

January 26, 2011

## TECHNICAL MEMORANDUM

**TO:** Andy Oberlander, P.E. – TxDOT Traffic Operations

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**THRU:** Scott A. Cooner, P.E. – Research Engineer, TTI

**SUBJECT:** Legacy Drive at Preston Road Median Left-turn – Summary of Analysis and Results

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## EXECUTIVE SUMMARY

The Texas Transportation Institute (TTI) developed this memorandum as part of the interagency contract (IAC) with the Texas Department of Transportation (TxDOT) – Dallas District. On July 27, 2010 the first median left-turn configuration in Texas was initiated at the intersection of Legacy Drive at Preston Road. The intent of the median left-turn configuration is to eliminate left turning vehicles within the intersection in an effort to improve traffic flow and improve safety.

TTI conducted an analysis of the median left-turn to determine the operational effects it has had at this intersection. TTI collected traffic volumes, turning movements, video, travel time information and illegal movement observations as part of this analysis. The initial objective of this analysis is to determine whether the implementation of the median left-turn configuration provides any operational improvements to the intersection at Legacy Drive and Preston Road. A secondary analysis will be performed to determine whether the implementation of the median left-turn configuration provides any safety improvements at this intersection.

Based on the operational analysis, the following key conclusions and suggestions can be drawn:

### Conclusions

- Left-turning vehicle movements from Legacy Drive to Preston Road have decreased
- Total traffic-flow through the Legacy Drive and Preston Road intersection has increased
- Vehicle queues longer than one signal phase were only found on the eastbound approach of Legacy Drive during the evening peak hour
- Travel time during the peak hours for vehicles using the median left-turn route take up to 2-minutes 20-seconds
- Illegal u-turns at the cross-over openings on Legacy Drive are still occurring

### Suggestions

- Adjust signal timing for evening period
- Improve enforcement of intersection and cross-over openings on Legacy Drive
- Reduce cross-section of median left-turns from two to one lane

## 1.0 INTRODUCTION

On July 27, 2010 the intersection of Legacy Drive at Preston Road opened the first median left-turn or “Michigan Left-turn” configuration in Texas. The intent of the median left-turn configuration is to eliminate left turning vehicles within the intersection in an effort to improve traffic flow by reducing signal time phasing and improve safety through a reduction of crashes. This, in-turn, should allow for a more efficient operation at the intersecting roadways. The concept of the median left-turn is to provide a substitute maneuver for vehicles making the left-turn movement. This is accomplished by having all left turning vehicles make a right-turn at the cross-street and then a u-turn back to the direction of intended travel. Figure 1 provides a diagram of this concept. However, at the Legacy Drive at Preston Road intersection, only left turning vehicles on Legacy Drive have been prohibited from the left-turn movement and are required to make the substitute maneuver.

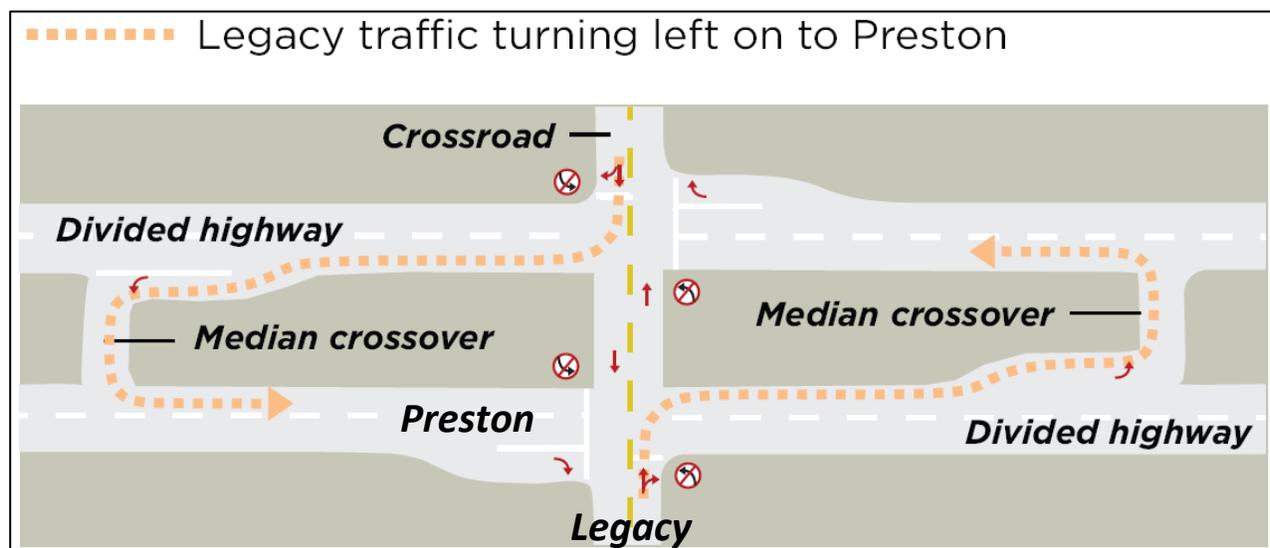


Figure 1. Legacy at Preston Median Left-turn Diagram. Source: Dallas Morning News

### 1.1 Purpose

The initial objective of the analysis is to determine whether the implementation of the median left-turn maneuver provides any operational improvements to the intersection at Legacy Drive and Preston Road. A second analysis will include a look at crash records to determine any safety improvements related to the implementation of the median left-turn configuration.

### 1.2 Organization of Report

This report is organized into six main sections. Section 2 presents vehicle volume comparisons before and after the median left-turn implementation. Section 3 discusses approach volume queue lengths, signal timing and travel time observations. Section 4 discusses illegal u-turns on Legacy Drive. Finally, Section 5 presents conclusions and suggestions from this study. An appendix contains information collected and used by TTI in this analysis.

## 2.0 VEHICLE VOLUME COMPARISON

This section analyzes vehicle volumes at the intersection of Legacy Drive and Preston Road. It compares turning movements before and after the median left-turn implementation.

### 2.1 Morning Period

Figure 2 compares vehicle turning movements before and after the implementation of the median left-turn configuration during the morning peak hour. Before implementation of the median left-turns, vehicles were able to make all movements through the intersection as shown in green or the first number in the set in Figure 2. During the morning period, the major left-turn movement at the intersection prior to the change, involved vehicles traveling westbound on Legacy Drive turning left onto southbound Preston Road. This movement included approximately 490 vehicles during the morning peak hour. Before volumes were obtained from a report titled "Preston Road & Legacy Drive Alternatives Analysis - Final Report", June 16, 2006 and prepared by Parsons.

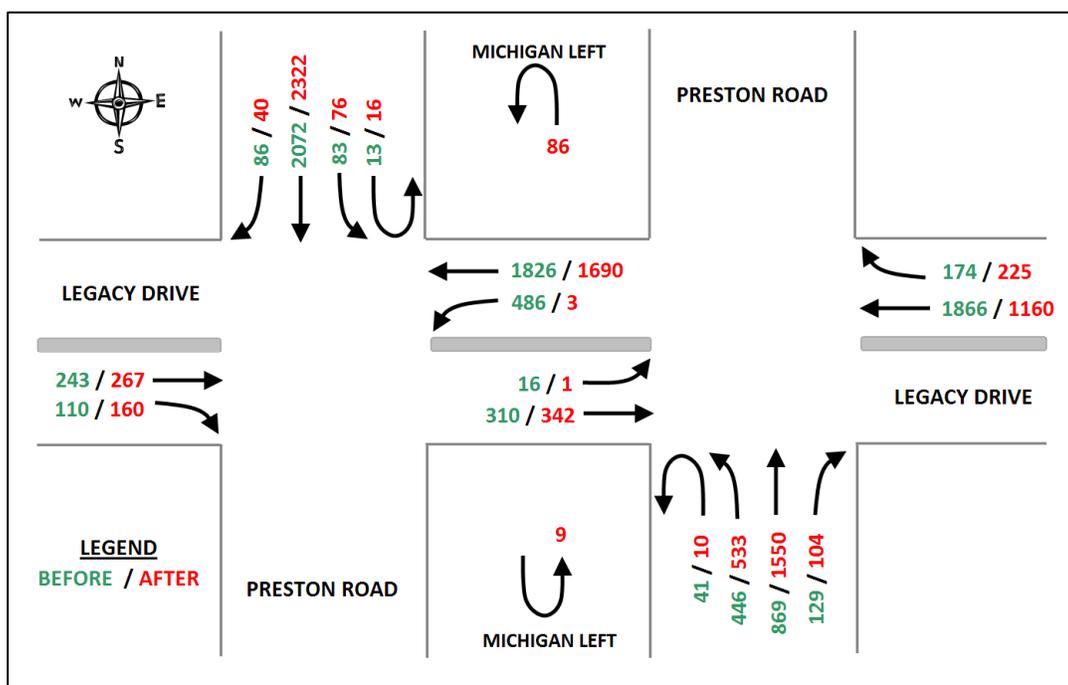


Figure 2. AM Peak Hour Movements

After the implementation of the median left-turns, vehicles were prohibited from making the direct left-turns from Legacy Drive to Preston Road. The new median left-turns provided an alternative means to make these movements. Figure 2 shows that approximately 90 vehicles utilize the northern median left-turn movement during the morning peak hour. The northern median left-turn emulates the movement of vehicles traveling from westbound on Legacy Drive to southbound on Preston Road. It can be seen that the number of vehicles making this maneuver has decreased since the implementation of the median left-turn configuration. This is also the case during the rest of the morning period.

While actual travel delay to motorists using the median left-turn maneuver is relatively low, it is hypothesized that the typical traveling motorist perceives the maneuver as untraditional and, therefore, should be avoided in order to save time. It is surmised that the reduction of left-turning vehicles from Legacy Drive to Preston Road during the morning peak period is due to these motorists having found

alternate routes in the vicinity that still allow direct left-turns. While there is no origin-destination data to support this assumption, approach volumes traveling in both directions on Preston Road have notably increased at the Legacy Drive intersection since the implementation of the median left-turn configuration.

Furthermore, total traffic at the intersection has increased during the morning period since the implementation of the median left-turn configuration. Adding up all traffic for each approach on a before and after implementation basis results in an increase of traffic passing through the intersection (6,132 vehicles per hour (vph) before and 6,463 vph after). This might suggest that motorists are aligning themselves to Preston Road upstream of Legacy Drive, in order to avoid having to use the median left-turn.

Additionally, it can be seen in Figure 2 that a few vehicles were observed making the illegal left-turn during the turning movement data collection period. While the observations of this illegal maneuver were low, police enforcement is a key component for the successful implementation of any new roadway configuration and should be continued indefinitely in order to adjust the motorists to this new concept.

## 2.2 Evening Period

Figure 3 compares vehicle turning movements before and after the implementation of the median left-turn configuration during the evening peak hour. During the evening period, both left-turn movements from Legacy Drive to Preston Road prior to the change were significant turning movements. The westbound Legacy Drive to southbound Preston Road turning movement included approximately 212 vehicles during the evening peak hour. Conversely, the eastbound Legacy Drive to northbound Preston Road turning movement included approximately 199 vehicles during the evening peak hour.

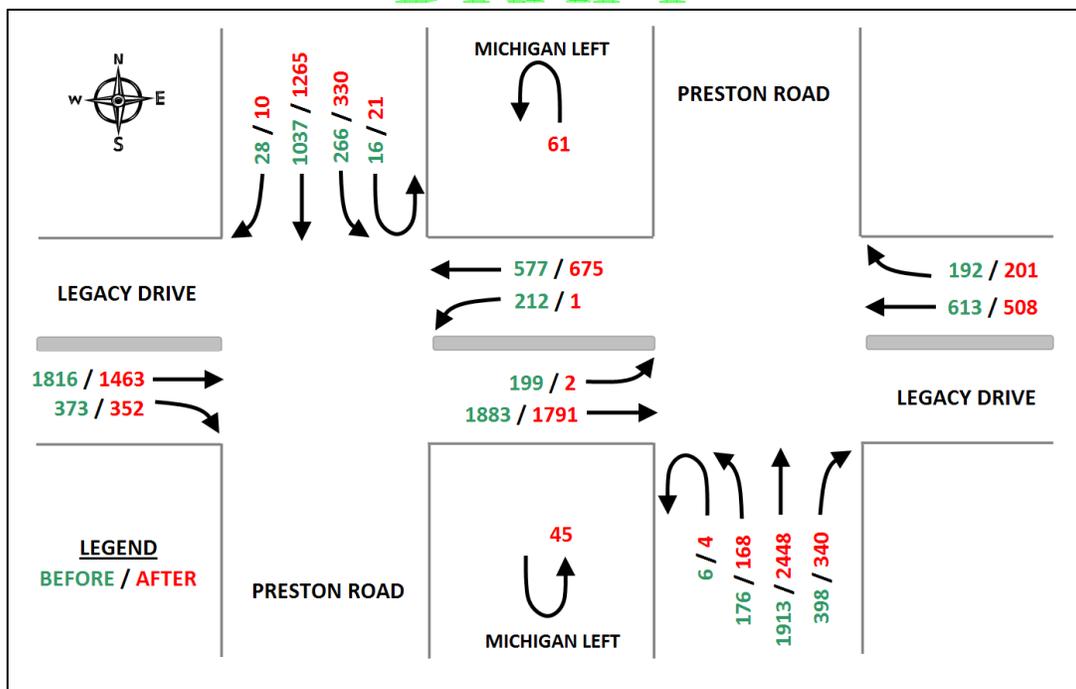


Figure 3. PM Peak Hour Movements

After the implementation of the median left-turn configuration, approximately 60 vehicles utilize the northern median left-turn movement during the evening peak hour in order to emulate the maneuver from westbound Legacy Drive to southbound Preston Road. Conversely, approximately 45 vehicles utilize the southern median left-turn movement in order to emulate the maneuver from eastbound Legacy Drive to northbound Preston Road during the evening peak hour.

The number of vehicles making the new alternative left-turn maneuvers during the evening period has decreased since the implementation of the median left-turn configuration. As in the morning peak period, it is surmised that the reduction of left-turning vehicles from Legacy Drive to Preston Road during the evening peak period is due to motorists having found alternate routes in the vicinity. These alternate routes may include using Tennyson Parkway or Hedgcoxe Road to align with Preston Road prior to intersecting with Legacy Drive. Additionally, as seen in the morning vehicle counts, the evening approach volumes traveling in both directions on Preston Road have notably increased at the Legacy Drive intersection since the implementation of the median left-turns.

Furthermore, total traffic at the intersection has increased during the evening period since the implementation of the median left-turn configuration. Adding up all traffic for each approach on a before and after implementation basis results in an increase of traffic passing through the intersection (6,834 vph before and 7,110 vph after). Again, this might suggest that motorists are aligning themselves to Preston Road prior to Legacy Drive, in order to avoid having to use the median left-turn.

### 3.0 VEHICLE QUEUES, SIGNAL TIMING and TRAVEL TIME

This section discusses vehicle queues and associated signal timing and travel times at the intersection of Legacy Drive and Preston Road. This information only includes after effects of the median left-turn implementation.

#### 3.1 Vehicle Queues

Another basis for implementing the median left-turn configuration at the intersection of Legacy Drive and Preston Road was to reduce the queue lengths of the approaches to the intersection. Prior to the configuration changes, substantial vehicle queues were common on all approaches to the intersection. It had been observed by TxDOT Dallas District personnel that multiple consecutive cycles (two or more) were needed to clear vehicles through the intersection during the peak periods of the day.

TTI conducted a queue analysis on all approaches of the Legacy Drive and Preston Road intersection during the morning and evening peak periods. TTI observed that during the morning peak period (6:00 A. M. to 9:00 A.M.) no vehicles had to wait beyond a single cycle to clear the intersection. In other words, the queue lengths at the intersection for each approach were not longer than the provided signal timing.

Furthermore, TTI observed that during the evening peak period (4:00 P.M. to 7:00 P.M.) no vehicles had to wait beyond a single cycle to clear the intersection except on the eastbound approach of Legacy Drive at Preston Road southbound. During the time from 5:00 P.M. to 5:45 P.M., it was observed that for seven instances vehicles on this approach were unable to clear the intersection on a single signal cycle. For each of these seven instances, however, only one additional cycle was needed to clear the intersection. It is surmised that a simple timing modification of the signal phasing during the evening peak period would reduce or eliminate this occurrence.

### 3.2 Signal Timing

Due to the elimination of the left-turns from Legacy Drive to Preston Road, the signal phasing at the intersection was adjusted to provide more green time to the remaining movements. The new signal timing plan utilizes a two phase operation on each side of the divided intersection.

Currently, the typical morning peak hour cycle length is 2-minutes 40-seconds in duration at this intersection. On the eastern side of the intersection, this typically provides 1-minute 37-seconds for the northbound Preston Road phase and 1-minute 3-seconds for the eastbound-westbound Legacy Drive phase. On the western side of the intersection, this typically provides 1-minute 25-seconds for the southbound Preston Road phase and 1-minute 15-seconds for the eastbound-westbound Legacy Drive phase. This cycle length and signal phasing plan seems to provide sufficient time for all vehicles to clear the intersection for each approach during the morning peak hour.

Conversely, the typical evening peak hour cycle length is 2-minutes 30-seconds in duration at this intersection. On the eastern side of the intersection, this typically provides 1-minute 36-seconds for the northbound Preston Road phase and 54-seconds for the eastbound-westbound Legacy Drive phase. On the western side of the intersection, this typically provides 1-minute 27-seconds for the southbound Preston Road phase and 1-minute 3-seconds for the eastbound-westbound Legacy Drive phase.

Based on the vehicle queue information discussed in the previous section, this cycle length and signal phasing plan does **not** seem to provide sufficient time for all vehicles to clear the intersection during the evening peak hour, especially the west side approach of Legacy Drive eastbound. It is surmised that lengthening the cycle length during the evening peak period may address this problem.

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### 3.3 Travel Time

One consequence of implementing the median left-turn configuration is the minor delay to left-turning motorists. Travel time information through the Legacy Drive and Preston Road intersection before the median left-turn implementation is unavailable for this analysis. However, TTI did conduct travel time runs on Legacy Drive after the median left-turn implementation and can reasonably estimate the travel time along the previous direct left-turn route. Direct left-turn travel times prior to the median left-turn configuration were estimated to take approximately 8-seconds to 11-seconds at a minimum to travel on Legacy Drive from one side of the divided intersection to the other side and turn left onto Preston Road.

Additionally, TTI collected travel time information along the new median left-turn routes. Vehicles traveling along the median left-turn routes would take approximately 1-minute during the off-peak and up to 2-minutes and 20-seconds during the peak period. Travel times for the direct routes and the median left-turn routes, for both directions respectively, use the same begin and end points in order to make proper comparisons.

One observation from the travel time study found that most of the delay during the median left-turn travel routes occurs at the median left-turn signals. Delay at these signals was as high as 2-minutes in some instances. A second observation from the travel time study found that once a vehicle proceeded from the median left-turn signal, little to no delay was incurred at the next downstream signal at Legacy Drive. This implies that the median left-turn signals are phased to progress with traffic on Preston Road through the Legacy Drive intersection signal.

#### 4.0 ILLEGAL U-TURNS ON LEGACY DRIVE

Another consequence of implementing the median left-turn configuration is that some vehicles are making use of the cross-over openings located on Legacy Drive to accomplish the left-turn maneuver. Since vehicles are now prohibited from directly turning left from Legacy Drive to Preston Road and since some vehicles do not want to use the median left-turn configuration provided, some vehicles will make u-turns at the median cross-over openings located on Legacy Drive east and west of Preston Road, come back to Preston Road and then turn right onto Preston Road to complete the maneuver. The intent of these median cross-over openings, however, is to allow for traffic to access businesses, etc. and not for making u-turns.

Some time after the implementation of the median left-turn configuration, “NO U-TURN” signs were installed at several of the cross-over openings on Legacy Drive east and west of Preston Road. This course of action made u-turns at these cross-over openings an illegal maneuver. However, this maneuver by motorists still occurs. As part of this analysis, TTI made field observations to document the illegal U-turn maneuvers.

TTI conducted field observations of the illegal u-turn maneuvers over a three day period during the morning (6:00 A.M. to 9:00 A.M.) and evening (4:00 P.M. to 7:00 P.M.) peak periods and during the midday (11:00 A.M. to 1:00 P.M.) period. Field observations were made at the Legacy Drive cross-over openings located immediately to the east and west of Preston Road.

Table 1 provides a summary of the total number of illegal u-turns observed for each observation day for each time period. It can be seen that illegal u-turns were higher on the west side of Preston Road for traffic wanting to travel from westbound Legacy Drive to southbound Preston Road. It was observed that most of the illegal u-turns involved single motorists at various times of the day. However, in a few cases it was observed that some of the illegal u-turns would occur in platoons up to 5 vehicles at a time. Additionally, it was observed that illegal u-turns did not occur during every signal phase.

**Table 1. Number of Illegal U-Turns**

LOCATION	Number of Illegal U-turns		
	AM Period (6:00-9:00)	Midday Period (11:00-1:00)	PM Period (4:00-7:00)
<b>West of Preston Road</b>			
Observation 1	21	33	32
Observation 2	33	35	47
<b>East of Preston Road</b>			
Observation 1	5	6	13
Observation 2	4	NA	13

For analysis purposes, adding together the number of illegal u-turns (Table 1) and the number of median left-turns (Figures 2 and 3) for each respective time period results in a lower volume of total left-turning traffic when compared to the before median left-turn configuration totals. This supports the hypothesis that some vehicles have found alternate routes upstream of the Legacy Drive and Preston Road intersection.

## 5.0 CONCLUSIONS AND SUGGESTIONS

This section discusses conclusions derived from the analysis of the median left-turn configuration at the Legacy Drive and Preston road intersection and will provide some suggestions for operational improvement.

### 5.1 Conclusions

Based on the site inspection and results of the data analysis, the findings from this investigation include the following:

- Left-turning vehicle movements from Legacy Drive to Preston Road have decreased since the median left-turn implementation.
- Total traffic-flow through the Legacy Drive and Preston Road intersection has increased since the median left-turn implementation.
  - **It is surmised that some motorists have found alternate routes that align motorists on Preston Road prior to reaching Legacy Drive. This action allows motorists to utilize direct left-turns at other intersections in the vicinity and avoid using the median left-turn configuration at Legacy Drive and Preston Road.**
- Vehicle queues longer than one signal phase were only found on the eastbound approach of Legacy Drive during the evening peak hour since the median left-turn implementation.
  - **It is surmised that by implementing the median left-turn configuration more green time is available for each approach to the Legacy Drive and Preston Road intersection since only a two phase signal timing plan is needed.**
- Travel time for vehicles using the median left-turn routes was observed to take as long as 2-minutes 20-seconds during the peak hour operation.
- Illegal U-turns at the cross-over openings on Legacy Drive are still occurring as a means to circumvent the prohibited direct left-turn at Preston and to avoid using the median left-turn.

### 5.1 Suggestions

Based on the findings from the investigation of the median left-turn configuration at the Legacy Drive and Preston Road intersection, the following suggestions are provided by TTI:

#### **Adjust Signal Timing**

- Adjust the signal timing during the evening peak period to allow for all vehicles to clear the intersection on a single phase, especially on the west side approach of Legacy Drive eastbound where some vehicles are having to wait two cycles to clear the intersection.

**Improve Enforcement**

- Greater police presence is needed at Legacy Drive and Preston Road to enforce the “NO LEFT TURN” signs and at the cross-over openings on Legacy Drive where the “NO U-TURN” signs have been implemented as part of the median left-turn configuration.

**Reduce Cross-section**

- Reduce the cross-section at each median left-turn location from two lanes to one lane. Traffic volumes at each location have been observed as very low and support the reduction from two to one lane at this time. If volumes increase in the future, the cross-section is available to increase from one to two lanes.
  - ❖ *If the median left-turn cross-section is reduced from two lanes to one lane, it might be practical to consider a “LEFT TURN ON RED PERMITTED” operation. This configuration should reduce delay to vehicles being stop at the median left-turn signal on red, especially during the off-peak time periods when sufficient gaps between vehicles on Preston Road are observed. This may encourage greater use of the median left-turn configuration. However, it is suggested that a separate study of this particular idea be performed prior to implementation.*

While left-turns at the Legacy Drive and Preston Road intersection have shown a reduction, overall traffic volume through the intersection has increased. It is surmised that motorists have found alternate routes in the vicinity of the Legacy Drive and Preston Road intersection in order to avoid using the median left-turn configuration. Though this is not the intent of implementing this configuration, operations for all approaches have shown improvement.

To understand the full impacts of the median left-turn configuration, safety operations before and after the implementation must be analyzed. A second analysis of the median left-turn configuration will include the examination of crash data in order to determine the safety effects from implementing this configuration. This analysis will be coordinated with the City of Plano and will be conducted at a later date, once sufficient crash data is available at this location.

# APPENDIX

# TURNING MOVEMENT COUNT – AM PERIOD

Turning Movement Count Sheet

City : Plano

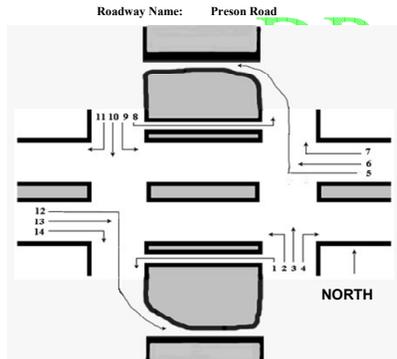
Date : 09/21/10 thru 09/23/10

Weather : Overcast and Clear

Intersection of : Preson Road @ Legacy Drive

Recorder(s) : RM and GB

A.M. Peak Period	PRESTON NORTHBOUND				LEGACY WESTBOUND				PRESTON SOUTHBOUND				LEGACY EASTBOUND			
	1	2	3	4	5	6	7		8	9	10	11	12	13	14	
6:00 - 6:15	1	18	61	9	5	72	10		1	1	131	5	0	14	9	
6:15 - 6:30	0	38	109	8	3	133	20		3	10	208	1	2	21	13	
6:30 - 6:45	1	53	130	13	6	203	35		1	4	280	6	0	31	19	
6:45 - 7:00	0	65	170	17	12	231	36		2	10	367	1	0	35	18	
7:00 - 7:15	3	63	166	8	16	199	26		0	14	436	10	1	59	26	
7:15 - 7:30	3	99	251	22	22	260	47		1	25	664	8	3	62	35	
7:30 - 7:45	4	177	439	36	25	262	51		3	18	545	18	3	75	44	
7:45 - 8:00	2	137	460	25	23	383	70		6	17	592	7	2	63	33	
8:00 - 8:15	1	120	400	21	16	255	57		6	16	521	7	1	67	48	
8:15 - 8:30	4	99	263	13	15	270	57		3	18	486	11	3	47	33	
8:30 - 8:45	1	91	283	24	17	280	63		2	19	452	3	1	59	38	
8:45 - 9:00	0	68	296	24	12	211	55		4	24	430	8	1	67	37	
7:15 - 8:15	10	533	1550	104	86	1160	225		16	76	2322	40	9	267	160	
Percent By Movement	0.5%	24.3%	70.6%	4.7%	5.8%	78.9%	15.3%	0.0%	0.7%	3.1%	94.6%	1.6%	2.1%	61.2%	36.7%	0.0%
Peak Hour By Street	2197				1471				2454				436			
Total By Movement	20	1028	3028	220	172	2759	527	0	32	176	5112	85	17	600	353	0
Percent By Movement	0.5%	23.9%	70.5%	5.1%	5.0%	79.8%	15.2%	0.0%	0.6%	3.3%	94.6%	1.6%	1.8%	61.9%	36.4%	0.0%
Total By Street	4296				3458				5405				970			

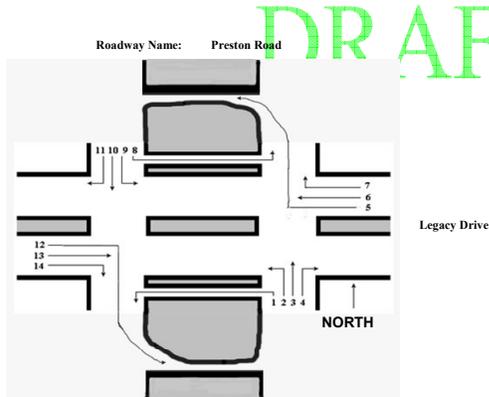


## TURNING MOVEMENT COUNT – PM PERIOD

Turning Movement Count Sheet

City : Plano Date : 09/21/10 thru 09/23/10 Weather : Overcast  
 Intersection of : Preston Road @ Legacy Drive Recorder(s) : TM and RM

P.M. Peak Period	PRESTON NORTHBOUND				LEGACY WESTBOUND				PRESTON SOUTHBOUND				LEGACY EASTBOUND			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4:00 - 4:15	0	24	349	41	10	77	42	5	38	253	6	1	143	72		
4:15 - 4:30	3	31	357	45	9	128	27	5	31	277	11	3	218	55		
4:30 - 4:45	2	31	489	74	6	104	48	2	49	232	3	2	227	74		
4:45 - 5:00	1	40	506	79	8	113	62	12	70	264	7	2	229	74		
5:00 - 5:15	0	48	672	69	15	97	51	3	68	338	4	16	366	84		
5:15 - 5:30	2	41	624	79	19	139	54	5	81	352	3	11	400	94		
5:30 - 5:45	2	48	584	58	13	129	51	4	108	307	1	10	345	92		
5:45 - 6:00	0	31	568	64	14	143	45	9	73	268	2	8	352	82		
6:00 - 6:15	1	21	462	73	9	137	62	2	57	255	4	2	273	73		
6:15 - 6:30	0	32	336	52	10	170	55	4	58	256	10	3	276	82		
6:30 - 6:45	0	26	303	38	8	124	54	6	37	260	4	7	236	57		
6:45 - 7:00	0	19	406	50	5	175	50	8	39	227	6	6	201	51		
5:00 - 6:00	4	168	2448	270	61	508	201	0	21	330	1265	10	45	1463	352	0
Percent By Movement	0.1%	5.8%	84.7%	9.3%	7.9%	66.0%	26.1%	0.0%	1.3%	20.3%	77.8%	0.6%	2.4%	78.7%	18.9%	0.0%
Peak Hour By Street	2890				770				1626				1860			
Total By Movement	11	392	5656	722	126	1536	601	0	65	709	3289	61	71	3266	890	0
Percent By Movement	0.2%	5.8%	83.4%	10.6%	5.6%	67.9%	26.6%	0.0%	1.6%	17.2%	79.8%	1.5%	1.7%	77.3%	21.1%	0.0%
Total By Street	6781				2263				4124				4227			



# TURNING MOVEMENT COUNT – MIDDAY PERIOD

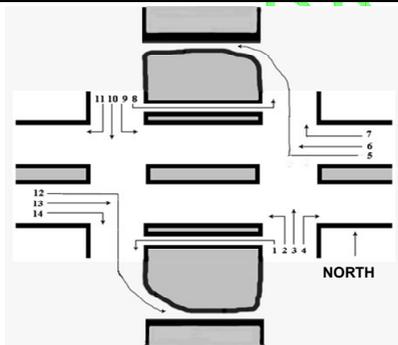
Turning Movement Count Sheet

City : Plano  
 Intersection of : 1470 @ Legacy Drive

Date : 09/21/10 thru 09/23/10

Weather : Overcast/Light Rain  
 Recorder(s) : DGW

Off Peak	PRESTON NORTHBOUND				LEGACY WESTBOUND				PRESTON SOUTHBOUND				LEGACY EASTBOUND				
	1	2	3	4	5	6	7		8	9	10	11	12	13	14		
11:00 - 11:15		4	29	226	30	7	96	28		Did	27	208		3	87	68	
11:15 - 11:30		0	27	296	28	6	128	41		Not	23	234		3	76	42	
11:30 - 11:45		1	25	272	39	10	115	35		Count	31	268		4	115	56	
11:45 - 12:00		0	40	284	40	12	120	48			32	267		8	147	68	
12:00 - 12:15		5	26	277	57	12	117	53			38	293		9	183	64	
12:15 - 12:30		2	47	290	47	14	141	49			28	260		3	136	56	
12:30 - 12:45		5	47	306	39	10	159	39			30	246		5	128	62	
12:45 - 13:00		9	63	292	40	7	175	48			32	276		3	119	57	
13:00 - 13:15																	
13:15 - 13:30																	
13:30 - 13:45																	
13:45 - 14:00																	
12:00 - 13:00		21	183	1165	183	43	592	189	0	0	128	1075	0	20	566	239	
Percent By Movement		1.4%	11.8%	75.1%	11.8%	5.2%	71.8%	22.9%	0.0%	0.0%	10.6%	89.4%	0.0%	2.4%	68.6%	29.0%	
Peak Hour By Street		1552				824				1203				825			
Total By Movement		26	304	2243	320	78	1051	341	0	0	241	2052	0	38	991	473	
Percent By Movement		0.9%	10.5%	77.5%	11.1%	5.3%	71.5%	23.2%	0.0%	0.0%	10.5%	89.5%	0.0%	2.5%	66.0%	31.5%	
Total By Street		2893				1470				2293				1502			



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**TRAVEL TIME ROUTES – AM AND PM PERIODS**

<b>WESTBOUND LEGACY DRIVE (MEDIAN LEFT-TURN ROUTE - NORTHSIDE)</b>												
CHECKPOINTS	MILEAGE	AM PERIOD START TIME						PM PERIOD START TIME				
		6:27	6:50	7:08	7:26	7:45	8:03	16:34	16:55	17:19	17:47	18:09
Ohio Dr	0.00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
NB Preston	0.22	0:26	0:32	0:23	0:31	0:31	0:31	0:41	1:15	0:25	0:30	0:29
SB Preston	0.38	0:58	1:10	1:30	2:30	2:18	1:01	2:02	1:48	1:46	1:41	1:27
Legacy	0.53	2:43	1:30	1:52	2:51	2:39	1:51	2:21	2:56	2:04	2:00	1:44
<b>WESTBOUND LEGACY DRIVE (DIRECT LEFT-TURN ROUTE)</b>												
CHECKPOINTS	MILEAGE	AM PERIOD START TIME						PM PERIOD START TIME				
		6:34	6:55	7:13	7:31	7:50	8:09	16:44	17:02	17:27	17:54	18:16
Ohio Dr	0.00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
NB Preston	0.22	0:24	0:35	0:32	1:01	0:45	0:36	0:29	1:57	0:24	0:24	0:45
SB Preston	0.29	0:33	0:47	0:42	1:11	0:55	0:45	0:37	2:07	0:32	0:34	0:55
Windcrest	0.80	1:20	1:28	1:26	1:57	1:40	1:29	1:21	2:51	1:38	1:15	1:34
<b>EASTBOUND LEGACY DRIVE (MEDIAN LEFT-TURN ROUTE - SOUTHSIDE)</b>												
CHECKPOINTS	MILEAGE	AM PERIOD START TIME						PM PERIOD START TIME				
		6:39	6:59	7:18	7:36	7:55	8:20	16:47	17:07	17:29	17:57	18:19
Windcrest Dr	0.00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
SB Preston	0.53	0:56	0:42	0:46	0:50	0:49	0:46	0:45	0:54	1:38	0:52	0:51
NB Preston	0.69	1:42	1:18	1:26	1:25	1:24	1:20	1:38	2:00	2:02	2:00	1:37
Legacy	0.85	2:34	1:49	1:47	1:50	2:07	1:46	1:56	3:35	3:23	3:25	2:00
<b>EASTBOUND LEGACY DRIVE (DIRECT LEFT-TURN ROUTE)</b>												
CHECKPOINTS	MILEAGE	AM PERIOD START TIME						PM PERIOD START TIME				
		6:47	7:04	7:23	7:42	8:01	8:25	16:52	17:14	17:37	18:00	18:27
Windcrest Dr	0.00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
SB Preston	0.53	0:46	0:48	0:49	0:47	0:44	0:44	0:40	2:28	2:28	2:24	2:23
NB Preston	0.59	0:54	0:57	0:57	0:55	0:52	0:52	0:49	2:38	2:37	2:35	2:32
Ohio Dr	0.82	1:36	1:25	1:18	1:15	1:11	1:11	2:07	2:58	3:01	2:58	2:53

**ILLEGAL U-TURNS - WESTBOUND**

12/13/2010 PM		12/14/2010 AM		12/14/2010 Midday		12/14/2010 PM		12/15/2010 AM		12/15/2010 Midday	
Time (hh:mm:ss)	U-turn Count										
16:08:18	1	6:20:57	1	11:01:03	1	16:01:18	1	6:24:28	1	11:03:07	2
16:13:31	4	7:09:45	1	11:02:56	1	16:05:52	1	6:27:38	1	11:06:08	1
16:20:46	1	7:14:44	2	11:09:29	2	16:08:39	1	6:32:42	1	11:08:09	1
16:23:23	1	7:17:19	1	11:13:13	1	16:13:31	1	6:59:32	1	11:09:50	1
16:28:35	2	7:20:10	1	11:16:15	2	16:15:38	1	7:17:30	1	11:11:19	2
16:31:21	4	7:25:30	1	11:24:52	1	16:20:42	1	7:25:49	2	11:21:11	1
16:41:10	2	7:28:04	1	11:29:45	2	16:23:35	2	7:30:54	1	11:24:48	1
16:43:29	1	7:32:57	1	11:30:56	1	16:41:13	1	7:44:15	1	11:25:58	1
16:46:02	1	7:38:44	1	11:31:38	1	16:43:42	3	7:46:44	1	11:26:31	1
16:50:51	2	7:42:21	1	11:41:02	1	16:48:45	1	7:50:08	1	11:33:15	1
17:01:04	1	7:43:55	1	11:43:20	1	16:58:33	2	7:57:41	1	11:35:05	1
17:03:41	1	7:52:16	1	11:46:09	2	17:03:28	1	8:00:46	3	11:37:40	1
17:14:04	1	8:00:08	1	11:52:47	1	17:05:52	1	8:05:43	1	11:47:56	2
17:43:34	1	8:06:04	1	11:56:23	1	17:08:48	2	8:14:17	5	11:50:10	2
17:55:50	1	8:16:06	1	11:57:56	2	17:16:17	1	8:16:20	1	11:52:45	1
18:30:58	2	8:30:00	1	11:59:24	1	17:30:55	1	8:21:37	1	11:54:20	1
18:33:18	1	8:32:36	1	12:04:19	1	17:31:35	1	8:27:08	1	11:56:08	1
18:50:50	1	8:37:25	1	12:09:35	1	17:36:03	1	8:32:11	1	11:57:47	1
18:51:13	1	8:40:16	1	12:29:57	3	17:41:28	3	8:38:14	1	12:03:19	1
18:53:10	1	8:48:13	1	12:39:29	1	17:43:36	1	8:45:29	1	12:08:15	1
18:56:33	2	<b>Total</b>	<b>21</b>	12:46:41	1	17:46:28	1	8:50:49	3	12:11:43	1
<b>Total</b>	<b>32</b>			12:48:11	1	17:53:39	1	8:56:32	2	12:16:00	1
				12:52:40	1	17:58:35	1	8:58:50	1	12:24:18	1
				12:53:00	1	18:00:52	1	<b>Total</b>	<b>33</b>	12:26:20	1
				12:56:09	1	18:03:59	1			12:28:11	2
				12:59:18	1	18:06:27	1			12:31:44	1
				<b>Total</b>	<b>33</b>	18:08:52	2			12:36:19	1
						18:20:54	1			12:38:40	1
						18:28:28	1			12:49:18	1
						18:33:20	1			12:50:56	1
						18:36:01	2			<b>Total</b>	<b>35</b>
						18:43:23	1				
						18:45:51	2				
						18:50:58	1				
						18:53:42	1				
						18:58:21	2				
						<b>Total</b>	<b>47</b>				

**ILLEGAL U-TURNS - EASTBOUND**

12/15/2010 PM		12/16/2010 AM		12/16/2010 Midday		12/16/2010 PM		12/17/2010 AM	
Time (hh:mm:ss)	U-turn Count								
16:08:20	1	6:48:04	1	11:29:28	1	16:23:18	1	8:02:41	1
16:18:11	1	6:50:53	1	11:31:10	1	16:38:22	1	8:11:44	1
16:30:49	1	6:59:16	1	11:51:02	1	16:50:41	1	8:32:07	1
16:48:37	1	8:09:06	1	11:53:12	1	16:53:24	1	8:58:46	1
16:53:18	1	8:30:15	1	12:09:47	1	16:56:08	1	<b>Total</b>	<b>4</b>
17:23:32	1	<b>Total</b>	<b>5</b>	12:39:57	1	17:13:50	1		
17:28:35	1			<b>Total</b>	<b>6</b>	17:31:09	1		
17:31:15	3					17:38:57	1		
17:38:55	1					17:43:57	1		
18:23:33	1					17:53:32	1		
18:40:44	1					17:56:16	1		
<b>Total</b>	<b>13</b>					18:08:43	1		
						18:50:56	1		
						<b>Total</b>	<b>13</b>		

**DRAFT**