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

FINAL REPORT

By

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April 2003

#### 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.
- 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.

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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.

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

# Table 1Data collection trips

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 (nonconstruction) 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:

- 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.
- 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.

Start Time	Number	Trip Delay Time	Number of Users	Total Delay Time
	of Obs.	(in min)	Affected (W   E	(W   E   Total) (in hours)
			Total)	
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 2Delay time summary (LaPlace)

Start Time	Number of	Trip Delay	Number of Users	Total Delay Time	
Hour of Day	Obs.	Time (W   E)	Affected	(W   E   Total) (in hours)	
-		(in min.)	(W   E   Total)		
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	

Table 3Delay time summary (Lake Charles)

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  $35,362 \pm 4,834$  (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.

Date	<b>Daily Vehicle Counts</b>		
10/23/01	29,100		
10/24/01	27,167		
10/25/01	25,200		
Average=27,156			
Standard Deviation=1950			
+/-3stdev confidence interval = [21,30533,005]			

	T	able 4	
Daily	vehicle	counts	(LaPlace)

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).

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

 Table 5

 Car counts at peak traffic during construction (LaPlace)
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 ( $\sim 2x$ ) 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 6Average observed upstream, work zone, and queue speeds (LaPlace)

	East	bound		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.

Date	Time	Vehicle Count	Queue
Oct 26 <sup>th</sup>	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 27 <sup>th</sup>	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

 Table 8

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

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:* 
  - o In work zone.
  - o 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:
  - o due to reduced speed in work zone.
  - o *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.

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	Е	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

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

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  $1,867\pm149$ , or 1718..2016.

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	Е	1	0	0
	W	1	0	0.092

 Table 10

 Comparison of predicted versus actual average queue delays (LaPlace)

## 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	1,867	2 074	9.98%
Time (in hours)	(17182016)	2,074	(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.

	1				
Time		V	Vest Bou	nd	
of	AOL	PQL	PQL	AOD	POD
Day	nyn.	Max	Avg	nyb	1 22
5pm	0	0	0	0	0
7pm	0	0	0	0	0
Time		E	ast Bour	ıd	
of	AOL	PQL	PQL	AOD	POD
Day		Max	Avg		•
5pm	0	0	0	0	0
opm	0	0	0	0	0
/pm	0	0	0	0	0
8pm	0	0	0	0	0
		Thu 1	0/25/01		
Time		v	Vest Bou	nd	
of	1.01	POL	POL	100	DOD
Day	AQL	Max	Avg	AQD	PQD
5pm	0	0	0	0	0
7pm	0	0	0	0	0
8pm	0	0	0	0	0
Time		F	ast Bour	ıd	
of	1.01	POL	POL	100	DOD
Dav	AQL	Max	Avg	AQD	PQD
5pm	0	0	0	0	0
6pm	0	0	0	0	0
751	r	Fri 10	0/26/01		
Time		V	Vest Bou	nd	
or Day	AQL	PQL Max	PQL Avg	AQD	PQD
6pm	0	0	0	0	0
7pm	0	0	0	0	0
Time		E	Cast Bour	ıd	
of	AOL	PQL	PQL	AOD	POD
Day		Max	Avg		- 20
5pm	0	0	0	0	0
6pm	0	0	0	0	0
		Sat 10	)/27/01		
Time		V	Vest Bou	nd	
of Dav	AQL	PQL Max	PQL Avg	AQD	PQD
4pm	.79	0	0	2.25	0
5pm	.87	.4	.07	3.15	3.68
Time		 F	Cast Bom	nd	2.20
of		POI-	POI-		
Dav	AQL	Max	Avg	AQD	PQD
4nm	0	0	0	0	0
TPIN					

# Table 12Predicted versus actual queue length and delay based on actual daily traffic counts<br/>(LaPlace)

#### **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  $45,798 \pm 4,846$  (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.

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

 Table 13

 Car counts at peak traffic during construction (Lake Charles)

**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.

	Eastbound	Eastbound		
	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

 Table 14

 Average observed work zone and queue speeds (Lake Charles)

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.

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	Е	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

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

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 16Comparison 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	2,550	2 252	-11.69%
Time (in hours)	(24572643)	2,252	(-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  $\pm 10\%$  error in the input value on the user delay cost.

Table 17	
Sensitivity analysis	

Innut Variable	Error in Estimated Daily Delay Time In Response to	Comments
input variable	±10% Error in Input Value	
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.

#### REFERENCES

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**APPENDIX I: Data Collection and Delay Time at LaPlace** 

45

#### 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	12	0.1
2	6:06:30	0	0.1
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)
	2 41 00		
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 a * 2 trucks and 21 cars per mile * 89 trucks and 924 cars per hour	and 693 cars.
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 <u>+</u> 5 car length.				

#### 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
Nota U	and war i m		and any construction of the second

Note: Headway ± 7 cars Average speed: 46.89 MPH

#### West Bound

Time: 7:04 PM

Average speed: 46.19 MPH

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
A	1	a second s	the second s

Average speed: 59.47 MPH

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#### 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	Oueue 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	1
13	3:29:45	1.6	1.37	Const. Starts
14	3:30:45	18.9	1.5	1
15	3:31:45	33	1.84	
16	3:32:45	8.6	2.18	1
17	3:33:45	21.7	2.45	-
18	3:34:45	46.5	2.97	1
19	3:35:45	49.4	3.86	
20	3:36:45	15.1	4.42	4
21	3:37:45	41	4.98	
22	3:38:23	49.5	5.56	]

#### Note: Headway during queue $\pm 1$ car length

Average speed:

#### in queue: 5.95 MPH

in construction: 29.12 MPH

#### East Bound

#### Time: 5:32 PM

$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	No. T	CDOT	<b>A 1 A A B A B A B B B B B B B B B B</b>		T
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	190.	Urs lime	Speed (MPH)	Dist. (Mile)	Remark
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	<u>├</u>				
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		4:32:12	0.5	0.07	Queue starts
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	2	4:33:12	2.4	0.13	At queue:
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	3	4:34:12	5.1	0.19	1.5 - 2 car length
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	4	4:35:12	4.8	0.28	]
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	5	4:36:12	14.6	0.46	1
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	6	4:37:12	19.3	0.78	
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	7	4:38:12	5.6	0.97	1
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	8	4:39:12	19.6	1.2	-
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	9	4:40:12	15.5	1.57	1
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	10	4:41:12	14.8	1.72	1
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	11	4:42:12	5.7	1.88	1
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	12	4:43:12	0	1.98	
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	13	4:44:12	6.7	2.05	-
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	14	4:45:12	14.5	2.27	-
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	15	4:46:12	6.8	2.43	-
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	16	4:46:46	0	2,48	Const. Starts
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	17	4:47:47	19.1	2.49	-
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	18	4:48:47	14.7	2.72	-
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	19	4:49:47	11.4	2.99	<b>-1</b> .
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	20	4:50:47	12.6	3.26	-1
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	21	4:51:47	15.4	3.46	-1
23         4:53:47         39.2         4.4           24         4:54:47         47.1         5.1           25         4:55:47         48.7         5.89	22	4:52:47	24.3	3.83	-
24         4:54:47         47.1         5.1           25         4:55:47         48.7         5.89	23	4:53:47	39.2	4.4	-
25 4:55:47 48.7 5.89	24	4:54:47	47.1	5.1	-1
5.05	25	4:55:47	48.7	5.89	
26 4:56:47 38.8 6.51	26	4:56:47	38.8	6.51	-
27 4:57:00 50.9 6.67	27	4:57:00	50.9	6.67	-1

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

GPS Time	Speed (MPH)	Dist. (Mile)
2:03:37	76.7	0
2:04:37	44	1.21
2:05:37	52.4	2.04
2:06:37	52.2	3.17
2:07:37	33.5	3.66
2:08:27	43.2	4 25
	GPS Time 2:03:37 2:04:37 2:05:37 2:06:37 2:07:37 2:08:27	GPS Time         Speed (MPH)           2:03:37         76.7           2:04:37         44           2:05:37         52.4           2:06:37         52.2           2:07:37         33.5           2:08:27         43.2

•

Average speed: 52.76 MPH

#### East Bound

			- 0	carr.	u	
T	im	e:	4:	09	РМ	

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

I LILLON D.				
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	1
9	2:48:39	28	2.14	1
10	2:49:39	21.4	2,61	1 ·
11	2:50:39	19.3	2.88	
12	2:51:39	42.5	3.5	
13	2:52:39	47.7	4.25	1
14	2:53:38	51.5	5.06	1
The second se		the second s		

Average speed:

in queue: 18.47 MPH in construction: 25.66 MPH

West	Bour	d
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	1
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	7
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	7
16	3:51:00	62.8	5.12	7

Average speed:

in queue: 16.48 MPH

in construction: 21.58 MPH

Note:

Car counter at I-10 West 3:51 - 4:39 PM: 30 trucks and 899 cars

 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	Oueue 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	1
26	5:01:44	3.4	2.19	1
27	5:02:44	0	2.24	1
28	5:03:44	3.9	2.29	1
29	5:04:44	1.4	2.35	-
30	5:05:44	6.4	2.44	

NO,	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
21	500.11			
- 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	6.3	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	1
44	5:19:44	17.4	3.44	1
45	5:20:44	0	3.49	1
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	1
51	5:26:09	8.9	4.26	1
52	5:27:09	11.3	4.48	
53	5:28:09	29.1	4.76	
54	5:29:09	47.6	5.4	1
55	5:30:09	47.9	6.23	1
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
	}			L
4	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

(ime:)	.06 FM	******		
No.	GPS Time	Speed (MPH)	Dist. (Mile)	Remark
1				
				ļ
1	1:08:31	59.7	0	1
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	T

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	5 7.1	2.00	
12	3:08:50	5 3.7	2.03	
13	3:09:0	1 8.2	2.04	Construction
14	3:10:0	1 2.3	2.41	
15	3:11:0	1 12.7	2.55	
16	3:12:0	1 3.1	2.80	
17	3:13:0	1 24.1	2.92	
	3:14:0	2 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	
<u> </u>	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	2 3:47:38	23.8	1.44	
1.	3 3:48:38	8.6	1.62	
14	4 3:49:38	3.5	1.74	
1.	5 3:50:38	6.2	1.83	
1	6 3:51:38	4.0	1.92	
1	7 3:52:38	11.4	2.01	L
1	8 3:53:38	6.0	2.17	· · · · · · · · · · · · · · · · · · ·
1	9 3:54:38	3 16.7	2.45	
2	0 3:55:38	8.2	2.55	
2	1 3:56:38	9.9	2.66	
2	2 3:57:3	3 26.6	2.90	
2	3 3:58:31	3 48.6	3.60	
2	4 3:59:3	3 49.1	4.48	
2	.5 4:00:3	8 43.8	5.29	
2	4:01:3	8 39.8	5.77	
2	4:02:3	8 49.5	5 6.43	
2	4:02:4	2 50.8	6.52	2

Average Speed:

In Queue: 7.0 MPH In Construction: 18.7 MPH

1
## DATA COLLECTION AT LAKE CHARLES SECTION I-10 WEST AND EAST

### West Bound

### Nov. 30, 2001 4:15 PM

Nov. 30, 2001 5:08 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

No.	GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
1	05:08:56	8.6	-	Oueue
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	1.50	
13	05:20:56	3.0	1.55	
14	05:21:56	3.0	1.05	
15	05.22.56	5.3	1.70	
16	05.23.56	1 2	1.83	
17	05:24:56	1.2	1:90	
15	05-25-56	3.0	1.95	<u> </u>
10	05:26:56		1.98	+
20	05.27.56		1.98	
	05.22.50	4.5	2.04	
	05.20.56	24.8	2.29	
.44	105:29:56	13.5	2.55	
	05:30:56	3.9	2.70	
24	105:31:56	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	1
29	05:36:56	-	3.38	1
3(	05:37:56	-	3.38	
3	05:38:56	1.4	3.40	1
31	2 05:39:56	-	3 40	1
33	3 05:40:56	2.2	3 42	
34	4 05:41:56	3.1	3.46	+
3	5 05:42:56	47	3.40	+
3	605:43:50	17.6	3.33	Canatavaria
3	7 05:44:50	22.4	3.74	Construction
3	8 05:45:50	114 6	4.02	
3	9105-46-50	14.0	4.39	+
4	0105-47-50	12.1	4.50	
	1 05:48:50	3.9	4.61	
	205:40.50	17.0	4.74	· ]
4	205.50.50	13.7	4.99	
<u>├</u>	103:30:30	3.4	5.23	
+	4103:31:30	8.4	5.35	
4	5105:52:50	8.4	5.48	
4	6105:53:50	17.7	5.71	
4	7 05:54:50	11.4	5.96	
4	8 05:55:50	39.7	6.36	
4	9 05:56:50	46.5	7.14	-
5	0 05:57:50	40.8	7.90	)
5	1 05:58:50	43.2	8.66	
5	2 06:00:01	46.2	937	
			و غې د مر	1

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	3 1:34:12	-	2.02	
9	1:35:12	-	2.02	
10	1:36:12	-	2.02	
1	1 1:37:12	12.5	2.13	
1	2 1:38:12	4.2	2.21	
1	3 1:39:12	2 4,4	2.29	
1	4 1:40:12	2 4.3	2.37	
1	5 1:41:11	2 10.7	2.49	
1	6 1:42:1	2 31.8	. 2.96	
1	7 1:43:1	2 45.8	3.48	
1	.8 1:44:1	2 46.0	4.26	
1	.9 1:45:1	2 33.9	4.94	
2	1:46:1	2 34.3	5.44	
2	1:47:1	2 . 44.1	6.19	)
2	1:47:3	5 50.7	6.47	1

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

#### East Bound

Dec. 6, 2001 4:50 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	1
8	4:32:16	44.0	. 5.16	
9	4:33:16	42.4	5.94	1
10	4:33:51	50.7	6.36	

Average Speed: 44.46 MPH

110.	Gratime	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	1
10	4:58:55	•	2.86	
11	4:59:55	12.8	2.97	1
12	5:00:55	13.8	3.15	
13	5:01:55	14.5	3.33	
14	5:02:55	24.4	3.60	1
15	5:03:55	54.1	4.31	1
16	5:04:55	1.7	4.78	1
17	5:05:55	7.4	4.87	
18	3 5:06:55	5 17.2	5.12	
19	5:07:55	5 16.9	5.41	
20	5:08:5	5 -	5.62	1
2	1 5:09:55	5 8.9	5.66	
2	2 5:10:5:	5 22.2	5.93	1
2	3 5:11:5:	5 13.4	6.15	1
24	4 5:12:5:	5 12.4	6.42	
2:	5 5:13:5:	5 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
 0.05

	2.34.17	44./5	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	
L	6:10:28	12.8	0.96	
L	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	
L	6:14:35	27.1	1.62	
	6:15:35	46.8	2.25	
	6:16:35	44.4	3.03	5
	6:17:35	46.2	3.79	
L	6:18:35	45.4	4.58	31
ļ	6:19:35	43.3	5.32	2
	6:20:35	41.8	6.05	5
	6:21:35	46	6.59	2

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	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	1
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
L	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	
L	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	1
	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	1
	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	- 3	4.53	
	24	5:33:38	9.0	4.65	
	25	5:34:38	13.6	4.86	
	26	5:35:38	3 12.0	5.08	
	27	5:36:3	3 19.5	5.33	-
	28	5:37:3	8 29.8	5.80	
	29	5:38:3	8 52.2	6.51	
	30	5:39:3	8 50.2	7.37	
	31	5:40:0	8 44.4	7.81	

## 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	1
16	6:12:28	45.4	5.77	
17	6:13:28	44.8	6.51	1
18	6:13:47	47.0	6.75	

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

Average Speed:

In Queue: 13.02 MPH In Construction: 17.27 MPH

### COLLECTION AT LAKE CHARLES SECTION 'EST AND EAST

Bound

GPS Time	Speed (MPH)	Dist. (Mile)	REMARK
	NO CONSTRUC	CTION	
			1

East Bo	und		
Dec. 19,	2001	3:57	PM
		~ -	1

	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	
F	4	4:00:55	7.3	0.73	
F	5	4:01:55	14.0	0.82	Construction
T	6	4:02:55	18.3	0.83	
	7	4:03:55	26.1	1.22	
	8	4:04:55	57.2	1.88	
T	9	4:05:55	42.7	2.76	
T	10	4:06:55	50.6	3.52	
T	11	4:07:55	44.6	4.28	
t	12	4:08:55	44.0	5.04	
ł	13	4:09:55	45.2	5.71	
t	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 CONSTRU	UCTION	

## 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	3 14.4	3.76	
22	4:51:18	21.8	4.28	
23	4:52:18	30.2	5.01	1
24	4:53:18	39.7	5.52	1
2.5	4:54:18	41.6	6.23	1
26	4:55:18	3 44.0	7.12	1
2	4:55:32	2 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 CONSTRUC	TION	1

### 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	
1.5	5 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)

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10-29-2001		LA DO TRAFFIC Volume by Lar	E ENGINEERING STUD Report - D10220
Sta: EAST00000000 Start: Mon - Oct 22, City/Town: LAPLACE Location: I-10 WB Ln1-East	Id: 2001 at 10:00	I0100WB00000	CId: 01
Mon - Oct 22, 2001 Lane	· · · · · · · · · · · · · · · · · · ·		1
11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00		,	1056 936 846 953 929 1049 1076 629 703 950 523 408
23:00 24:00 Tue - Oct 23 2001			339 240
01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00			155 120 116 106 190 435 701 802 795 850
24 Hour Totals 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 24:00	· · · · · · · · · · · · · · · · · · ·		14907 956 839 823 814 986 1058 598 497 640 633 485 420 366 243

.

Wed - Oct 24, 2001

22:00 23:00 24:00					220 179 126
Frì - Oct 26, 2001					
01:00 02:00 03:00 04:00	•	· ·			97 84 76 82
10-29-2001			T Volume	LA DOTD I RAFFIC ENG by Lane Rep	DISTRICT 62 INEERING STUI Dort - D10220
Fri - Oct 26, 2001 Lane		·			
05:00 06:00 07:00 08:00 09:00 10:00					125 229 250 252 227 274
24 Hour Totals 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 24:00 Sat - Oct 27, 2001					7162 332 287 273 289 318 430 413 265 0 0 0 0 0
01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 ==============================					0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

•

01:00 02:00 03:00 04:00 05:00				161 136 97 107 173
			LA DOTD TRAFFIC EN	DISTRICT 6 JINEBRING S
10-29-2001		Volum	he by Lane Re	eport - D10
Wed - Oct 24, 2001				
Lane				1
				401
07.00				401
07:00				7.7.7
				734
10.00				/12
				627
24 Hour Totals				17215
11 - 00				13313 671
12.00	·			601 601
13-00				631
14.00				C01
14:00				207
15.00				640
17.00				000
18.00				7/0
10:00				702
79:00				515
20:00				407
21:00				351
22:00				318
23:00		•		307
24:00	••			190
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
11.00				10049 600
12.00				544
13.00				595
14.00				200
15:00				541
16:00				510
17:00				511
18:00				343
19:00	•			27g
20:00				239
	· _			

L6:00		エルジェ
L7:00		1183
18:00		1116
19:00		942
20.00		675
21:00		551
22.00		387
22.00		464
23.00		502
24:00		502
Sun - Oct 28, 2001		
01:00		581
02:00		352
03:00		212
		DIA DIA
·		TD DISTRICT 62
	TRAFFIC	ENGINEERING STUDY
10-29-2001	Volume by Lan	e Report - D1022003
Sun - Oct 28, 2001		
Lane		1
04:00		45T
05:00	• · · · · · · · · · · · · · · · · · · ·	128
06:00	·	142
07:00		184
08:00		279
09:00		407
10:00		632
和且非非非非非常的。		*****
24 Hour Totals		15686
11:00		840
12:00		1248
13-00	· · ·	1288
14.00		1200
15.00		1100
10:00		1146
10:00		
17:00		
18:00		1348
19:00		1231
		1098
20:00		
20:00 21:00		760
20:00 21:00 22:00		760
20:00 21:00 22:00 23:00		760 609 461
20:00 21:00 22:00 23:00 24:00		760 609 461 396
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001		760 609 461 396
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001		760 609 461 396
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001 01:00		760 609 461 396 254
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001 01:00 02:00		760 609 461 396 254 167
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001 01:00 02:00 03:00		760 609 461 396 254 167 168
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001 01:00 02:00 03:00 04:00		760 609 461 396 254 167 168 130
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001 01:00 02:00 03:00 04:00 05:00		760 609 461 396 254 167 168 130 110
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001 01:00 02:00 03:00 04:00 05:00 06:00		760 609 461 396 254 167 168 130 110 203
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001 01:00 02:00 03:00 04:00 05:00 06:00 07:00		760 609 461 396 254 167 168 130 110 203 441
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00		760 609 461 396 254 167 168 130 110 203 441 775
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00		760 609 461 396 254 167 168 130 110 203 441 775 792
20:00 21:00 22:00 23:00 24:00 Mon - Oct 29, 2001 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00		760 609 461 396 254 167 168 130 110 203 441 775 793

## 24 Hour Totals

22:00 23:00 24:00			419 388 271
?ri - Oct 26, 2001			
01:00 02:00 03:00 04:00			205 146 157 202
10-29-2001		LA D TRAFFI Volume by La	OTD DISTRICT ( C ENGINEERING S De Report - D1)
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			748
14:00		· · · · · · · · · · · · · · · · · · ·	2093 2001
15:00			11 <i>2</i> 7
17-00			1001 1001
			2621
19.00			1120
20.00			1008
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
			453
			50/ 19
TAINA			01. 
24 Hour Totale			1776
11.00			911
12:00	\$		1055
13:00			104!
	•		7 7 7

.6:00 .7:00 .8:00 .9:00					1145 1065 1099 985
20:00 21:00 22:00					623 533 571
24:00		•			492
Sun - Oct 28,	2001				
01:00 02:00 03:00					1057 1156 366
				L/ TRAI	A DOTD DISTRICT 62 FIC ENGINEERING STUI
10-29-2001				Volume by	Lane Report - D10220
Sun - Oct 28,	2001		,		
Lane	<b>-</b> .	. •			لب 
04:00			-		102
05:00					96
06:00		· ·			169
07:00				•	210
09:00					275
10:00					361
24 Hour Total	.S				16489
11:00					204
12:00					980
14:00					943
15:00					- 935
16:00					914
17:00					1041
18:00					1183
19:00					1175
20.00					1049
22:00					788
23:00					433
24:00					488
Mon - Oct 29	, 2001	,			
01:00		,			346
02:00					147
03:00					
04:00					128
06:00					229
07:00					675
08:00					1060
09:00					1030
10:00					/92

## 4 Hour Totals

17138

## WEST BOUND

## EAST BOUND

Oct. 23rd Tuesday

Oct. 23rd — Tuesday

ט				·- ·	
- ,			1	HEF	
1:00		155	1	37.92258	
2:00		120	ļ	113.5667	
3:00		116		117.4828	
4:00		106		128.566	
5:00		190	1	71.72632	
6:00		435	j_	31.32874	
7:00		701		19.4408	
8:00		802	2	16.99252	
9:00		79	5	17.14214	
10:00		85	2	16.03294	
11:00	L	95	6	14.25523	
12:00	L	83	9	16.24315	
13:00		82	3	16.55893	ĺ.
14:00		81	4	16.74201	
15:00		98	6	13.8215	
16:00		105	58	12.88091	1
17:00		59	98	22.7893	
18:00		49	37	27.42052	
19:00		64	40	21.29375	-
20:00		6	33	21.52923	4
21:00		4	85	28.09897	1
22:00		4	20	32.44762	-
23:00		3	66	37.23497	
24:00	- \	2	43	56.0823	3
		136	28	3	_

<i>_</i>	UND .					HEF	
٢	1:00			150	1	03.1467	
t	2:00			172	8	9.95349	
ł	3:00			128		120.875	
Ì	4:00			157	Ş	8.54777	
	5:00			289	!	53.53633	1
ļ	6:00	ŀ		622		24.8746	1
	7:00			956		16.1841	1
	8:00			801		19.31586	4
	9:00			912		16.96491	
	10:00			970	1	15.95052	4
	11:00			994		15.56539	1
	12:00			842	2	18.3753	3]
	13:00		_	792	2	19.53535	5
	14:00			91(	2	17.002	2
	15:00	·		860	기	17.990	7
	16:00	ŀ		105	5	14.665	4
	17:00			102	9	15.0359	6
	18:00			99	7	15.5185	6
	19:00	·		89	5	17.2871	5
	20:00	·		58	9	26.2682	:5
	21:00			44	7	34.6129	8
	22:00			38	0	40.7157	<u>'9</u>
	23:00			32	20	48.3	35
	24:00			20	)5	75.473	17
				1547	2	L	

## WEST BOUND

## EAST BOUND

WESI BUU	<b>ט</b> או						
			HEF				HEF
Oct 24th	1:00	161	71.11801	Oct. 24th	1:00	159	98.84906
Wednesday	2:00	136	84.19118	Wednesday	2:00	136	115.5662
i i i i i i i i i i i i i i i i i i i	3:00	97	118.0412		3:00	146	107.6507
	4.00	107	107.0093		4:00	197	79.78173
	5:00	173	66,18497		5:00	279	56.33333
	6:00	401	28,55362		6:00	683	23.01171
• •	7:00	611	18,73977		7:00	1020	15.40882
	8.00	732	15,64208		8:00	921	17.06515
	9.00	712	16.08146		9:00	890	17.65955
	10:00	827	13.84522		10:00	972	16.16975
	11:00	671	17.06408		11:00	853	18.42556
	12:00	691	16.57019		12:00	889	17.67942
	13:00	631	18.1458		13:00	838	18.75537
	14.00	587	19.50596		14:00	· 859	18.29686
	15:00	648	17.66975		15:00	954	16.47484
	16:00	689	16.61829		16:00	989	15.89181
	17:00	778	14,71722		17:00	932	16.86373
	18:00	702	16.31054		18:00	1027	15.3038
	19:00	515	22.23301		19:00	· 867	18.12803
· · · ·	20:00	407	28.13268		20:00	654	24.03211
	21:00	351	32.62108		21:00	494	31.81579
•	22:00	318	36.00629		22:00	383	41.03655
	23:00	307	37.29642	1	23:00	367	42.82561
•	24:00	198	3 57.82828		24:00	208	75.5625
		11450	5			15717	<u>'</u>
	the second se	and the second se		J			

							· .		
					EAST BO	UND			
	WEST BOUNI	D			LAGI DO	0		HEF	
				HEF	Oat 25th	1:00	164 1	01.0854	
	Oct. 25th	1:00	197 4	13.7665	Thursday	2:00	170 9	7.51765	
·	Thursday	2:00	109 79	9.10092	indiaday	3:00	137 1	21.0073	
		3:00	97 8	38.8866		4:00	206 8	0.47573	
		4:00	1.04 8	2.90385		5:00	. 328 5	0.54268	
		5:00	161	53.5528		6:00	608 2	27.26645	
		6:00	344 2	5.06395		7:00	1093	15.16743	
		7:00	530 1	5.26792		8:00	1067	15.53702	
		8:00	491 1	7.56006		9:00	995	16.66131	
		9:00	542 1	5.90775		10:00	952	17.41387	
	Ŀ	10:00	581	14.83993		11:00	876	18.92466	
		11:00.	622	13.80174		12:00	897	18.48161	
		12:00	595	14.49070		13:00	868	19.09908	
	· L	13:00	566	15.23322		14:00	946	17.52431	
		14:00	487	17.70431		15:00	962	17.23285	
		15:00	541	15.93715		16:00	991	16.72856	
		16:00	519	10.01272		17:00	1020	16.25294	
	Ļ	17:00	511	10.0120		18:00	1019	16.26889	
		18:00	363	23.75207		19:00	961	17.25078	
	1	19:00	2/8	31.01439		20:00	657	25.23288	
		20:00	239	36.07531		21:00	583	28.43568	
		21:00	220	39.19091		22:00	419	39.56563	
		22:00	220	49 1676		23:00	388	42.7268	
		23:00	1/9	40.1070		24:00	271	61.17343	
		24:00	126	00.42007	4	L	16578		
			1 8622	1					~

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WEST BOUN	ND.			EAST BOU	D		
11201 2001			HEF				HEF
Oct. 26th	1:00	97	44.36082	Oct. 26th	1:00	205	93.54634
Friday	2:00	84	51.22619	Friday	2:00	146	131.3493
	3:00	76	56.61842		3:00	157	122.1465
	4:00	82	52.47561		4:00	202	94.93564
	5:00	125	34.424		5:00	313	61.26837
	6:00	229	18.79039		6:00	617	31.08104
	7:00	250	17.212		7:00	907	21.14333
	8:00	252	17.0754		8:00	974	19.68891
F	9:00	227	18.95595		9:00	882	21.74263
F	10:00	274	15.70438		10:00	968	19.81095
	11:00	<b>332</b>	12.96084		.11:00	908	21.12004
	12:00	287	14.99303	1 [	12:00	899	21.33148
· · · · ·	13:00	273	15.7619	] [	13:00	948	20.2289
	14:00	289	14.88927	] [	14:00	1093	17.54529
	15:00	318	13.53145		15:00	1220	15.71885
	16:00	430	10.00698		16:00	1167	16.43273
	17:00	413	10.41889		17:00	1221	15.70598
	18:00	265	16.23774		18:00	1139	16.8367
	19:00		· ·		19:00	1139	16.8367
	20:00				20:00	1228	15.61645
	21:00				21:00	1098	17.46539
	22:00				22:00	618	31.03074
	23:00				23:00	617	31.08104
	24:00	1	·		24:00	511	37.52838
		430	3		·	19177	[]

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r.

## WEST BOUND

## EAST BOUND

			HEF				HEF	
Oct. 27th	11:00	612	20.60948	Oct. 27th	1:00	277	58.26715	
Saturday	12:00	1178	10.70713	Saturday	, 2:00	207	77.97101	
	13:00	1225	10.29633		3:00	152	106.1842	
	14:00	1259	10.01827		4:00	157	102.8025	
	15:00	1225	10.29633		5:00	212	76.13208	
• • •	16:00	1294	9.747295		6:00	331	48.76133	
	17:00	1183	10.66188		7:00	370	43.62162	
•	18:00	1116	11.30197	,	8:00	453	35.62914	
	19:00	942	13.3896		9:00	582	27.73196	
	20:00	675	18.68593		10:00	813	19.8524	
	21:00	551	22.89111		11:00	918	17.5817	
	22:00	387	32.59173		12:00	1059	15.24079	
	23:00	464	27.18319		13:00	1045	15.44498	
	24:00	502	25.1255		14:00	1122	14.38503	
		12613			15:00	1102	14.6461	
			<u></u>		16:00	1145	14.09607	1
<i>,</i>					17:00	1065	15.15493	l
		,			18:00	1099	14.68608	l
			-		19:00	985	16.38579	
•					20:00	827	19.51632	1
		•			21:00	623	25.9069	
					22:00	533	30.28143	
					23:00	571	28.2662	J .
				·	24:00	492	32.80488	
						16140	·	]
$\smile$								-

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

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## 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)



LA DOTD DISTRICT 62 TRAFFIC ENGINEERING STUDY Volume by Lane Report - D012200 01-29-2002 - - -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 1 Lane -----\_\_\_\_\_ 1008 12:00 1010 13:00 947 14:00 1071 15:00 1131 16:00 1305 17:00 1329 18:00 946 19:00 660 20:00 522 21:00 . 557 22:00 377 23:00 248 24:00 Wed - Jan 23, 2002 172 01:00 135 02:00 155 03:00 127 04:00 199 05:00 465 06:00 . 753 07:00 894 08:00 936 09:00 987 10:00 1016 11:00 ===== \_\_\_\_\_\_ 16950 24 Hour Totals 956 12:00 858 13:00 933 14:00 1081 15:00 1200 16:00 1277 17:00 1353 18:00 993 19:00 690 20:00 544 21:00 503 22:00 446 23:00 267 24:00 Thu - Jan 24, 2002

01:00

٠.

02:00					161
03:00					170
04:00					- 124
05:00					206
06:00					504
				LA DOTD	DISTRICT
01-29-2002			Vol	ume by Lane R	eport - DO
Thu - Jan 24, 20	002				· _
Lane					1
07.00					822
07:00					928
08:00					945
09:00					962
T0:00				1	1045
TT:00					======
24 Hour Totals					17118
12.00					980
13:00					923
14:00		·			99:
15.00					989
16.00					116
17:00					130
18.00					136
10.00					96
20.00					69
20.00					52
22:00					54
22:00					40
23.00					50
24.00					
Fri - Jan 25, 2	2002				
01:00					. 58
02:00					22
03:00					17
04:00					16
05:00					24
06:00					42
					74
07:00					84
07:00 08:00					93
07:00 08:00 09:00					
07:00 08:00 09:00 10:00					91
07:00 08:00 09:00 10:00 11:00					91 106
07:00 08:00 09:00 10:00 11:00					91 106 =====
07:00 08:00 09:00 10:00 11:00 24 Hour Totals					91 106 ===== 1766
07:00 08:00 09:00 10:00 11:00 24 Hour Totals 12:00					91 106 ===== 1766 104
07:00 08:00 09:00 10:00 11:00 ========================	=	·			91 106 ===== 1766 104 106
07:00 08:00 09:00 10:00 11:00 ========================					91 106 ===== 1766 106 116
07:00 08:00 09:00 10:00 11:00 ========================	=				91 106 ===== 1766 104 106 116 125
07:00 08:00 09:00 10:00 11:00 ========================	=	• •			91 106 ===== 1766 104 106 116 129 123
07:00 08:00 09:00 10:00 11:00 ========================	=	•			91 106 ===== 1766 104 106 116 129 123 144
07:00 08:00 09:00 10:00 11:00 ========================		•			91 106 ===== 1766 104 106 116 129 123 144 14
07:00 08:00 09:00 10:00 11:00 ========================		• •			91 106 ===== 1766 106 116 129 129 129 144 14
07:00 08:00 09:00 10:00 11:00 ========================		• • •			91 106 ===== 1766 104 106 125 128 144 149 117
07:00 08:00 09:00 10:00 11:00 ========================		· ·	·		91 106 ===== 1766 104 106 125 128 144 145 117 76

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24:00			433
Sat - Jan 26, 2002			
JZ:00			310
03.00			223
04.00			1/8
05:00			164
			T04
		LA DOTI	DISTRICT 62
01-29-2002		Volume by Lane	Report - D012
Lane			7
		:	
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			15000
12:00			1060U 1051
13:00			100F
14:00			1020
15:00			· 1014
10.00			1017
1.5 1 1 1			

••		
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		130
03:00		120
04:00		153
		155
	LA DOTD	DISTRICT 62
01 30 3003	TRAFFIC ENG	INEERING STUDY
01-29-2002	Volume by Lane Re	port - D012200!
Mon - Jan 28, 2002	2	
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	2	
01 - 00		
02-00		180
		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

4	
· · · · · · · · · · · · · · · · · · ·	LA DOTD DISTRICT 62
01-29-2002	TRAFFIC ENGINEERING STUDY
Sta: WEST00000000 Id: I-100000 Start: Tue - Jan 22, 2002 at 11:00 City/Town: LAPLACE Location: I-10 EASTBOUND Ln1-West	00000 CId: 01
Tue - Jan 22, 2002 Lane	1
12:00 $13:00$ $14:00$ $15:00$ $16:00$ $17:00$ $18:00$ $19:00$ $20:00$ $21:00$ $22:00$ $23:00$ $24:00$	915 914 948 920 1024 1083 1057 881 514 470 338 299 245
Wed - Jan 23, 2002	
01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00	188 146 121 163 347 758 1239 1219 1049 1126 881
24 Hour Totals 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00	===== 16845 903 952 917 961 1152 1093 1011 943 542 440 400 313 229
Thu - Jan 24, 2002	

01:00

01-29-2002 Thu - Jan 24, 20						
Thu - Jan 24, 20				T Volume	LA DOTD I RAFFIC ENG by Lane Rep	)ISTRICT 62 INEERING STUD port - D01220
Lane	002					1
07:00 08:00 09:00 10:00 11:00						1211 1211 1065 1104 950
24 Hour Totals 12:00	• * · · · · ·					===== 17100 951 879
14:00 15:00 16:00 17:00 18:00				* .		1010 1083 1198 1221 1280
19:00 20:00 21:00 22:00						1080 835 486 420
23:00 24:00	2002					255
fri - Jan 25, 2 01:00			•		• •	185
02:00 03:00 04:00 05:00						145 167 200 293
06:00 07:00 08:00 09:00						710 1138 1195 1064
10:00 11:00	,					1079 1090
24 Hour Totals 12:00 13:00	5				. · · ·	18357 1171 1105 1264
14:00 15:00 16:00 17:00		· ·	• •			1207 1606 1415
18:00 19:00 20:00 21:00						1538 1417 1048 722 579

2'3:00 24:00					439 378
Sat - Jan 26,	2002				
01:00 02:00 03:00			· · · · · · · ·		283 211 162
05:00	•				185 256
01-29-2002			Volume	LA DOTD D TRAFFIC ENGI by Lane Rep	ISTRICT 62 NEERING STU Ort - D0121
Sat - Jan 26, Lane	2002				
	-				
06:00				×	377
08:00		· · · ·			411
09:00					553
10:00					1155
11:00					1149
24 Hour Total	== S	· · · · ·			======
12:00					1200
13:00					1185
14:00	•		· · ·		1119
15:00					1038
17.00			,		1088
18:00					1125
19:00					1010
20:00	······································				115
21:00					· 0
22:00	•				0.
24:00	ч <sup>с</sup>				0
					0
Sun - Jan 27,	2002				
01:00			· •		0
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06:00					0
07:00			· · · .		U 0
08:00			· · · · · · · · · · · · · · · · · · ·		õ
09:00					0
11:00				· · ·	0
	==				0
24 Hour Total	S				9099
12:00 "				•	0
L3:00		· •		•	0
15.00				•	0
16:00					0
			й. 1		0

s ••\*

L'7:00 L8:00 L9:00 20:00 21:00 22:00 23:00 24:00			•		
Mon - Jan 28,	2002				X
01:00 02:00 03:00 04:00		• • • • •			
01-29-2002			Volume	LA DOTD I TRAFFIC ENG by Lane Rep	DISTRICT 62 INEERING STUDY Port - D0122006.
Mon - Jan 28 Lane	, 2002				1
05:00 06:00 07:00 08:00 09:00 10:00 11:00				· ·	
24 Hour Tota 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00	ls				
23:00 24:00	0.000				0
lue - Jan 2	9, 2002			•	0
01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00					

24 Hour Totals

2-05-2002				Volume b	by Lane Re	eport - D0201004
Sta: WEST00000 Start: Fri - H City/Town: LAN Location: I-10	)000 Feb 01, 2002 a PLACE ) EASTBOUND	Id: t 11:00	I-110EBC	0000		CId: 01
Ent nege	2002					
Lane	2002					1
12.00	-	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -				1188
13.00		×			:	1210
14:00						1423
15:00						1537 :
16:00						1430
17:00						1597
19.00						1427
20:00						1066
21:00		· .				981
22:00						588
23:00						513
24:00						
02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00					•	233 184 225 260 366 442 606 871
10:00	•					1045
						21093
24 Hour Tota	ILS.					1310
13:00	•					1207
14:00						1261
15:00						1285
16:00	• •					1430
17:00	· · ·					1437
19.00	•			· ·		1156
20:00			•			971
21:00	e e e e e e e e e e e e e e e e e e e	•. • •		an tan ta		767
22:00		12 - 14 				7.04
						707
04:00 05:00 06:00		19 19 25				
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	LA	DOTD DISTRIC				
02-05-2002	TRAFF Volume by L	IC ENGINEERING ane Report - I				
Sun - Feb 3,	2002					
Lane	<b>_</b>					
07:00		2				
08:00		3				
09:00		5				
10:00		7				
TT:00		8				
24 Hour Total	 S	====				
12:00		0 TQT				
13:00		8				
14:00		8				
15:00		'8				
17.00		8				
18:00		9				
19.00		8				
20:00		6				
21:00		4				
22:00		5				
23:00		6				
24:00		, 3				
Mon - Feb 4,	2002	· .				
01.00						
02:00		2				
03:00	·	1				
04:00		. 1				
05:00		2				
07:00		7				
08:00		13				
09:00		בע דר				
10:00		10				
11:00		10				
	==					
24 nour Tota.	S S S S S S S S S S S S S S S S S S S	168				
13:00		. 10				
14:00		9 10				
15:00		10				
16:00		9				
17:00		11				
18:00		10				
19:00		8				
21.00		5				
		4				

		x	
			318
23:00			200
24:00			
Tue - Feb 5, 2002			
			. 107
01:00			150
02:00		• •	160
03:00			105
04:00			224
05:00			214
			DISTRICT 62
		TRAFFI	C ENGINEERING STUDY
02 05 2002		Volume by La	ne Report - D0201004
02-03-2002	 		
The - Feb 5, $2002$			•
Lane			1
			_
06:00			
			776
07:00			776 1275
07:00			776 1275 1248
07:00 08:00 09:00			776 1275 1248 1084
07:00 08:00 09:00			776 1275 1248 1084 1017
07:00 08:00 09:00 10:00			776 1275 1248 1084 1017 1056
07:00 08:00 09:00 10:00 11:00			776 1275 1248 1084 1017 1056
07:00 08:00 09:00 10:00 11:00			776 1275 1248 1084 1017 1056 ====== 17496

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

WEATHEI PARISH: ( CITY: NE/	R: JEFFERSOI AR LACASS	N DAVIS NNE				LOUISIANA 70602			
LOCATIO	N: EAST B	OUND I-10	AT M.P. 50	0	an ing a sy i ang gin dia pangananya ya Ya Ya Ma				Sile Code: 33333333333333
Time	Mon 24-Jun-02	1ue 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 Averane
·12:00 AM	*	461	523	517	0	375	*	*	07E (2000)
01:00	*	429	426	319	0	294	<b>*</b> .	*	
02:00	*	386	363	5		189	*	*	
03:00	*	421	381	2		201	*	*	100 回波調査 1000
04:00	×	408	377	0		196	¥	÷	
05:00	*	520	553	0	Ú	268 0	*	÷	「四日間には、「日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日日
00:00	*	691	715	0	0	352	*	*	50.0 戦闘戦闘 35.2 戦闘戦闘戦闘
02:00	*	930	· 880	0		603 (j) - 24	*	¥	のつく、政策は自然は変換である。
08:00	*	1084	1038	2	. <b>*</b>	708	*	*	0.00 指指指的方式的复数形式的一种方式
00:00	1034	1122	1151	5		2.828 States State	*	*	/ U.O. 医结束性试验性试验性试验检试验的 0 A/O. 医胃炎症状的生产的生产的生产的
10:00	1088	1181	1195			Rff	×	*	
11:00	1142	1283	1306	Ċ.	•	032	*	•	
12:00 PM	1199	1351	1430		*	and the second se	<b>- +</b>	: • •	934
01:00	1259	1492	1455 8	4	- 		٠	-	
02:00	1112	1434	1420	2	· · · 24. 25. 25. 25. 25. 25. 20. 20. 20. 20. 20. 20. 20. 20. 20. 20	000 000	* *	₩ <sup>0</sup>	
03:00	1371 靈	1561	1299	0	¥	1058 Contraction Contra	*	•	
04:00	1570	1483	1631		*		*	•	1058 1999 1999
02:00	1861	1435	1624	. 6	#	1111	: ,	ε.	
00:00	1312	1283	1247	4 m	*		<b>r</b> ,	* 4	
07:00	1186	1028	1080	0 a.		201 824	*	≤ ¥4	
08:00	935	923	847	5	+	677	*	: • <b>x</b>	
00:60	. 813	890	815	2	•	630	*	*	
10:00	673	635	659	<del></del>	*	492	*	*	0.5U (BREAMERINE REPORTS AND A CONTRACT AND A CONTR
11:00	549	538	589	e	*	420	*	*	
Day Total	17104	22969	23004	877	2	16317	0		4.2.0 開始開始計画
% Avg. WkDay	104.8%	140.8%	141.0%	5.4%	%0.0				11001
% 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	a manan ma ana ana ana ana ana ana ana a	A a to share the manual second s	
Volume	1142	1283	1306	517		6021			11:00
PM Peak	17:00	15:00	16:00	13.00	normalization of the second	17:00			934 47.00
Volume	1861	1561	1631	4		1230			
Total	17104	22969	23004	877	2	16317	0	0	16317
ADT	Not C	almhatad							

Page 1 Date Printed: 28-Jun-02

LA DOTD 5827 HWY 90 EAST LAKE CHARLES -OUISIANA 70602

Page 1 nted: 28-Jun-02	
Prin	
Date	

LA DOTD 5827 HWY 90 EAST LAKE CHARLES LOUISIANA 70602

2 .

WEATHER						LAKE CHARLES LOUISIANA 70602			
CITY: NFAI	EFFEKSUI R I ACASS	N DAVIS							
LOCATION	I: WEST BC	DUND I-10	AT M.P. 50	(					Site Code: 11111111111111
Time	Mon 17-Jun-02	1ue 18-Jun-02	Wed 19-Jun-02	Thu 20-Jun-02	Fri 21-Jun-02	Average	Sat	Sun	Week
12:00 AM	**	*	*	*	459	150	20-unr-77	23-Jun-02	Average
01:00	*	*	*	*	VEV	452	488	336	425 周重複要
02:00	*	*	*	*	404	4.04	342	295	357 職務副
03:00	٠	*	٠	*	47R	774	334	229	328 (2019)
04:00	*	*	*	*	4 <u>40</u> 538	420	362	256	349 2323
05:00	*	*	*	*	330 813	010	456	270	421 10412
00:00	×	×	*	*	016 016	013 213	419	319	517 國家政策
07:00	×	×	*	*	1128	910	655	379	650 Mai waw
08:00	*	*	*	*	1006	1120	750	549	809 <b>Walking Walking Wa</b>
00:60	*	*	*	*	1301	1090	948	735	926 Batta 200 Batta
10:00	¥	*	*	·浅爱 ★	1001	1301 13 A A F	1223	1042	1189 10 11 11 11 11 11 11 11 11 11 11 11 11
11:00	×	*	*	41 *		011	L87L	1229	1318 <b>WALKS WINDOW STRUCTURE</b>
12:00 PM	*	×	*	1411	1435	1435	1235	1470	1380 800 800 800 800 800 800 800 800 800
01:00	*	×	*	1411	14 14 1 EDO	1412	1274	1586	14.21 million and a second
02:00	÷	*	*	1400	1009	145/	1333	1653	14.75 100 100 100 100 100 100 100 100 100 10
03:00	*	*	*	1440 1364 🎆	1400	1453	1326 (1326)	1702	1484 Benefits and a second
04.00	÷	*	*				1369	1901	1568 <b>(1998)</b>
02:00	٠	*	** *	0.10	1524	1550	1339	1840	
00:00	*	×	*	1420	1602	1514	1175	1826	
07:00	*	*	•	7111	1303	1248	1295	1581	1343 BEREVERSE AND A CONTRACTOR AND A CONT
08:00	×	*	¥	1140	1259 1080	1200	1037	1322	
00:60	×	*	*	819 819	775	101/	772	1112	980 <b>(2011)</b>
10:00	×	*	*	794	533	134	667	875	782、國際電影物源的統領
11:00	*	*	*	565	614	121	568	706	682 <b>(2010)</b>
Day Total	0	0	0	13922	25AD7	02020	480	537	549
% Avg.	0.0%	0.0%	0.0%	56 0%	101-02	240/0	21128	23750	23220
VVNUdy				0/0.00	0/ 7.701				
% Avg. Week	0.0%	0.0%	0.0%	60.0%	109.4%	107 1%	04 00/		
AM Peak	· · · · · · · · · · · · · · · · · · ·	a series and a series of the s	And the second second second second second		10.00		91.070	102.3%	
Volume					1445	10:00	10:00	11:00	11:00
PM Peak		the second	and a second	16-00	15-00	1440	1781	1470	1380
Volume				1575	1637	10:00	15:00	15:00	16:00
		April 1 of the second second second	And a state of the		551	1330	1369	1901	1570

Page 2 Date Printed: 28-Jun-02

LA UULU 5827 HWY 90 EAST LAKE CHARLES LOUISIANA 70602

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WEATHER: PARISH: JEFFERSON DAVIS CITY: NEAR LACASSINE

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Site Code: 111111111111

	Week	Average	309 2022	307 [101]	280 飯種類	309 898 30	426 1441 144	58月 國際觀察影響	768 [2012]	750 歐征爾斯國際推進	798 and 200	846 100 200 200 200	927	803	843 [20] [20] [20] [20] [20] [20] [20] [20]	842 1444 1444	828 10000000	846. 100 100 100 100 100 100 100 100 100 10	893 893 893			600 離鮮新聞記書		461 2021	382 [2014]	303 100 100	15030			10:00	927	16:00	893	38250	
	Sun	30-Jun-02	<b>*</b>	*	*	*	•	*	*	*	· *	*	*	*	*	*	*	*	*	*	*	*	*	•	*	*	0		0.0%	n and a manager of the second s				23750	
	Sat	29-Jun-02	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	0		0.0%	in a construction of the second s		intervention of the second		21128	
	Average	Day	309	307	280	309	426	581	768	750	798	846	927	803	843		828	13. <b>1846</b> at 1997	893	763	666	600	499	461	382	303 //	15030		100.0%	10.00	927	16:00	893	39900	
	E1	28-Jun-02	*	*	*	*	¥	¥	×	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	0.0%	0.0%	a na managementa da la companya da managementa da companya da companya da companya da companya da companya da c				25407	
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WEST BC	Mon	24-Jun-02	422	465	355	434	608	834	985	1005	1013	1115	1280	1324	1268	1201	1196	1203	1311	1094	1018	839	707	615	570	441	21303	141.7%	141.7%	11:00	1324	16:00	1311	21303	Not C
LOCATION:	Start	Time	12:00 AM	01:00	02:00	03:00	04:00	05:00	06:00	00:70	08:00	03:00	10:00	11:00 徽	12:00 PM	-01:00	02:00	03:00	04:00 麗	05:00	00:00	00:70	08:00	00:60	10:00	11.00	Day Total	% Avg. WkDay	% Avg. Week	AM Peak	Volume	PM Peak	Volume	Grand Total	ADT

# APPENDIX VI: LaPlace LA DOTD LCCA Model Spreadsheet

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														ADT	34000		
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	4	255	255	101	101	1440	. 1	048	2554.0	005908	0.57	70639	0,429361	697	524		
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	5	1237	1237	1014	1014	201		0112	4548 (	064447	0.55	51011	0.448989	1207	984		
	7	1253	1253	1021	1021	4 500		.078	4108 /	0.058487	0.52	20601	0.479399	1035	953		
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	14	1208	1209	599	699	241	8	1398	3814	0.054046	0.6	31456	0,356344	1104	017		
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APPENDIX VII: Lake Charles LA DOTD LCCA Model Spreadsheet

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STAN	n an the second second	97	1 0.16089		0.00807	38.54			0.7681	NC'SDIV/CL	#DIV/OL
SU PA	e	8.2	0 16089		0.00807	19.54		I. NOIVAN	0.7651	#OIV/Cf	a solviol
Comb	21.6 N	c g	0.72177	na del angle	r. 0.02072	22.31	Contraction (	1 YOIV/CF	0.8248	i anv/oi:	#DIV/01
	D14	- <b>z</b> g	بر بورد ب		5	÷ 22.31		* #DIWOF	0.8248	101V/01∰#OIV/01	edinol .
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$S^{2}$	2631	12.12	5.201	5.53	S	1.50		1 A V	<b>U</b> 27	24.05	5 A 4	1250	1.5.19	- C C	30	- N (* 1	44 a G	- e - j	-12-1	2.51	3.55	1.11.1		51.10	****		1.4	61.64	an 13	1.00	S 19	- U.	6.5.2.	3.0	1.1.1	
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8				60.05	1.1.1			1.1	1.1	0.5	332	1.1	1.8			NP.5	10.00	0.99		- C	12.7	0.03	0.12 A	5730		- A - A	5500		1. 1.	話ちは	1.5		12.21	100	12.13	2
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	۰ <b>۳</b> .	ne.	- C	9.00	2.353	·		1.1	wine .	1.21	0.7	1.513	A	106	S	1.1		1.1.1	1.1	11.12	1.1	· · · ·		1.1	(H) (H)	1.5		1.1.1	1		1.16-		1.1		20.25	.77
28	S. 197		12 C U	2010	1.5 ( 1.5)	1.1	12	20.0	(2.5)	2.75.12		5.55.	81.6	2.2.2		1.77	1533		1997	u\	1.25	1.1.1	1.2.1	0.1	21.19		1.1.1		1.11	NE PE	17.3		19.36		1.1	24
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	ME.	(X.)	50	61. A S	S. 1. 1	12.12	4.10	12.00	<b>1</b>		1.7.71	2361	16.5	1	7. T-	1.675	1.56	10.0	1.00		2		580)	S71.V	200	1.1	1.1		12 N 1	27.2	1.1	165	1.5	1.50	63 - A	
	1.5	2.51	5.44	1.1	10.0	1.1	1.1.1	1.1.1	1402	12.10	10 S.	32.5	10.000	0.55	- C.	100	100	1.000	\$ 5.8	0.75	-0.6	1.00	10.00	2924	75.00	$1 \le 1 \le 3$	1.1		25.01	1.10	1.00	32.53	11.	1.5	1.54	

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APPENDIX VIII: Relevant Data From FHWA LCCA Manual

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Initial	Add (	ed Time (Hr/1 Excludes Idlin	,000 Stops) g Time)	Added Cost (\$/1,000 Stops) (Excludes Idling Time)								
Speed (mi/h)	Pass Cars	ass Single-Unit Combination ars Truck 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 Co	st (\$/Veh-	Hr)		0.6927	0.7681	0.8248						

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

\*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.

Initial	Add (	led Time (Hr/1 Excludes Idlin	,000 Stops) g Time)	Ad (	ded Cost (\$/1,0 Excludes Idlin	00 Stops) g Time)
(mi/h)	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

### Table 2.4. Speed change computations.

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.

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

Table 2.12. Composite listing of travel time values.

\* 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.

Tał	ole	2.13	5. J	Recommended	values	of	time	(\$/	Veh-Hr	)(	(Aug	z 96	í \$`	).
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Passanger Cars	Trucks							
r assenger Cars	Single-Unit	Combinations						
\$10 to 13	\$17 to 20	\$21 to 24						

## **Crash Cost Rates**

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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 r	rates (\$1	,000,	1990 \$).
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Intersection or	Fatality		Nonfatal Injury		Property Damage Only (PDO)	
Facinty Type	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)