (hours)	26	2	21	
Total Time Delay	298	14	70	
Cost for Delay ($)	3422	261	1582	
Added Cost ($)	772	56	1173	
Total Cost for Base Case ($)	4194	318	2754	$ 7,265

Added Time (Hr/1000 Stops) (Excludes Idling Time)

Speed (mph)	Pass Cars	Single Unit Truck	Combination Truck
70	7.25	10.19	32.1
60	6.31	8.8	27.94
70-60-70	0.94	1.39	4.16

Added Cost ($/1000 Veh) (Excludes Idling Time)

Pass Cars	Single Unit Truck	Combination Truck
123.61	222.05	1032
95.7	178.98	798.99
27.91	43.07	233.01

Work Zone Length (miles)	Time at 60 mph (hours)	Time at 70 mph (hours)	Work Zone Delay/Veh (hours)
5.121	0.08535	0.073157	0.012193

	Pass Cars	Single Unit Truck	Combination Truck	
PCT (%)	81.4	3.8	14.8	
Reduced Speed Delay (hours)	337	16	61	
Added Time (hours)	26	2	21	
Total Time Delay	363	18	82	
Cost for Delay ($)	4180	316	1851	
Added Cost ($)	772	56	1173	
Total Cost for Base Case ($)	4952	372	3024	$ 8,348

Added Time (Hr/1000 Stops) (Excludes Idling Time)

Speed (mph)	Pass Cars	Single Unit Truck	Combination Truck
70	7.25	10.19	32.1
60	6.31	8.8	27.94
70-60-70	0.94	1.39	4.16

Added Cost ($/1000 Veh) (Excludes Idling Time)

Pass Cars	Single Unit Truck	Combination Truck
123.61	222.05	1032
95.7	178.98	798.99
27.91	43.07	233.01

	E.Bound	W.Bound	Capacity	E.Bound Queued Vehicles Hrly Rate	E.Bound Queued Vehicles Cumulative	E.Bound Vehicles Stopped	W.Bound Queued Vehicles Hrly Rate	W.Bound Queued Vehicles Cumulative	W.Bound Vehicles Stopped
1	119	105	1270	-1151	0		0 -1165	0	0
2	98	95	1270	-1174	0		0 -1175	0	0
3	142	91	1270	-1128	0		0 -1179	0	0
4	246	174	1270	-1024	0		0 -1098	0	0
5	697	524	1270	-573	0		0 -746	0	0
6	1192	977	1270	-78	0		0 -293	0	0
7	1207	984	1270	-63	0		0 -286	0	0
8	1035	953	1270	-235	0		0 -317	0	0
9	1042	964	1270	-228	0		0 -306	0	0
10	922	984	1270	-348	0		0 -288	0	0
11	918	971	1270	-352	0		0 -299	0	0
12	998	932	1270	-272	0		0 -338	0	0
13	1029	808	1270	-241	0		0 -462	0	0
14	1164	674	1270	-106	0		0 -596	0	0
15	1174	917	1270	-96	0		0 -353	0	0
16	1233	1367	1270	-37	0		0 97	97	1367
17	1363	1590	1270	93	93		1363 320	417	1590
18	997	1097	1270	-273	0		338 -173	244	1097
19	622	673	1270	-648	0		0 -597	0	274
20	432	497	1270	-838	0		0 -773	0	0
21	385	431	1270	-885	0		0 -839	0	0
22	280	340	1270	-990	0		0 -930	0	0
23	224	249	1270	-1046	0		0 -1021	0	0
24	153	134	1270	-1117	0		0 -1136	0	0
	17870	16330					1701		4328

EASTBOUND
21.1666667 18.82179 4.5448727 20.3537744 336.3162

WESTBOUND
21.1666667 11.20987 9.95699308 24.464358 274.4616

E Bound

Period	Vehicle Flow Queue	Vehicle Flow Upstream	Speed (mph) Queue	Speed (mph) Upstream	Density (veh/mile) Queue	Density (veh/mile) Upstream	Change
AM Peak	1270	1207	6	70	211.6667	17	194
PM Peak	1270	1363	6	70	211.6667	19	192

E.Bound

Period	Max no. of Queued Vehicles	Delta Density (Veh/Mile)	Queue Length (Miles) Max.	Queue Length (Miles) Ave.	Time @ 5 mph	Time @ 70 mph	Avg. Queue Delay,Veh (hours)
			0.00	0.00	0.00000	0.00000	0.00000
AM Peak	0	194	0.48	0.24	0.04032	0.00345	0.03687
PM Peak	93	192					

Queued Traffic by Class Vehicle Class	Affected Vehicles	PCP %	Vehicles By Class	Added VOC (70-0-70)	Cost 4 $	Added Time,(hrs)	Unit Cost	Cost 5 $	Added Time,(hrs)	VOC Idle $/veh-hr	Cost 6 $	Cost 7 $	
Auto AM	0	81.4	0	0.12361	0	0.00725	11.58	0	0.00000	0.8927	0	0	
Auto PM	1701	81.4	1384	0.12361	171	0.00725	11.58	116	0.03687	0.8927	35	587	
SU AM	0	3.8	0	0.22205	0	0.01019	18.54	0	0.00000	0.7681	0	0	
SU PM	1701	3.8	65	0.22205	14	0.01019	18.54	12	0.03687	0.7681	2	44	
Comb AM	0	14.8	0	1.032	0	0.0321	22.31	0	0.00000	0.8248	0	0	
Comb PM	1701	14.8	252	1.032	260	0.0321	22.31	180	0.03687	0.8248	8	209	
			1,701		445			309			45	840	$ 1,638

W.Bound

Period	Vehicle Flow Queue	Vehicle Flow Upstream	Speed (mph) Queue	Speed (mph) Upstream	Density (veh/mile) Queue	Density (veh/mile) Upstream	Change
AM Peak	1270	984	6	70	211.6667	14	196
PM Peak	1270	1590	6	70	211.6667	23	189

W.Bound

Period	Max no. of Queued Vehicles	Delta Density (Veh/Mile)	Queue Length (Miles) Max.	Queue Length (Miles) Ave.	Time @ 5 mph	Time @ 70 mph	Avg. Queue Delay,Veh (hours)
			0.00	0.00	0.00000	0.00000	0.00000
AM Peak	0	196	2.21	1.10	0.16391	0.01575	0.16815
PM Peak	417	189					

Queued Traffic by Class Vehicle Class	Affected Vehicles	PCP %	Vehicles By Class	Added VOC (70-0-70)	Cost 4 $	Added Time,(hrs)	Unit Cost	Cost 5 $	Added Time,(hrs)	VOC Idle $/veh-hr	Cost 6 $	Cost 7 $	
Auto AM	0	81.4	0	0.12361	0	0.00725	11.58	0	0.00000	0.8927	0	0	
Auto PM	4328	81.4	3523	0.12361	436	0.00725	11.58	296	0.16815	0.8927	410	6813	
SU AM	0	3.8	0	0.22205	0	0.01019	18.54	0	0.00000	0.7681	0	0	
SU PM	4328	3.8	164	0.22205	37	0.01019	18.54	31	0.16815	0.7681	21	512	
Comb AM	0	14.8	0	1.032	0	0.0321	22.31	0	0.00000	0.8248	0	0	
Comb PM	4328	14.8	641	1.032	661	0.0321	22.31	459	0.16815	0.8248	89	2423	
			4,328		1,133			786			520	9,748	$ 12,187

$ 13,825

LAKE CHARLES

YEAR 0

ADT 34650

Hour	E.Bound 6/25/2002	E.Bound 6/26/2002	W.Bound 6/25/2002	W.Bound 6/26/2002	E.Bound	W.Bound	Total	PCT of ADT %	Dir Factor E.Bound	Dir Factor W.Bound	E.Bound	W.Bound
1	461	523	422	409	984	831	1815	0.020393	0.542149	0.457851	383	324
2	429	426	465	348	855	813	1668	0.018741	0.51259	0.48741	333	317
3	386	363	355	359	749	714	1463	0.016438	0.511962	0.488038	292	278
4	421	381	434	371	802	805	1607	0.018056	0.499067	0.500933	313	313
5	408	377	609	541	785	1145	1934	0.02173	0.405895	0.594105	306	447
6	520	553	834	723	1073	1557	2630	0.02955	0.407985	0.592015	419	606
7	691	715	925	1017	1406	2002	3408	0.038292	0.412559	0.587441	547	779
8	930	880	1005	996	1810	2001	3811	0.04282	0.474941	0.525059	705	779
9	1064	1058	1013	1086	2122	2099	4221	0.047426	0.502724	0.497276	826	817
10	1122	1151	1115	1120	2273	2235	4508	0.050651	0.504215	0.495785	885	870
11	1181	1195	1280	1215	2376	2495	4871	0.05473	0.487785	0.512215	925	971
12	1283	1305	1324	1264	2588	2588	5177	0.058166	0.500097	0.499903	1008	1008
13	1351	1430	1268	1234	2781	2502	5283	0.059359	0.526405	0.473595	1083	974
14	1492	1455	1201	1320	2947	2521	5468	0.061438	0.538954	0.461046	1147	981
15	1434	1420	1196	1237	2854	2433	5287	0.059404	0.539787	0.460213	1111	947
16	1561	1299	1203	1336	2860	2539	5399	0.060662	0.529728	0.470272	1113	988
17	1483	1631	1311	1368	3114	2679	5793	0.065089	0.537545	0.462455	1212	1043
18	1435	1624	1094	1195	3059	2289	5348	0.060089	0.57199	0.42801	1191	891
19	1283	1247	1018	973	2530	1991	4521	0.050797	0.559611	0.440389	985	775
20	1028	1080	839	962	2108	1801	3909	0.043921	0.539268	0.460732	821	701
21	923	847	707	791	1770	1498	3268	0.036719	0.541616	0.458384	689	583
22	890	815	615	768	1705	1383	3088	0.034696	0.552137	0.447863	664	538
23	635	659	570	575	1294	1145	2439	0.027404	0.530545	0.469455	504	446
24	538	589	441	467	1127	908	2035	0.022865	0.553808	0.446192	439	354
					45973	43028	89001				17898	15752

Work Zone Length (miles)	Time at 45 mph (hours)	Time at 70 mph (hours)	Work Zone Delay/Veh (hours)
1	0.022222	0.014286	0.007937

	Pass Cars	Single Unit Truck	Combination Truck	
PCT (%)	75.5	4.8	19.7	
Reduced Speed Delay (hours)	208	13	54	
Added Time (hours)	61	6	128	
Total Time Delay	269	19	182	
Cost for Delay ($)	3115	355	4058	
Added Cost ($)	1610	153	3207	
Total Cost for Base Case ($)	4725	508	7265	$ 12,500

Speed (mph)	Added Time (Hr/1000 Stops) (Excludes Idling Time) Pass Cars	Single Unit Truck	Combination Truck	Added Cost ($/1000 Veh) (Excludes Idling Time) Pass Cars	Single Unit Truck	Combination Truck
70	7.25	10.19	32.1	123.61	222.05	1032
45	4.9	6.6	13.39	62.07	130.08	562.14
70-45-70	2.35	3.59	18.71	61.54	91.97	469.86

Work Zone Length (miles)	Time at 60 mph (hours)	Time at 70 mph (hours)	Work Zone Delay/Veh (hours)
10.68	0.178	0.152571	0.025429

	Pass Cars	Single Unit Truck	Combination Truck	
PCT (%)	75.5	4.8	19.7	
Reduced Speed Delay (hours)	665	42	174	
Added Time (hours)	25	2	28	
Total Time Delay	690	45	202	
Cost for Delay ($)	7988	827	4506	
Added Cost ($)	730	72	1591	
Total Cost for Base Case ($)	8718	899	6097	$ 15,713

Speed (mph)	Added Time (Hr/1000 Stops) (Excludes Idling Time) Pass Cars	Single Unit Truck	Combination Truck	Added Cost ($/1000 Veh) (Excludes Idling Time) Pass Cars	Single Unit Truck	Combination Truck
70	7.25	10.19	32.1	123.61	222.05	1032
60	6.31	8.8	27.94	95.7	178.98	798.99
70-60-70	0.94	1.39	4.16	27.91	43.07	233.01

Work Zone Length (miles)	Time at 60 mph (hours)	Time at 70 mph (hours)	Work Zone Delay/Veh (hours)
11.68	0.194667	0.166857	0.02781

	Pass Cars	Single Unit Truck	Combination Truck	
PCT (%)	75.5	4.8	19.7	
Reduced Speed Delay (hours)	728	46	190	
Added Time (hours)	25	2	28	
Total Time Delay	752	48	218	
Cost for Delay ($)	8709	900	4869	
Added Cost ($)	730	72	1591	
Total Cost for Base Case ($)	9440	972	6459	$ 16,871

Speed (mph)	Added Time (Hr/1000 Stops) (Excludes Idling Time) Pass Cars	Single Unit Truck	Combination Truck	Added Cost ($/1000 Veh) (Excludes Idling Time) Pass Cars	Single Unit Truck	Combination Truck
70	7.25	10.19	32.1	123.61	222.05	1032
60	6.31	8.8	27.94	95.7	178.98	798.99
70-60-70	0.94	1.39	4.16	27.91	43.07	233.01

APPENDIX VII: Lake Charles LA DOTD LCCA Model Spreadsheet

	E.Bound	W.Bound	Capacity	S.Bound Queued Vehicles Hrly Rate	Vehicles Cumulative	Vehicles Stopped	N.Bound Queued Vehicles Hrly Rate	Vehicles Cumulative	Vehicles Stopped
1	383	324	1270	-887	0	0	-946	0	0
2	333	317	1270	-937	0	0	-939	0	0
3	292	278	1270	-978	0	0	-992	0	0
4	312	313	1270	-958	0	0	-957	0	0
5	306	447	1270	-964	0	0	-823	0	0
6	418	806	1270	-852	0	0	-654	0	0
7	547	779	1270	-723	0	0	-491	0	0
8	705	779	1270	-565	0	0	-491	0	0
9	826	817	1270	-444	0	0	-453	0	0
10	885	870	1270	-385	0	0	-420	0	0
11	925	971	1270	-345	0	0	-299	0	0
12	1008	1008	1270	-262	0	0	-262	0	0
13	1083	974	1270	-187	0	0	-296	0	0
14	1147	981	1270	-123	0	0	-289	0	0
15	1111	967	1270	-159	0	0	-303	0	0
16	1113	989	1270	-157	0	0	-282	0	0
17	1212	1043	1270	-58	0	0	-227	0	0
18	1191	891	1270	-79	0	0	-379	0	0
19	985	775	1270	-285	0	0	-495	0	0
20	821	701	1270	-449	0	0	-569	0	0
21	689	583	1270	-581	0	0	-687	0	0
22	664	538	1270	-606	0	0	-732	0	0
23	504	446	1270	-766	0	0	-824	0	0
24	439	354	1270	-831	0	0	-916	0	0
	17898	16752			0	0			0

SOUTHBOUND
21.1666667 19.84891 1.31775047 0 0

NORTHBOUND
21.1666667 12.91398 8.24758261 0 0

S.Bound

Period	Vehicle Flow Queue	Upstream	Speed (mph) Queue	Upstream	Density (veh/mile) Queue	Upstream	Change
AM Peak	0	1	45	55	0	0	0
PM Peak	0	0	45	55	0	0	0

S.Bound

Period	Max no. of Queued Vehicles	Delta Density (Veh/Mile)	Queue Length (Miles) Max.	Ave.	Time @ 45 mph	Time @ 55 mph	Avg. Queue Delay,Veh (hours)
AM Peak	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
PM Peak	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Queued Traffic by Class

Vehicle Class	Affected Vehicles	PCP %	Vehicles By Class	VOC (55-0-55) $	Cost 4	Added Time,(hrs)	Added Cost	Unit Cost $	Cost 5	Added Time,(hrs)	VOC Idle $/Veh-hr	Cost 6 $	Cost 7 $
Auto AM	0	86	0	0.08347	0	0.00584	11.58	0	#DIV/0!	0.5927	#DIV/0!	#DIV/0!	
Auto PM	0	86	0	0.08347	0	0.00584	11.58	0	#DIV/0!	0.5927	#DIV/0!	#DIV/0!	
SU AM	0	8.2	0	0.16089	0	0.00807	18.54	0	#DIV/0!	0.7681	#DIV/0!	#DIV/0!	
SU PM	0	8.2	0	0.16089	0	0.00807	18.54	0	#DIV/0!	0.7681	#DIV/0!	#DIV/0!	
Comb AM	0	5.8	0	0.72177	0	0.02072	22.31	0	#DIV/0!	0.8248	#DIV/0!	#DIV/0!	
Comb PM	0	5.8	0	0.72177	0	0.02072	22.31	0	#DIV/0!	0.8248	#DIV/0!	#DIV/0!	
											#DIV/0!	#DIV/0!	#DIV/0!

N.Bound

Period	Vehicle Flow Queue	Upstream	Speed (mph) Queue	Upstream	Density (veh/mile) Queue	Upstream	Change
AM Peak	0	0	45	55	0	0	0
PM Peak	0	0	45	55	0	0	0

N.Bound

Period	Max no. of Queued Vehicles	Delta Density (Veh/Mile)	Queue Length (Miles) Max.	Ave.	Time @ 45 mph	Time @ 55 mph	Avg. Queue Delay,Veh (hours)
AM Peak	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
PM Peak	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Queued Traffic by Class

Vehicle Class	Affected Vehicles	PCP %	Vehicles By Class	VOC (55-0-55) $	Cost 4	Added Time,(hrs)	Added Cost	Unit Cost $	Cost 5	Added Time,(hrs)	VOC Idle $/Veh-hr	Cost 6 $	Cost 7 $
Auto AM	0	86	0	0.08347	0	0.00584	11.58	0	#DIV/0!	0.5927	#DIV/0!	#DIV/0!	
Auto PM	0	86	0	0.08347	0	0.00584	11.58	0	#DIV/0!	0.5927	#DIV/0!	#DIV/0!	
SU AM	0	8.2	0	0.16089	0	0.00807	18.54	0	#DIV/0!	0.7681	#DIV/0!	#DIV/0!	
SU PM	0	8.2	0	0.16089	0	0.00807	18.54	0	#DIV/0!	0.7681	#DIV/0!	#DIV/0!	
Comb AM	0	5.8	0	0.72177	0	0.02072	22.31	0	#DIV/0!	0.8248	#DIV/0!	#DIV/0!	
Comb PM	0	5.8	0	0.72177	0	0.02072	22.31	0	#DIV/0!	0.8248	#DIV/0!	#DIV/0!	
											#DIV/0!	#DIV/0!	#DIV/0!

#DIV/0!

APPENDIX VIII: Relevant Data From FHWA LCCA Manual

Table 2.3. Added time and vehicle running cost/1,000 stops and idling costs (Aug 96 $).

Initial Speed (mi/h)	Added Time (Hr/1,000 Stops) (Excludes Idling Time)			Added Cost ($/1,000 Stops) (Excludes Idling Time)		
	Pass Cars	Single-Unit Truck	Combination Truck	Pass Cars	Single-Unit Truck	Combination Truck
5	1.02	0.73	1.10	2.70	9.25	33.62
10	1.51	1.47	2.27	8.83	20.72	77.49
15	2.00	2.20	3.48	15.16	33.89	129.97
20	2.49	2.93	4.76	21.74	48.40	190.06
25	2.98	3.67	6.10	28.67	63.97	256.54
30	3.46	4.40	7.56	36.10	80.23	328.21
35	3.94	5.13	9.19	44.06	96.88	403.84
40	4.42	5.87	11.09	52.70	113.97	482.21
45	4.90	6.60	13.39	62.07	130.08	562.14
50	5.37	7.33	16.37	72.31	145.96	642.41
55	5.84	8.07	20.72	83.47	160.89	721.77
60	6.31	8.80	27.94	95.70	178.98	798.99
65	6.78	9.53	NA*	109.02	195.84	NA*
70	7.25	NA*	NA*	123.61	NA*	NA*
75	7.71	NA*	NA*	139.53	NA*	NA*
80	8.17	NA*	NA*	156.85	NA*	NA*
Idling Cost ($/Veh-Hr)				0.6927	0.7681	0.8248

*Original data did not provide values for trucks at higher speed. Analysts will need to extrapolate these values when truck calculations are needed at these higher speeds.

Table 2.4. Speed change computations.

Initial Speed (mi/h)	Added Time (Hr/1,000 Stops) (Excludes Idling Time)			Added Cost ($/1,000 Stops) (Excludes Idling Time)		
	Pass Cars	Single-Unit Truck	Combination Truck	Pass Cars	Single-Unit Truck	Combination Truck
55	5.84	8.07	20.72	83.47	160.89	721.77
40	4.42	5.87	11.09	52.70	113.97	482.21
55-40-55	1.42	2.20	9.63	30.77	46.92	239.56

operating conditions. Typically this is expressed as an overall cents-per-mile rate. These rates would typically apply to any additional miles that must be driven because of detours.

Some readily apparent values are the marginal cost rates used by the Federal Government. Federal travel regulations authorize the payment of $0.31 per mile for using privately owned passenger vehicles for official government travel. The flat mileage rate allowed by the IRS for business use of a privately owned passenger vehicle is also $0.31 per mile (tax year 1996).

Recommended Values of Travel Time (Dollars per Vehicle Hour)

Table 2.12 below is a composite table that brings together the several sources of the value of time previously discussed.

Table 2.12. Composite listing of travel time values.

Source	Units	Autos	Trucks	Combination
U.S. DOT – OST *	$/Person-Hr	$10.80	$16.50	$16.50
MicroBENCOST	$/Veh-Hr	11.37	17.44	24.98
NCHRP	$/Veh-Hr	11.78	19.64	19.64
HERS	$/Veh-Hr	14.30	25.99	31.30

* Values for U.S. DOT — OST reflect dollars per *person* hour

Based on consideration of these potential sources, table 2.13 reflects the ranges of the value of travel time per vehicle recommended for use in typical analyses where distribution data on trip purpose and type are not known.

Table 2.13. Recommended values of time ($/Veh-Hr)(Aug 96 $).

Passenger Cars	Trucks	
	Single-Unit	Combinations
$10 to 13	$17 to 20	$21 to 24

Crash Cost Rates

The MicroBENCOST software package, developed for the NCHRP Research Project 7-12, includes default crash cost rates. Table 2.14 shows the default crash cost rates by crash type for both rural and urban settings in 1990 dollars.

Table 2.14. MicroBENCOST default crash cost rates ($1,000, 1990 $).

Intersection or Facility Type	Fatality		Nonfatal Injury		Property Damage Only (PDO)	
	Rural	Urban	Rural	Urban	Rural	Urban
RR Grade Crossing	$1,008	$994	$25.2	$13.3	$1.59	$3.09
Intersection/Interchange	1,059	932	21.9	14.3	1.98	1.35
Bridge	1,111	978	24.9	14.3	2.14	1.27
Highway Segment	1,111	978	24.9	14.3	2.14	1.27

Figure 3.4 is used to incorporate a reliability factor in the value selected for the work zone capacity. Figure 3.4 is used by selecting the desired percent reliability factor from the Y axis, then intersecting the appropriate work zone situation, and estimating the corresponding capacity. The x-axis intercept represents the adjusted work zone directional mixed vehicle flow capacity per lane for the work zone configuration and reliability factor selected.

For the example problem, an 80 percent reliability factor will be used to determine work zone capacity. By entering the figure at an 80 percent reliability and intersecting the curve for a 3-lane directional facility with 2 lanes open, the work zone capacity, determined by inspection, is approximately 1,415 vehicles per lane or 2,830 vph. Using an 80 percent reliability is roughly equivalent to saying that the work zone capacity will be at least equal to 2,830 vehicles per hour 80 percent of the time. It also means, however, that the capacity of the work zone can be less than 2,830 for 20 percent of the time.

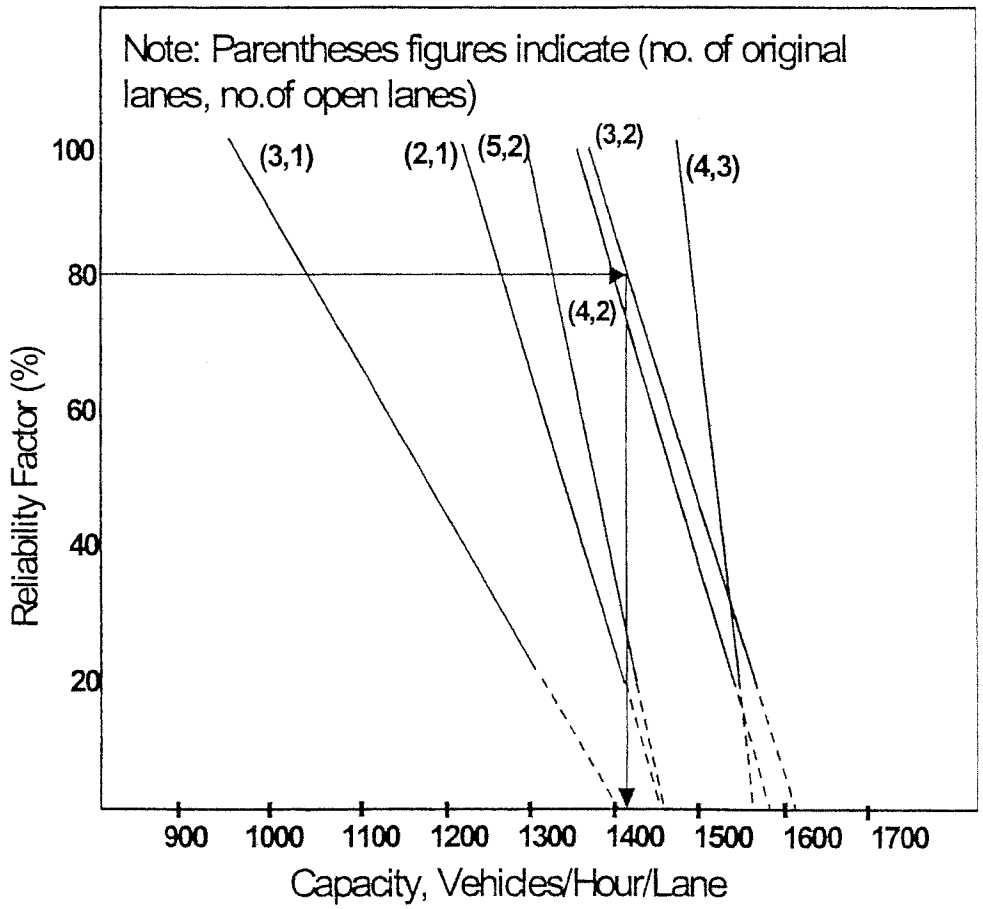


Figure 3.4. Cumulative distribution of observed work zone capacities. (Source: HCM, 1994)