

# **EDWARD SPUR ROAD & US HIGHWAY 6**

## **Traffic Engineering Study**

**Prepared for:**

**Edwards Community Authority**

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**July 2013**

## Table of Contents

List of Tables and Figures.....	i
INTRODUCTION .....	1
DATA COLLECTION.....	3
TRAFFIC FORECASTS .....	6
OPERATIONAL ANALYSES.....	9
CONCEPT DEVELOPMENT .....	9
SUMMARY.....	15
APPENDIX	

## List of Tables and Figures

Figure 1: Vicinity Map.....	2
Figure 2: Existing Traffic Volumes .....	5
Table 1: Variation* in Monthly Traffic Volumes for I-70 Automatic Traffic Recorder (ATR) Stations.....	6
Figure 3: Future Traffic Forecasts.....	8
Table 2: Intersection LOS Results: Existing Year 2012 (Signal) .....	9
Table 3: Intersection LOS Results: Future Year 2032 (Existing Geometry).....	9
Table 4: Intersection LOS Results: Future Year 2032 (Improved Signal) .....	10
Figure 4: Signalized Intersection Concept.....	11
Table 5: Sum of Entering and Conflicting Volumes (2032) .....	12
Table 6: Intersection LOS Results: Future Year 2032 (2 Lane Roundabout) .....	13
Table 7: Intersection LOS Results: Future Year 2032 (Hybrid 3 Lane Roundabout).....	13
Figure 5: Roundabout Intersection Concept.....	14

## INTRODUCTION

Recently, the Colorado Department of Transportation (CDOT) completed Phase 1 of the Edwards Spur Road improvements. These improvements consisted of roadway widening, interchange modifications, and a series of four roundabout intersections along the Edwards Spur Road (Beard Creek Road, I-70 westbound ramp, I-70 eastbound ramp, and Miller Ranch Road). The improvements generally extend from Beard Creek Road to just south of Miller Ranch Road where they tie back into the two-lane section just north of the UPRR tracks.

CDOT, Eagle County and the Edwards Community Authority (ECA) are now considering moving forward with Phase 2 of the Edwards Spur Road which will include completing an Environmental Assessment for the remaining portion from the UPRR tracks to US Hwy 6. The intersection of Edwards Spur Rd and US Hwy 6 will likely be a focal point of the Phase 2 project.

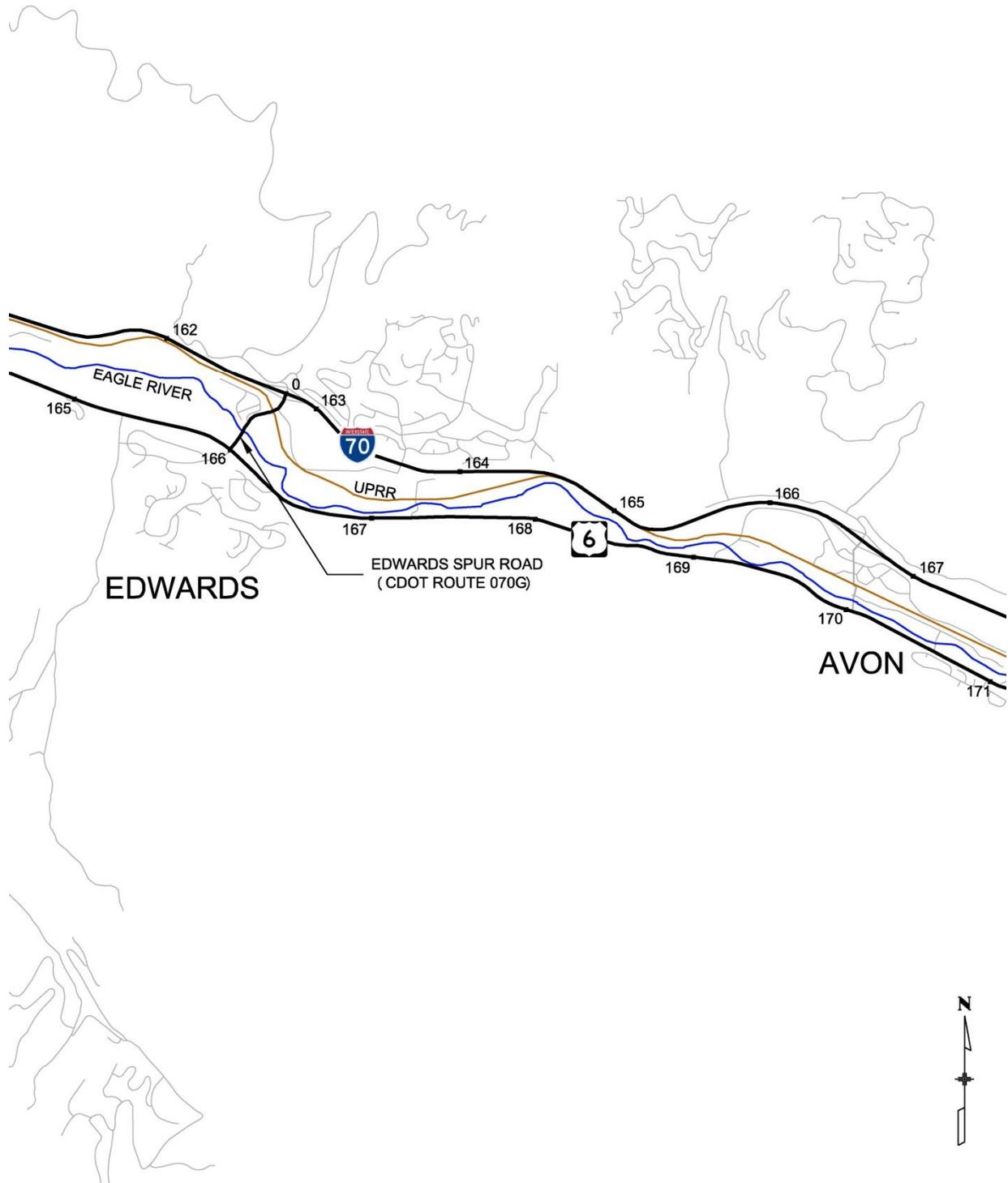
The Edwards Community Authority (ECA) in cooperation with Eagle County initiated this study in the fall of 2012. The purpose of the study was to provide initial findings related to:

- The quality of existing and future traffic operations at the intersection of US Hwy 6 and Edwards Spur Road
- Indication of when (time frame) the existing intersection and adjacent roadway segments fail
- Whether a two-lane roundabout would provide improved operations in the future
- The roundabout geometry necessary to provide improved operations (provide a concept figure)
- An order-of-magnitude construction cost for the roundabout concept

The primary focus of the study was to illustrate future traffic volume and operational conditions to assist the ECA and Eagle County in planning for future improvements to the Edwards Spur Road (i.e., Phase 2).

A vicinity map showing the location of the intersection is provided in Figure 1.

Figure 1: Vicinity Map



## DATA COLLECTION

### Previous Studies

**US 6 and I-70G (Edwards Spur Road) Corridor Feasibility Study (March 2004)** was completed in conjunction with CDOT, Eagle County, and the Metro Districts and provided the foundation for future projects along Edwards Spur Road. This study concluded that US Hwy 6 and Edwards Spur Road should ultimately be planned as four lane roadways and it identified the intersection of US Hwy 6 & Edwards Spur Road as a top priority for future improvement. These improvements were assumed in all subsequent studies, including the West End PUD Traffic Study, and the Eagle River Meadows Traffic Study.

The corridor feasibility study also included an **Access Management Plan** element for US Hwy 6 and the Edwards Spur Road. Although this plan was never formally adopted, it anticipates the need for access management and illustrates a vision of how it could occur in the future.

### Area Roadways

**Edwards Spur Road** (SH 070G) is a state highway with a Non-Rural Arterial (NR-B) access category classification. Edwards Spur Rd extends from I-70 to US Hwy 6 providing regional access to the Edwards area from I-70. Both ramp terminals at I-70 and the intersection with Miller Ranch Road are roundabouts. Conventional intersections along Edwards Spur Rd are equipped with auxiliary lanes. Edwards Spur Road has a posted speed limit of 35 MPH. According to the CDOT database, the average daily traffic (ADT) along Edwards Spur Rd is 14,000 vehicles per day (vpd).

**US Hwy 6** (SH 006E) has an access category of Non-Rural Regional Highway (NR-A) west of Edwards Spur Road and NR-B to the east. US Hwy 6 is a two-lane rural highway with a posted speed limit of 40 MPH. There are left and right turn lanes at the intersection with Edwards Spur Road. The ADT along US Hwy 6 is 11,000 vpd west of Edwards Spur Rd and 10,000 vpd to the east.

**Edwards Village Drive** is a collector providing access to residential properties south of US Hwy 6.

**Main Street** is a collector providing full movement access to the Riverwalk area from the Edwards Spur Rd.

**1<sup>st</sup> Avenue** is a local roadway providing full movement access to the Riverwalk area from US Hwy 6.

### Traffic Volumes and Data

Turning movement counts were collected at the following intersections on October 4, 2012:

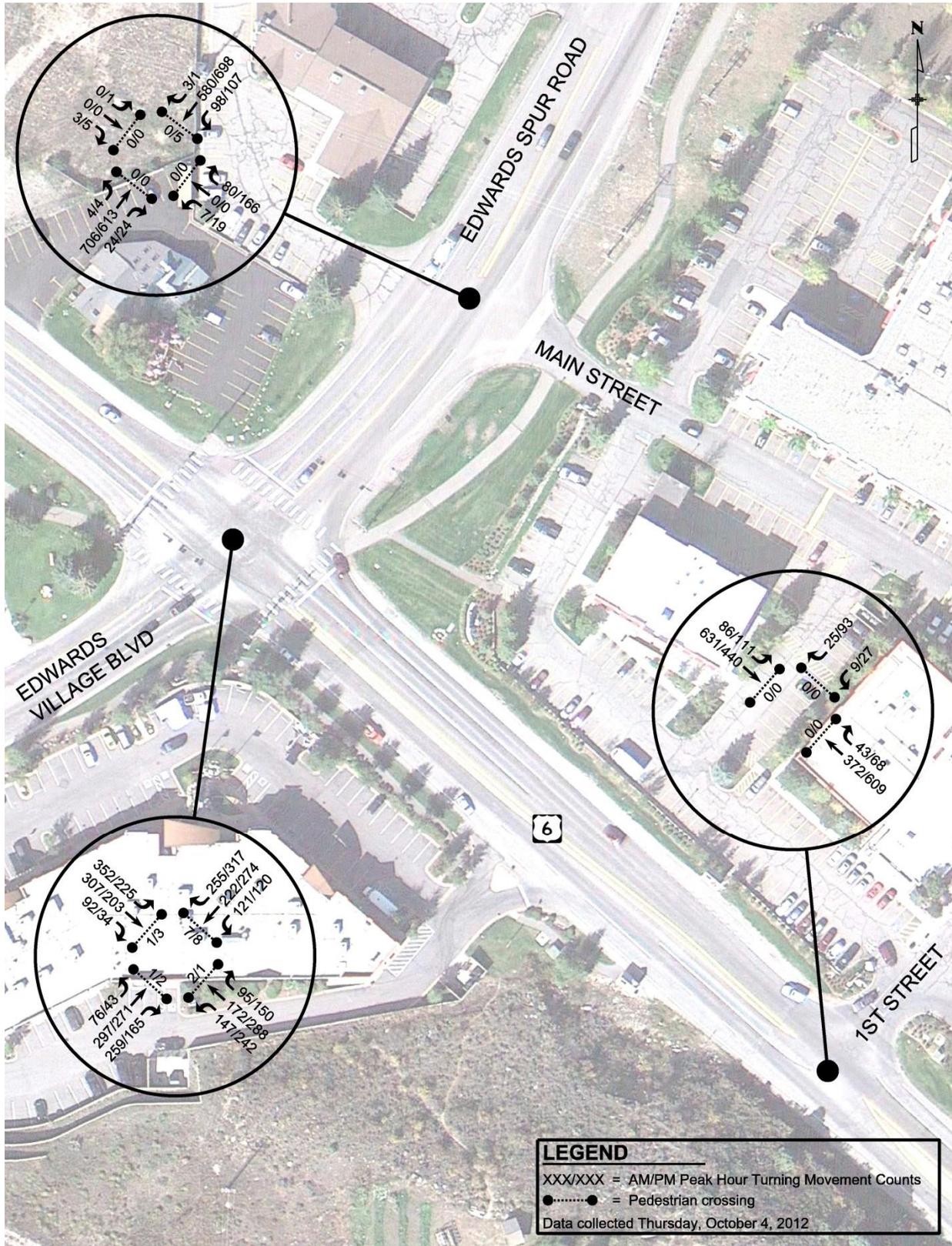
- US Hwy 6 / Edwards Spur Rd
- US Hwy 6 / 1<sup>st</sup> Street
- Edwards Spur Rd / Main Street

Figure 2 shows the existing traffic counts.

Based upon CDOT's traffic database, the percentage of heavy vehicles in the vicinity of the intersection is approximately 4.0%.

Existing traffic signal timings were obtained from CDOT for the intersection of US Hwy 6 and Edwards Spur Rd. The signal currently operates in a "free" actuated mode with US Hwy 6 phases on recall. Pedestrian phases are push button activated. The signal goes into flash between 11:00 p.m. and 6:00 a.m.

Figure 2: Existing Traffic Volumes



## TRAFFIC FORECASTS

Traffic forecasts were prepared for the horizon traffic year of 2032. These forecasts include:

1. A seasonal adjustment factor;
2. A minor amount of background traffic growth; and
3. Traffic from planned developments.

### Seasonal Adjustment Factor

In order to determine whether a seasonal adjustment factor was appropriate, historical count data for two of CDOT's Automated Traffic Recorders (ATRs) along I-70 in Eagle County were reviewed: one at West Vail; the other near Wolcott. The ATR data reflects a distinct seasonal trend whereby the summer months (June, July and August) are considerably higher than any other time of year. Since the counts for this study were collected in October, a seasonal adjustment factor was considered necessary to better represent a "design" traffic condition.

Historically, average monthly traffic volumes along I-70 are significantly higher in June, July and August than they are in October when the counts were collected. For example, as shown in Table 1 volumes in June are 14% to 19% higher (depending on location) than in October. Based upon engineering judgment, a 12% seasonal adjustment factor was considered reasonably justifiable and was applied in this study. Application of a 12% seasonal adjustment factor results in baseline volumes that are approximately at the 75<sup>th</sup> percentile for the year.

**Table 1: Variation\* in Monthly Traffic Volumes for I-70 ATRs**

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
W Vail	+1%	+3%	+12%	-5%	-7%	+14%	+28%	+24%	+11%	0%	-4%	+4%
Wolcott	-10%	-9%	+2%	-4%	+4%	+19%	+28%	+21%	+10%	0%	-8%	-11%

\*As compared to the month of October. A summary of the ATR data is provided in the Appendix.

### Background Traffic Growth

CDOT's 20-year traffic volume growth factor is 1.58 for US Hwy 6 and Edwards Spur Rd. The growth factor enables future traffic volumes to be quickly estimated by multiplying existing volumes by the factor. A 20-year factor of 1.58 is approximately equal to an annual growth rate of 2.3% per year. Since application of the factor results in total future volumes, it reflects background traffic growth, traffic from planned developments, etc.

Historical traffic volume data for US Hwy 6 and Edwards Spur Rd is sparse; however, based on the available data it appears that moderate traffic volume growth (1% to 2% annually) was experienced from Year 2000 to approximately 2007; followed by a period of decline through 2011/2012. Although it appears that traffic volumes may have started to rebound over the past year or so, traffic volumes in the study area are not dramatically different than they were 10 years ago making it difficult to justify CDOT's 20-year factor of 1.58. In light of the inherent uncertainty in predicting future travel behavior, it is equally difficult to justify a no-

growth position based upon a limited amount of historical data. For these reasons, an annual growth rate of 1% (e.g., a 20-year factor of 1.22) was assumed in this study.

No background traffic growth was assumed along Main Street or 1<sup>st</sup> Street since this traffic is a result of existing development.

#### Traffic from Planned Developments

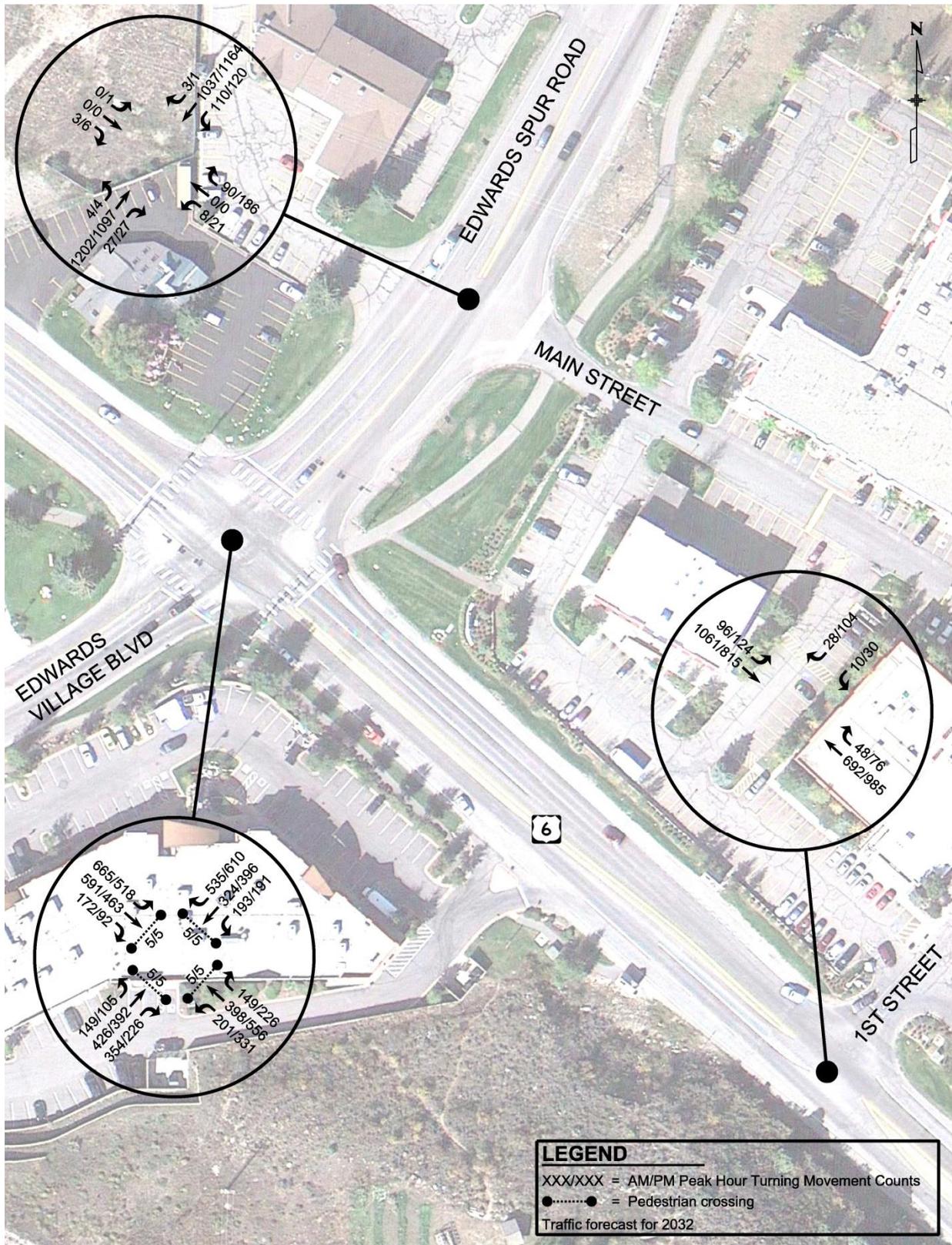
There are a number of developments planned for the Edwards area, including: the Wolcott PUD; West End PUD; and Eagle River Meadows. Traffic associated with planned developments was obtained from the traffic impact studies for inclusion in the future traffic forecasts.

Although a specific development proposal has not yet been made; Eagle County is also considering redevelopment of the existing rest area located along Edwards Spur Rd. Traffic growth associated with redevelopment of the rest area is assumed to be included in the 1% annual background traffic growth.

In order to derive the future traffic forecasts, existing traffic volumes were seasonally adjusted, subjected to annual growth, and combined with traffic from planned developments. Where access management measures (i.e., turn movement restrictions) have been proposed the forecasts were also manually adjusted to reflect anticipated changes in local traffic behavior.

Future traffic forecasts are illustrated in Figure 3.

Figure 3: Future Traffic Forecasts



## OPERATIONAL ANALYSES

Intersection capacity analyses were conducted in order to determine the quality of traffic operations for existing as well as future traffic conditions. The analyses were conducted in accordance with Highway Capacity Manual (HCM) procedures. The results of the analyses are reported in terms of Level-of-Service (LOS) which is a letter grade ranging from A to F. LOS A represents nearly ideal flow with very little delay. On the other end of the spectrum, LOS F represents very long delays and is generally an undesirable condition for most motorists. Generally, LOS D or better conditions are desirable (though not always attainable) when evaluating future traffic conditions.

**Table 2: Intersection LOS Results: Existing Year 2012 (Signal)**

Intersection	Control	AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay
Edwards Spur Rd / US Hwy 6	Signal	C	27.4	C	23.8
Edwards Spur Rd / Main St	Stop	C	19.1	C	20.7
US Hwy 6 / 1 <sup>st</sup> St	Stop	C	23.3	D	26.5

**Table 3: Intersection LOS Results: Future Year 2032 (Existing Geometry)**

Intersection	Control	AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay
Edwards Spur Rd / US Hwy 6	Signal	F	107.6	F	126.1
Edwards Spur Rd / Main St	Stop	F	132.4	F	>200
US Hwy 6 / 1 <sup>st</sup> St	Stop	E	44.9	F	93.2

Currently, all intersections operate acceptably (LOS D or better) during peak periods but vehicle queuing at the intersection of Edwards Spur Rd / US Hwy 6 occasionally blocks adjacent accesses. As shown in Table 3, the intersections will fail (LOS F) within the 20 year planning horizon unless improvements are made. In fact, the intersection of Edwards Spur Rd / US Hwy 6 fails within 10 years if only signal timing improvements are assumed. Unsignalized operations at Edwards Spur Rd / Main St and US Hwy 6 / 1<sup>st</sup> St will also be at LOS F, suggesting that access control measures may need to be implemented at these locations to restrict problem movements.

## CONCEPT DEVELOPMENT

Concepts were formulated using basemapping assembled from digital aerial photography and GIS parcel data provided by Eagle County. Concepts were developed in plan view only. Vertical alignments were not investigated in detail, and based on site conditions it is likely that retaining walls will be necessary in some instances. The objective of the concept development was to determine the approximate extent of the necessary improvements and how these improvements generally fit into the area context. Parcel boundaries are shown to provide an early indication of where improvements may require the acquisition of right-of-way.

All concepts have been designed to accommodate the AASHTO WB-67 design vehicle. Accommodation means the design vehicle can traverse the intersection; however, it may encroach upon adjacent lanes and/or the truck apron (in the case of a roundabout).

Signalized Intersection Concept

Based upon the analyses, the minimum improvements necessary to the Edwards Spur Rd / US Hwy 6 intersection to mitigate failure long-term include:

- Eastbound double lefts\*
- Eastbound through and through/right\*
- Westbound through and through/right\*
- Northbound through and through/right\*
- Southbound right turn overlap phase
- Main converted to RIRO west and ¾ east side (access management)

\*Note: Previous planning efforts identified the above improvements, plus eastbound and westbound right turn lanes, and double left turns in the southbound and westbound directions.

**Table 4: Intersection LOS Results: Future Year 2032 (Improved Signal)**

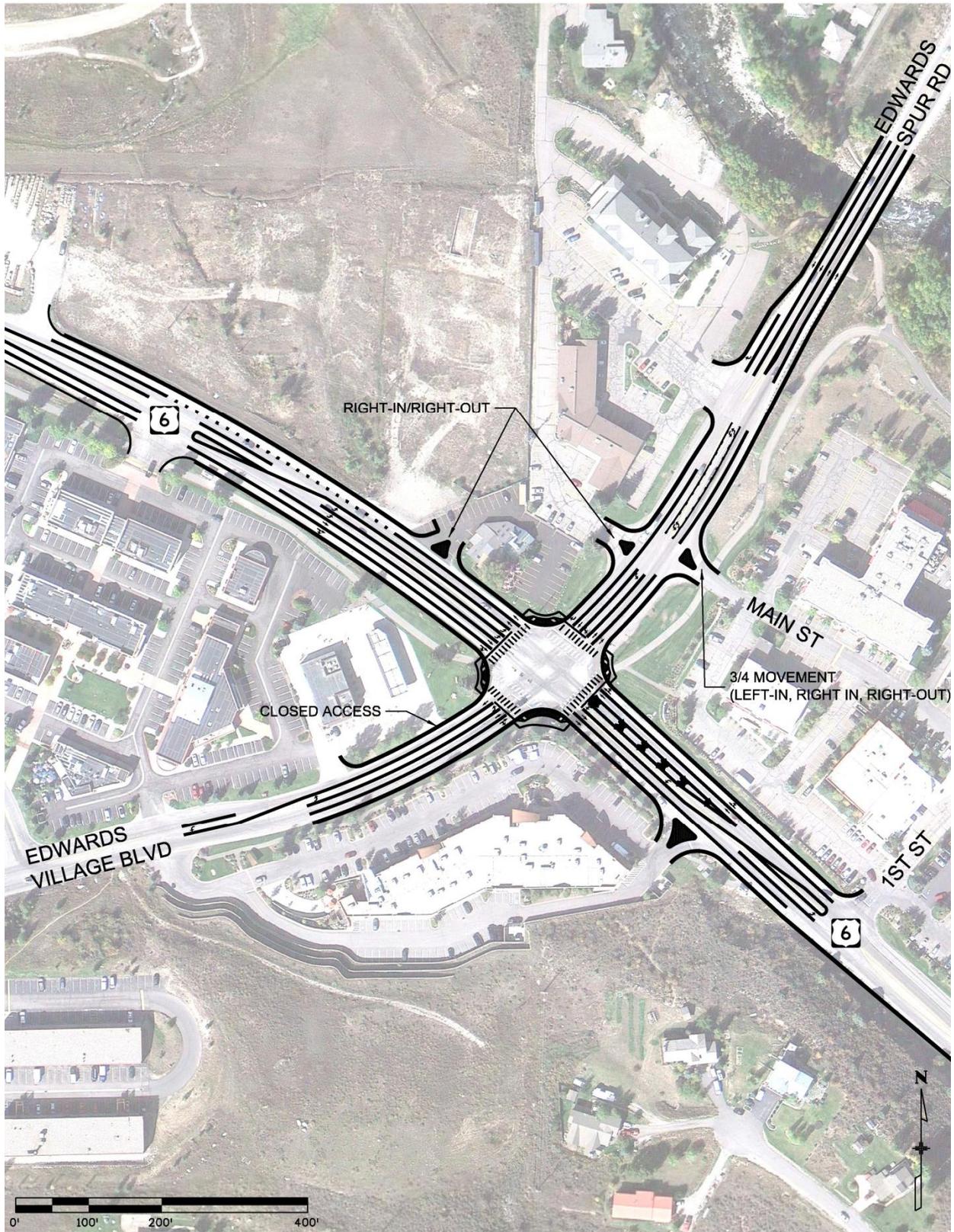
Intersection	Control	AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay
Edwards Spur Rd / US Hwy 6	Signal	D	45.8	D	45.6
Edwards Spur Rd / Main St*	Stop	C	17.1	C	19.4
US Hwy 6 / 1 <sup>st</sup> St**	Stop	E	44.9	F	93.2

\*Converted to RIRO west side and ¾ movement east side

\*\*Despite poor LOS, movements are under capacity and queues are minimal. A wider median could be implemented along US Hwy 6 to enable a two-stage left turn movement from 1<sup>st</sup> Street. LOS D (PM) and LOS C (AM) would result.

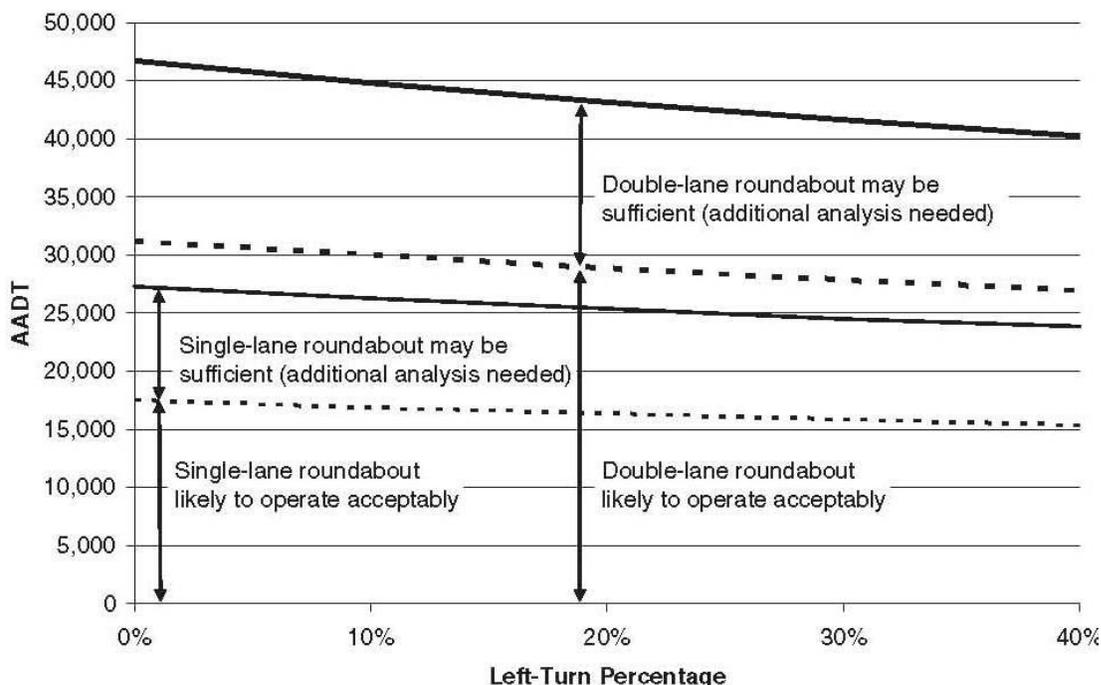
Based upon State Highway Access Code criteria for auxiliary lanes, the intersection geometry identified above would require that the bridge over the Eagle River be widened to accomplish all of the necessary transitions, deceleration, and storage. The signalized intersection concept is illustrated in Figure 4.

Figure 4: Signalized Intersection Concept



Roundabout Intersection Concept

The following chart is from **NCHRP Report 672 Roundabouts: An Informational Guide** and shows the relationship between Average Annual Daily Traffic (AADT), percentage of left turns, and the number of roundabout lanes.



For planning purposes, the intersection of Edwards Spur Rd / US Hwy 6 currently has an ADT of approximately 26,300 vehicles per day (vpd) with 25 to 30% left turns. Entering these values into the chart reveals that existing volumes most likely necessitate a two-lane roundabout. With a future ADT of over 40,000 vpd volumes are pushing the envelope for a 2 lane roundabout.

Similarly, the sum of entering and conflicting traffic volumes can be used to predict the number of lanes required on each entry to the roundabout. As shown in Table 5, this sum ranges from 1,783 to 2,372 vehicles per hour depending on approach and time of day. An entering and conflicting traffic volume exceeding 1,800 vehicles per hour may require more than two entering lanes.

**Table 5: Sum of Entering and Conflicting Volumes (2032)**

Approach	AM			PM		
	Entering	Conflicting	Total	Entering	Conflicting	Total
Southbound	1,052	731	1,783	1,197	990	2,187
Eastbound	1,428	717	2,145	1,073	916	1,989
Northbound	929	1,443	2,372	723	1,170	1,893
Westbound	748	1,172	1,920	1,113	1,013	2,126

Roundabout analyses were conducted using RODEL. RODEL has an empirical model based upon roundabout experience in the United Kingdom (UK) as well as a method based on the Highway Capacity Manual (2010). The results are presented below for a 2 lane roundabout under 2032 conditions.

**Table 6: Intersection LOS Results: Future Year 2032 (2 Lane Roundabout)**

Intersection	RODEL Model	AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay
Edwards Spur Rd / US Hwy 6	Empirical	F	110.1	D	28.0
	HCM	F	245.3	F	209.6

As reflected in Table 6, the results differ depending upon the model used. However, both models predict that a two lane roundabout fails to accommodate Year 2032 traffic volumes.

The empirical model applied a 90% confidence interval which reduces the effective capacity by approximately 15 to 20% compared to the UK experience. The empirical model takes into consideration detailed roundabout design features such as diameter, entry and exit widths, circulating roadway width, etc. and therefore better represents the relationship between design and operations than does the HCM model. In any event, the empirical model predicts that a 2 lane roundabout will fail by approximately 2027. As shown in Table 7: A hybrid 3 lane roundabout (3 entering lanes eastbound and a southbound right turn bypass lane) would provide acceptable operations through 2032.

**Table 7: Intersection LOS Results: Future Year 2032 (Hybrid 3 Lane Roundabout)**

Intersection	RODEL Model	AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay
Edwards Spur Rd / US Hwy 6	Empirical	D	26.0	C	19.8

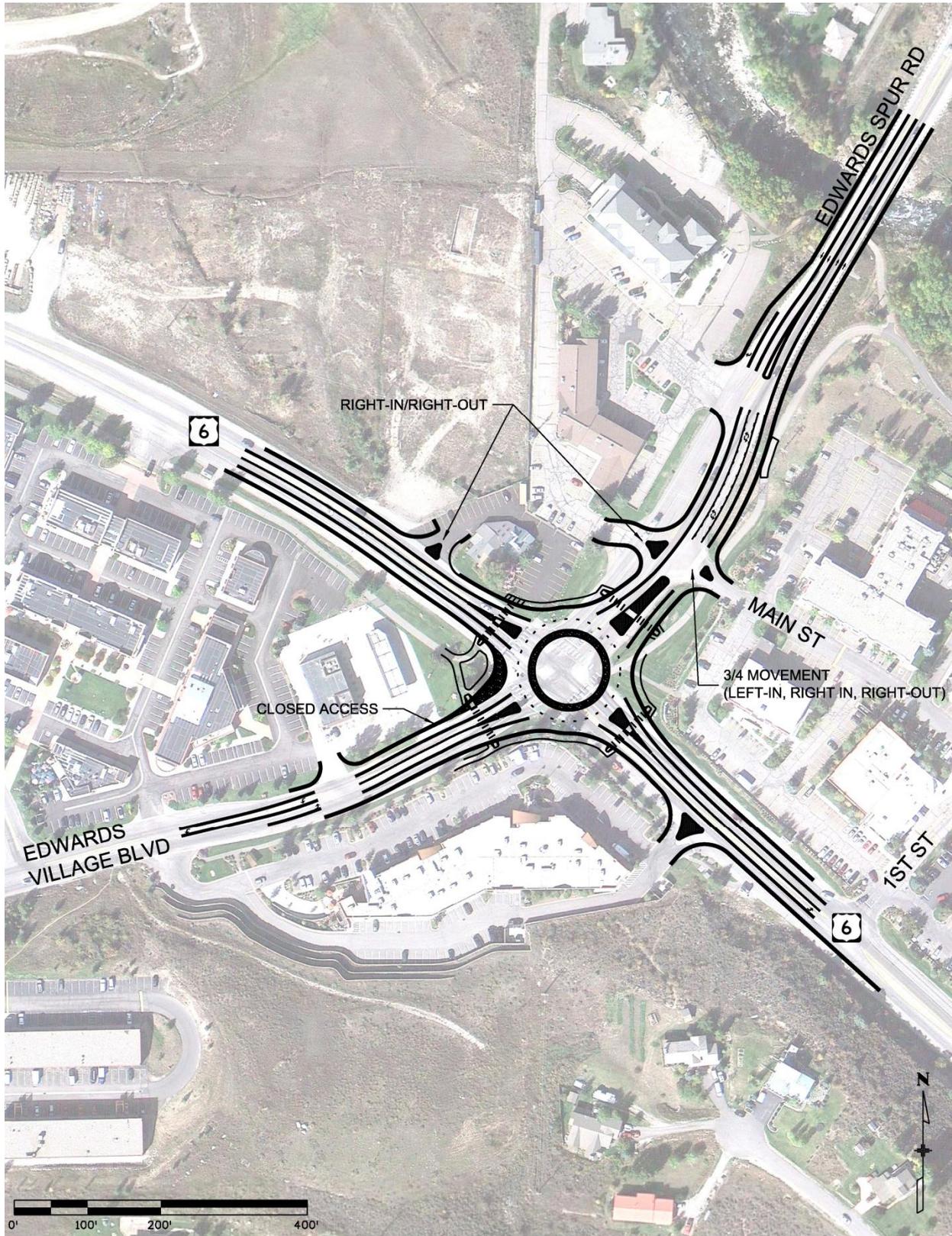
#### Roundabout Geometry

The original concept was based on a two-lane roundabout having a 180-ft inscribed diameter. Although this concept met or exceeded all design criteria, additional refinements were made to minimize the size of the roundabout in order to reduce impacts to adjacent properties while providing additional opportunities for pedestrian circulation.

Ultimately, a two-lane roundabout concept having an inscribed diameter of approximately 170-ft was developed. Although the existing roundabouts to the north have diameters between 150-ft and 165-ft; they also experience much lower volumes.

The final roundabout concept is illustrated in Figure 5.

Figure 5: Roundabout Intersection Concept



### Opinion of Probable Construction Cost

An engineer's opinion of probable construction cost was prepared for the roundabout concept. Opinions of probable cost developed based on a concept design are not intended to be a guaranteed maximum price but are intended to be suitable for initial budgeting purposes.

CDOT historical data was used to determine unit costs. Contingencies were applied for those aspects of the project's construction that are not known at this time. An overall contingency of 25 percent was also applied. The opinion of probable construction cost for a two lane roundabout concept is \$3,609,000 (excluding ROW). A detailed opinion of probable cost is provided in the Appendix.

### **SUMMARY**

The primary focus of the study was to illustrate future traffic volume and operational conditions to assist the ECA and Eagle County in planning for future improvements to the Edwards Spur Road (i.e., Phase 2). The study has concluded that the existing intersection of Edwards Spur Rd / US Hwy 6 will fail within 10 years unless the capacity of the intersection is improved. Two promising intersection improvement concepts were developed through the study process: an improved signalized intersection and a roundabout. Based upon the growth and development assumptions outlined in the study, a two-lane roundabout would provide acceptable service through approximately 2027. A hybrid three-lane roundabout would provide acceptable service through 2032.

## **APPENDIX**

Turning Movement Counts

Automatic Traffic Recorder (ATR) Data

Existing Traffic Signal Timings

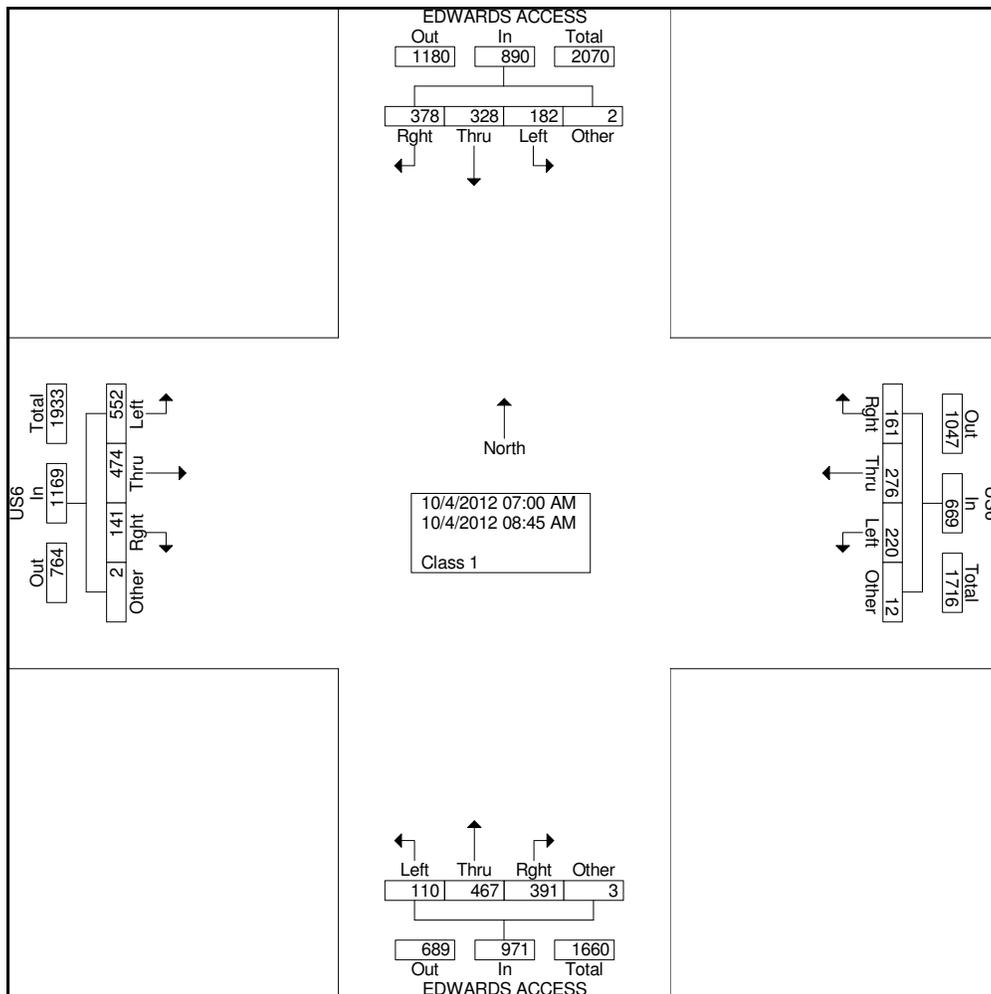
Opinions of Probable Cost

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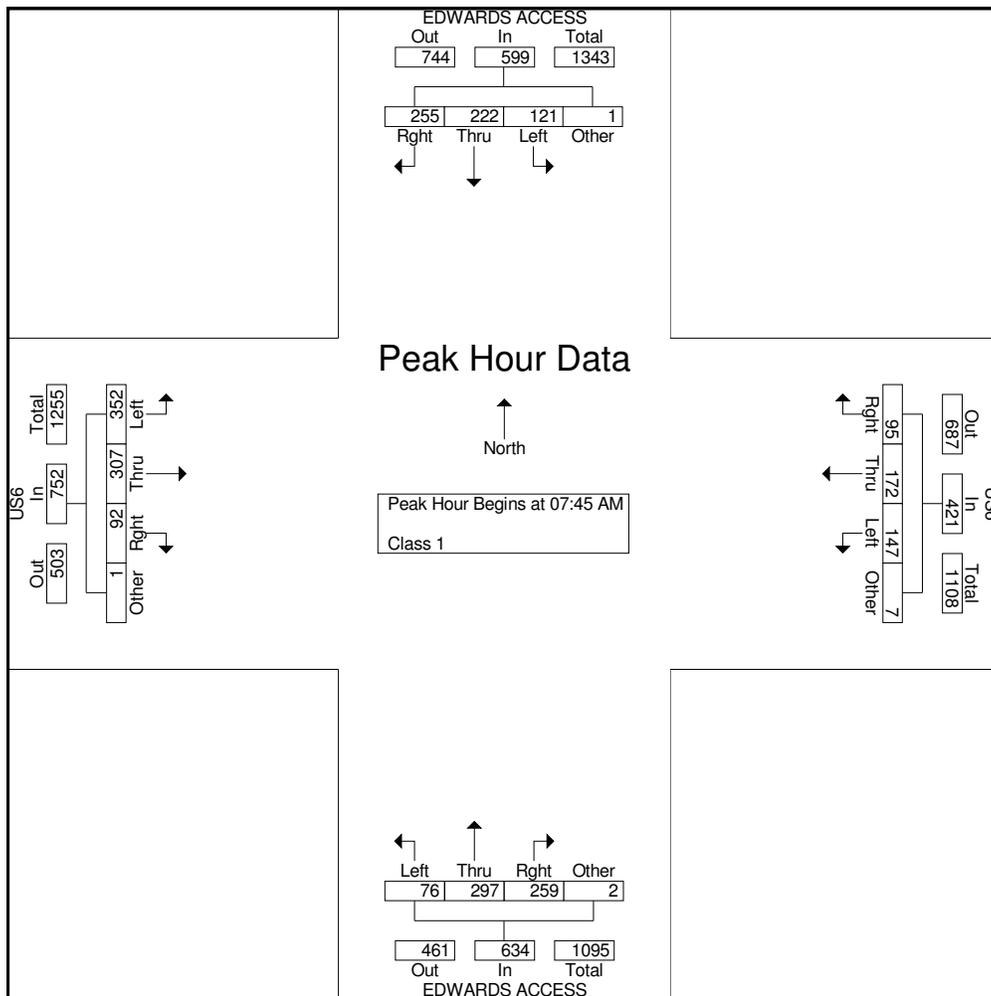
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Start Date : 10/4/2012  
Page No : 1

Groups Printed- Class 1

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	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Rght	Thru	Left	Other	
07:00 AM	14	15	4	0	14	24	8	0	23	25	8	0	10	19	41	0	205
07:15 AM	25	18	11	0	13	25	12	0	20	28	4	0	11	41	45	0	253
07:30 AM	42	29	15	0	18	33	20	4	40	59	18	0	16	65	72	1	432
07:45 AM	69	60	26	1	28	51	52	0	83	90	40	0	23	103	120	0	746
Total	150	122	56	1	73	133	92	4	166	202	70	0	60	228	278	1	1636
08:00 AM	88	67	35	0	27	55	27	2	81	93	18	2	26	90	102	0	713
08:15 AM	50	43	33	0	23	39	35	2	47	59	11	0	20	63	81	0	506
08:30 AM	48	52	27	0	17	27	33	3	48	55	7	0	23	51	49	1	441
08:45 AM	42	44	31	1	21	22	33	1	49	58	4	1	12	42	42	0	403
Total	228	206	126	1	88	143	128	8	225	265	40	3	81	246	274	1	2063
Grand Total	378	328	182	2	161	276	220	12	391	467	110	3	141	474	552	2	3699
Apprch %	42.5	36.9	20.4	0.2	24.1	41.3	32.9	1.8	40.3	48.1	11.3	0.3	12.1	40.5	47.2	0.2	
Total %	10.2	8.9	4.9	0.1	4.4	7.5	5.9	0.3	10.6	12.6	3	0.1	3.8	12.8	14.9	0.1	



Start Time	EDWARDS ACCESS Southbound					US6 Westbound					EDWARDS ACCESS Northbound					US6 Eastbound					Int. Total
	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	69	60	26	1	156	28	51	52	0	131	83	90	40	0	213	23	103	120	0	246	746
08:00 AM	88	67	35	0	190	27	55	27	2	111	81	93	18	2	194	26	90	102	0	218	713
08:15 AM	50	43	33	0	126	23	39	35	2	99	47	59	11	0	117	20	63	81	0	164	506
08:30 AM	48	52	27	0	127	17	27	33	3	80	48	55	7	0	110	23	51	49	1	124	441
Total Volume	255	222	121	1	599	95	172	147	7	421	259	297	76	2	634	92	307	352	1	752	2406
% App. Total	42.6	37.1	20.2	0.2		22.6	40.9	34.9	1.7		40.9	46.8	12	0.3		12.2	40.8	46.8	0.1		
PHF	.724	.828	.864	.250	.788	.848	.782	.707	.583	.803	.780	.798	.475	.250	.744	.885	.745	.733	.250	.764	.806

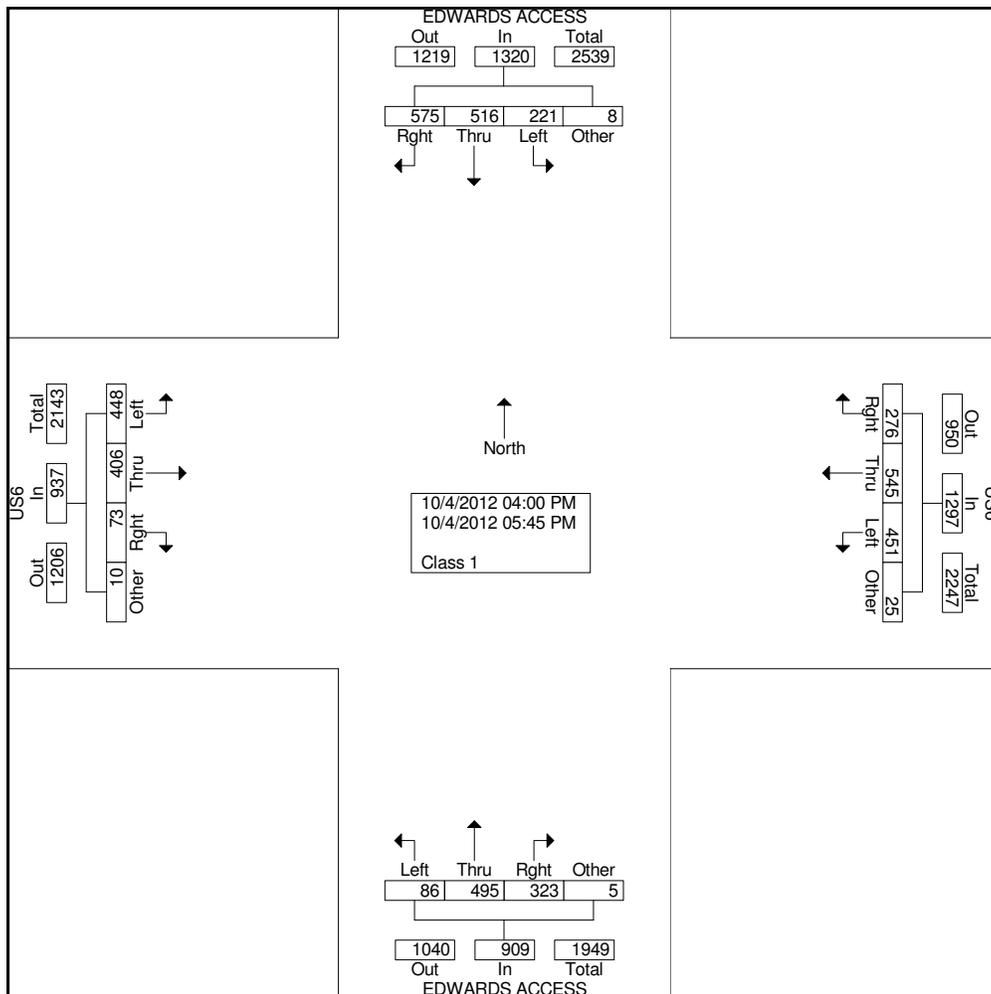


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Groups Printed- Class 1

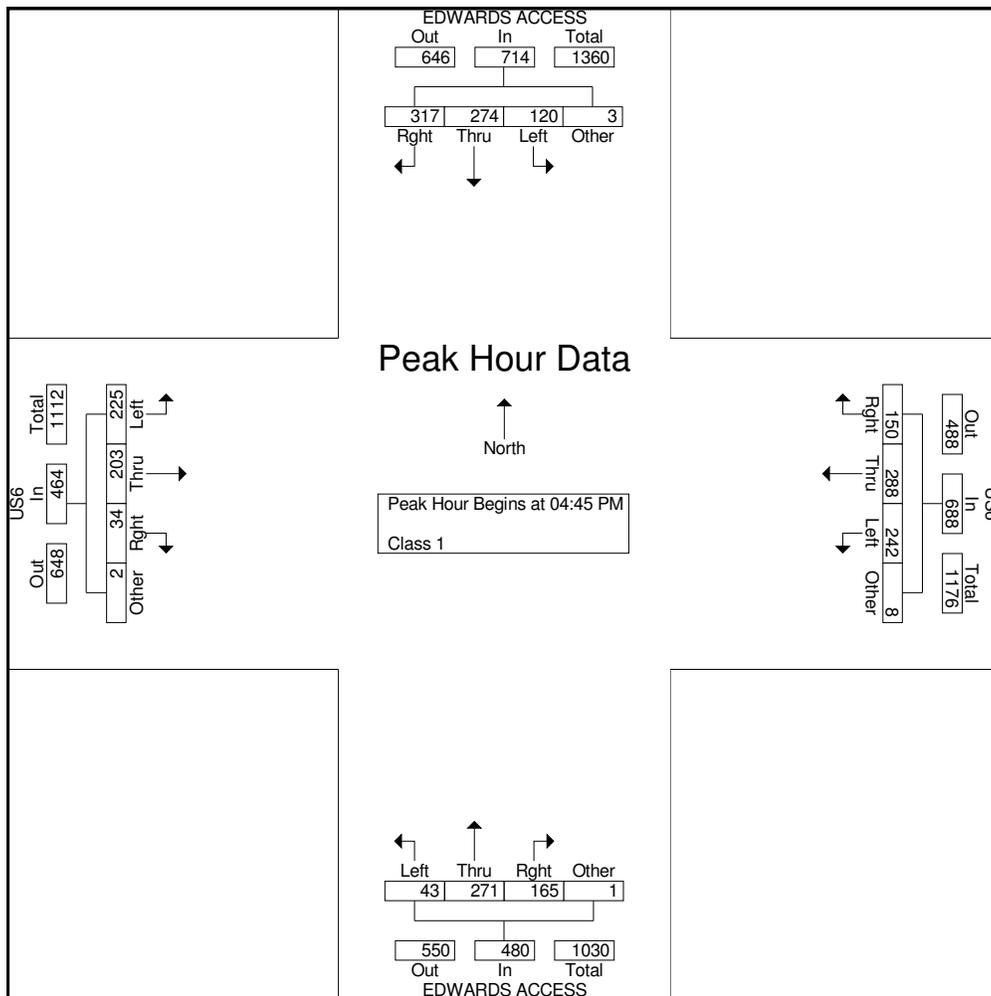
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	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Rght	Thru	Left	Other	
04:00 PM	50	56	27	1	24	58	58	2	42	60	8	3	15	39	51	3	497
04:15 PM	71	51	32	0	37	62	49	8	38	47	13	1	9	44	48	0	510
04:30 PM	72	61	20	4	34	76	50	7	27	54	16	0	8	63	58	4	554
04:45 PM	80	63	22	3	35	85	57	8	55	52	7	1	10	55	51	1	585
Total	273	231	101	8	130	281	214	25	162	213	44	5	42	201	208	8	2146
05:00 PM	76	73	35	0	38	59	49	0	40	89	16	0	6	51	61	0	593
05:15 PM	88	65	25	0	37	72	65	0	39	72	11	0	10	49	57	0	590
05:30 PM	73	73	38	0	40	72	71	0	31	58	9	0	8	48	56	1	578
05:45 PM	65	74	22	0	31	61	52	0	51	63	6	0	7	57	66	1	556
Total	302	285	120	0	146	264	237	0	161	282	42	0	31	205	240	2	2317
Grand Total	575	516	221	8	276	545	451	25	323	495	86	5	73	406	448	10	4463
Apprch %	43.6	39.1	16.7	0.6	21.3	42	34.8	1.9	35.5	54.5	9.5	0.6	7.8	43.3	47.8	1.1	
Total %	12.9	11.6	5	0.2	6.2	12.2	10.1	0.6	7.2	11.1	1.9	0.1	1.6	9.1	10	0.2	



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 Page No : 2

Start Time	EDWARDS ACCESS Southbound					US6 Westbound					EDWARDS ACCESS Northbound					US6 Eastbound					Int. Total
	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	80	63	22	3	168	35	85	57	8	185	55	52	7	1	115	10	55	51	1	117	585
05:00 PM	76	73	35	0	184	38	59	49	0	146	40	89	16	0	145	6	51	61	0	118	593
05:15 PM	88	65	25	0	178	37	72	65	0	174	39	72	11	0	122	10	49	57	0	116	590
05:30 PM	73	73	38	0	184	40	72	71	0	183	31	58	9	0	98	8	48	56	1	113	578
Total Volume	317	274	120	3	714	150	288	242	8	688	165	271	43	1	480	34	203	225	2	464	2346
% App. Total	44.4	38.4	16.8	0.4		21.8	41.9	35.2	1.2		34.4	56.5	9	0.2		7.3	43.8	48.5	0.4		
PHF	.901	.938	.789	.250	.970	.938	.847	.852	.250	.930	.750	.761	.672	.250	.828	.850	.923	.922	.500	.983	.989

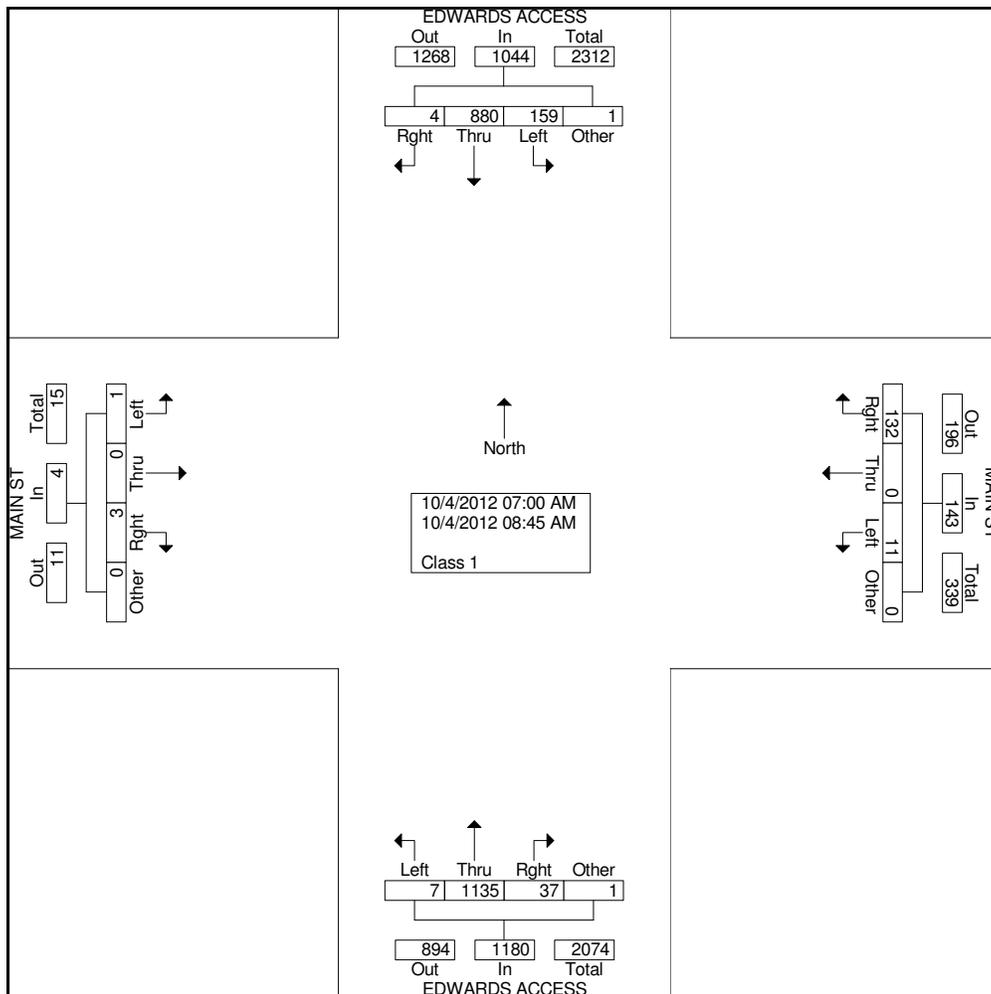


All Traffic Data Services  
 Wheat Ridge, CO 80033  
 303-668-0220

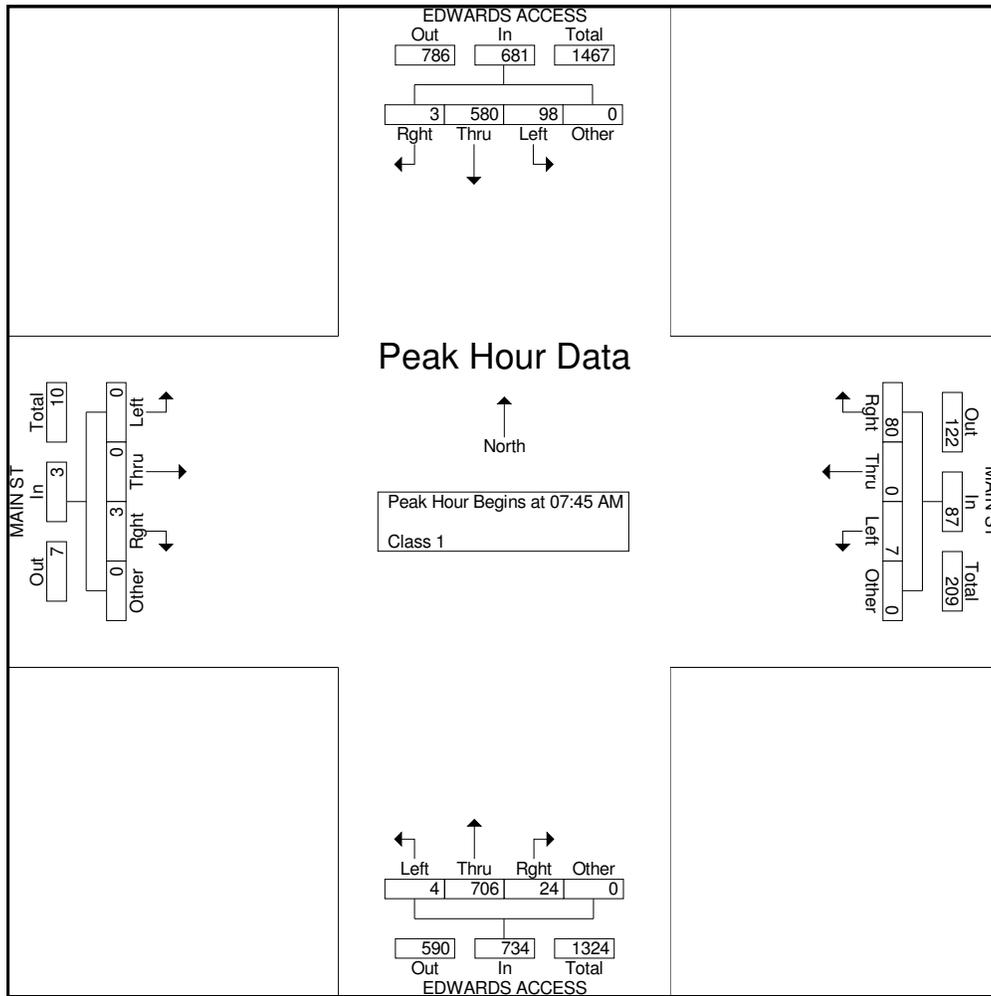
File Name : #2 EDWARDS&MAINAM  
 Site Code : 00000000  
 Start Date : 10/4/2012  
 Page No : 1

Groups Printed- Class 1

Start Time	EDWARDS ACCESS Southbound				MAIN ST Westbound				EDWARDS ACCESS Northbound				MAIN ST Eastbound				Int. Total	
	Right	Thru	Left	Other	Right	Thru	Left	Other	Right	Thru	Left	Other	Right	Thru	Left	Other		
07:00 AM	0	39	5	0	8	0	1	0	1	75	2	0	0	0	0	0	0	131
07:15 AM	0	57	7	0	15	0	0	0	3	88	1	0	0	0	0	1	0	172
07:30 AM	0	88	15	0	13	0	1	0	4	152	0	0	0	0	0	0	0	273
07:45 AM	0	166	22	0	16	0	1	0	7	228	2	0	0	0	0	0	0	442
Total	0	350	49	0	52	0	3	0	15	543	5	0	0	0	1	0	0	1018
08:00 AM	0	168	26	0	28	0	2	0	5	217	2	0	2	0	0	0	0	450
08:15 AM	2	132	26	0	18	0	1	0	9	143	0	0	0	0	0	0	0	331
08:30 AM	1	114	24	0	18	0	3	0	3	118	0	0	1	0	0	0	0	282
08:45 AM	1	116	34	1	16	0	2	0	5	114	0	1	0	0	0	0	0	290
Total	4	530	110	1	80	0	8	0	22	592	2	1	3	0	0	0	0	1353
Grand Total	4	880	159	1	132	0	11	0	37	1135	7	1	3	0	1	0	0	2371
Apprch %	0.4	84.3	15.2	0.1	92.3	0	7.7	0	3.1	96.2	0.6	0.1	75	0	25	0	0	
Total %	0.2	37.1	6.7	0	5.6	0	0.5	0	1.6	47.9	0.3	0	0.1	0	0	0	0	

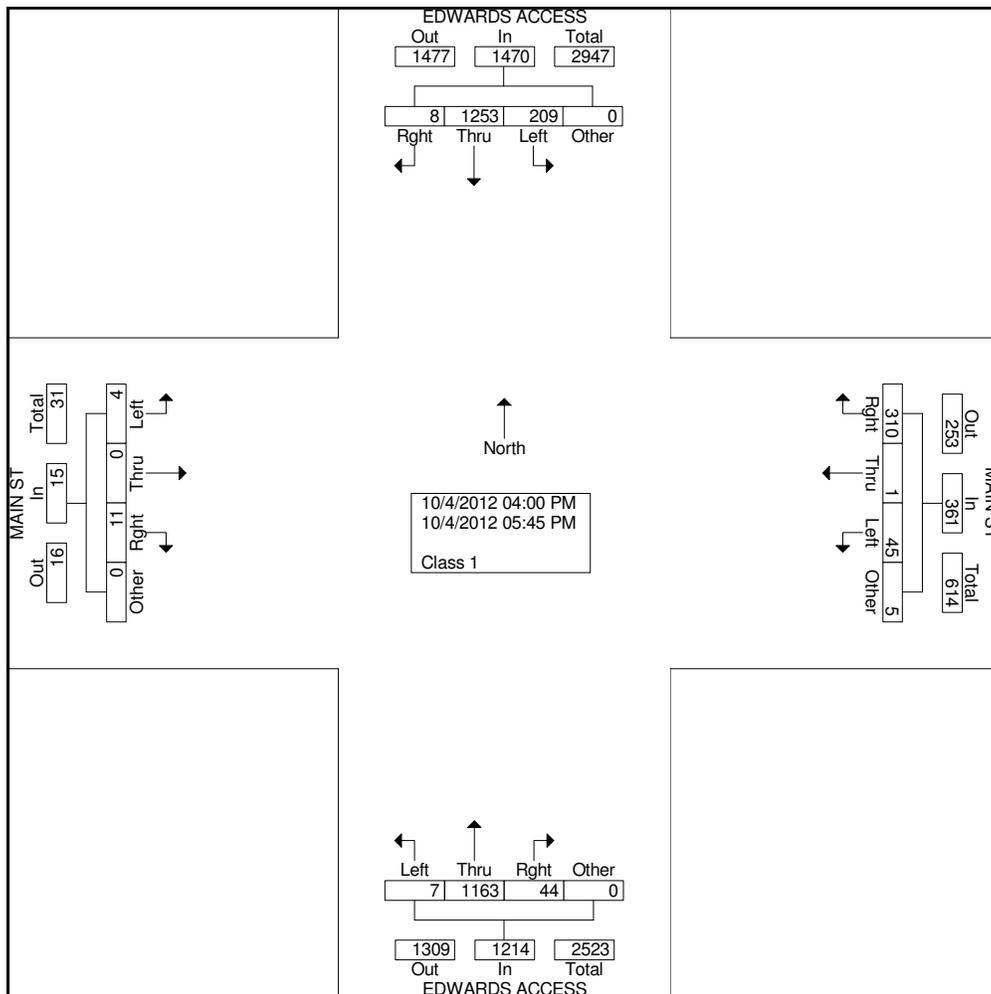


Start Time	EDWARDS ACCESS Southbound					MAIN ST Westbound					EDWARDS ACCESS Northbound					MAIN ST Eastbound					Int. Total
	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	166	22	0	188	16	0	1	0	17	7	228	2	0	237	0	0	0	0	0	442
08:00 AM	0	168	26	0	194	28	0	2	0	30	5	217	2	0	224	2	0	0	0	2	450
08:15 AM	2	132	26	0	160	18	0	1	0	19	9	143	0	0	152	0	0	0	0	0	331
08:30 AM	1	114	24	0	139	18	0	3	0	21	3	118	0	0	121	1	0	0	0	1	282
Total Volume	3	580	98	0	681	80	0	7	0	87	24	706	4	0	734	3	0	0	0	3	1505
% App. Total	0.4	85.2	14.4	0		92	0	8	0		3.3	96.2	0.5	0		100	0	0	0		
PHF	.375	.863	.942	.000	.878	.714	.000	.583	.000	.725	.667	.774	.500	.000	.774	.375	.000	.000	.000	.375	.836



Groups Printed- Class 1

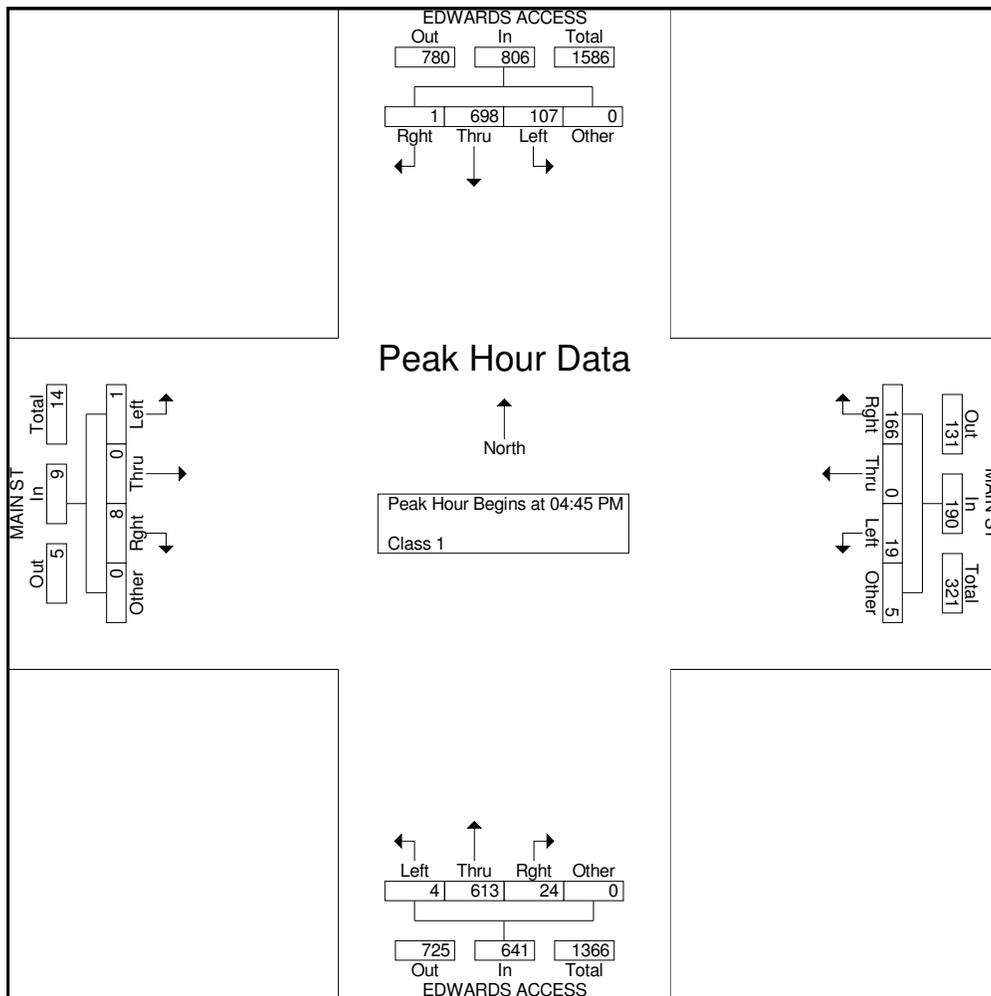
Start Time	EDWARDS ACCESS Southbound				MAIN ST Westbound				EDWARDS ACCESS Northbound				MAIN ST Eastbound				Int. Total
	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Rght	Thru	Left	Other	
04:00 PM	1	128	23	0	27	0	2	0	7	121	1	0	1	0	0	0	311
04:15 PM	1	143	28	0	39	1	12	0	4	126	1	0	1	0	2	0	358
04:30 PM	3	146	28	0	37	0	7	0	3	144	0	0	0	0	0	0	368
04:45 PM	0	165	21	0	42	0	6	5	11	131	0	0	0	0	0	0	381
Total	5	582	100	0	145	1	27	5	25	522	2	0	2	0	2	0	1418
05:00 PM	0	176	26	0	41	0	4	0	7	169	0	0	1	0	0	0	424
05:15 PM	0	177	32	0	42	0	5	0	3	171	0	0	2	0	0	0	432
05:30 PM	1	180	28	0	41	0	4	0	3	142	4	0	5	0	1	0	409
05:45 PM	2	138	23	0	41	0	5	0	6	159	1	0	1	0	1	0	377
Total	3	671	109	0	165	0	18	0	19	641	5	0	9	0	2	0	1642
Grand Total	8	1253	209	0	310	1	45	5	44	1163	7	0	11	0	4	0	3060
Apprch %	0.5	85.2	14.2	0	85.9	0.3	12.5	1.4	3.6	95.8	0.6	0	73.3	0	26.7	0	
Total %	0.3	40.9	6.8	0	10.1	0	1.5	0.2	1.4	38	0.2	0	0.4	0	0.1	0	



All Traffic Data Services  
Wheat Ridge, CO 80033  
**303-668-0220**

File Name : #2 EDWARDS&MAINPM  
Site Code : 00000000  
Start Date : 10/4/2012  
Page No : 2

Start Time	EDWARDS ACCESS Southbound					MAIN ST Westbound					EDWARDS ACCESS Northbound					MAIN ST Eastbound					Int. Total
	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	165	21	0	186	42	0	6	5	53	11	131	0	0	142	0	0	0	0	0	381
05:00 PM	0	176	26	0	202	41	0	4	0	45	7	169	0	0	176	1	0	0	0	1	424
05:15 PM	0	177	32	0	209	42	0	5	0	47	3	171	0	0	174	2	0	0	0	2	432
05:30 PM	1	180	28	0	209	41	0	4	0	45	3	142	4	0	149	5	0	1	0	6	409
Total Volume	1	698	107	0	806	166	0	19	5	190	24	613	4	0	641	8	0	1	0	9	1646
% App. Total	0.1	86.6	13.3	0		87.4	0	10	2.6		3.7	95.6	0.6	0		88.9	0	11.1	0		
PHF	.250	.969	.836	.000	.964	.988	.000	.792	.250	.896	.545	.896	.250	.000	.911	.400	.000	.250	.000	.375	.953

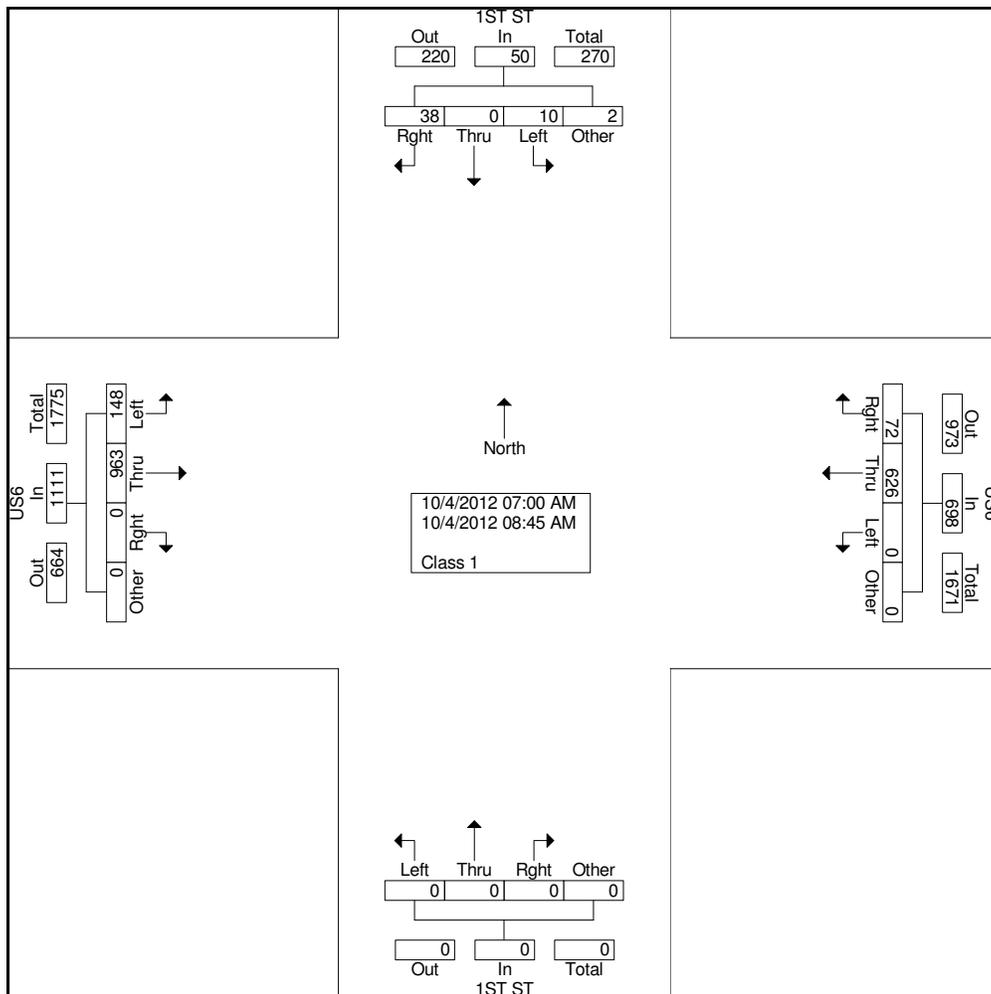


All Traffic Data Services  
Wheat Ridge, CO 80033  
303-668-0220

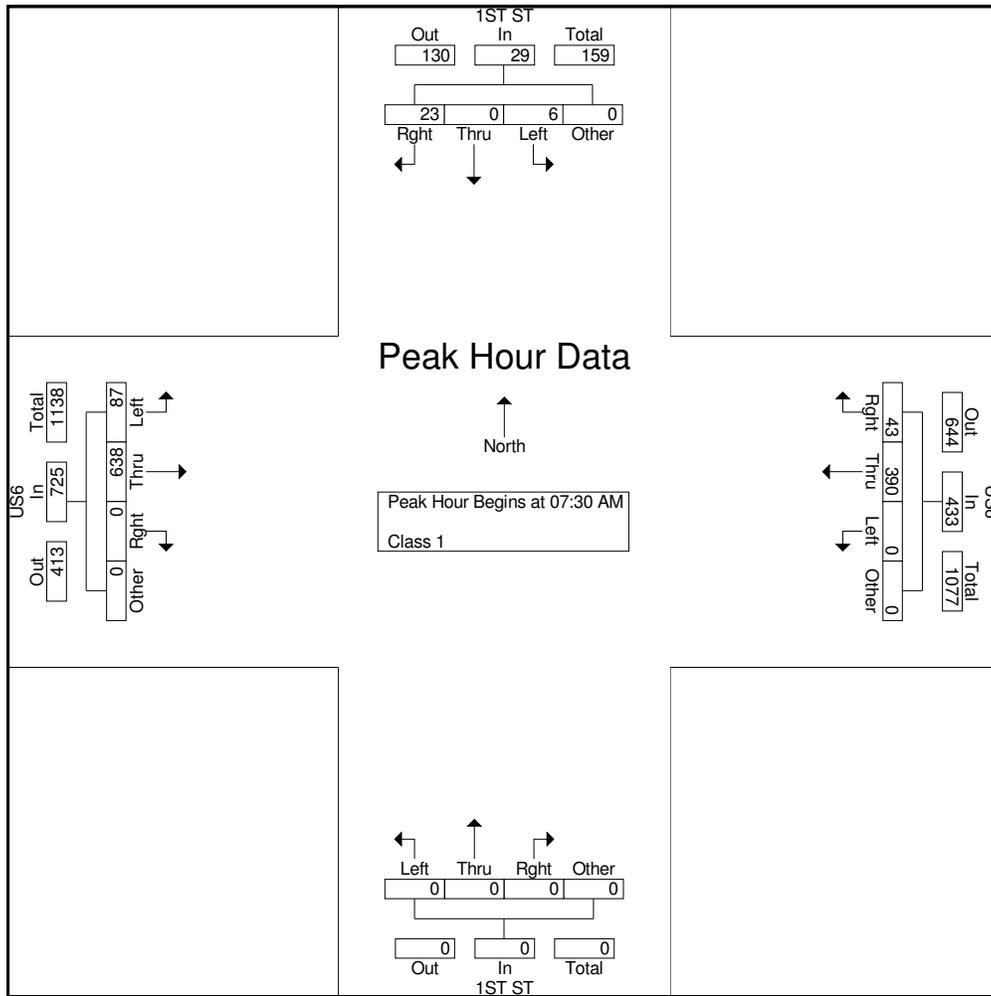
File Name : #3 1STST&US6AM  
Site Code : 00000000  
Start Date : 10/4/2012  
Page No : 1

Groups Printed- Class 1

Start Time	1ST ST Southbound				US6 Westbound				1ST ST Northbound				US6 Eastbound				Int. Total
	Right	Thru	Left	Other	Right	Thru	Left	Other	Right	Thru	Left	Other	Right	Thru	Left	Other	
07:00 AM	1	0	0	0	4	44	0	0	0	0	0	0	0	38	12	0	99
07:15 AM	2	0	0	0	6	51	0	0	0	0	0	0	0	67	11	0	137
07:30 AM	5	0	0	0	6	84	0	0	0	0	0	0	0	116	17	0	228
07:45 AM	5	0	2	0	12	117	0	0	0	0	0	0	0	208	17	0	361
Total	13	0	2	0	28	296	0	0	0	0	0	0	0	429	57	0	825
08:00 AM	6	0	1	0	13	116	0	0	0	0	0	0	0	178	28	0	342
08:15 AM	7	0	3	0	12	73	0	0	0	0	0	0	0	136	25	0	256
08:30 AM	7	0	3	0	6	66	0	0	0	0	0	0	0	109	16	0	207
08:45 AM	5	0	1	2	13	75	0	0	0	0	0	0	0	111	22	0	229
Total	25	0	8	2	44	330	0	0	0	0	0	0	0	534	91	0	1034
Grand Total	38	0	10	2	72	626	0	0	0	0	0	0	0	963	148	0	1859
Apprch %	76	0	20	4	10.3	89.7	0	0	0	0	0	0	0	86.7	13.3	0	
Total %	2	0	0.5	0.1	3.9	33.7	0	0	0	0	0	0	0	51.8	8	0	



Start Time	1ST ST Southbound					US6 Westbound					1ST ST Northbound					US6 Eastbound					Int. Total
	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	5	0	0	0	5	6	84	0	0	90	0	0	0	0	0	0	116	17	0	133	228
07:45 AM	5	0	2	0	7	12	117	0	0	129	0	0	0	0	0	0	208	17	0	225	361
08:00 AM	6	0	1	0	7	13	116	0	0	129	0	0	0	0	0	0	178	28	0	206	342
08:15 AM	7	0	3	0	10	12	73	0	0	85	0	0	0	0	0	0	136	25	0	161	256
Total Volume	23	0	6	0	29	43	390	0	0	433	0	0	0	0	0	0	638	87	0	725	1187
% App. Total	79.3	0	20.7	0		9.9	90.1	0	0		0	0	0	0		0	88	12	0		
PHF	.821	.000	.500	.000	.725	.827	.833	.000	.000	.839	.000	.000	.000	.000	.000	.000	.767	.777	.000	.806	.822

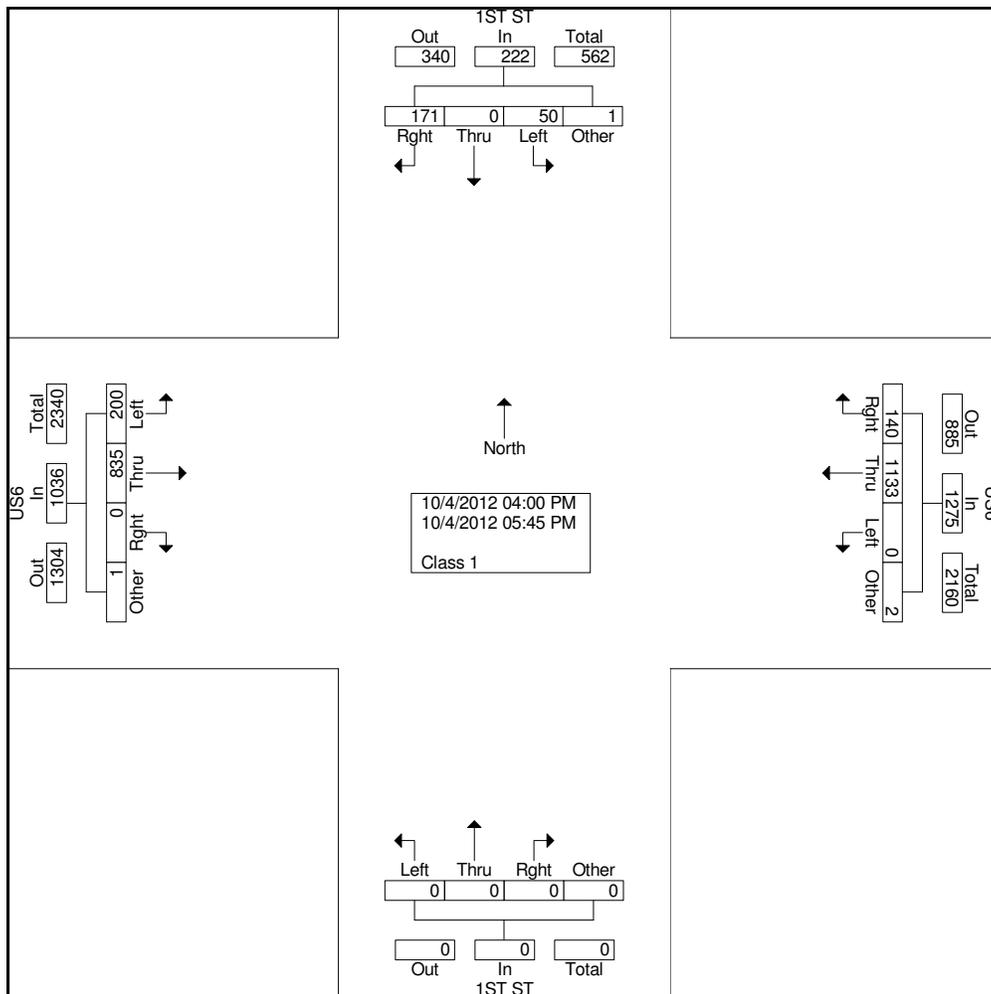


All Traffic Data Services  
Wheat Ridge, CO 80033  
303-668-0220

File Name : #3 1STST&US6PM  
Site Code : 00000000  
Start Date : 10/4/2012  
Page No : 1

Groups Printed- Class 1

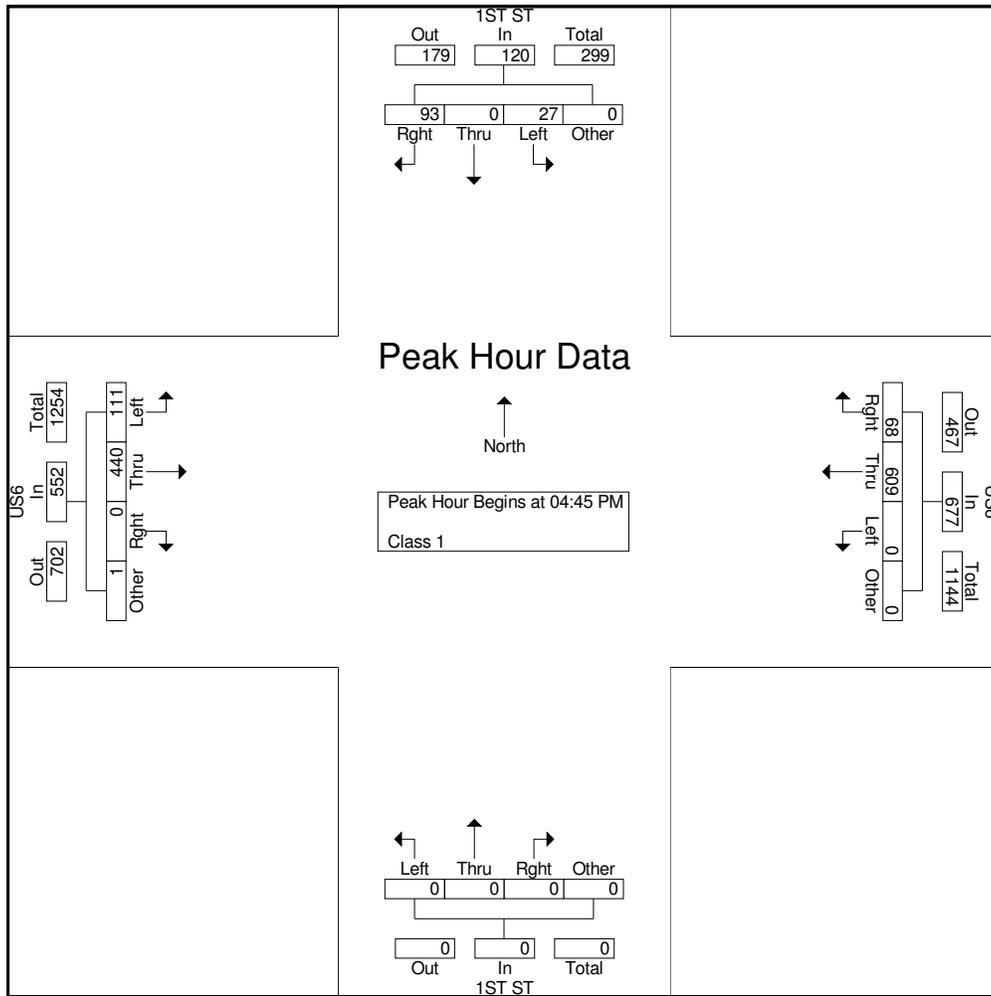
Start Time	1ST ST Southbound				US6 Westbound				1ST ST Northbound				US6 Eastbound				Int. Total
	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Rght	Thru	Left	Other	
04:00 PM	18	0	5	0	15	119	0	2	0	0	0	0	0	96	22	0	277
04:15 PM	22	0	7	0	18	140	0	0	0	0	0	0	0	98	24	0	309
04:30 PM	21	0	3	1	25	138	0	0	0	0	0	0	0	99	19	0	306
04:45 PM	22	0	8	0	18	150	0	0	0	0	0	0	0	102	30	0	330
Total	83	0	23	1	76	547	0	2	0	0	0	0	0	395	95	0	1222
05:00 PM	22	0	8	0	17	141	0	0	0	0	0	0	0	118	31	0	337
05:15 PM	25	0	5	0	12	150	0	0	0	0	0	0	0	109	26	1	328
05:30 PM	24	0	6	0	21	168	0	0	0	0	0	0	0	111	24	0	354
05:45 PM	17	0	8	0	14	127	0	0	0	0	0	0	0	102	24	0	292
Total	88	0	27	0	64	586	0	0	0	0	0	0	0	440	105	1	1311
Grand Total	171	0	50	1	140	1133	0	2	0	0	0	0	0	835	200	1	2533
Apprch %	77	0	22.5	0.5	11	88.9	0	0.2	0	0	0	0	0	80.6	19.3	0.1	
Total %	6.8	0	2	0	5.5	44.7	0	0.1	0	0	0	0	0	33	7.9	0	



All Traffic Data Services  
Wheat Ridge, CO 80033  
**303-668-0220**

File Name : #3 1STST&US6PM  
Site Code : 00000000  
Start Date : 10/4/2012  
Page No : 2

Start Time	1ST ST Southbound					US6 Westbound					1ST ST Northbound					US6 Eastbound					Int. Total
	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	Right	Thru	Left	Other	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	22	0	8	0	30	18	150	0	0	168	0	0	0	0	0	0	102	30	0	132	330
05:00 PM	22	0	8	0	30	17	141	0	0	158	0	0	0	0	0	0	118	31	0	149	337
05:15 PM	25	0	5	0	30	12	150	0	0	162	0	0	0	0	0	0	109	26	1	136	328
05:30 PM	24	0	6	0	30	21	168	0	0	189	0	0	0	0	0	0	111	24	0	135	354
Total Volume	93	0	27	0	120	68	609	0	0	677	0	0	0	0	0	0	440	111	1	552	1349
% App. Total	77.5	0	22.5	0		10	90	0	0		0	0	0	0		0	79.7	20.1	0.2		
PHF	.930	.000	.844	.000	1.00	.810	.906	.000	.000	.896	.000	.000	.000	.000	.000	.000	.932	.895	.250	.926	.953



**Historical Traffic Data from Permanent Count Stations in Eagle County**

<b>West Vail ATR (I70)</b>													
<b>Yr</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Average</b>
2012	31,414	32,342	36,296	28,834	28,920	35,918	40,673	38,229	34,065	30,120	30,000	32,031	33,237
2011	30,967	30,694	34,411	28,579	26,662	31,112	34,760	34,120	33,952	29,232	28,986	33,666	31,428
2010	31,409	31,435	32,666	28,649	27,865	34,478	39,547	37,380	33,903	29,044	27,747	31,967	32,174
2009	31,547	32,818	33,380	29,202	28,569	35,070	39,587			28,483	27,782	31,426	31,786
2008	31,578	33,493	36,401	30,499	30,655	36,789	40,446	38,900	35,203	31,976	29,165	31,330	33,870
2007	28,202	27,200	28,152	25,772	25,820	34,565	40,544	39,704	35,795	33,259	32,755	32,023	31,983
2006						40,836	41,740	39,756	36,017	32,204	31,488	32,397	36,348
2005	33,466	34,326	37,465	31,553								28,446	33,051
2004	33,216	33,603	38,061	32,057	30,909	37,286	41,957	39,627	36,039	32,233	30,011	34,973	34,998
2003	33,365	32,827	33,940	30,501	30,338	37,050	41,405	40,332	34,717	32,612	29,126	33,829	34,170
2002	32,646	33,616	37,615	29,882	31,586	36,152	41,800	40,754	35,440	32,988	31,947	34,495	34,910
2001	31,571	32,988	35,920	31,268	30,140	34,210	37,186	40,432	33,478	32,800	32,015	33,920	33,827
2000	29,830	31,624	35,278	30,294	29,612	35,890	41,020	39,108	35,132	30,718	29,310	32,214	33,336
1999	30,476	33,128	34,548	29,402	28,761	35,812	40,628	39,098	34,986	31,370	29,892	31,882	33,332
<b>Average</b>	31,514	32,315	34,933	29,730	29,153	35,782	40,099	38,953	34,894	31,311	30,017	32,471	

<b>Wolcott ATR (I70)</b>													
<b>Yr</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Average</b>
2012	19,531	19,755	23,271	20,611	23,037	26,496	27,976	27,526	24,666	22,125	20,449	18,208	22,804
2011	18,928	18,957	21,794	19,271	21,061	25,090	27,358	27,519	25,481	22,004	19,863	20,684	22,334
2010	19,580	19,845	20,536	20,416	22,368	25,691	28,091	27,231	24,872	20,956	19,086	19,337	22,334
2009	20,473	21,084	22,687	20,734	22,971	26,494	28,787	27,696	25,134	22,138	20,205	19,814	23,185
2008	21,786	22,880	24,374	22,791	24,524	26,906	28,666	28,362	25,861	23,962	20,539	19,436	24,174
2007	21,395	21,353	23,637	22,582	24,265	27,268	29,439	26,065	23,595	22,722	22,460	20,238	23,752
2006	19,845	18,485	23,220	22,153	21,138	26,740	28,011	27,524	25,338	20,618	21,992	20,939	23,000
2005	19,470	21,207	22,943	21,288	23,505	27,502	26,983	26,646	24,940	22,596	20,515	19,588	23,099
2004	18,910	18,951	22,690	21,136	22,659	24,727	28,076	27,149	24,787	22,388	19,567	19,931	22,581
2003	18,431	17,949	18,942	20,692	22,441	25,869	27,729	27,381	23,831	22,323	18,017	18,767	21,864
2002	17,455	18,639	20,925	20,125	22,250	23,241	25,979	25,025	21,984	21,313	18,322	19,105	21,197
2001								18,732	19,138	18,973	18,976	17,924	18,749
<b>Average</b>	19,619	19,919	22,274	21,073	22,747	26,002	27,918	26,405	24,136	21,843	19,999	19,498	



W4IKS Table 5 Sheet 1

Date: Thursday, October 04, 2012 Time: 06:49 AM  
 Intersection #001 SH 6 @ SH 70G

(A+CODE)

EVENT	1234567	HR	MIN	FUNC	CODE	EVENT	1234567	HR	MIN	FUNC	CODE
1	1234567	23	0	33	80-83	17	_____	0	0	0	CO-C3
2	1234567	6	0	32	84-87	18	_____	0	0	0	C4-C7
3	_____	7	0	0	88-8B	19	_____	0	0	0	C8-CB
4	_____	8	15	0	8C-8F	20	_____	0	0	0	CC-CF
5	_____	16	0	0	90-93	21	_____	0	0	0	D0-D3
6	_____	18	0	0	94-97	22	_____	0	0	0	D4-D7
7	_____	0	0	0	98-9B	23	_____	0	0	0	D8-DB
8	_____	0	0	0	9C-9F	24	_____	0	0	0	DC-DF
9	_____	0	0	0	A0-A3	25	_____	0	0	0	E0-E3
10	_____	0	0	0	A4-A7	26	_____	0	0	0	E4-E7
11	_____	0	0	0	A8-AB	27	_____	0	0	0	E8-EB
12	_____	0	0	0	AC-AF	28	_____	0	0	0	EC-EF
13	_____	0	0	0	B0-B3	29	_____	0	0	0	F0-F3
14	_____	0	0	0	B4-B7	30	_____	0	0	0	F4-F7
15	_____	0	0	0	B8-BB	31	_____	0	0	0	F8-FB
16	_____	0	0	0	BC-BF	32	_____	0	0	0	FC-FF

W4IKS Table 5 Sheet 2

Date: Thursday, October 04, 2012 Time: 06:49 AM  
 Intersection #001 SH 6 @ SH 70G

(D+8+CODE)

EVENT	1234567	HR	MIN	FUNC	CODE	EVENT	1234567	HR	MIN	FUNC	CODE
33	_____	0	0	0	80-83	49	_____	0	0	0	CO-C3
34	_____	0	0	0	84-87	50	_____	0	0	0	C4-C7
35	_____	0	0	0	88-8B	51	_____	0	0	0	C8-CB
36	_____	0	0	0	8C-8F	52	_____	0	0	0	CC-CF
37	_____	0	0	0	90-93	53	_____	0	0	0	D0-D3
38	_____	0	0	0	94-97	54	_____	0	0	0	D4-D7
39	_____	0	0	0	98-9B	55	_____	0	0	0	D8-DB
40	_____	0	0	0	9C-9F	56	_____	0	0	0	DC-DF
41	_____	0	0	0	A0-A3	57	_____	0	0	0	E0-E3
42	_____	0	0	0	A4-A7	58	_____	0	0	0	E4-E7
43	_____	0	0	0	A8-AB	59	_____	0	0	0	E8-EB
44	_____	0	0	0	AC-AF	60	_____	0	0	0	EC-EF
45	_____	0	0	0	B0-B3	61	_____	0	0	0	F0-F3
46	_____	0	0	0	B4-B7	62	_____	0	0	0	F4-F7
47	_____	0	0	0	B8-BB	63	_____	0	0	0	F8-FB
48	_____	0	0	0	BC-BF	64	_____	0	0	0	FC-FF

W4IKS Table 6

Date: Thursday, October 04, 2012 Time: 06:49 AM  
 Intersection #001 SH 6 @ SH 70G

(B+0+KEY)

FUNCTIONS	KEY	VALUE
Present Plan	0	0
TOD/DOW Plan	1	0
Hardwire Plan	2	0
Modem Plan	3	0
Mode (0-4)	4	0
Master (0-OFF)	5	0
Master Clock	6	0
Local Clock	7	0
Dwell Clock	8	0
Future	9	0
Future	A	0
Future	B	0
Future	C	_____
NEMA CNA Phases	D	_____
Adv Warning Phases	E	_____
MRI Phases	F	12345678

(D+KEY1+KEY2)

FUNCTIONS	KEY	VALUE
Floating Ped	2E	0
ID Number	2F	1
No Coord Ped Recall	3E	0
Rest In Walk	3F	0
Adv Warning EOG	4E	0
Adv Warning SOG	4F	0
RR Red Clear	5E	0
RR Clear Color	5F	0
Bus Delay	6D	0.0
Bus Free T1	6E	0
Bus Free T3	6F	0
EV Min Aft Clear	7E	0
EV Indicators	7F	0
NEMA Inputs	66	0.0

**ENGINEER'S OPINION OF PROBABLE COST  
CONCEPTUAL**

Project #



Project Name	US 6 Edwards Roundabout	Date: 05/02/13	P.E. Project code (SA#)	
County of	Eagle	US 6	Length In Feet 600	Length In Miles 0.11
Type	Intersection Improvements	Roadway Pavement	Concrete	
Prepared by	Stolfus & Associates, Inc.	Thickness in inches	Roadway: 12 In over 6 In	Shoulders:

**In providing opinions of probable construction cost, the Client understands that Stolfus & Associates Inc. has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. These costs do not reflect escalation for future costs. Stolfus & Associates, Inc. makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.**

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST
201-00000	CLEARING AND GRUBBING	LS	1	\$20,000.00	\$20,000
202-00200	REMOVAL OF SIDEWALK	SY	190	\$10.00	\$1,900
202-00220	REMOVAL OF ASPHALT MAT	SY	12,300	\$4.00	\$49,200
203-00010	UNCLASSIFIED EXCAVATION (COMPLETE IN PLACE)	CY	13,200	\$15.00	\$198,000
203-00210	BORROW MATERIAL (COMPLETE IN PLACE)	CY	8,800	\$25.00	\$220,000
304-06000	AGGREGATE BASE COURSE (CLASS 6)	TON	4,100	\$35.00	\$143,500
412-00800	CONCRETE PAVEMENT (8 INCH)	SY	400	\$50.00	\$20,000
412-00120	CONCRETE PAVEMENT (12 INCH)	SY	11,300	\$60.00	\$678,000
608-00006	CONCRETE SIDEWALK (6 INCH)	SY	400	\$35.00	\$14,000
608-00010	CONCRETE CURB RAMP	SY	30	\$100.00	\$3,000
609-21010	CURB AND GUTTER TYPE 2 (SECTION I-B)	LF	900	\$15.00	\$13,500
609-21020	CURB AND GUTTER TYPE 2 (SECTION II-B)	LF	3,500	\$20.00	\$70,000
625-00000	CONSTRUCTION SURVEYING	LS	1	\$20,000.00	\$20,000
626-00000	MOBILIZATION	LS	1	\$150,000.00	\$150,000
626-01000	PUBLIC INFORMATION SERVICES	LS	1	\$5,000.00	\$5,000
Total Major Items					\$1,607,000
<b>Total Major Items (A)</b>					<b>\$1,607,000</b>

Item	Percent Range	Percent Selected	Costs \$
<b>Major Items (above)</b>			<b>\$1,607,000 (A)</b>
Signing and Striping and Removal of Signal Equipment	5 to 15% of (A)	7%	\$113,000 (B)
Erosion Control and Landscaping	1 to 5% of (A)	5%	\$81,000 (C)
Construction Phasing & Traffic Control	5 to 25% of (A+B+C+D)	15%	\$271,000 (D)
Drainage	2 to 10% of (A+B+C+D)	3%	\$63,000 (E)

**TOTAL OPINION OF PROBABLE CONSTRUCTION BID ITEMS COST, CBI (A+B+C+D+E) \$2,135,000 (F)**

Force Account - Utilities	1 to 5% of (F)	5%	\$107,000 (G)
Force Account - Miscellaneous	1 to 5% of (F)	5%	\$107,000 (H)

**TOTAL OPINION OF PROBABLE CONSTRUCTION ITEMS COST, CI (F+G+H) \$2,349,000 (I)**

Construction Engineering, CE	10 to 20% of (I)	12%	\$282,000 (J)
Construction Engineering Indirects	1 to 5% of (I)	5%	\$118,000 (K)
Utility Relocations	5 to 10% of (I+J+K)	5%	\$138,000 (L)
Contingency	25% of (I+J+K+L)	25%	\$722,000 (M)

**TOTAL PROJECT OPINION OF PROBABLE COST (I+J+K+L+M) \$3,609,000 (N)**