Final Report

Traffic Signal Timing Optimization Project Addison, Texas

Prepared for:
Town of Addison

October 9, 2001

063543001

Kimley-Horn
and Associates, Inc.

Final Report

Traffic Signal Timing Optimization Project Addison, Texas

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1.0 INTRODUCTION / BACKGROUND

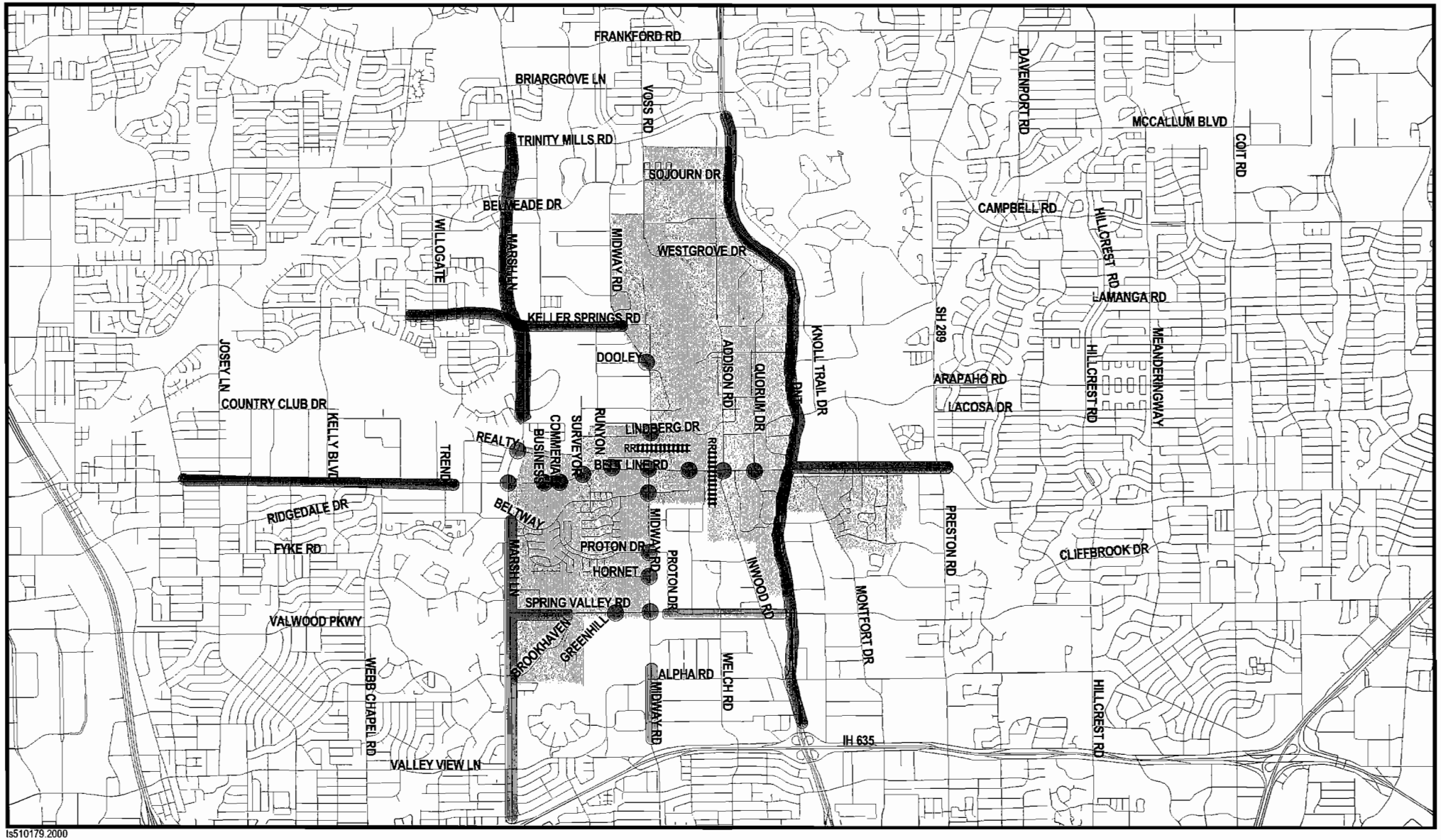
The purpose of this document is to summarize the data collection efforts, traffic signal timing optimization methodology, and results of a traffic signal timing optimization project for the Town of Addison. Kimley-Horn and Associates, Inc. developed new, optimized traffic signal timing plans for the seventeen (17) intersections listed below and illustrated in **Exhibit A.**

- Belt Line at Marsh
- Belt Line at Business
- Belt Line at Commercial
- Belt Line at Surveyor
- Belt Line at Runyon
- Belt Line at Midway
- Belt Line at Beltway
- Belt Line at Addison
- Belt Line at Quorum
- Midway at Spring Valley
- Midway at Hornet
- Midway at Proton
- Midway at Beltway
- Midway at Lindberg
- Midway at Dooley
- Marsh at Realty
- Spring Valley at Greenhill

The need for this project was significant. Intersections along Belt Line Road and Midway Road had not been retimed for eight to ten years. Traffic patterns and volumes within the Town of Addison have been in constant flux over the last decade. Traffic volumes along Belt Line Road and Midway Road are some of the highest in the Dallas-Fort Worth area. Parts of the hardwire-interconnect system are inoperable and impractical to repair. This interconnect failure means the loss of coordination between traffic signals. Finally, the need for coordinated timing plans within the Town of Addison is significant due to the Dallas / Fort Worth metropolitan area's (D/FW) designation as a non-attainment area. D/FW must conform to acceptable pollutant standards within the next few years or risk severe sanctions. Traffic signal timing improvements are the most cost effective solution for reducing vehicle emissions, delay, stops, and fuel consumption.

One of the primary objectives of the project was to provide coordination between jurisdictions. As shown in **Exhibit A**, the cities of Carrollton, Dallas, and Farmers Branch all have coordinated systems adjacent to the Town of Addison. The adjacent agency intersections, which were evaluated for inter-jurisdictional coordination, are listed below:

- Marsh at Country Square (Carrollton)
- Marsh at Beltway (Farmers Branch)
- Belt Line at Trend (Carrollton)
- Belt Line at Tollway NB and Tollway SB (Dallas)
- Midway at Keller Springs (Carrollton)
- Midway at Alpha (Farmers Branch)
- Spring Valley at Proton (Farmers Branch)



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- Project Intersections
- Carrollton Coordinated Systems
- Dallas Coordinated Systems
- Farmers Branch Coordinated Systems

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Exhibit A. Project Location

2.0 DATA COLLECTION

The information required to model existing conditions and develop optimized timing plans is extensive. The type of information that was collected is highlighted below:

- Number of traffic lanes per approach
- Assignment of traffic lanes
- Existing actuated timing plans (min and max greens, clearance intervals, etc…)
- Existing coordinated timing plans for adjacent jurisdictions
- Distance between intersections
- Speed limits
- Traffic volumes (24-hour counts and turning movement counts)
- "Before" and "after" travel time runs

Traffic Counts

Two types of traffic counts, 24-hour recording machine counts and turning movement counts, were made by Kimley-Horn's data collection subconsultant (Metrocount). The machine counts recorded the number of vehicles by direction in 15-minute increments. Each such count included one weekday of data. These directional counts are shown in **Exhibit B**. More detailed daily count information is illustrated in **Appendix A**.

Accordingly, having traffic volume data on a daily basis, it is possible to determine the appropriate "time-of-day, day-of-week" schedule for operation of the new timing plans.

The turning movement counts were hand counted by observers. For each intersection approach, the observers counted the vehicles by specific movement (i.e., left turn, straight through, or right turn). Data were tabulated by 15-minute increments and totaled by the hour. Turning movement counts were performed during the following time periods on a typical non-holiday weekday:

- AM Peak (6:30 AM – 8:30 AM)
- Off Peak (9:00 AM – 11:00 AM)
- Noon Peak (11:30 AM – 1:30 PM)
- PM Peak (4:30 PM – 6:30 PM)

Detailed turning movement count data sheets are included as **Appendix B**.

Travel Time Runs

Both "before" and "after" travel time runs were made using the floating car technique during the time periods shown above. The "before" runs were made prior to the implementation of the new signal timing to establish baseline conditions (vehicle speeds, delay, and number of stops) and to determine appropriate progression speeds, areas where queue management is critical, and areas where recurrent congestion may affect progressive traffic movement.

"After" travel time runs were made to evaluate the degree of improvements in vehicle speeds, delay, travel times, and stops due to the implementation of optimized signal timing.

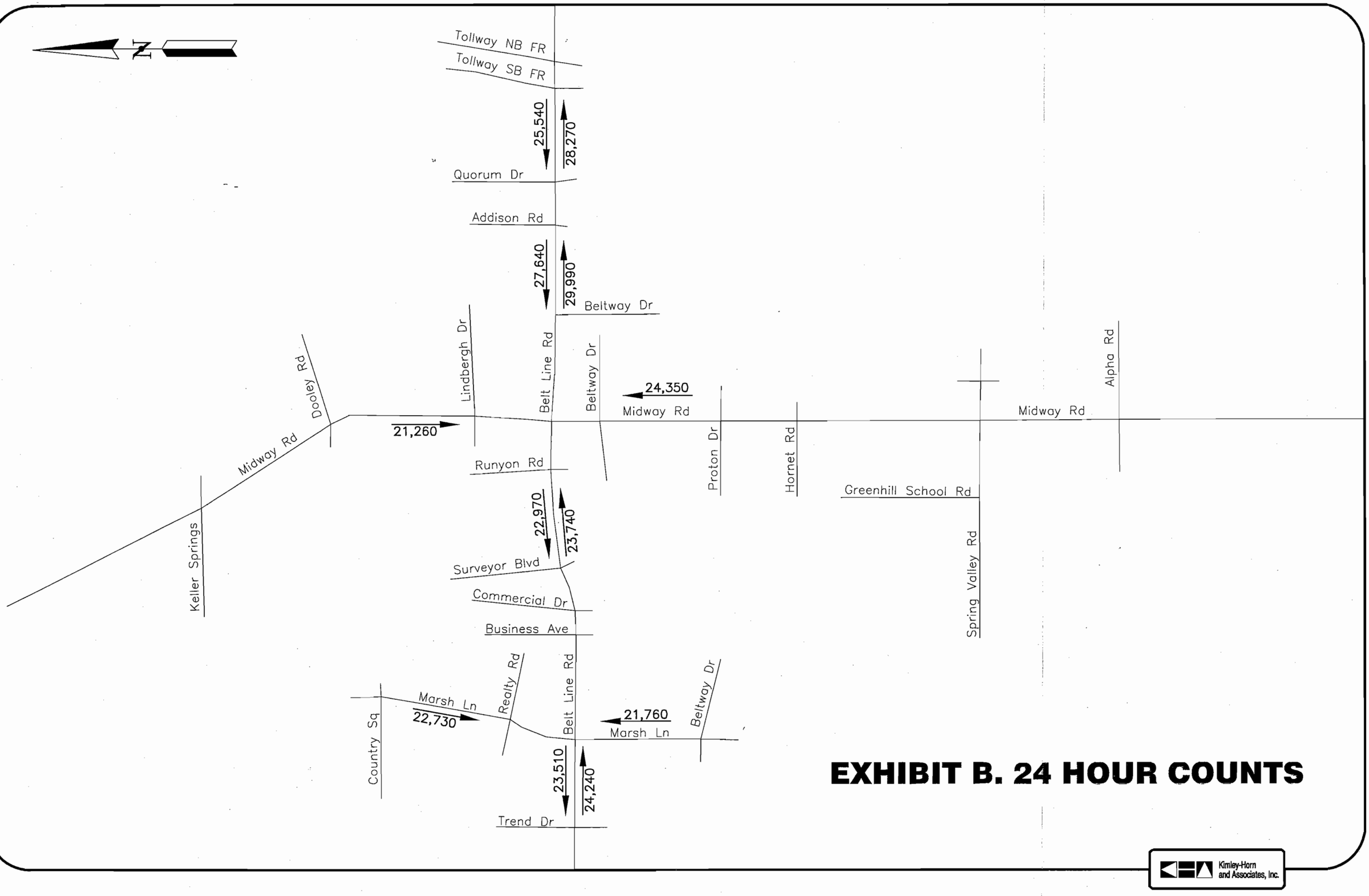

EXHIBIT B. 24 HOUR COUNTS

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3.0 NEW TIMING PLANS

Coordinated traffic signal timing plans were developed for each of the project intersections for the AM, Off, Noon, and PM peak periods. These plans run Monday through Friday from 6:30 AM to 11:00 PM. Weekend plans run from 11:00 AM to 7:00 PM on Saturday and Sunday. The development of timing plans for the Town of Addison had to consider the incorporation of existing coordinated timing plans from the adjacent jurisdictions. Coordination between jurisdictions is impossible unless you have the cooperation of the other jurisdictions and the cycle lengths of each system are the same. Fortunately, the cities of Carrollton, Dallas, and Farmers Branch supported the concept of inter-jurisdictional traffic signal coordination. Unfortunately, all three agencies utilized completely different cycle lengths.

Cycle Lengths

The traffic signal cycle length in a coordinated system is the amount of time to go from the beginning of the main street yellow around to the beginning of the main street yellow. For a coordinated system to function properly, each intersection within the system must have the same cycle length. The peak period cycle lengths of the adjacent agencies were noted as follows:

- 144 seconds for Carrollton (Marsh at Country Place and Midway at Keller Springs)
- 160 seconds for Dallas (Belt Line at the Tollway)
- 120 seconds for Farmers Branch (Midway at Alpha and Marsh at Beltway)

After calculating the cycle length requirements of the Addison intersections, evaluating the need for coordination, and discussing possibilities with the various agencies, we determined that the biggest benefits would occur with the following coordination strategies:

- Belt Line Road system to match the Dallas system
- Belt Line at Trend to match Belt Line system (Carrollton modification)
- Midway at Dooley to match Carrollton system
- Marsh at Beltway to match Belt Line system (Farmers Branch modification)

Optimized Timing Plans

Using the above coordination strategies, the timing optimization model calculated preliminary timing for each intersection movement. This information was input in the field into each traffic signal controller. Individual intersection movement time lengths and progression throughout the system were extensively reviewed. Improvements to the traffic signal timing plans were implemented and reanalyzed.

4.0 RESULTS

In order to determine the extent to which the new plans had improved traffic flow, travel time runs were once again made by Metrocount. These runs were made using "floating car techniques", i.e., the driver of the test vehicle took care to drive with the pace of the other traffic. As the vehicle passed through each signalized intersection, the elapsed time was recorded. Also, the duration of stopped time, if any, was recorded. The results of these travel time runs are highlighted in **Exhibit C**.

Thanks to Dallasnews.com

EXHIBIT C. VEHICLE TRAVEL TIME RESULTS					
Peak Period	Units	Midway Road		Belt Line Road	
		NB	SB	EB	WB
AM	seconds	(45.0)	(29.8)	(191.7)	(128.4)
	percent	-22.0%	-15.0%	-45.0%	-41.0%
OFF	seconds	(7.5)	(127.9)	(101.3)	(107.5)
	percent	-5.0%	-45.0%	-33.0%	-37.0%
NOON	seconds	(34.4)	(82.9)	(21.9)	(126.1)
	percent	-17.0%	-33.0%	-6.0%	-32.0%
PM	seconds	(100.5)	(56.5)	(145.6)	(96.4)
	percent	-35.0%	-23.0%	-33.0%	-25.0%

This table summarizes the differential between the "Before" and "After" travel time runs by direction. The results show significant travel time reductions for each arterial during each time period in each direction. These results were verified in the field with Town of Addison staff.

A detailed summary of these results is provided in **Appendix C**.

5.0 OBSERVATIONS / RECOMMENDATIONS

Throughout the course of the project, a few important issues were noted for future reference. These issues and our recommendations, which are based on past experience and current standards, are noted below:

- All traffic signal controllers and traffic signal cabinets need to be upgraded. Most of this equipment has not been updated for over ten years. The controller is no longer in production. Spare parts will eventually not be available. A good analogy is to visualize a 286 computer at each intersection.

- The amount of Town staff dedicated to traffic signals is below the industry standard of one technician per 20 to 30 traffic signals. The Town's one technician is only partly dedicated to traffic signals meaning that the Town cannot perform proactive maintenance or operational improvements. Another staff member should also be trained in operation and maintenance of the traffic signals. This second individual would could assist in daily maintenance and operational calls as well as provide back-up for vacations, sick-leave, and late night on-call shifts.

- A traffic signal system with intersection communications needs to be installed. Without this improvement, Town staff will have to continue to manually reset the controller clocks on a weekly (sometimes daily) basis. This resynchronization is required for optimized coordination. The benefits of having this type of system include the following:

- A precise timing relationship can be maintained at all times. The system periodically downloads a clock update to its local controllers, thereby assuring that each controller is precisely "in step" with the desired timing plan.

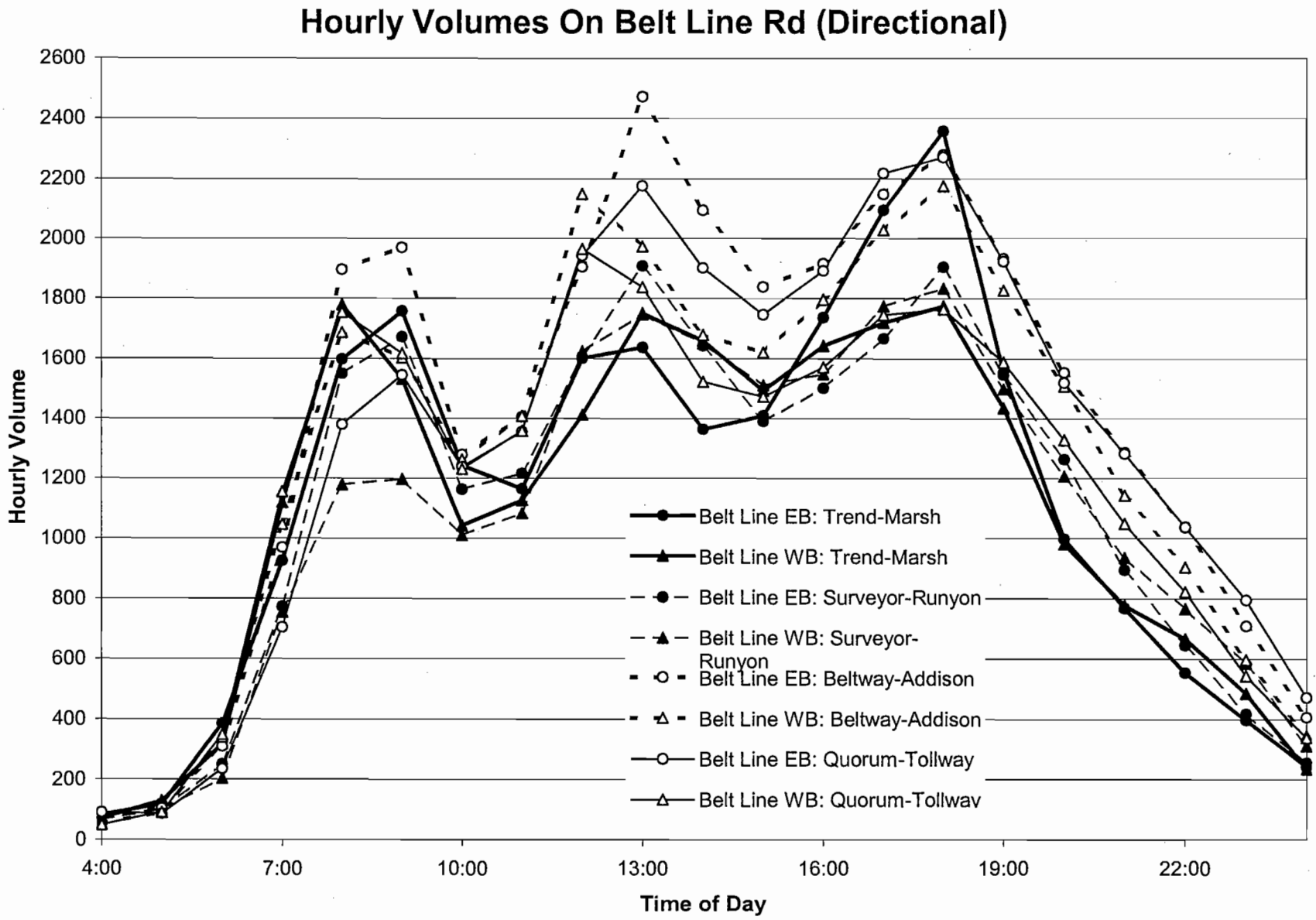
- Timing adjustments can be made remotely; an operator at the signal maintenance shop enters the change into the microcomputer and then executes a download.

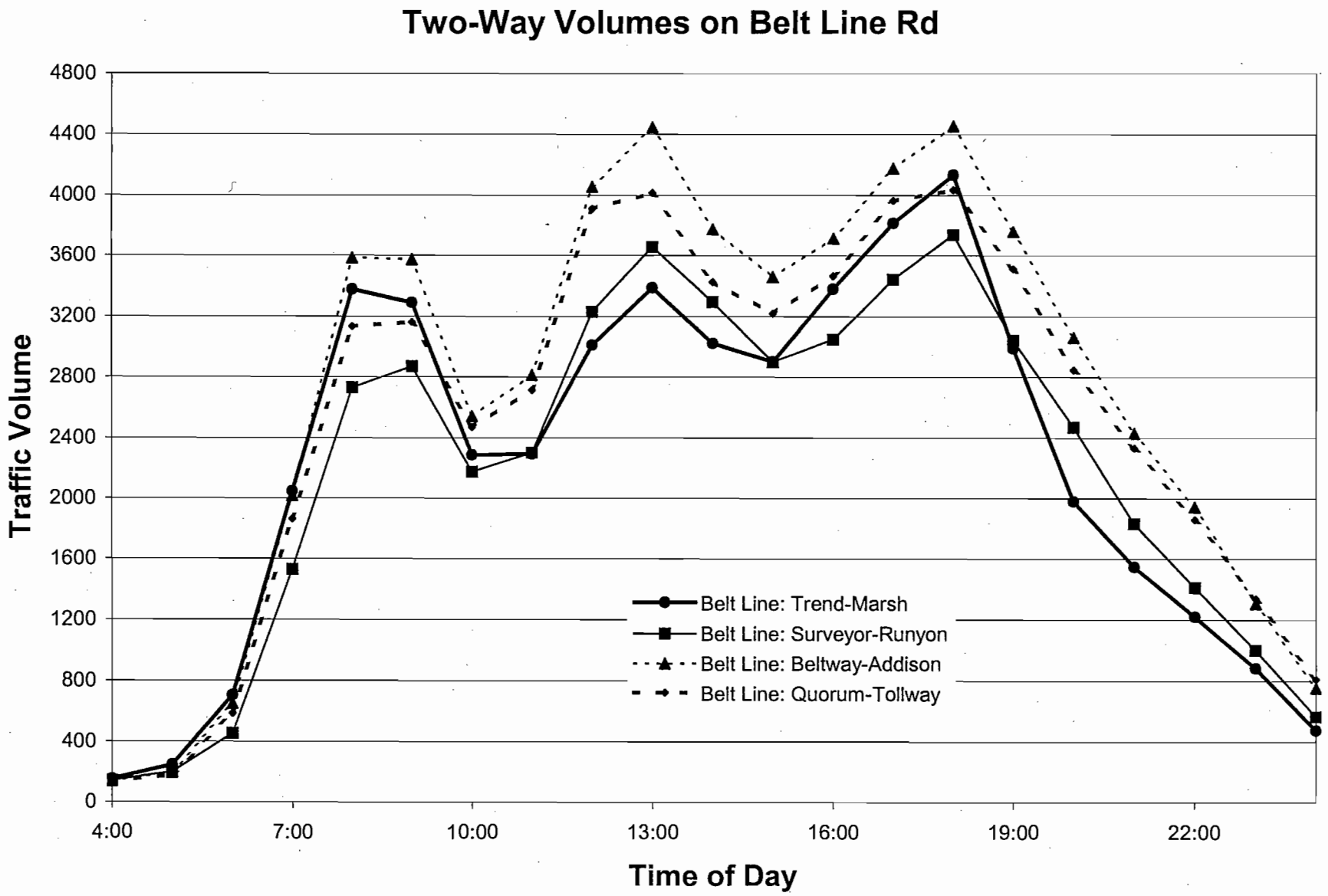
- Most system malfunctions are reported automatically; the field master auto-dials the shop's microcomputers and uploads an "alarm." The Town does not have to wait for a motorist to complain to determine that the system is not working properly.

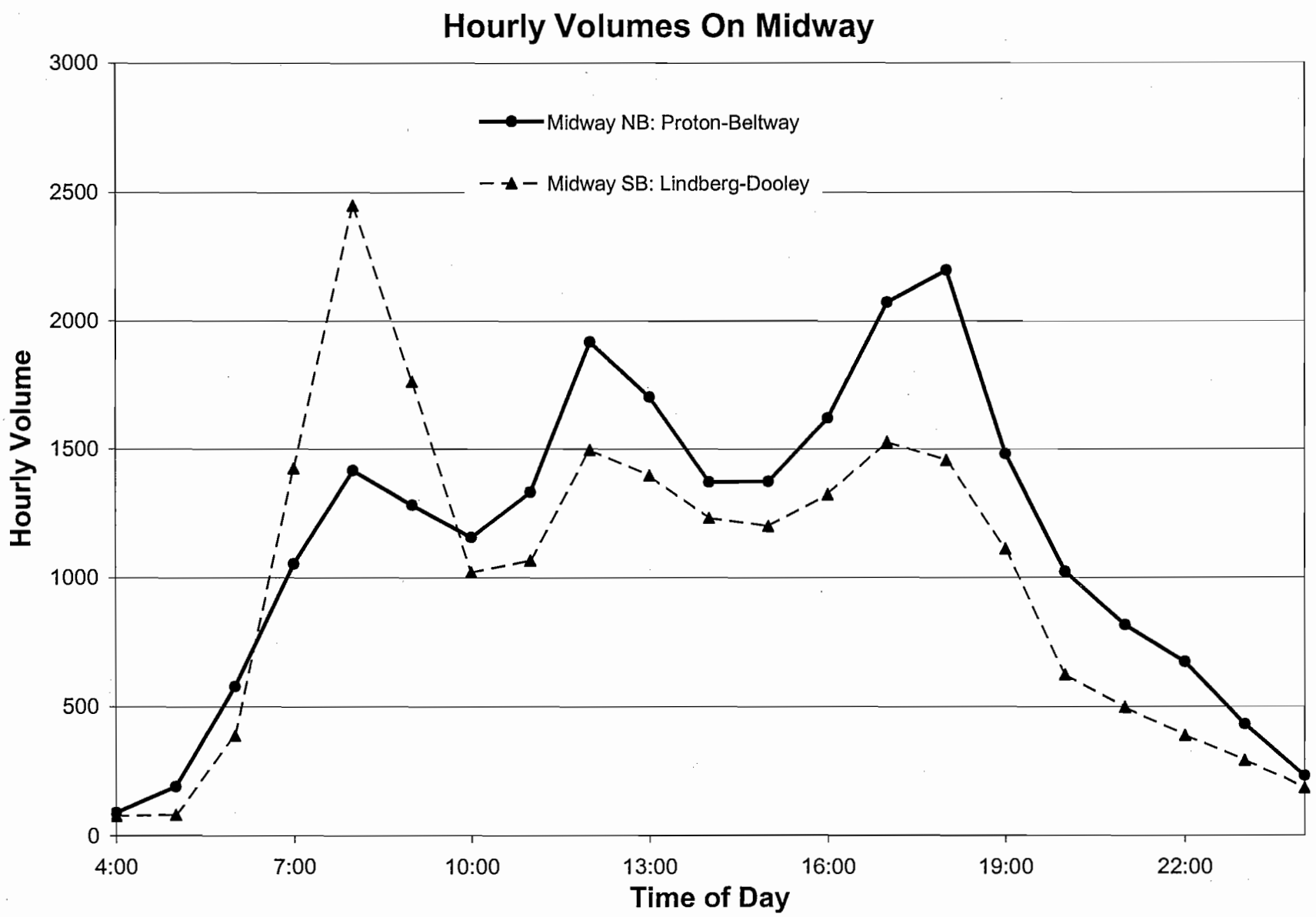
In order to insure the longevity of the new timing plans, the Town of Addison should address these issues in the near future.

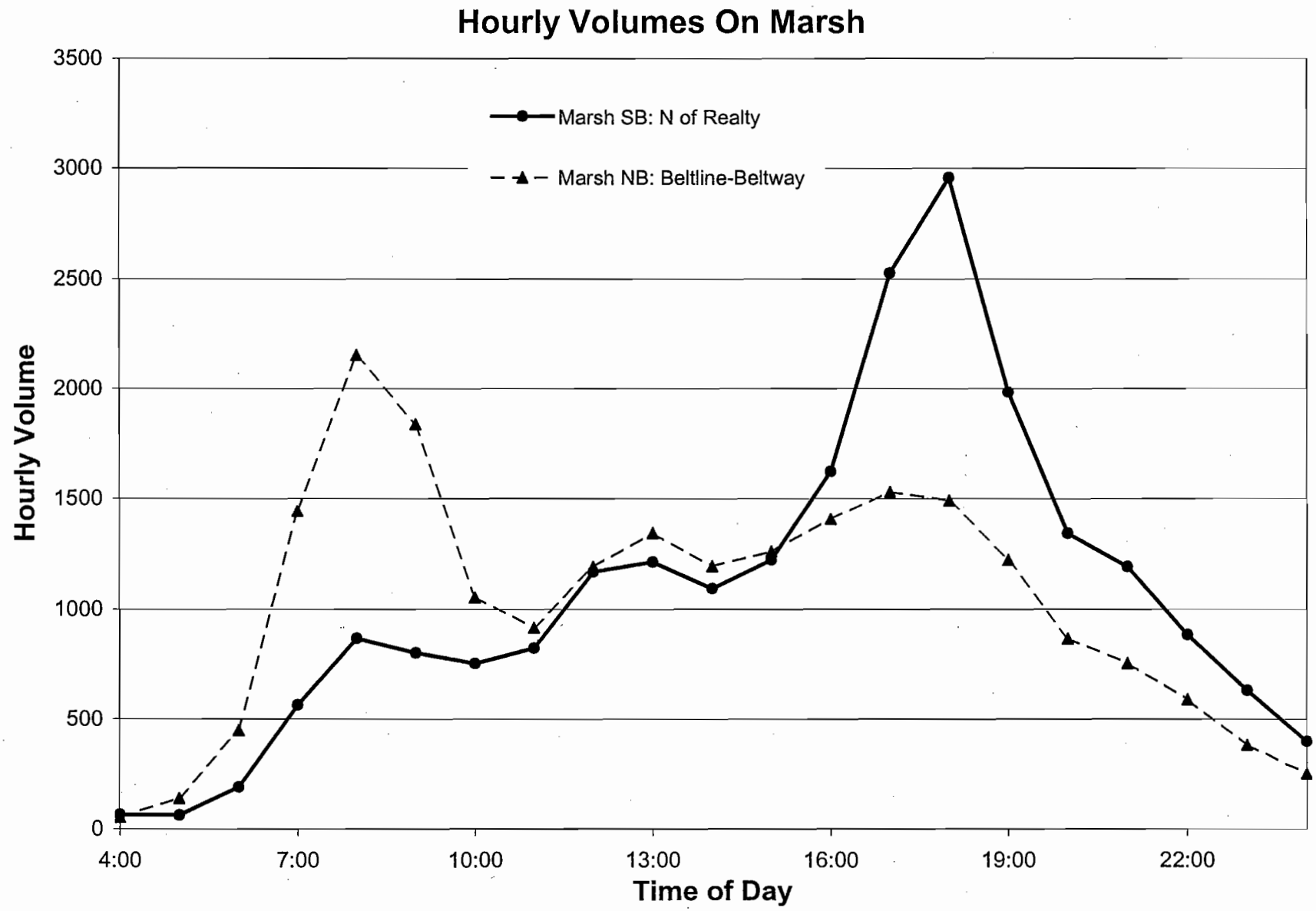
6.0 ACKNOWLEDGEMENTS

Kimley-Horn acknowledges the support of Robin Jones and Charles Mitchell of the Town of Addison. They provided extensive insight to the traffic needs of the Town and "went the extra mile" to facilitate the timing plan implementation and fine-tuning process.


Hourly Volumes On Belt Line Rd (Directional)
Hourly Volume
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
4:00
7:00
10:00
13:00
16:00
19:00
22:00
Time of Day
Belt Line EB: Trend-Marsh
Belt Line WB: Trend-Marsh
Belt Line EB: Surveyor-Runyon
Belt Line WB: Surveyor-Runyon
Belt Line EB: Beltway-Addison
Belt Line WB: Beltway-Addison
Belt Line EB: Quorum-Tollway
Belt Line WB: Quorum-Tollwav

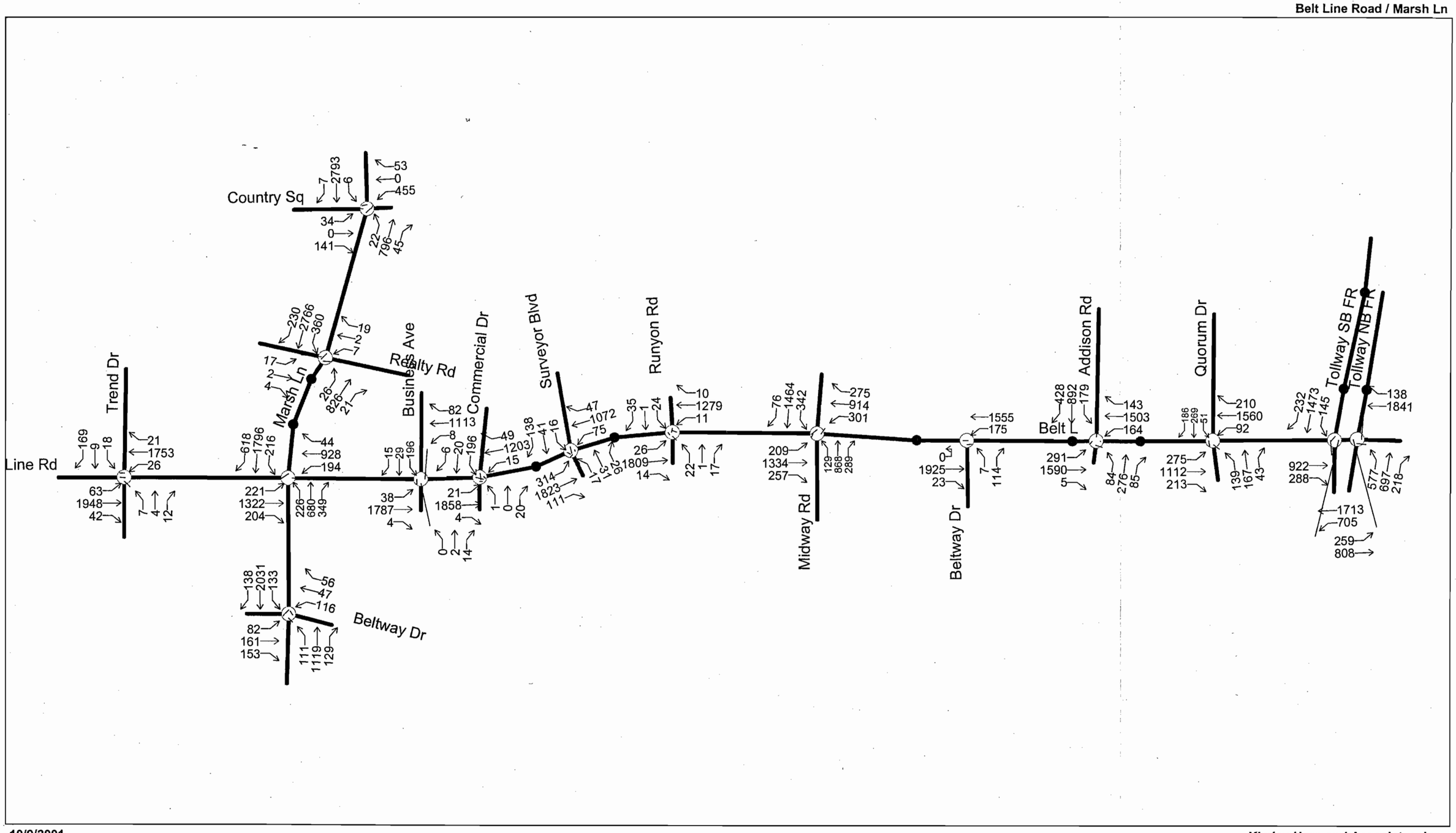

Two-Way Volumes on Belt Line Rd
Traffic Volume
4800
4400
4000
3600
3200
2800
2400
2000
1600
1200
800
400
0
4:00
7:00
10:00
13:00
16:00
19:00
22:00
Time of Day
Belt Line: Trend-Marsh
Belt Line: Surveyor-Runyon
Belt Line: Beltway-Addison
Belt Line: Quorum-Tollway


Hourly Volumes On Midway
Midway NB: Proton-Beltway
Midway SB: Lindberg-Dooley
Hourly Volume
3000
2500
2000
1500
1000
500
0
4:00
7:00
10:00
13:00
16:00
19:00
22:00
Time of Day


Hourly Volumes On Marsh
Marsh SB: N of Realty
Marsh NB: Beltline-Beltway
Hourly Volume
3500
3000
2500
2000
1500
1000
500
0
4:00
7:00
10:00
13:00
16:00
19:00
22:00
Time of Day

Addison Signal Timing

AM Peak Counts
Belt Line Road / Marsh Ln



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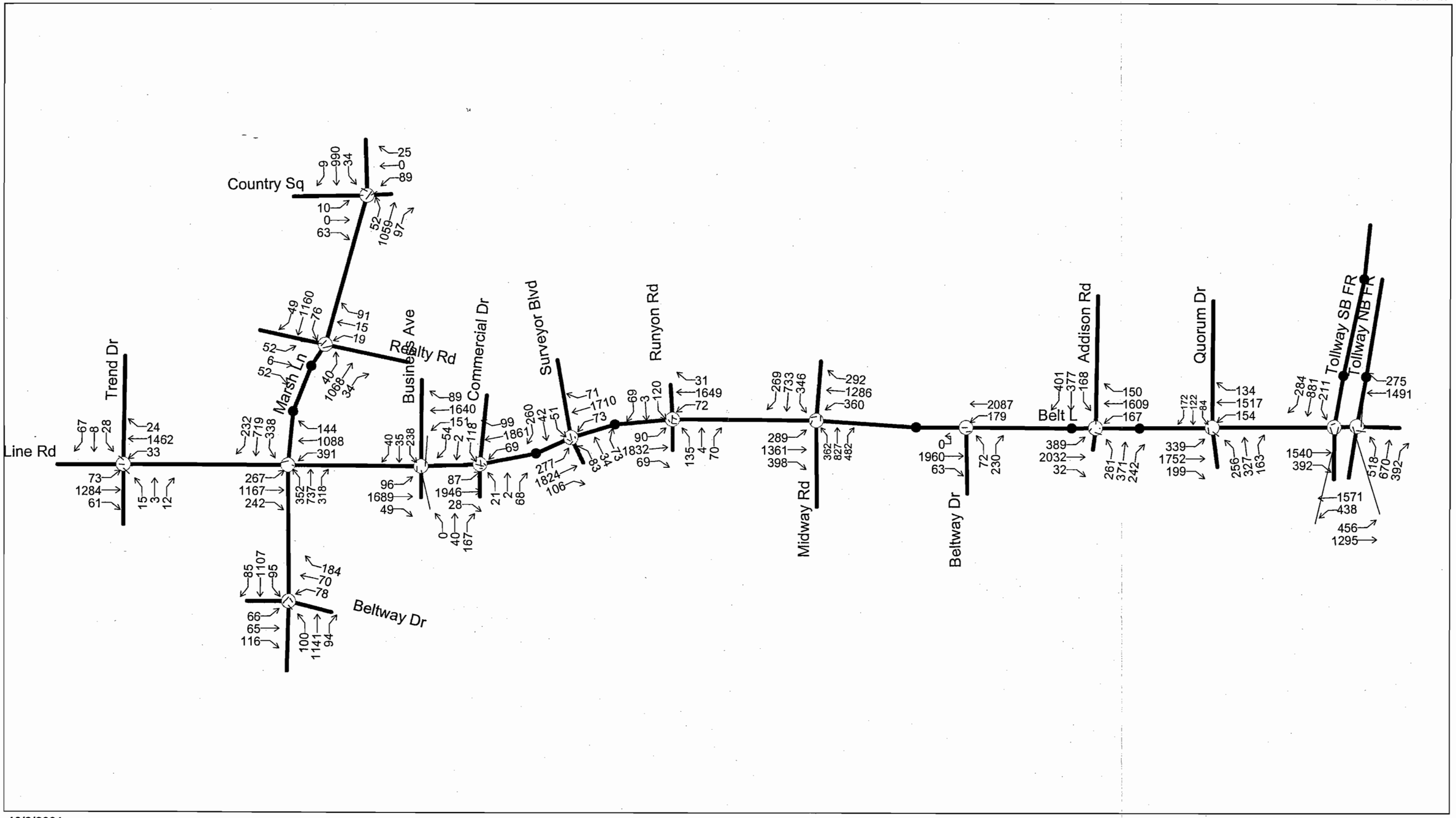
Addison Signal Timing

Midday Peak Counts
Belt Line Road / Marsh Ln



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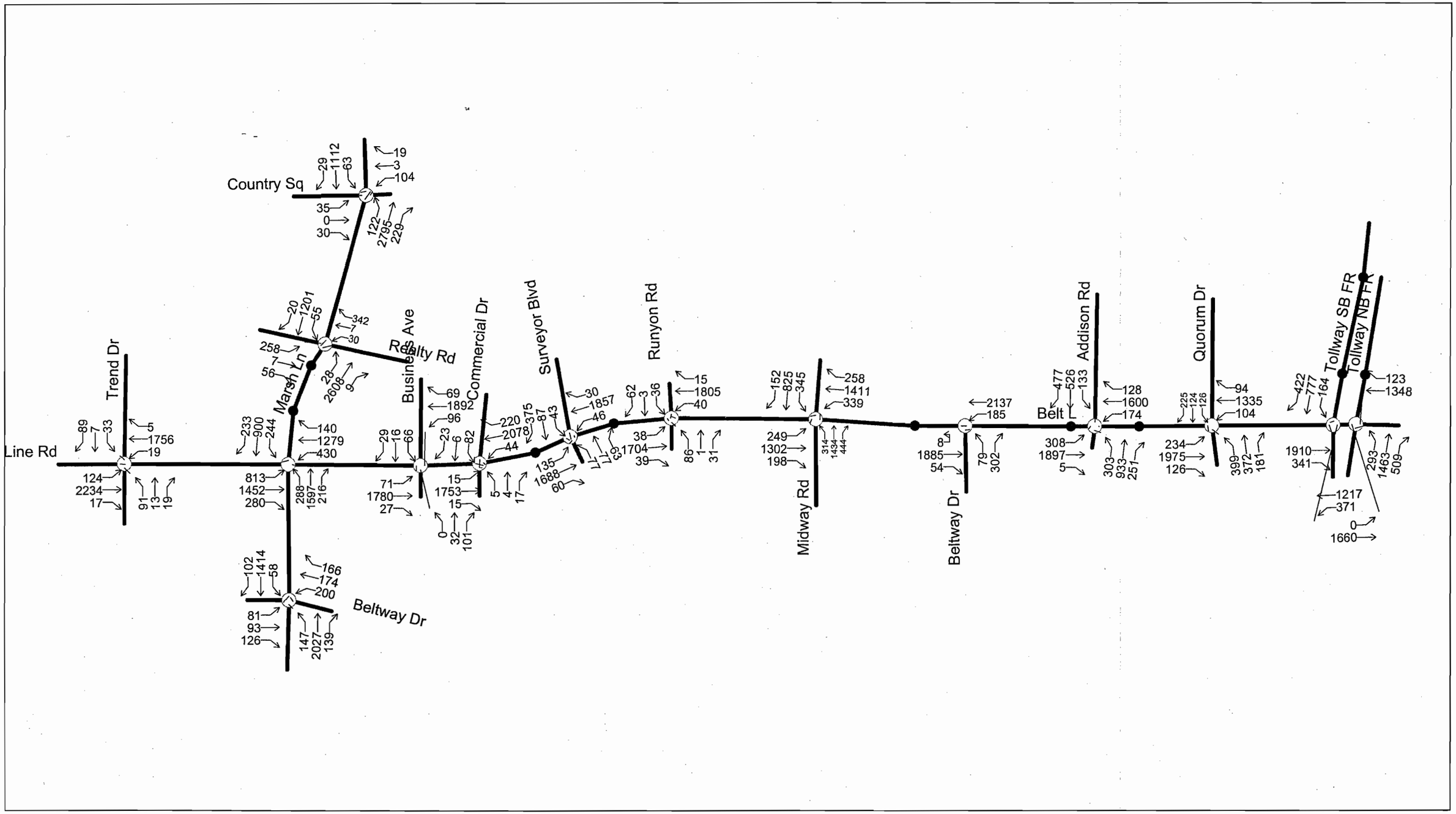
Addison Signal Timing

PM Peak Counts
Belt Line Road / Marsh Ln



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Roadway and Direction		AM Peak Hours per Day = 2 Days per Week = 5 Weeks per Year = 50				Weekday Midday Hours per Day = 2 Days per Week = 5 Weeks per Year = 50				PM Peak Hours per Day = 2 Days per Week = 5 Weeks per Year = 50				Weekday Off Peak* Hours per Day = 6 Days per Week = 5 Weeks per Year = 50				Overall Change in Delay (Vehicle-Hours per Year)	
		Volume (Veh per Hr)	Change in Delay (Seconds per Veh)	(%)	Change in Delay (Veh-Hours per Year)	Volume (Veh per Hr)	Change in Delay (Seconds per Veh)	(%)	Change in Delay (Veh-Hours per Year)	Volume (Veh per Hr)	Change in Delay (Seconds per Veh)	(%)	Change in Delay (Veh-Hours per Year)	Volume (Veh per Hr)	Change in Delay (Seconds per Veh)	(%)	Change in Delay (Veh-Hours per Year)	By Roadway and Direction	By Roadway Overall
Belt Line Road	EB	1,606	-191.7	-77%	(42,749)	2,048	-21.9	-13%	(6,225)	2,203	-145.6	-56%	(44,560)	1,460	-101.3	-77%	(61,604)	(155,138)	(302,717)
Belt Line Road	WB	1,600	-128.4	-96%	(28,529)	1,827	-126.1	-60%	(31,994)	1,887	-96.4	-46%	(25,272)	1,380	-107.5	-46%	(61,784)	(147,578)	
Overall					(71,278)				(38,219)				(69,832)				(123,388)	(302,717)	(302,717)

*Between Peaks

Roadway and Direction		AM Peak Hours per Day = 2 Days per Week = 5 Weeks per Year = 50				Weekday Midday Hours per Day = 2 Days per Week = 5 Weeks per Year = 50				PM Peak Hours per Day = 2 Days per Week = 5 Weeks per Year = 50				Weekday Off Peak* Hours per Day = 6 Days per Week = 5 Weeks per Year = 50				Overall Change in Travel Time (Vehicle-Hours per Year)	
		Volume (Veh per Hr)	Change in Travel Time (Seconds per Veh)	(%)	Change in Travel Time (Veh-Hours per Year)	Volume (Veh per Hr)	Change in Travel Time (Seconds per Veh)	(%)	Change in Travel Time (Veh-Hours per Year)	Volume (Veh per Hr)	Change in Travel Time (Seconds per Veh)	(%)	Change in Travel Time (Veh-Hours per Year)	Volume (Veh per Hr)	Change in Travel Time (Seconds per Veh)	(%)	Change in Travel Time (Veh-Hours per Year)	By Roadway and Direction	By Roadway Overall
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Belt Line Road	WB	1,600	-128.4	-41%	(28,529)	1,827	-126.1	-32%	(31,994)	1,887	-96.4	-25%	(25,272)	1,380	-107.5	-37%	(61,784)	(147,578)	
Overall					(71,278)				(38,219)				(69,832)				(123,388)	(302,717)	(302,717)

*Between Peaks

APPENDIX C-1
Summary of Project Benefits - Belt Line Road

Roadway and Direction		AM Peak Hours per Day = 2 Days per Week = 5 Weeks per Year = 50 Volume (Veh per Hr)	Change in Delay (Seconds per Veh)	Change in Delay (%)	Change in Delay (Veh-Hours per Year)	Weekday Midday Hours per Day = 2 Days per Week = 5 Weeks per Year = 50 Volume (Veh per Hr)	Change in Delay (Seconds per Veh)	Change in Delay (%)	Change in Delay (Veh-Hours per Year)	PM Peak Hours per Day = 2 Days per Week = 5 Weeks per Year = 50 Volume (Veh per Hr)	Change in Delay (Seconds per Veh)	Change in Delay (%)	Change in Delay (Veh-Hours per Year)	Weekday Off Peak* Hours per Day = 6 Days per Week = 5 Weeks per Year = 50 Volume (Veh per Hr)	Change in Delay (Seconds per Veh)	Change in Delay (%)	Change in Delay (Veh-Hours per Year)	Overall Change in Delay (Vehicle-Hours per Year) By Roadway and Direction	By Roadway Overall
Midway Rd	NB	1,300	-45.0	-50%	(8,122)	1,675	-34.4	-39%	(8,014)	1,990	-100.5	-58%	(27,784)	1,245	-7.5	-14%	(3,899)	(47,819)	(138,652)
Midway Rd	SB	2,020	-29.8	-36%	(8,361)	1,380	-82.9	-59%	(15,883)	1,390	-56.5	-42%	(10,908)	1,045	-127.9	-74%	(55,683)	(90,834)	
Overall					(16,483)				(23,896)				(38,691)				(59,582)	(138,652)	(138,652)

*Between Peaks

Roadway and Direction		AM Peak Hours per Day = 2 Days per Week = 5 Weeks per Year = 50 Volume (Veh per Hr)	Change in Travel Time (Seconds per Veh)	Change in Travel Time (%)	Change in Travel Time (Veh-Hours per Year)	Weekday Midday Hours per Day = 2 Days per Week = 5 Weeks per Year = 50 Volume (Veh per Hr)	Change in Travel Time (Seconds per Veh)	Change in Travel Time (%)	Change in Travel Time (Veh-Hours per Year)	PM Peak Hours per Day = 2 Days per Week = 5 Weeks per Year = 50 Volume (Veh per Hr)	Change in Travel Time (Seconds per Veh)	Change in Travel Time (%)	Change in Travel Time (Veh-Hours per Year)	Weekday Off Peak* Hours per Day = 6 Days per Week = 5 Weeks per Year = 50 Volume (Veh per Hr)	Change in Travel Time (Seconds per Veh)	Change in Travel Time (%)	Change in Travel Time (Veh-Hours per Year)	Overall Change in Travel Time (Vehicle-Hours per Year) By Roadway and Direction	By Roadway Overall
Midway Rd.	NB	1,300	-45.0	-22%	(8,122)	1,675	-34.4	-17%	(8,014)	1,990	-100.5	-35%	(27,784)	1,245	-7.5	-5%	(3,899)	(47,819)	(138,652)
Midway Rd.	SB	2,020	-29.8	-15%	(8,361)	1,380	-82.9	-33%	(15,883)	1,390	-56.5	-23%	(10,908)	1,045	-127.9	-45%	(55,683)	(90,834)	
Overall					(16,483)				(23,896)				(38,691)				(59,582)	(138,652)	(138,652)

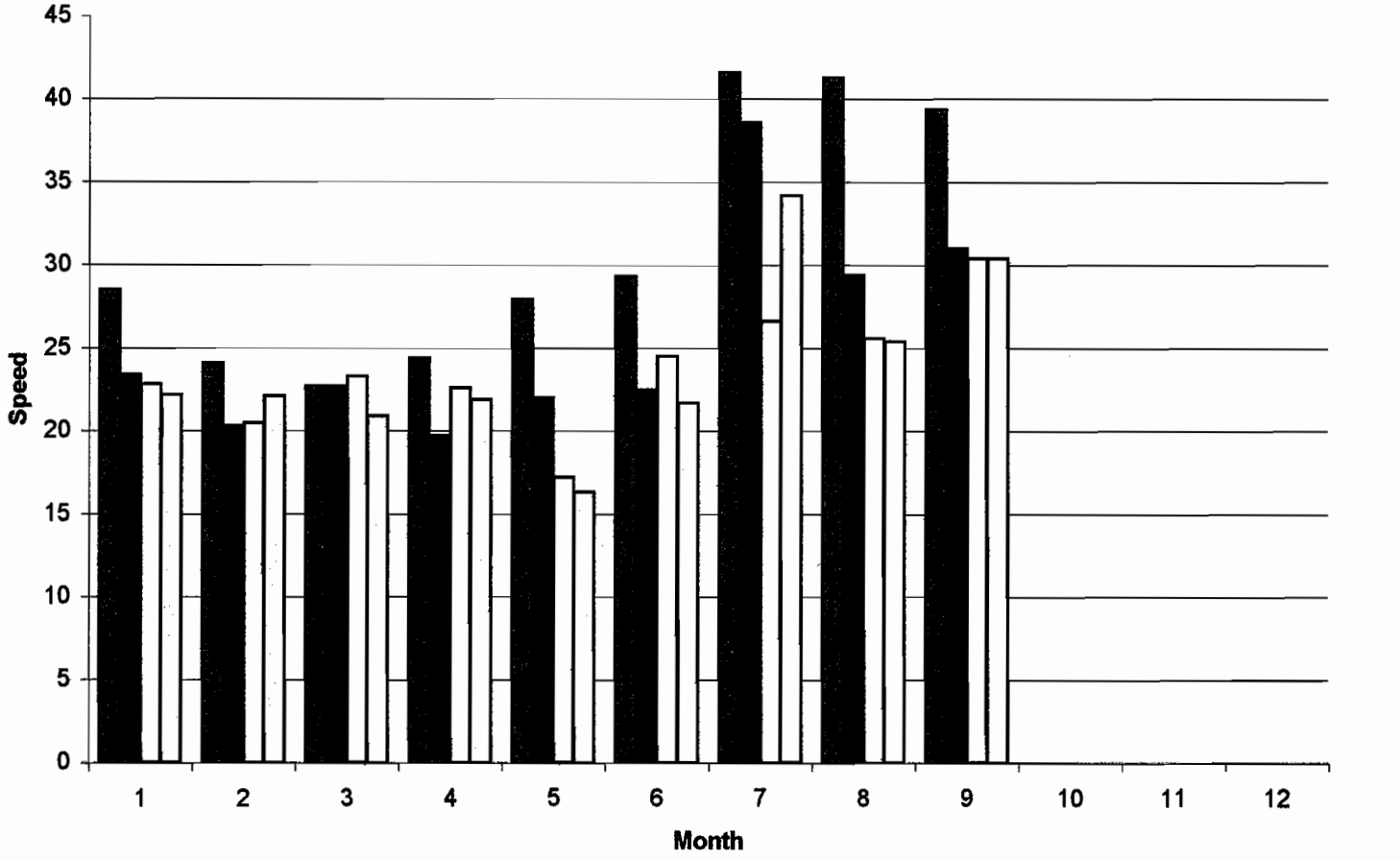
*Between Peaks

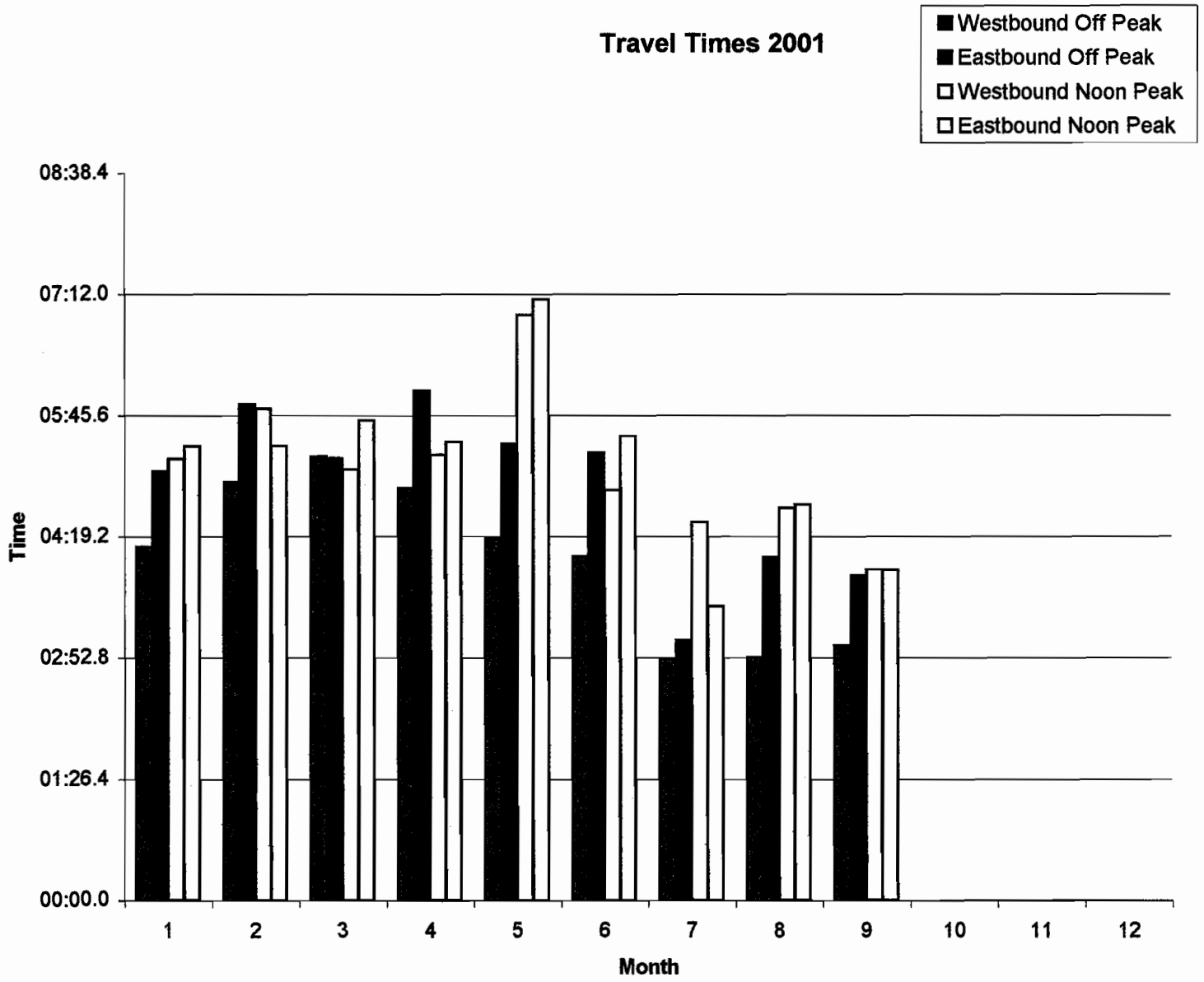
APPENDIX C-2
Summary of Project Benefits - Midway Road

Annual Statistics for Travel Times on Belt Line Road for 2001

OFF PEAK	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly Avg.
Westbound													
Time:	04:11.6	04:57.7	05:16.1	04:53.8	04:17.2	04:04.9	02:52.2	02:53.3	03:01.7	00:00.0	00:00.0	00:00.0	04:03.2
Speed:	28.5	24.1	22.7	24.4	27.9	29.3	41.6	41.3	39.4	0	0	0	31.0
Eastbound													
Time:	05:05.9	05:53.4	05:15.2	06:03.2	05:25.1	05:19.2	03:05.7	04:04.2	03:51.4	00:00.0	00:00.0	00:00.0	04:53.7
Speed:	23.4	20.3	22.7	19.7	22	22.5	38.6	29.4	31	0	0	0	25.5
NOON PEAK:													
Westbound													
Time:	05:14.8	05:50.4	05:07.3	05:17.2	06:57.2	04:52.3	04:29.4	04:39.6	03:56.0	00:00.0	00:00.0	00:00.0	05:09.4
Speed:	22.8	20.5	23.3	22.6	17.2	24.5	26.6	25.6	30.4	0	0	0	23.7
Eastbound													
Time:	05:23.6	05:24.0	05:42.1	05:26.9	07:08.5	05:30.9	03:29.5	04:42.1	03:55.5	00:00.0	00:00.0	00:00.0	05:11.5
Speed:	22.2	22.1	20.9	21.9	16.3	21.7	34.2	25.4	30.4	0	0	0	23.9

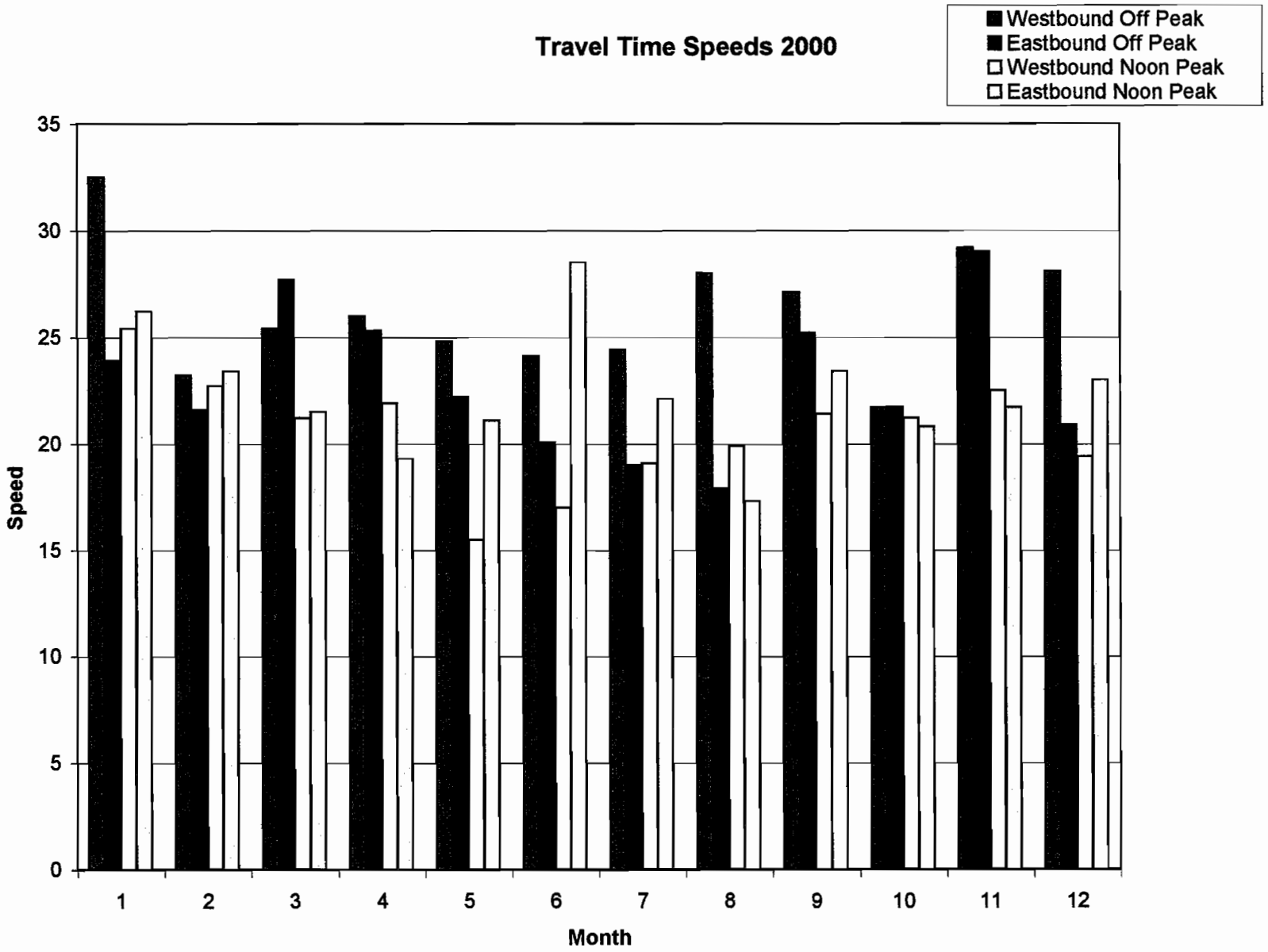
Travel Time Speeds 2001

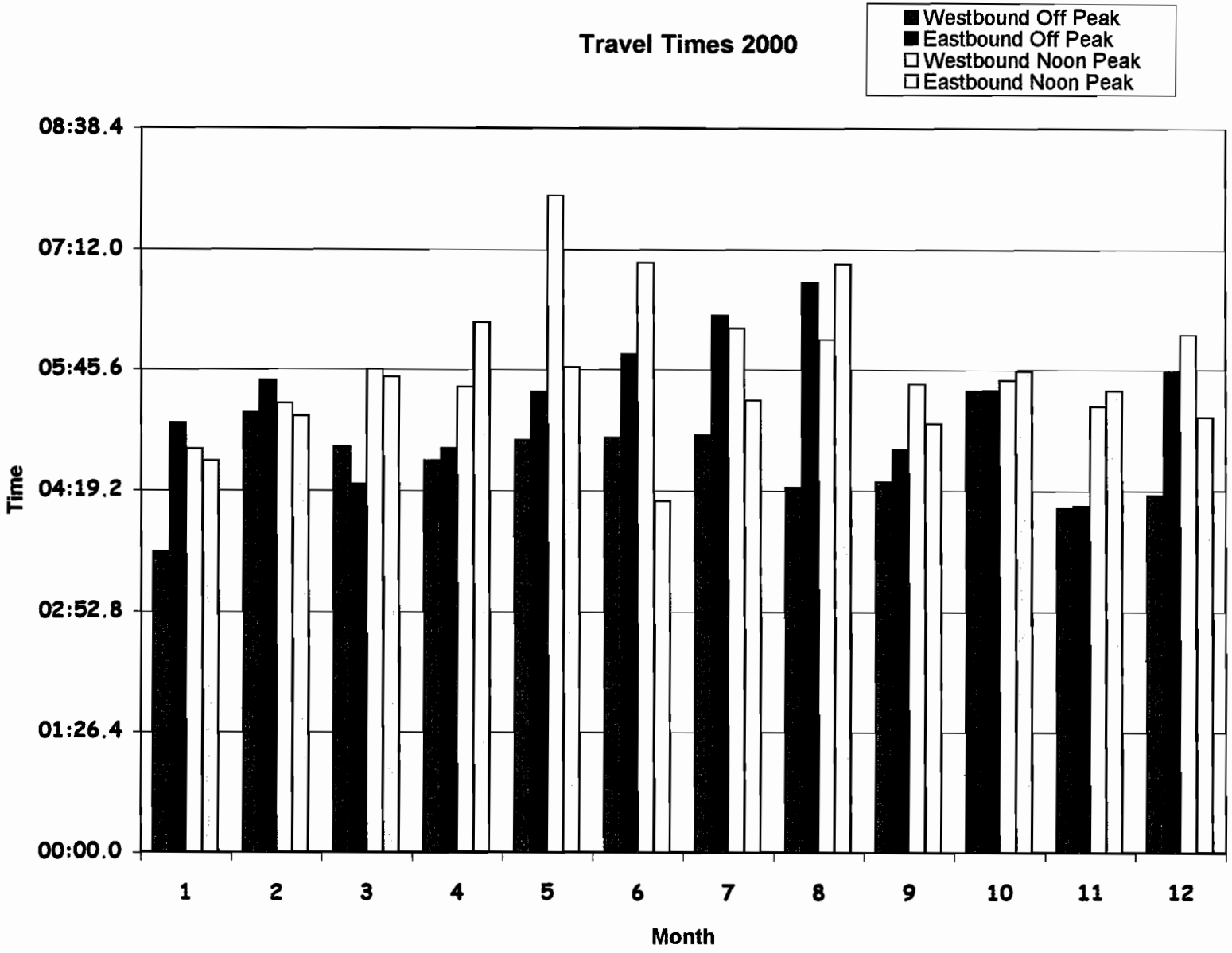



Travel Times 2001
Westbound Off Peak
Eastbound Off Peak
Westbound Noon Peak
Eastbound Noon Peak
08:38.4
07:12.0
05:45.6
04:19.2
02:52.8
01:26.4
00:00.0
Time
1
2
3
4
5
6
7
8
9
10
11
12
Month

Annual Statistics for Travel Times on Belt Line Road for 2000

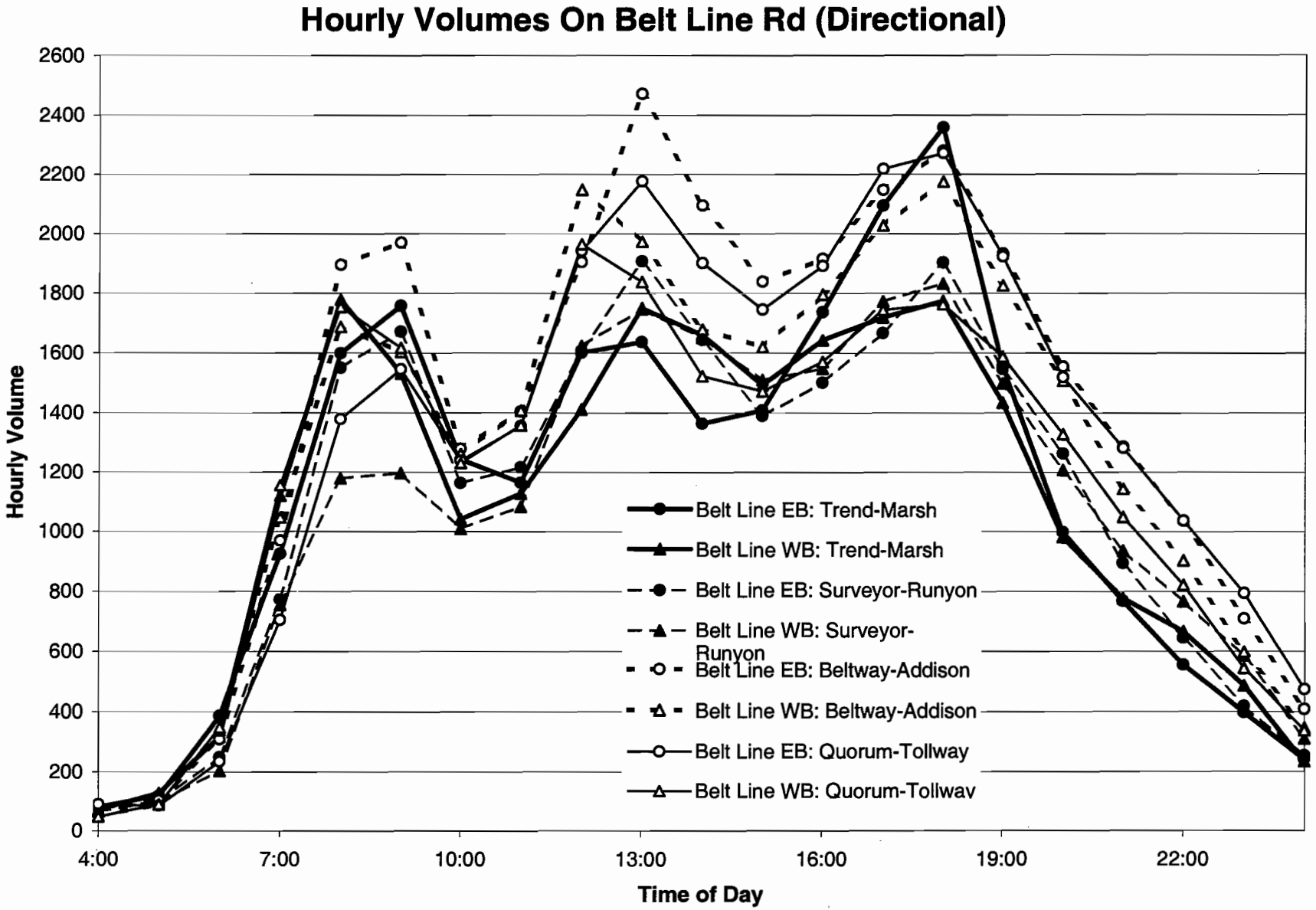
OFF PEAK	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly Avg.
Westbound													
Time:	03:35.0	05:14.6	04:50.0	04:40.3	04:54.9	04:57.0	04:59.0	04:21.4	04:25.3	05:30.1	04:06.3	04:15.7	04:39.1
Speed:	32.5	23.2	25.4	26	24.8	24.1	24.4	28	27.1	21.7	29.2	28.1	26.2
Eastbound													
Time:	05:07.3	05:37.6	04:23.6	04:49.0	05:29.3	05:56.8	06:24.3	06:48.2	04:48.7	05:30.9	04:08.0	05:44.0	05:24.0
Speed:	23.9	21.6	27.7	25.3	22.2	20.1	19	17.9	25.2	21.7	29	20.9	22.9
NOON PEAK:													
Westbound													
Time:	04:48.7	05:21.3	05:45.6	05:33.0	07:50.2	07:02.6	06:15.0	06:06.8	05:35.1	05:37.9	05:19.3	06:10.3	05:57.2
Speed:	25.4	22.7	21.2	21.9	15.5	17	19.1	19.9	21.4	21.2	22.5	19.4	20.6
Eastbound													
Time:	04:40.3	05:12.3	05:40.3	06:19.0	05:47.0	04:11.5	05:23.7	07:01.3	05:06.7	05:44.1	05:30.3	05:11.7	05:29.0
Speed:	26.2	23.4	21.5	19.3	21.1	28.5	22.1	17.3	23.4	20.8	21.7	23	22.4


Travel Time Speeds 2000
Westbound Off Peak
Eastbound Off Peak
Westbound Noon Peak
Eastbound Noon Peak
Speed
35
30
25
20
15
10
5
0
1
2
3
4
5
6
7
8
9
10
11
12
Month


Travel Times 2000
Westbound Off Peak
Eastbound Off Peak
Westbound Noon Peak
Eastbound Noon Peak
08:38.4
07:12.0
05:45.6
04:19.2
02:52.8
01:26.4
00:00.0
Time
1
2
3
4
5
6
7
8
9
10
11
12
Month

MEETING AGENDA
Town of Addison
Signal Timing Project
May 8, 2001

1. Summary of project activity to date
2. Discussion of clearance calculations
3. Time of day plans
4. Preliminary system timing
5. Next steps


Hourly Volumes On Belt Line Rd (Directional)
Hourly Volume
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
4:00
7:00
10:00
13:00
16:00
19:00
22:00
Time of Day
Belt Line EB: Trend-Marsh
Belt Line WB: Trend-Marsh
Belt Line EB: Surveyor-Runyon
Belt Line WB: Surveyor-Runyon
Belt Line EB: Beltway-Addison
Belt Line WB: Beltway-Addison
Belt Line EB: Quorum-Tollway
Belt Line WB: Quorum-Tollway

Addison Signal Timing Project
Recommended Controller Interval Timing
KHA PROJECT NO. 063543001

INT. NO.	INTERSECTION	APPR. DIR.	MVMT.	APPROX. SPEED (MPH)	APPROX. WIDTH (FT)	APPROX. GRADE (%)	APPROX. PED. WALK-ING DIST. (FT)	PED. TREAT-MENT	SIGNAL PHASE	RECOMMENDED TIME SETTINGS						CALCULATED MINIMUMS						
										MIN GRN	W	CLEARANCES Y	R	Y+R	FDW	MPT	VMGR	VMPT	PMGR	PMPT	TOTAL PCLR	TOTAL Y+R
1	Marsh & Realty	NB	TH	40	60		69	WDW	4	12	4	4.0	1.4	5.4	12	22	12	18		22	17.25	5.301
			LT	25	60			N/A	7	7		3.5	1.6	5.1		13	7	13				5.014
		SB	TH	40	71		61	WDW	8	12	4	4.0	1.5	5.5	10	20	12	18		20	15.25	5.488
			LT	25	71			N/A	3	7		3.5	1.9	5.4		13	7	13				5.314
		EB	TH	30	103		107	WDW	6	10	4	4.0	2.0	6.0	21	31	10	16		31	26.75	5.994
			LT	25	103			N/A	1	7		3.5	2.7	6.2		14	7	14				6.184
		WB	TH	30	122			N/A	2	10		4.0	2.5	6.5		17	10	17				6.425
2	Midway & Spring Valley	NB	TH	40	98		90	WDW	6	12	4	4.0	2.0	6.0	17	27	12	18		27	22.50	5.947
			LT	25	98			N/A	1	7		3.5	2.6	6.1		14	7	14				6.048
		SB	TH	40	96		96	WDW	2	12	4	4.0	2.0	6.0	18	28	12	18		28	24.00	5.9
			LT	25	96			N/A	5	7		3.5	2.5	6.0		13	7	13				5.994
		EB	TH	35	112		105	WDW	8	12	4	4.0	2.2	6.2	21	32	12	19		32	26.25	6.138
			LT	25	112			N/A	3	7		3.5	3.0	6.5		14	7	14				6.429
		WB	TH	35	108		99	WDW	4	12	4	4.0	2.1	6.1	19	30	12	19		30	24.75	6.060
			LT	25	108			N/A	7	7		3.5	2.9	6.4		14	7	14				6.320
3	Midway & Hornet	NB	TH	40	125			N/A	6	12		4.0	2.5	6.5		19	12	19				6.406
			LT	25	125			N/A	1	7		3.5	3.3	6.8		14	7	14				6.783
		SB	TH	40	125			N/A	2	12		4.0	2.5	6.5		19	12	19				6.406
		EB	TH	30	102			N/A	8	10		4.0	2.0	6.0		16	10	16				5.971
		WB	TH	30	102		96	WDW	4	10	4	4.0	2.0	6.0	18	28	10	16		28	24.00	5.971
4	Midway & Proton	NB	TH	40	77		61	WDW	6	12	4	4.0	1.6	5.6	10	20	12	18		20	15.25	5.590
			LT	25	77			N/A		7		3.5	2.0	5.5		13	7	13				5.477
		SB	TH	40	84		42	WDW	2	12	4	4.0	1.8	5.8	5	18	12	18		15	10.50	5.709
			LT	25	84			N/A		7		3.5	2.2	5.7		13	7	13				5.667
		EB	TH	30	98		87	WDW	8	10	4	4.0	1.9	5.9	16	26	10	16		26	21.75	5.881
			LT	25	98			N/A	3	7		3.5	2.6	6.1		14	7	14				6.048
		WB	TH	30	98		85	WDW	4	10	4	4.0	1.9	5.9	16	26	10	16		26	21.25	5.881
5	Midway & Beltway	NB	TH	40	62		60	WDW	6	12	4	4.0	1.4	5.4	10	20	12	18		20	15.00	5.335
			LT	25	62			N/A	1	7		3.5	1.6	5.1		13	7	13				5.066
		SB	TH	40	76		65	WDW	2	12	4	4.0	1.6	5.6	11	21	12	18		21	16.25	5.5
			LT	25	76			N/A	5	7		3.5	2.0	5.5		13	7	13				5.450
		EB	TH	30	107		115	WDW	8	10	4	4.0	2.1	6.1	23	34	10	17		34	28.75	6.085
			LT	25	107			N/A	3	7		3.5	2.8	6.3		14	7	14				6.293
		WB	TH	30	106		104	WDW	4	10	4	4.0	2.1	6.1	20	31	10	17		31	26.00	6.062
			LT	25	106			N/A	7	7		3.5	2.8	6.3		14	7	14				6.266
6	Midway & Lindbergh	NB	TH	40	72		43	WDW	6	12	4	4.0	1.6	5.6	6	18	12	18		16	10.75	5.505
			LT	25	72			N/A	1	7		3.5	1.9	5.4		13	7	13				5.341
		SB	TH	40	67		45	WDW	2	12	4	4.0	1.5	5.5	6	18	12	18		16	11.25	5.420
			LT	25	67			N/A	5	7		3.5	1.8	5.3		13	7	13				5.205
		EB	TH	30	96		84	WDW	8	10	4	4.0	1.9	5.9	16	26	10	16		26	21.00	5.835
			LT	25	96			N/A	3	7		3.5	2.5	6.0		13	7	13				5.994
		WB	TH	30	107		84	WDW	4	10	4	4.0	2.1	6.1	15	26	10	17		26	21.00	6.085
			LT	25	107			N/A	7	7		3.5	2.8	6.3		14	7	14				6.293

JIM

AGENDA ITEM

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 144 Addison, Texas 75001 16801 Westgrove

MEMO

To: Chris Terry

From: Mike Murphy

Date: March 6, 2001

Re: Traffic Signal Timing Agreement

In January, staff received statements of qualification for traffic engineering services from three firms for the development and implementation of optimized signal timing plans for Belt Line Road and Midway Road. As a result of our selection process, Kimley-Horn and Associates was asked to submit a proposal for consideration.

Attached is an agreement between the Town of Addison and Kimley-Horn and Associates for professional services relative to the optimization of signal timing for 17 intersections in Addison. These include all Belt Line Road and Midway Road signalized intersections.

The development, implementation, and fine-tuning of optimized traffic signal timing plans for these roadways is one of the most important actions we can take to improve mobility in Addison. Improvements in reducing vehicular delay, stops, fuel consumption, and emissions can be realized with optimized timing plans.

Staff recommends awarding this project to Kimley-Horn and Associates for a cost of $87,835.82

Funds are available in the Street Department operations budget.

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND ENGINEER FOR PROFESSIONAL SERVICES

THIS IS AN AGREEMENT effective as of _____, _____("Effective Date") between the

TOWN OF ADDISON ("OWNER") and

KIMLEY-HORN AND ASSOCIATES, INC. ("ENGINEER").

OWNER intends to Hire ENGINEER to collect traffic data, develop new traffic signal timing plans, and provide assistance during the implementation and fine-tuning of the new timing plans ("PROJECT).

OWNER and ENGINEER in consideration of their mutual covenants as set forth herein agree as follows:

ARTICLE 1 - SERVICES OF ENGINEER

1.01 Scope

A. ENGINEER shall provide the Basic and Additional Services set forth herein and in Exhibit A.

B. Upon this Agreement becoming effective, ENGINEER is authorized to begin Basic Services as set forth in Exhibit A.

ARTICLE 2 - OWNER'S RESPONSIBILITIES

2.01 General

A. OWNER shall have the responsibilities set forth herein and in Exhibit B.

ARTICLE 3 - TIMES FOR RENDERING SERVICES

3.01 General

A. ENGINEER's services and compensation under this Agreement have been agreed to in anticipation of the orderly and continuous progress of the Project through completion. Unless specific periods of time or specific dates for providing services are specified in this Agreement, ENGINEER's obligation to render services hereunder will be for a period which may reasonably be required for the completion of said services.

B. If in this Agreement specific periods of time for rendering services are set forth or specific dates by which services are to be completed are provided, and if such periods of time or dates are changed through no fault of ENGINEER, the rates and amounts of compensation provided for herein shall be subject to equitable adjustment. If OWNER has requested changes in the scope, extent, or character of the Project, the time of performance of ENGINEER's services shall be adjusted equitably.

C. For purposes of this Agreement the term "day" means a calendar day of 24 hours.

3.02 Suspension

A. If OWNER fails to give prompt written authorization to proceed with any phase of services after completion of the immediately preceding phase, or if ENGINEER's services are delayed through no fault of ENGINEER, ENGINEER may, after giving seven days written notice to OWNER, suspend services under this Agreement.

B. If ENGINEER's services are delayed or suspended in whole or in part by OWNER, or if ENGINEER's services are extended by Contractor's actions or inactions for more than 90 days through no fault of ENGINEER, ENGINEER shall be entitled to equitable adjustment of rates and amounts of compensation provided for elsewhere in this Agreement to reflect, reasonable costs incurred by ENGINEER in connection with, among other things, such delay or suspension and reactivation and the fact that the time for performance under this Agreement has been revised.

ARTICLE 4 - PAYMENTS TO ENGINEER

4.01 Methods of Payment for Services and Reimbursable Expenses of ENGINEER

A. *For Basic Services.* OWNER shall pay ENGINEER for Basic Services performed or furnished under Exhibit A, Part 1, as set forth in Exhibit C.

B. *For Additional Services.* OWNER shall pay ENGINEER for Additional Services performed or furnished under Exhibit A, Part 2.

C. *For Reimbursable Expenses.* In addition to payments provided for in paragraphs 4.01.A and 4.01.B, OWNER shall pay ENGINEER for Reimbursable Expenses incurred by ENGINEER and ENGINEER's Consultants as set forth in Exhibit C-1.

4.02 Other Provisions Concerning Payments

A. *Preparation of Invoices.* Invoices will be prepared in accordance with ENGINEER's standard invoicing practices and will be submitted to OWNER by ENGINEER, unless otherwise agreed. The amount billed in each invoice will be calculated as set forth in Exhibit C.

B. *Payment of Invoices.* Invoices are due and payable within 30 days of receipt. If OWNER fails to make any payment due ENGINEER for services and expenses within 30 days after receipt of ENGINEER's invoice therefor, the amounts due ENGINEER will be increased at the rate of 1.0% per month (or the maximum rate of interest permitted by law, if less) from said thirtieth day. In addition, ENGINEER may, after giving seven days written notice to OWNER, suspend services under this Agreement until ENGINEER has been paid in full all amounts due for services, expenses, and other related charges. Payments will be credited first to interest and then to principal.

C. *Disputed Invoices.* In the event of a disputed or contested invoice, only that portion so contested may be withheld from payment, and the undisputed portion will be paid.

D. *Payments Upon Termination.*

1. In the event of any termination under paragraph 6.06, ENGINEER will be entitled to invoice OWNER and will be paid in accordance with Exhibit C for all services performed or furnished and all Reimbursable Expenses incurred through the effective date of termination.

2. In the event of termination by OWNER for convenience or by ENGINEER for cause, ENGINEER, in addition to invoicing for those items identified in subparagraph 4.02.D.1, shall be entitled to invoice OWNER and shall be paid a reasonable amount for services and expenses directly attributable to termination, both before and after the effective date of termination, such as reassignment of personnel, costs of terminating contracts with ENGINEER's Consultants, and other related close-out costs, using methods and rates for Additional Services as set forth in Exhibit C.

E. *Records of ENGINEER's Costs.* Records of ENGINEER's costs pertinent to ENGINEER's compensation under this Agreement shall be kept in accordance with generally accepted accounting practices. To the extent necessary to verify ENGINEER's charges and upon OWNER's timely request, copies of such records will be made available to OWNER at cost.

F. *Legislative Actions.* In the event of legislative actions after the Effective Date of the Agreement by any level of government that impose taxes, fees, or costs on ENGINEER's services or other costs in connection with this Project or compensation therefor, such new taxes, fees, or costs shall be invoiced to and paid by OWNER as a Reimbursable Expense to which a Factor of 1.0 shall be applied. Should such taxes, fees, or costs be imposed, they shall be in addition to ENGINEER's estimated total compensation.

ARTICLE 5 - OPINIONS OF COST

5.01 Opinions of Probable Construction Cost

A. ENGINEER's opinions of probable Construction Cost provided for herein are to be made on the basis of ENGINEER's experience and qualifications and represent ENGINEER's best judgment as an experienced and qualified professional generally familiar with the industry. However, since ENGINEER has no control over the cost of labor, materials, equipment, or services furnished by others, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions, ENGINEER cannot and does not guarantee that proposals, bids, or actual Construction Cost will not vary from opinions of probable Construction Cost prepared by ENGINEER. If OWNER wishes greater assurance as to probable Construction Cost, OWNER shall employ an independent cost estimator as provided in Exhibit B.

5.02 Designing to Construction Cost Limit

A. If a Construction Cost limit is established between OWNER and ENGINEER, such Construction Cost limit and a statement of ENGINEER's rights and responsibilities with respect thereto will be specifically set forth in Exhibit F, "Construction Cost Limit," to this Agreement.

5.03 Opinions of Total Project Costs

A. ENGINEER assumes no responsibility for the accuracy of opinions of Total Project Costs.

ARTICLE 6 - GENERAL CONSIDERATIONS

6.01 Standards of Performance

A. The standard of care for all professional engineering and related services performed or furnished by ENGINEER under this Agreement will be the care and skill ordinarily used by members of ENGINEER's profession practicing under similar circumstances at the same time and in the same locality. ENGINEER makes no warranties, express or implied, under this Agreement or otherwise, in connection with ENGINEER's services.

B. ENGINEER shall be responsible for the technical accuracy of its services and documents resulting therefrom, and OWNER shall not be responsible for discovering deficiencies therein. ENGINEER shall correct such deficiencies without additional compensation except to the extent such action is directly attributable to deficiencies in OWNER-furnished information.

C. ENGINEER shall perform or furnish professional engineering and related services in all phases of the Project to which this Agreement applies. ENGINEER shall serve as OWNER's prime professional for the Project. ENGINEER may employ such ENGINEER's Consultants as ENGINEER deems necessary to assist in the performance or furnishing of the services. ENGINEER shall not be required to employ any ENGINEER's Consultant unacceptable to ENGINEER.

D. ENGINEER and OWNER shall comply with applicable Laws or Regulations and OWNER-mandated standards. This Agreement is based on these requirements as of its Effective Date. Changes to these requirements after the Effective Date of this Agreement may be the basis for modifications to OWNER's responsibilities or to ENGINEER's scope of services, times of performance, or compensation.

E. OWNER shall be responsible for, and ENGINEER may rely upon, the accuracy and completeness of all requirements, programs, instructions, reports, data, and other information furnished by OWNER to ENGINEER pursuant to this Agreement. ENGINEER may use such requirements, reports, data, and information in performing or furnishing services under this Agreement.

F. OWNER shall make decisions and carry out its other responsibilities in a timely manner and shall bear all costs incident thereto so as not to delay the services of ENGINEER.

G. Prior to the commencement of the Construction Phase, OWNER shall notify ENGINEER of any variations from the language indicated in Exhibit E, "Notice of Acceptability of Work," or of any other notice or certification that ENGINEER will be requested to provide to OWNER or third parties in connection with the Project. OWNER and ENGINEER shall reach agreement on the terms of any such requested notice or certification, and OWNER shall authorize such Additional Services as are necessary to enable ENGINEER to provide the notices or certifications requested.

H. ENGINEER shall not be required to sign any documents, no matter by whom requested, that would result in the ENGINEER's having to certify, guarantee or warrant the existence of conditions whose existence the ENGINEER cannot ascertain. OWNER agrees not to make resolution of any dispute with the ENGINEER or payment of any amount due to the ENGINEER in any way contingent upon the ENGINEER's signing any such certification.

I. During the Construction Phase, ENGINEER shall not supervise, direct, or have control over Contractor's work, nor shall ENGINEER have authority over or responsibility for the means, methods, techniques, sequences, or procedures of construction selected by Contractor, for safety precautions and programs incident to the Contractor's work in progress, nor for any failure of Contractor to comply with Laws and Regulations applicable to Contractor's furnishing and performing the Work.

J. ENGINEER neither guarantees the performance of any Contractor nor assumes responsibility for any Contractor's failure to furnish and perform the Work in accordance with the Contract Documents.

K. ENGINEER shall not be responsible for the acts or omissions of any Contractor(s), subcontractor or supplier, or of any of the Contractor's agents or employees or any other persons (except ENGINEER's own employees) at the Site or otherwise furnishing or performing any of the Contractor's work; or for any decision made on interpretations or clarifications of the Contract Documents given by OWNER without consultation and advice of ENGINEER.

L. The General Conditions for any construction contract documents prepared hereunder are to be the "Standard General Conditions of the Construction Contract" as prepared by the Engineers Joint Contract Documents Committee (Document No. 1910-8, 1996 Edition) unless both parties mutually agree to use other General Conditions as specifically referenced in Exhibit J.

6.02 Authorized Project Representatives

A. Contemporaneous with the execution of this Agreement, ENGINEER and OWNER shall designate specific individuals to act as ENGINEER's and OWNER's representatives with respect to the services to be performed or furnished by ENGINEER and responsibilities of OWNER under this Agreement. Such individuals shall have authority to transmit instructions, receive information, and render decisions relative to the Project on behalf of each respective party.

6.03 Design without Construction Phase Services

A. Should OWNER provide Construction Phase services with either OWNER's representatives or a third party, ENGINEER's Basic Services under this Agreement will be considered to be completed upon completion of the Final Design Phase or Bidding or Negotiating Phase as outlined in Exhibit A.

B. It is understood and agreed that if ENGINEER's Basic Services under this Agreement do not include Project observation, or review of the Contractor's performance, or any other Construction Phase services, and that such services will be provided by OWNER, then OWNER assumes all responsibility for interpretation of the Contract Documents and for construction observation or review and waives any claims against the ENGINEER that may be in any way connected thereto.

6.04 Use of Documents

A. All Documents are instruments of service in respect to this Project, and ENGINEER shall retain an ownership and property interest therein (including the right of reuse at

the discretion of the ENGINEER) whether or not the Project is completed.

B. Copies of OWNER-furnished data that may be relied upon by ENGINEER are limited to the printed copies (also known as hard copies) that are delivered to the ENGINEER pursuant to Exhibit B. Files in electronic media format of text, data, graphics, or of other types that are furnished by OWNER to ENGINEER are only for convenience of ENGINEER. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk.

C. Copies of Documents that may be relied upon by OWNER are limited to the printed copies (also known as hard copies) that are signed or sealed by the ENGINEER. Files in electronic media format of text, data, graphics, or of other types that are furnished by ENGINEER to OWNER are only for convenience of OWNER. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk.

D. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the party delivering the electronic files. ENGINEER shall not be responsible to maintain documents stored in electronic media format after acceptance by OWNER.

E. When transferring documents in electronic media format, ENGINEER makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by ENGINEER at the beginning of this Project.

F. OWNER may make and retain copies of Documents for information and reference in connection with use on the Project by OWNER. Such Documents are not intended or represented to be suitable for reuse by OWNER or others on extensions of the Project or on any other project. Any such reuse or modification without written verification or adaptation by ENGINEER, as appropriate for the specific purpose intended, will be at OWNER's sole risk and without liability or legal exposure to ENGINEER or to ENGINEER's Consultants. OWNER shall indemnify and hold harmless ENGINEER and ENGINEER's Consultants from all claims, damages, losses, and expenses, including attorneys' fees arising out of or resulting therefrom.

G. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

H. Any verification or adaptation of the Documents for extensions of the Project or for any other project will entitle ENGINEER to further compensation at rates to be agreed upon by OWNER and ENGINEER.

6.05 Insurance

A. ENGINEER shall procure and maintain insurance as set forth in Exhibit G, "Insurance."

B. OWNER shall procure and maintain insurance as set forth in Exhibit G, "Insurance." OWNER shall cause ENGINEER and ENGINEER's Consultants to be listed as additional insureds on any general liability or property insurance policies carried by OWNER which are applicable to the Project.

C. OWNER shall require Contractor to purchase and maintain general liability and other insurance as specified in the Contract Documents and to cause ENGINEER and ENGINEER's Consultants to be listed as additional insureds with respect to such liability and other insurance purchased and maintained by Contractor for the Project

D. OWNER and ENGINEER shall each deliver to the other certificates of insurance evidencing the coverages indicated in Exhibit G. Such certificates shall be furnished prior to commencement of ENGINEER's services and at renewals thereafter during the life of the Agreement.

E. All policies of property insurance shall contain provisions to the effect that ENGINEER's and ENGINEER's Consultants' interests are covered and that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder.

F. At any time, OWNER may request that ENGINEER, at OWNER's sole expense, provide additional insurance coverage, increased limits, or revised deductibles that are more protective than those specified in Exhibit G. If so requested by OWNER, with the concurrence of ENGINEER, and if commercially available, ENGINEER shall obtain and shall require ENGINEER's Consultants to obtain such additional insurance coverage, different limits, or revised deductibles for such periods of time as requested by OWNER, and Exhibit G will be supplemented to incorporate these requirements.

6.06 Termination

A. The obligation to provide further services under this Agreement may be terminated:

1. *For cause,*

a. By either party upon 30 days written notice in the event of substantial failure by the other party to perform in accordance with the terms hereof through no fault of the terminating party.

b. By ENGINEER:

1) upon seven days written notice if ENGINEER believes that ENGINEER is being requested by OWNER to furnish or perform services contrary to ENGINEER's responsibilities as a licensed professional; or

2) upon seven days written notice if the ENGINEER's services for the Project are delayed or suspended for more than 90 days for reasons beyond ENGINEER's control.

3) ENGINEER shall have no liability to OWNER on account of such termination.

c. Notwithstanding the foregoing, this Agreement will not terminate as a result of such substantial failure if the party receiving such notice begins, within seven days of receipt of such notice, to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt thereof; provided, however, that if and to the extent such substantial failure cannot be reasonably cured within such 30 day period, and if such party has diligently attempted to cure the same and thereafter continues diligently to cure the same, then the cure period provided for herein shall extend up to, but in no case more than, 60 days after the date of receipt of the notice.

2. *For convenience,*

a. By OWNER effective upon the receipt of notice by ENGINEER.

B. The terminating party under paragraphs 6.06.A.1 or 6.06.A.2 may set the effective date of termination at a time up to 30 days later than otherwise provided to allow ENGINEER to demobilize personnel and equipment from the Site, to complete tasks whose value would otherwise be lost, to prepare notes as to the status of completed and uncompleted tasks, and to assemble Project materials in orderly files.

6.07 Controlling Law

A. This Agreement is to be governed by the law of the state in which the Project is located.

6.08 Successors, Assigns, and Beneficiaries

A. OWNER and ENGINEER each is hereby bound and the partners, successors, executors, administrators and legal representatives of OWNER and ENGINEER (and to the extent permitted by paragraph 6.08.B the assigns of OWNER and ENGINEER) are hereby bound to the other party to this Agreement and to the partners, successors, executors, administrators and legal representatives (and said assigns) of such other party, in respect of all covenants, agreements and obligations of this Agreement.

B. Neither OWNER nor ENGINEER may assign, sublet, or transfer any rights under or interest (including, but without limitation, moneys that are due or may become due) in this Agreement without the written consent of the other, except to the extent that any assignment, subletting, or transfer is mandated or restricted by law. Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under this Agreement.

C. Unless expressly provided otherwise in this Agreement:

1. Nothing in this Agreement shall be construed to create, impose, or give rise to any duty owed by OWNER or ENGINEER to any Contractor, Contractor's subcontractor, supplier, other individual or entity, or to any surety for or employee of any of them.

2. All duties and responsibilities undertaken pursuant to this Agreement will be for the sole and exclusive benefit of OWNER and ENGINEER and not for the benefit of any other party. The OWNER agrees that the substance of the provisions of this paragraph 6.08.C shall appear in the Contract Documents.

6.09 Dispute Resolution

A. OWNER and ENGINEER agree to negotiate all disputes between them in good faith for a period of 30 days from the date of notice prior to exercising their rights under Exhibit H or other provisions of this Agreement, or under law. In the absence of such an agreement, the parties may exercise their rights under law.

B. If and to the extent that OWNER and ENGINEER have agreed on a method and procedure for resolving

disputes between them arising out of or relating to this Agreement, such dispute resolution method and procedure is set forth in Exhibit H, "Dispute Resolution."

6.10 Hazardous Environmental Condition

A. OWNER represents to Engineer that to the best of its knowledge a Hazardous Environmental Condition does not exist.

B. OWNER has disclosed to the best of its knowledge to ENGINEER the existence of all Asbestos, PCB's, Petroleum, Hazardous Waste, or Radioactive Material located at or near the Site, including type, quantity and location.

C. If a Hazardous Environmental Condition is encountered or alleged, ENGINEER shall have the obligation to notify OWNER and, to the extent of applicable Laws and Regulations, appropriate governmental officials.

D. It is acknowledged by both parties that ENGINEER's scope of services does not include any services related to a Hazardous Environmental Condition. In the event ENGINEER or any other party encounters a Hazardous Environmental Condition, ENGINEER may, at its option and without liability for consequential or any other damages, suspend performance of services on the portion of the Project affected thereby until OWNER: (i) retains appropriate specialist consultant(s) or contractor(s) to identify and, as appropriate, abate, remediate, or remove the Hazardous Environmental Condition; and (ii) warrants that the Site is in full compliance with applicable Laws and Regulations.

E. OWNER acknowledges that ENGINEER is performing professional services for OWNER and that ENGINEER is not and shall not be required to become an "arranger," "operator," "generator," or "transporter" of hazardous substances, as defined in the Comprehensive Environmental Response, Compensation, and Liability Act of 1990 (CERCLA), which are or may be encountered at or near the Site in connection with ENGINEER's activities under this Agreement.

F. If ENGINEER's services under this Agreement cannot be performed because of a Hazardous Environmental Condition, the existence of the condition shall justify ENGINEER's terminating this Agreement for cause on 30 days notice.

6.11 Allocation of Risks

A. Indemnification

1. To the fullest extent permitted by law, ENGINEER shall indemnify and hold harmless OWNER, OWNER's officers, directors, partners, and employees from and against any and all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) caused solely by the negligent acts or omissions of ENGINEER or ENGINEER's officers, directors, partners, employees, and ENGINEER's Consultants in the performance and furnishing of ENGINEER's services under this Agreement.

2. To the fullest extent permitted by law, OWNER shall indemnify and hold harmless ENGINEER, ENGINEER's officers, directors, partners, employees, and ENGINEER's Consultants from and against any and all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) caused solely by the negligent acts or omissions of OWNER or OWNER's officers, directors, partners, employees, and OWNER's consultants with respect to this Agreement or the Project.

3. To the fullest extent permitted by law, ENGINEER's total liability to OWNER and anyone claiming by, through, or under OWNER for any cost, loss, or damages caused in part by the negligence of ENGINEER and in part by the negligence of OWNER or any other negligent entity or individual, shall not exceed the percentage share that ENGINEER's negligence bears to the total negligence of OWNER, ENGINEER, and all other negligent entities and individuals.

4. In addition to the indemnity provided under paragraph 6.11.A.2 of this Agreement, and to the fullest extent permitted by law, OWNER shall indemnify and hold harmless ENGINEER and its officers, directors, partners, employees, and ENGINEER's Consultants from and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from a Hazardous Environmental Condition, provided that (i) any such cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than completed Work), including the loss of use resulting therefrom, and (ii) nothing in this paragraph 6.11.A.4. shall obligate OWNER to indemnify any individual or entity from and against the consequences

of that individual's or entity's own negligence or willful misconduct.

5. The indemnification provision of paragraph 6.11.A.1 is subject to and limited by the provisions agreed to by OWNER and ENGINEER in Exhibit I, "Allocation of Risks," if any.

6.12 Notices

A. Any notice required under this Agreement will be in writing, addressed to the appropriate party at its address on the signature page and given personally, or by registered or certified mail postage prepaid, or by a commercial courier service. All notices shall be effective upon the date of receipt.

6.13 Survival

A. All express representations, indemnifications, or limitations of liability included in this Agreement will survive its completion or termination for any reason.

6.14 Severability

A. Any provision or part of the Agreement held to be void or unenforceable under any Laws or Regulations shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and ENGINEER, who agree that the Agreement shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

6.15 Waiver

A. Non-enforcement of any provision by either party shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Agreement.

6.16 Headings

A. The headings used in this Agreement are for general reference only and do not have special significance.

ARTICLE 7 - DEFINITIONS

7.01 Defined Terms

A. Wherever used in this Agreement (including the Exhibits hereto) and printed with initial or all capital letters, the terms listed below have the meanings indicated, which are applicable to both the singular and plural thereof:

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Documents.

2. *Additional Services*--The services to be performed for or furnished to OWNER by ENGINEER in accordance with Exhibit A, Part 2 of this Agreement.

3. *Agreement*--This "Standard Form of Agreement between OWNER and ENGINEER for Professional Services," including those Exhibits listed in Article 8 hereof.

4. *Application* for Payment--The form acceptable to ENGINEER which is to be used by Contractor in requesting progress or final payments for the completion of its Work and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

5. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

6. *Basic Services*--The services to be performed for or furnished to OWNER by ENGINEER in accordance with Exhibit A, Part 1, of this Agreement.

7. *Bid*--The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

8. *Bidding Documents*--The advertisement or invitation to Bid, instructions to bidders, the Bid form and attachments, the Bid bond, if any, the proposed Contract Documents, and all Addenda, if any.

9. *Change Order*--A document recommended by ENGINEER, which is signed by Contractor and OWNER to authorize an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Construction Agreement.

10. *Construction Agreement*--The written instrument which is evidence of the agreement, contained in the Contract Documents, between OWNER and Contractor covering the Work.

11. *Construction Contract*--The entire and integrated written agreement between the OWNER and Contractor concerning the Work.

12. *Construction Cost*--The cost to OWNER of those portions of the entire Project designed or specified by ENGINEER. Construction Cost does not include costs of services of ENGINEER or other design professionals and consultants, cost of land, rights-of-way, or compensation for damages to properties, or OWNER's costs for legal, accounting, insurance counseling or auditing services, or interest and financing charges incurred in connection with the Project, or the cost of other services to be provided by others to OWNER pursuant to Exhibit B of this Agreement. Construction Cost is one of the items comprising Total Project Costs.

13. *Contract Documents*--Documents that establish the rights and obligations of the parties engaged in construction and include the Construction Agreement between OWNER and Contractor, Addenda (which pertain to the Contract Documents), Contractor's Bid (including documentation accompanying the Bid and any post-Bid documentation submitted prior to the notice of award) when attached as an exhibit to the Construction Agreement, the notice to proceed, the bonds, appropriate certifications, the General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Construction Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Construction Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents.

14. *Contract Price*--The moneys payable by OWNER to Contractor for completion of the Work in accordance with the Contract Documents and as stated in the Construction Agreement.

15. *Contract Times*--The numbers of days or the dates stated in the Construction Agreement to: (i) achieve Substantial Completion, and (ii) complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment.

16. *Contractor*--An individual or entity with whom OWNER enters into a Construction Agreement.

17. *Correction Period*--The time after Substantial Completion during which Contractor must correct, at no cost to OWNER, any Defective Work, normally one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee or specific provision of the Contract Documents.

18. *Defective*--An adjective which, when modifying the word Work, refers to Work that is unsatisfactory, faulty, or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment.

19. *Documents*--Data, reports, Drawings, Specifications, Record Drawings, and other deliverables, whether in printed or electronic media format, provided or furnished in appropriate phases by ENGINEER to OWNER pursuant to this Agreement.

20. *Drawings*--That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings are not Drawings as so defined.

21. *Effective Date of the Construction Agreement*--The date indicated in the Construction Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Construction Agreement is signed and delivered by the last of the two parties to sign and deliver.

22. *Effective Date of the Agreement*--The date indicated in this Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

23. *ENGINEER's Consultants*--Individuals or entities having a contract with ENGINEER to furnish services with respect to this Project as ENGINEER's independent professional associates, consultants, subcontractors, or vendors. The term ENGINEER includes ENGINEER's Consultants.

24. *Field Order*--A written order issued by ENGINEER which directs minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

25. *General Conditions*-That part of the Contract Documents which sets forth terms, conditions, and procedures that govern the Work to be performed or furnished by Contractor with respect to the Project.

26. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCB's, Petroleum, Hazardous Waste, or Radioactive Materials in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

27. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

28. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, standards, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

29. PCB's--Polychlorinated biphenyls.

30. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

31. *Radioactive Materials*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

32. *Record Drawings*--The Drawings as issued for construction on which the ENGINEER, upon completion of the Work, has shown changes due to Addenda or Change Orders and other information which ENGINEER considers significant based on record documents furnished by Contractor to ENGINEER and which were annotated by Contractor to show changes made during construction.

33. *Reimbursable Expenses*--The expenses incurred directly by ENGINEER in connection with the performing or furnishing of Basic and Additional Services for the Project for which OWNER shall pay ENGINEER as indicated in Exhibit C.

34. *Resident Project Representative*--The authorized representative of ENGINEER, if any, assigned to assist ENGINEER at the Site during the Construction Phase. The Resident Project Representative will be ENGINEER's agent or employee and under ENGINEER's supervision. As used herein, the term Resident Project Representative includes any assistants of Resident Project Representative agreed to by OWNER. The duties and responsibilities of the Resident Project Representative are as set forth in Exhibit D.

35. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

36. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to ENGINEER to illustrate some portion of the Work.

37. *Site*--Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for use of Contractor.

38. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

39. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

40. Supplementary Conditions--That part of the Contract Documents which amends or supplements the General Conditions.

41. Total Project Costs--The sum of the Construction Cost, allowances for contingencies, the total costs of services of ENGINEER or other design professionals and consultants, cost of land, rights-of-way, or compensation for damages to properties, or OWNER's costs for legal, accounting, insurance counseling or auditing services, or interest and financing charges incurred in connection with the Project, or the cost of other services to be provided by others to OWNER pursuant to Exhibit B of this Agreement.

42. Work--The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents with respect to this

Project. Work includes and is the result of performing or furnishing labor, services, and documentation necessary to produce such construction and furnishing, installing, and incorporating all materials and all equipment into such construction, all as required by the Contract Documents.

43. *Work Change Directive*--A written directive to Contractor issued on or after the Effective Date of the Construction Agreement and signed by OWNER upon recommendation of the ENGINEER, ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change directed or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

44. *Written Amendment*--A written amendment of the Contract Documents signed by OWNER and Contractor on or after the Effective Date of the Construction Agreement and normally dealing with the non-engineering or non-technical rather than strictly construction-related aspects of the Contract Documents.

ARTICLE 8 - EXHIBITS AND SPECIAL PROVISIONS

8.01 Exhibits Included

A. Exhibit A, "ENGINEER's Services," consisting of 6 pages.

B. Exhibit B, "OWNER's Responsibilities," consisting of 0 pages.

C. Exhibit C, "Payments to Engineer for Services and Reimbursable Expenses," consisting of 2 pages.

D. Exhibit D, "Duties, Responsibilities and Limitations of Authority of Resident Project Representative," consisting of 0 pages.

E. Exhibit E, "Notice of Acceptability of Work," consisting of 0 pages.

F. Exhibit F, "Construction Cost Limit," consisting of 0 pages.

G. Exhibit G, "Insurance," consisting of 2 pages.

H. Exhibit H, "Dispute Resolution," consisting of 0 pages.

I. Exhibit I, "Allocation of Risks," consisting of 0 pages.

J. Exhibit J, "Special Provisions," consisting of 0 pages.

8.02 Total Agreement

A. This Agreement (consisting of pages 1 to 12 inclusive, together with the Exhibits identified above) constitutes the entire agreement between OWNER and ENGINEER and supersedes all prior written or oral understandings. This Agreement may only be amended, supplemented, modified, or canceled by a duly executed written instrument.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, the Effective Date of which is indicated on page 1.

ENGINEER:	OWNER:
By: **Thomas L. Whalen**	By:
Title: **Production Manager**	Title:
Date Signed: **3/5/01**	Date Signed:
Address for giving notices:	Address for giving notices:
12700 Park Central Drive, Suite 1800	
Dallas, Texas 75251	
Designated Representative (paragraph 6.02.A):	Designated Representative (paragraph 6.02.A):
Brian K. Shewski, P.E., PTOE	
Title: **Senior Project Manager**	Title:
Phone Number: **972-770-1341**	Phone Number:
Facsimile Number: **972-239-3820**	Facsimile Number:
E-Mail Address: **bshewski@kimley-horn.com**	E-Mail Address:

EXHIBIT A. ENGINEER'S SERVICES

I. PROJECT DEFINITION, MANAGEMENT, AND CONTROL

Kimley-Horn and Associates, Inc. (KHA) shall perform the following Professional Services relative to the optimization of signal timing for 17 intersections in the Town of Addison (TOWN). This Scope of Services shall hereinafter be referred to as "the Project."

Project Definition. For purposes of this Project the following 17 intersections in the TOWN shall be included:

1. Town of Addison intersections to be included in signal timing:
   a) Belt Line at Marsh
   b) Belt Line at Business
   c) Belt Line at Commercial
   d) Belt Line at Surveyor
   e) Belt Line at Runyon
   f) Belt Line at Midway
   g) Belt Line at Beltway
   h) Belt Line at Addison
   i) Belt Line at Quorum
   j) Midway at Spring Valley
   k) Midway at Hornet
   l) Midway at Proton
   m) Midway at Beltway
   n) Midway at Lindberg
   o) Midway at Dooley
   p) Marsh at Realty
   q) Spring Valley at Greenhill

2. Other agency intersections to be included in the model:
   r) Marsh at Country Square (Carrollton)
   s) Marsh at Beltway (Farmers Branch)
   t) Belt Line at Trend (Carrollton)
   u) Belt Line at Tollway NB and Tollway SB (Dallas)
   v) Midway at Keller Springs (Carrollton)
   w) Midway at Alpha (Farmers Branch)
   x) Spring Valley at Proton (Farmers Branch)

Timing plans for intersections shown above in the Project Definition (subpart 2) will not be optimized, modified, or fine-tuned. However, existing coordinated timing plans, phasing, and turning movement counts of these intersections will be added to the model.

A. Project Meetings. Unless otherwise stated herein, it is assumed that all Project technical and review meetings will be held in the Addison Service Center. It is agreed for budgeting purposes that up to six (6) meetings will be held relative to the Project, which is expected to have a total duration of approximately three (3) months.

B. Project Control. KHA will coordinate data collection and design efforts with TOWN staff and/or consultants working within or adjacent to the project limits. Project records will be

maintained throughout the duration of the project. One set of these records will be given to the TOWN upon the completion of the project.

C. Project Schedule. KHA shall develop a project schedule using the **Microsoft Project** software program. Deviations from the original schedule will be incorporated into the schedule and discussed with the TOWN.

D. QA/QC. Throughout the project, KHA senior staff will conduct quality reviews. These reviews will address the completeness and accuracy of traffic data collected and of the timing plans developed.

II. DATA COLLECTION

KHA will collect the following data:

A. Turning Movement Counts. New turning movement count data will be collected and reduced for four (4) two (2)-hour time periods at each Project intersection. Data will be tabulated by 15-minute increments, by approach direction (e.g., northbound, etc.), and by turning movement (e.g., left, straight, or right). In addition, the number of vehicles not being serviced on the first cycle will be counted every five minutes for the intersection of Belt Line and Midway.

The time periods shall be defined as follows:

- AM Peak = eight (8) consecutive 15-minute periods (normally 6:30 AM to 8:30 AM) on a non-holiday Tuesday, Wednesday, Thursday, or Friday;
- Noon Peak = eight (8) consecutive 15-minute periods (normally 11:30 AM to 1:30 PM) on a non-holiday Monday, Tuesday, Wednesday, or Thursday;
- PM Peak = eight (8) consecutive 15-minute periods (normally 4:30 PM to 6:30 PM) on a non-holiday Monday, Tuesday, Wednesday, or Thursday; and
- Off Peak = any eight (8) consecutive 15-minute periods between 9:00 AM and 11:00 AM on a non-holiday Tuesday, Wednesday, Thursday, or Friday.

It is understood that the beginning and ending times of the AM Peak, Noon Peak, PM Peak, and Off Peak counts may be adjusted based on the results of recording machine count data.

B. 24-Hour Machine Counts. For up to 12 locations, new Monday-through-Friday recording machine count data will be collected and reduced. For each location and direction, a minimum of twenty-four (24) hours of data will be recorded by 15-minute increments, beginning on or before 11:00 PM on a Monday and ending on or after 1:00 AM on Friday. Counts will not be made on holidays, during adverse weather conditions, or when school is not in session. Four additional counts will be made on Saturday.

C. Travel Time Runs. Both "before" and "after" travel time runs will be made using floating car techniques during the time periods shown in Section II.A above. The three routes to be included in these travel time runs include Belt Line, Midway, and Marsh.

The "before" runs will be made prior to the development of the new signal timing to establish baseline conditions (speeds, delay, and number of stops) and to determine appropriate progression speeds, areas where queue management is critical, and areas where recurrent congestion may affect progressive traffic movement. KHA will review recently

completed travel time runs by TOWN staff for possible inclusion into the "Before" run database.

After the fine-tuning and adjustment of the new, optimized signal timing is in place, the "after" runs will be made to document the degree of improvement.

D. Initial Field Observation. Prior to the development of new signal timing, KHA shall conduct field observation on each route during each time period. A traffic engineer with extensive experience in the development and implementation of progressive traffic signal timing plans shall perform such observations.

E. Photolog Summary. KHA shall photograph each approach of each signalized intersection. These photographs shall highlight the traffic signal hardware for each approach. A copy of the photolog will be given to the TOWN upon completion of the project.

F. Existing Timing Plan Review. TOWN personnel will download existing traffic signal timing information from each of the controllers. This information will be reviewed and input into the timing model developed by KHA. Likewise, traffic signal timing information for the other local agency controllers will also be input into the model.

G. Verification of Intersection Geometrics. For each Project intersection, KHA will verify the following elements of intersection geometrics and pedestrian accommodations that affect signal timing:

- The number of lanes on each approach and the required or permitted usage of each lane (i.e., "left only"; "left or straight"; "straight only"; "straight or right"; "right only"; or "left, straight, or right");
- Approximate street widths, crosswalk lengths, and grades; and
- Existence of pedestrian signal indications (i.e., "Walk" and "Don't Walk") and/or pedestrian actuation.

III. PRELIMINARY ANALYSIS.

KHA will perform the following preliminary analysis:

A. Adjust Count Data. Using information from the traffic counts, KHA will make adjustments as necessary to ensure the reasonableness of the turning movement counts for each intersection. If any adjustments are deemed necessary the changes will be made upon conference with the TOWN.

B. Determine Number of Timing Plans Required. Based on an assessment of existing recording machine count data, it is anticipated that most areas should have unique timing plans for the AM Peak, Noon Peak, PM Peak, and Off Peak time periods. For each control area, KHA will review the newly collected count data to verify the number of plans.

C. Determine Control Area Boundaries. KHA shall use the following process to determine the optimum control area boundaries for timing plan purposes:

- Review traffic timing parameters of coordinated systems in adjacent cities;
- Review the new and previously existing count data to determine similarities in volume fluctuation patterns;

- For each timing plan period (e.g., AM Peak, Noon Peak, PM Peak, and Off Peak), determine approximate cycle length requirements for key intersections, which shall include all diamond interchanges and all arterial/arterial intersections.
- Based on the above, and taking into consideration opportunities for mutual coordination with existing intersecting systems and systems in adjacent cities, KHA will make an initial division of the overall Project area into control areas. This information will be presented in map form for review and subsequent interactive discussion.

Generally speaking, the need for coordination between any two signalized intersections is directly proportional to the traffic volume and inversely proportional to the distance between the intersections. This relationship can be quantified mathematically by the "coupling index", where D = distance, V = volume, I = coupling index, and I = V/D. The coordinatability factor calculated by Synchro™ 4.0 which is a modified version of the coupling index may be substituted for the coupling index.

Wherever feasible and appropriate, however, the overall control areas for this Project will be structured to achieve interlocking two-way progression, north-south and east-west. Accordingly, in those instances where adjacent signals have essentially the same cycle length requirement, the presumption will be that they should be coordinated, irrespective of volume or distance.

In those instances where different cycle lengths are required, coupling indices will be computed for selected links to refine the initial control area configurations.

D. KHA will prepare a technical memorandum that documents the following:

- Proposed control area boundaries, with discussion of factors which went into their determination (e.g., cycle length requirements, volume fluctuation patterns, and coupling indices);
- Proposed cycle lengths; and
- Preliminary measures of effectiveness.

In addition, the following information will be provided as an appendix to the technical memorandum:

- Traffic counts, both raw data and adjusted values;
- Before travel time data.

KHA will meet to receive comments on the draft technical memorandum. KHA will incorporate review comments and submit a final technical memorandum. Any changes that are agreed to at the review meeting will be documented in the minutes of the review meeting and will be incorporated into the final report.

IV. GENERATION OF TIMING PLANS

A. Develop Controller Interval Timing. Based on approach speeds and intersection geometrics, KHA will develop the appropriate controller interval timing for the *yellow, all-red,* and *pedestrian* clearance intervals will be calculated by KHA. This data will be provided in tabular (spreadsheet) format for TOWN review. After receipt of review comments, this data will be finalized and submitted again in tabular format.

B. Initial Timing Plans. Making appropriate use of Synchro™ 4.0, PASSER II-90, PASSER III-90, PASSER IV-94, and/or TRANSYT-7F, KHA will generate new signal timing plans. It is anticipated that up to four (4) unique plans will be generated for all subsystems of the Project. This generally will consist of unique plans for the AM Peak, Noon Peak, PM Peak, and Off Peak time periods.

Progression bandwidths for all timing plans will be optimized to the maximum practical extent using dual leading left-turns. After this optimization is complete, the arterial will be re-optimized allowing the variation of the signal phase sequence (i.e., a particular left-turn phase may be "leading" during one timing plan but lagging during one or more other timing plans). KHA will identify locations where a "yellow trap" condition would result because of a leading "protected-permitted" left-turn phase on the opposite approach. This information will be provided to the TOWN and reviewed with them to determine the most appropriate method for eliminating the yellow trap condition. The final timing will make use of lagging left-turns only at those locations where the yellow trap will not occur.

Each timing plan will include a cycle length, offset, and split. The plans, along with a computer-generated time-space diagram, will be submitted for review. At a subsequent review meeting, KHA will discuss the characteristics of each plan and receive comments. KHA will then finalize each timing plan to incorporate such comments.

This project will follow current Town of Addison requirements for traffic signal timing.

C. Finalize Timing Plans. KHA will furnish the final timing plan data in an electronic format for the 820A controllers.

V. TIMING PLAN IMPLEMENTATION AND FINE-TUNING

A. Implementation Assistance. KHA will assist TOWN personnel during the implementation of coordinated timing plans. A senior engineer will be available to download the new coordinated plans and respond to questions that may arise during the implementation process.

B. Timing Plan Fine-Tuning. When the new timing is operational, KHA will provide qualified staff members for on-site fine-tuning assistance. During the course of this assistance, KHA will observe the actual operation of the new timing plans and suggest adjustments to improve the operation. Each of the TOWN intersections will be observed during the AM, NOON, PM, and OFF peak periods.

It is assumed that TOWN personnel will participate in this process, thereby gaining familiarity with the timing plans.

For budgeting purposes, it is mutually understood and agreed to that no more than one-hundred and thirty-two (132) man-hours will be expended under this contract for fine-tuning purposes.

VI. FINAL REPORT

A. Analysis of "Before" and "After" Results. KHA will update the model for the fine-tuning changes. The results from the final ("After") model runs will be compared with the results from the "Before" study. Specific measures of effective which will be compared are vehicle delays, stops, fuel consumption, emissions, and travel times.

B. Preparation of Final Report. At the conclusion of the Project, KHA will prepare a final report that will include the following:

- The updated information originally provided in the technical memoranda; and
- Summary of Project benefits as determined from an analysis of the "before" and "after" data.

The following additional information will be provided in the appendix:

- Final signal timing data along with time-space diagrams; and
- "After" travel time runs.

KHA will submit a draft final report for review and will subsequently meet to receive comments. KHA will then submit the final report, incorporating the review comments.

C. Presentation of Results. KHA will present the results of the project at one (1) Town Council meeting.

EXHIBIT C. COST PROPOSAL - Addison Traffic Signal Retiming Project

as of 2/19/01

TASK DESCRIPTION	FIRM NAME: KIMLEY-HORN AND ASSOCIATES, INC.							GERRY DE CAMP & ASSOC., INC.		Subtotal Hours
	Principal[1]	PM[2]	Sr. Traffic Engineer[3]	Traffic Engineer[4]	Traffic Analyst[4]	CADD[4]	Clerical[4]	Traffic Operations Engineer[5]		
1.0 Project Administration										
A. Project Meetings	0	16	2	4	4	4	6	2		38
B. Project Control	0	8	0	0	0	0	8	0		16
C. Project Schedule	0	4	0	0	4	2	2	0		12
D. QA/QC	2	8	4	0	0	0	0	16		30
Subtotal =	2	36	6	4	8	6	16	18		96
2.0 Data Collection										
A. Turning Movement Counts	0	0	0	0	4	0	0	0		4
B. 24-Hour Machine Counts	0	0	0	0	8	0	0	0		8
C. Travel Time Runs	0	2	0	0	4	0	0	0		6
D. Initial Field Observation	0	16	0	8	0	0	2	4		30
E. Photolog Summary	0	0	0	0	20	8	0	0		28
F. Existing Timing Plan Review	0	2	0	8	0	0	2	0		12
G. Verification of Intersection Geometrics	0	0	0	0	8	4	0	0		12
Subtotal =	0	20	0	16	44	12	4	4		100
3.0 Preliminary Analysis										
A. Adjust Count Data	0	0	0	0	4	0	0	0		4
B. Determine # of Timing Plans Required	0	2	4	2	0	0	0	0		8
C. Determine Control Area Boundaries	0	2	6	8	0	0	0	0		16
D. Prepare Technical Memorandum	0	2	4	16	8	8	8	0		46
Subtotal =	0	6	14	26	12	8	8	0		74
4.0 Generation of Timing Plans										
A. Develop Controller Interval Timing	0	4	8	16	18	4	0	0		50
B. Generate Initial Timing Plans	0	2	4	18	32	8	0	0		64
C. Finalize Timing Plans	0	12	4	0	0	0	0	12		28
Subtotal =	0	18	16	34	50	12	0	12		142
5.0 Implementation/Fine-Tuning										
A. Inplementation Assistance	0	16	4	24	0	0	0	4		48
B. Timing Plan Fine-Tuning	0	48	8	32	4	0	0	40		132
Subtotal =	0	64	12	56	4	0	0	44		180
6.0 Final Report and Presentation										
A. Analysis of "Before" and "After" Results	0	4	4	0	8	2	2	0		20
B. Preparation of Final Report	0	2	4	16	8	8	8	2		48
C. Presentation of Results	0	4	0	2	0	4	4	0		14
Subtotal =	0	10	8	18	16	14	14	2		82
Grand Total Hours =	2	154	56	154	134	52	42	80		674
Hourly Rates* =	$ 181.12	$ 140.89	$ 148.45	$ 100.97	$ 85.37	$ 64.59	$ 54.65	$ 100.00		
Subtotal Labor Costs =	$ 362.24	$ 21,696.87	$ 8,313.40	$ 15,548.71	$ 11,440.00	$ 3,358.85	$ 2,295.35	$ 8,000.00		
Total Firm Labor Costs =	$ 63,015.42							$ 8,000.00		
Total Firm Expenses** =	$ 16,620.40							$ 200.00		
GRAND TOTAL COSTS =	**$ 87,835.82**									

* - KHA hourly rates include audited overhead costs of 1.6849 and a fixed fee of 15 percent.

** - See Exhibit C-1 for detailed estimate. These expenses also include the cost of traffic data collection.

(1) Roy Wilshire, P.E.

(2) Brian Shewski, P.E., PTOE

(3) Wayne Kurfees, P.E.

(4) Represents functional staff category.

(5) Gerry de Camp, P.E.

EXHIBIT C-1. DETAILED DIRECT COST ESTIMATE					as of 2/19/01
COST DESCRIPTION	UNITS	UNIT COST	QUANTITY	RATE CATEGORY	COST
REPRODUCTION					
Blueline prints (22" X 34")	EA	$ 2.00	40	1	$ 80.00
Mylar prints (11" X 17")	EA	$ 6.00	0	1	$ -
Plots, Vellum B&W (22" X 34")	EA	$ 15.00	0	1	$ -
Plots, Mylar B&W (22" X 34")	EA	$ 15.00	0	1	$ -
Plots, Bond Color (22" X 34")	EA	$ 25.00	0	1	$ -
Photocopies (8 1/2" X 11")	EA	$ 0.05	800	1	$ 40.00
Photocopies (11" X 17")	EA	$ 0.12	2400	1	$ 288.00
Subtotal =					$ 408.00
TRAVEL					
Airfare	TRIPS	$ 200.00	0	2	$ -
Rental car	DAYS	$ 65.00	0	2	$ -
Per Diem	DAYS	$ 30.00	0	3	$ -
Lodging	DAYS	$ 90.00	0	3	$ -
Gas, parking, tolls	DAYS	$ 15.00	0	2	$ -
Subtotal =					$ -
PRIVATELY OWNED VEHICLE					
Mileage	MILE	$ 0.32	400	1	$ 128.00
Subtotal =					$ 128.00
COMMUNICATIONS					
Express delivery (@ $12.00/delivery)	LSUM	$ 60.00	1	2	$ 60.00
Postage (@ $0.34/parcel)	LSUM	$ 10.00	1	2	$ 10.00
Phone-long distance	LSUM	$ -	1	2	$ -
Facsimile (@ $1.00/page)	LSUM	$ 50.00	1	5	$ 50.00
Subtotal =					$ 120.00
COMPUTER					
CAD, GIS, simulation, modeling	HOURS	$ 23.37	120	1	$ 2,804.40
Word processing, data entry	HOURS	$ 5.00	40	1	$ 200.00
Subtotal =					$ 3,004.40
SUBCONSULTANT (Metrocount)					
24-Hour Tube Counts	EA	$ 60.00	32	1	$ 1,920.00
Turning Movement Counts	INTER	$ 340.00	24	1	$ 8,160.00
Travel Time Runs	EA	$ 20.00	144	1	$ 2,880.00
Subtotal =					$ 12,960.00
					$ 16,620.40

Legend for Rate Category

1 - Actual rate to be charged by Engineer or subconsultant.
2 - Estimate of rate to be charged by third party.
3 - Maximum rate allowed per diem or mile.
4 - Cost to be established based on actual cost and scope subject to TOWN approval.
5 - Maximum transmission charge of $10 for facsimile.

LETTER OF TRANSMITTAL

TOWN OF ADDISON®

Public Works / Engineering
16801 Westgrove • P.O. Box 9010
Addison, Texas 75001-9010
Telephone: (972) 450-2871 • Fax: (972) 450-2837

DATE 2-20-01	JOB NO.
ATTENTION	
RE: Midway / Belt Line Traffic Engineering	

TO Brian Shewski
Kimley-Horn

GENTLEMAN:

WE ARE SENDING YOU ☑ Attached ☐ Under separate cover via _____ the following items:

☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1	10-12-00		Report by Lee Engineering that gives some turning movements.

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ 19_____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS FYI

COPY TO Robin

SIGNED: Jim Pierce

If enclosures are not as noted, please notify us at once.

3.5 fps 85% walking Speed, not really 4 fps

10 Pitfalls of Traffic Studies

1-01

Brian Sherwoke's Talk @ TexITE January 01 meeting

10. Obnoxious motorists
9. Human errors in keying
8. Not understanding the model being used. Give the output a reality check. How does new opns compare with the old system?
7. Violating minimum clearances
6. Mfgrs defaults and model differences
5. Understanding timing is a Science and an art.
4. Poor traffic data collection ~~are~~ ques being addressed?
3. Invalid speed assumptions
2. Incorrect clock time or clock drift
1. Not conducting an opns survey @ start