

Acton Road Study

Prepared for:

Regional Planning Commission of Greater Birmingham

Jefferson County, Alabama

And

Vestavia Hills, Alabama



VESTAVIA
HILLS



Prepared by:

VOLKERT

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23 U.S.C. §409 states "Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

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- 2.) Build

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Introduction

The purpose of this study is to explore the feasibility of improving the safety and flow of traffic Along Acton Road in Birmingham Alabama between International Park Drive and Camp Horner Road. This study examines current and future traffic demands, develops alternative concepts for the roadway alignment and cross-section, develops conceptual designs and identifies potential funding sources for the improvements. The study area is illustrated below in Figure 1.



Figure 1: Aerial of the Study Area

Existing Conditions

The existing alignment of Acton Road between International Park Drive and Camp Horner Road is a two-lane roadway with a posted speed limit of 35 mph. For the purposes of this study, Acton Road is considered to be a north/south roadway. Moving from south to north through the study area Acton Road transitions from a four-lane roadway at the I-459 interchange serving mainly commercial and office land uses into a two-lane cross-section through a residential area. Near the northern end of the study area, the roadway makes an S-curve leading into the intersection with Lakeland Trail. Additionally, where Lakeland Trail intersects Acton Road near the curve, there may be limited sight distance for vehicles leaving Lakeland Trail and turning onto Acton Road. This project will seek to improve the geometry at this

location to allow for a larger turning radius in the curve and better conditions for turning vehicles to and from Lakeland Trail.

Existing traffic data was collected along Acton Road including daily traffic counts, speed data, and turning movement counts. Currently, Acton Road carries approximately 13,600 vehicles per day. The 85th percentile speed is 46.5 mph on the southern end of the study area and 36.3 mph on the northern end of the study area.

The existing traffic count data was supplemented with projected traffic volumes expected to occur as part of future area developments. These developments include a new residential development that will access off of Lakeland Trail and the redevelopment of Altadena Valley County Club into the City of Vestavia Hill's athletic fields. The resulting traffic volumes used for the no-build analysis are summarized in Figure's 2 and 3 below.

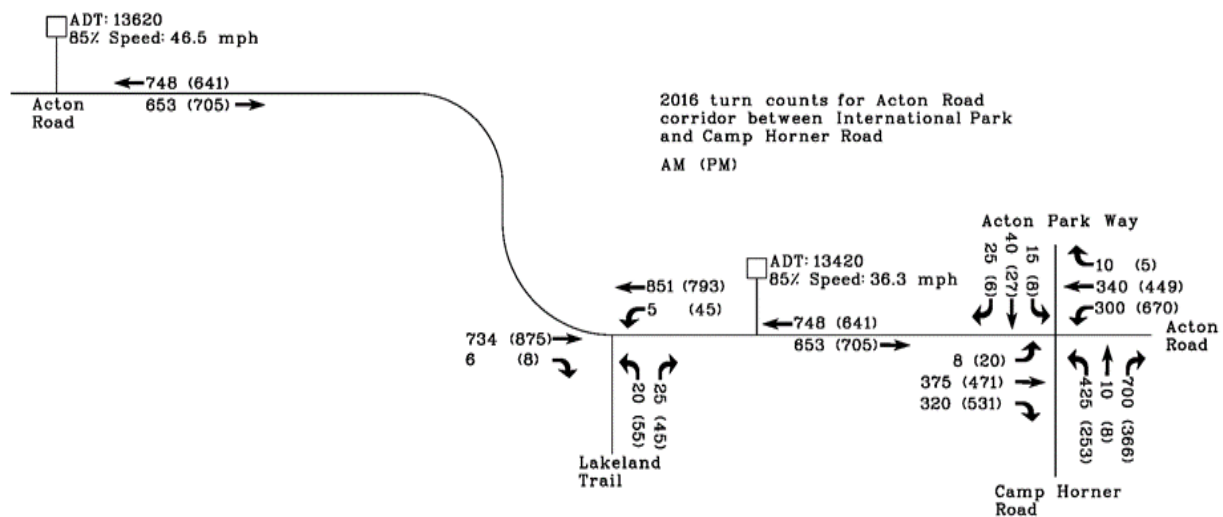


Figure 2: Summary of Traffic Data

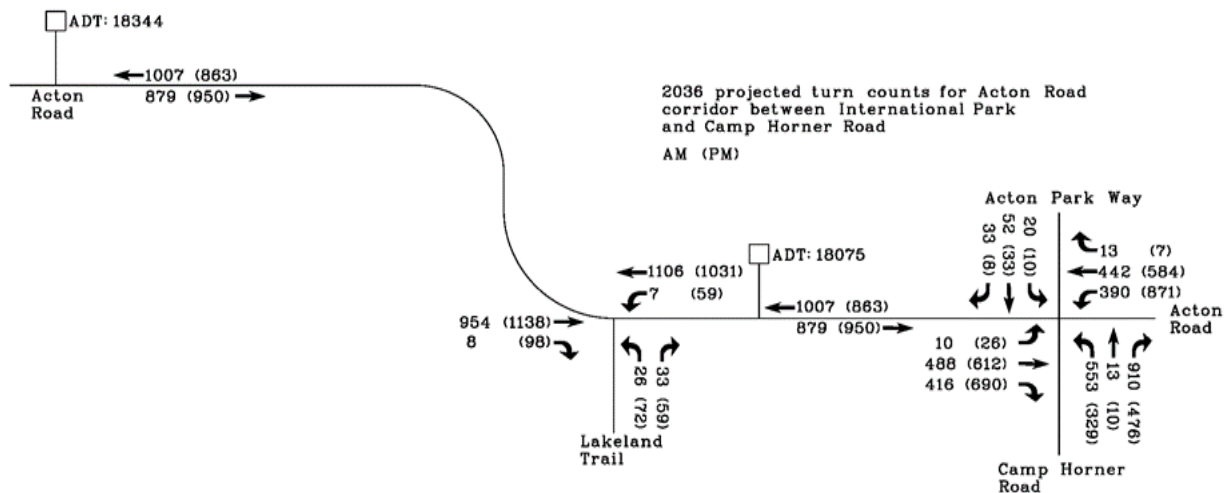


Figure 3: Projection of Traffic Counts for 2036

Operational Analysis

The no-build traffic conditions were analyzed to determine operational performance and highlight the differences with the current configuration. The study intersections were analyzed for morning and afternoon peak periods using methods outlined in the latest edition of the Highway Capacity Manual. The results of the analysis are presented in the table below.

Table 1: No-Build Operational Analysis

<u>Intersection</u>	<u>Approach</u>	<u>2016</u>		<u>2036</u>	
		<u>LOS (Delay)</u>		<u>LOS (Delay)</u>	
		<u>AM</u>	<u>PM</u>	<u>AM</u>	<u>PM</u>
Acton Road at Lakeland Trail	Acton Rd (WBL)	A (9.4)	B (10.4)	B (10.5)	B (12.3)
	Lakeland Trail	E (36.3)	F (194.7)	F (128.9)	F (1491.3)
Acton Road at Camp Horner Drive	Acton Rd (NB)	C (31.9)	E (58.5)	F (84.0)	F (146.9)
	Acton Rd (SB)	B (18.0)	D (39.2)	E (69.4)	F (145.3)
	Camp Horner Road	D (48.8)	F (105.5)	F (88.7)	F (139.7)
	Acton Park Way	E (60.6)	F (100.5)	E (60.8)	F (81.4)

As shown in the table above the study intersections operate at poor levels of service under no build conditions for both 2016 and 2036. The Lakeland Trail approach experiences significant delay for left turning vehicles onto southbound Acton Road. The installation of a signal at this location could help alleviate this delay, albeit with an impact to the through movements along Acton Road.

Proposed Alternatives

The goal of this study was to develop alternative alignments for Acton Road that have a safer geometry, increase the capacity of the roadway, and better serve as a collector roadway for the area. In exploring alternative configurations many factors were considered including terrain, required right of way, environmental impacts, constructability, and cost. The highest priority for the alternative alignment was to correct the sharp curve along Acton Road at Lakeland Trail. The secondary purpose is to develop a cross section to provide better carrying capacity of the roadway for all users.

The results of the alternatives analysis produced three options for improving the roadway. Two options involve rebuilding the entire section of roadway with a 3-lane section along with possibly including a multi-use pedestrian path, as well. The third option takes into account the difficult task of finding a funding source for large construction projects. This option is meant to be a lower cost alternative to address the sharp curve and limited sight distance at the Lakeland Trail intersection.

Alternative 1

Alternative 1 roughly follows the existing footprint of the study section of Acton Road. This alignment increases the radii along Acton Road to create better horizontal and vertical geometric conditions. The result is a straighter alignment through the study area with a minimum curve design speed of 35mph.

Figure 4 below shows a section of the Alternative 1 alignment near Lakeland Trail. More detailed graphics of the proposed alignment from International Drive through Camp Horner Road are attached at the end of this report.

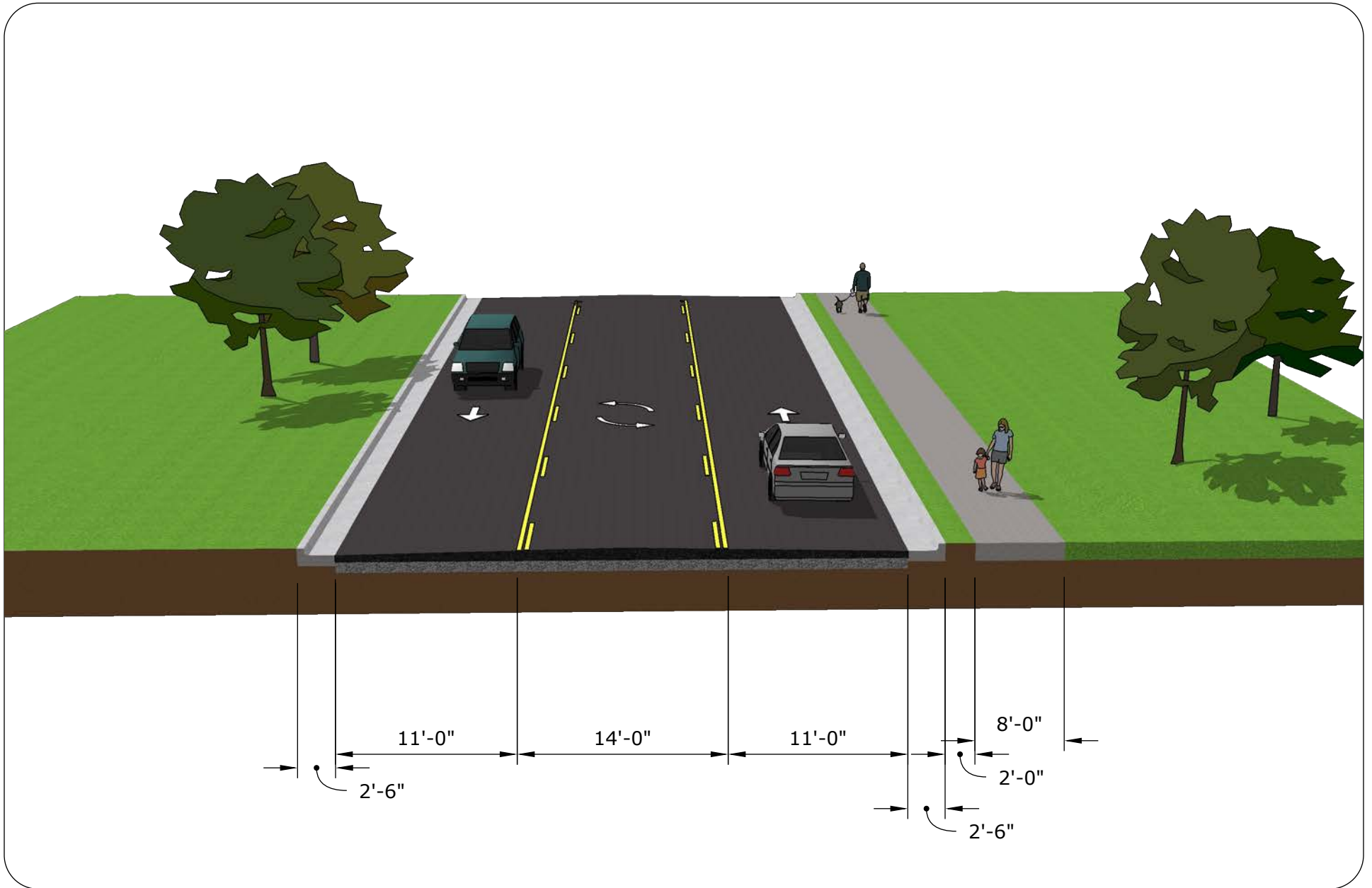


Figure 4: *Alternative 1 (Realignment)*

The proposed cross section for Alternative 1 includes a 3 lane roadway section with an adjacent multiuse path on the east side of the road. It is proposed that the travel lanes be 11 feet wide and the center turn lane be 13 feet wide. The road would have a typical curb and gutter. The multiuse path would be 8 feet in width to serve both bicycles and pedestrians and be separated from the roadway with a grassed buffer. An example typical section is illustrated on the following page in Figure 5.

As a result of the alignment of Alternative 1, additional right of way will be required. The majority of this will be acquired from the properties located in the curves. It is anticipated that at least one entire property and portions of additional properties will be needed to complete the alignment.

In order to implement this proposed alignment, it is estimated that construction costs will be approximately \$2.2 million. This estimate includes all construction related costs including earthwork, drainage, paving, environmental mitigation and contingencies. It does not include right of way costs which are estimated to cover approximately 7 total acres of acquisition and an additional \$350,000. A detailed cost estimate is provided in the Appendices of this report.



VOLKERT

**Acton Road
Alternative 1
Typical Section**

This alignment will impact current plans for the Vestavia Hills park to be located on the former Altadena Valley Country Club. In order to route the roadway through this section, some of the park property will need to be acquired for the roadway footprint. While it is currently undeveloped, the park is expected to be in place before the start of construction of an Acton Road alternative.

Since this alternative will be routed along an alignment away from the existing roadway, there will be more extensive environmental impacts. Most of the section through the old golf course is currently within a flood plain, so the roadway will need to be built up to cross this section. Additionally, the southwest end of the alignment cuts through a wooded section with an existing creek that will require consideration to avoid erosion, runoff and storm water impacts.

This option is the more expensive of the two options with an estimated construction cost of approximately \$4 million. As with the Alternative 1 estimate this does not include right of way costs. A large portion of the cost is attributed to the earthwork to raise the roadway through the golf course.

Intersections

The study intersections along Acton Road at International Park, Lakeland Trail and Camp Horner Road were evaluated to determine geometric improvements needed to improve operations and safety of each as part of the Alternative improvements. The need for left and right turn lanes were evaluated, as well as, additional modifications including traffic control, widening and pedestrian improvements.

The proposed redevelopment of Altadena Valley Country Club into athletic fields is planned to access Acton Road at the existing intersection with the daycare just north of International Park Drive. It is recommended that the four-lane section that ends just north of International Park Drive be extended to the park access road intersection. It is here that the outside northbound lane is recommended to be dropped as a dedicated right turn lane into the park. This concept is illustrated in Figure 7 below.



Figure 7 – International Park Drive/Park Access Improvements

The intersection at Lakeland Trail will gain a large improvement under each alternative due to the increase in the sight distance for vehicles turning out of Lakeland Trail. Additionally, the inclusion of a left turn lane onto Lakeland Trail from southbound Acton Road as part of each alternative will benefit the through traffic along Acton Road. The need for a northbound right turn deceleration lane along Acton Road was evaluated and it was determined that based on existing movement volumes at the intersection it would

not be warranted, however the proposed residential development accessing Lakeland Trail will generate higher future volumes resulting in the need for a right turn lane at this location.

Camp Horner Road at Acton Road currently suffers significant congestion in the morning and afternoon peak periods. An evaluation of the intersection was performed to determine additional improvements available to increase the operations at the intersection in the peak periods. During the morning peak period, there is a heavy demand from Camp Horner Road turning in both directions along Acton Road. This causes queuing along Camp Horner especially for the left turning movement. The afternoon period experiences more congestion related issues from both directions of Acton Road. The most significant of which is the left turn from southbound Acton Road onto Camp Horner Drive. The volume making this movement easily justifies the need for dual southbound left turn lanes. Implementing such a modification would present significant challenges. The right of way along Acton Road is fairly constrained. Widening along Acton to accommodate the second turn lane will need to take place on the northwest side of the road. Due to the slope in this area, a retaining wall will need to be installed to accommodate the widening. The second challenge with the dual left turn lanes is providing a second receiving lane along Camp Horner Road. In order to incorporate the two eastbound lanes widening would need to occur for approximately 500 to 1000 feet. It is anticipated that the cost for the proposed improvements to the Camp Horner Road intersection would be approximately \$620,000. A concept for this implementation is presented below in Figure 8 with a detailed layout provided in the Appendices.



Figure 8 – Camp Horner Road Intersection Improvements

In addition to the SB dual left turn lanes along Acton Road, it is recommended that the traffic signal timings be updated and optimized for the existing and future traffic. Ensuring that the intersection is operating at optimal efficiency is crucial to ensuring that it is moving as many vehicles as possible under its current configuration. Further changes that were explored at this intersection included converting the Acton Park approach to a right in/out only and installing a roundabout at the intersection. Both options have potential positive impacts. The Acton Park option would result in a more efficient intersection by reducing the

number of phases, but it would only be slightly since the traffic volumes from this approach are low. For the roundabout alternative, there are significant challenges with right of way, geometry and grade in order to implement it. It was also determined that this option would require a multilane roundabout, as well. An exhaustive multilane roundabout configuration study was not performed, but it is recommended that this be explored further if stakeholders express interest.

Operational Evaluation of Alternatives 1 and 2

While each of the alternatives vary in their alignments, the operations of the sections will be very similar. Under typical analysis methods, there would be no operational difference between the two alternatives. As a result, the operational evaluation of the alternatives was combined into a single ‘build’ scenario.

Table 2: Operational Analysis for Build Scenario

<u>Intersection</u>	<u>Approach</u>	<u>2016</u>		<u>2036</u>	
		<u>LOS (Delay)</u>		<u>LOS (Delay)</u>	
		<u>AM</u>	<u>PM</u>	<u>AM</u>	<u>PM</u>
Acton Road at Lakeland Trail	Acton Rd (NB)	A (3.6)	A (4.0)	A (3.1)	B (5.8)
	Acton Rd (SB)	A (4.2)	A (3.7)	A (4.3)	B (4.6)
	Lakeland Trail	C (22.7)	C (27.5)	D (40.4)	F (52.5)
Acton Road at Camp Horner Drive	Acton Rd (NB)	C (30.1)	C (26.9)	E (63.5)	E (78.1)
	Acton Rd (SB)	C (33.3)	C (23.4)	D (52.8)	D (41.8)
	Camp Horner Road	D (42.9)	E (55.5)	D (52.3)	F (87.9)
	Acton Park Way	E (64.7)	E (64.6)	F (161.5)	F (81.7)

The table above shows the benefit of the recommended improvements to the roadway and intersections. The dual left turn lanes from southbound Acton onto Camp Horner Road provide the largest improvement, especially for afternoon peak period conditions. In addition to the quantified operational benefits shown above, there will be additional capacity improvements as a result of the geometric modifications including increasing sight distances and removing the sharp curves.

Alternative 3

A third alternative was explored to develop a lower cost improvement that could be implemented to aid in increasing the safety of the Lakeland trail intersection. The concept developed for this alternative involves the installation of a roundabout at the intersection with Lakeland Trail. This alternative intersection is able to incorporate the existing curvature of roadway as the southern limits of the roundabout. By eliminating the need for left turns across traffic to enter or exit Lakeland Trail, the potential for crashes at this intersection is reduced significantly both in frequency and severity. A conceptual drawing of the roundabout is presented in Figure 9 below.



Figure 9: Alternative 3 (Roundabout Concept)

As depicted in Figure 9, additional right of way will still be required to install the proposed roundabout. Furthermore, there will be significant earthwork required on the northern edge of the intersection in order to create the needed grades.

Based on traffic operational analysis conducted it was determined that the roundabout would provide sufficient capacity for current and future traffic volumes through the intersection.

The costs associated with implementing the roundabout at Lakeland Trail will be heavily weighted by the amount of earthwork required to create a level surface for the roundabout. The northern side of the roundabout is currently a hill that will need to be cut, much of this can be used as fill to build up the northbound approach of Acton Road into the roundabout. It is estimated that construction costs for the roundabout will be around \$700,000. While this cost is still significant, it is less than the full proposed alternative alignments.

Preferred Alternative

Based on stakeholder involvement, cost, and the impacts to the park it was determined that Alternative 1 was preferred alignment. As a result, a detailed preliminary design was performed. These layouts are presented in the appendices of this report and illustrate the alignment in respect to the existing roadway geometry, right of way, and driveways. The preliminary design incorporates the proposed park entrance

at international drive. Additionally, drawings illustrating the existing utilities in the scope of the project are included in an effort to help identify potential utility conflicts.

Funding

In order to accelerate the implementation of a preferred alternative for Acton Road a funding source will need to be identified and allocated. There are different funding sources, each with differing requirements. Funding can be obtained at the federal, state or local level or a combination of each. Local funding sources may include funding appropriations by the City Council, shared funding agreement between the City, ALDOT, and the Greater Birmingham MPO, and special tax increases such as local option sales tax or assessments to properties along the project corridor. Available grant programs that could assist in project funding include federal transportation safety funds that could be obtained through the Greater Birmingham MPO, as well as, state grant programs such as ATRIP or economic development funds available through ADECA.

A summary of the options and estimated improvement costs are presented in the Table 3 below. Detailed cost estimates are available in the Appendices.

Table 3: Estimated Improvement Costs

<i>Improvement</i>	<i>Description</i>	<i>Anticipated Costs</i>
<i>Alternative 1</i>	3-lane Acton along existing alignment w/pedestrian path	\$3,621,000
<i>Alternative 1(a)</i>	3-lane Acton along existing alignment without pedestrian path	\$3,400,000
<i>Alternative 2</i>	3-lane Acton southern alignment, w/pedestrian path	\$4,200,000
<i>Alternative 3</i>	Roundabout at Acton and Lakeland Trail	\$700,000
<i>Camp Horner Intersection</i>	Intersection Improvements at Camp Horner Road	\$620,000

Conclusions

Acton Road from Camp Horner Road to International Park Drive is currently congested and presents an alignment with sharp curves and poor sight distance. This report has detailed the steps taken to evaluate and develop multiple alternative alignments to the roadway to increase operational flow and safety of the roadway.

Two alternative alignments were developed for the Acton Road. While they follow different paths, each has similar operational benefits. As shown in the analysis, a significant reduction in vehicle delay at the intersections will occur due to the improvements. Furthermore, there will be safety and additional capacity improvements as a result of the geometric modifications including increasing sight distances and removing the sharp curves.

A third alternative for improvements at the intersection of Acton Road at Lakeland Trail was developed. The recommended alternative involves installing a roundabout at the intersections. While still a significant

cost, it was determined that this configuration would operate with acceptable levels of service while reduce points of conflict at the intersection and increasing the safety of the curved section of the roadway.

It is the recommendation of this study in conjunction with the stakeholders involved that Alternative 1 be pursued for implementation. The limited impact to existing projects and right-of-way, in addition to the operational and safety benefits, are the main justifications for the recommendation.

Appendix A
Existing Traffic Counts

TRAFFIC DATA, LLC

1409 Turnham Lane
Birmingham, AL 35216
205-824-0125

Birmingham, AL

File Name : birmingham14
Site Code : 00000000
Start Date : 04/06/2016
Page No : 1

Groups Printed- Unshifted

Start Time	ACTON RD Westbound		LAKELAND TRAIL Northbound		ACTON RD Eastbound		Int. Total
	Left	Thru	Left	Right	Thru	Right	
07:00 AM	0	143	2	0	109	0	254
07:15 AM	1	228	0	0	173	3	405
07:30 AM	0	248	3	1	193	2	447
07:45 AM	0	200	1	1	215	1	418
Total	1	819	6	2	690	6	1524
08:00 AM	0	175	0	1	153	0	329
08:15 AM	2	164	1	0	126	1	294
08:30 AM	0	134	0	0	157	1	292
08:45 AM	0	111	1	2	151	2	267
Total	2	584	2	3	587	4	1182
04:00 PM	0	172	0	1	163	4	340
04:15 PM	1	171	1	3	194	2	372
04:30 PM	1	213	0	2	197	6	419
04:45 PM	1	172	0	1	204	2	380
Total	3	728	1	7	758	14	1511
05:00 PM	0	220	0	1	233	0	454
05:15 PM	0	188	0	0	241	0	429
05:30 PM	2	155	0	2	163	3	325
05:45 PM	0	124	1	0	126	5	256
Total	2	687	1	3	763	8	1464
Grand Total	8	2818	10	15	2798	32	5681
Apprch %	0.3	99.7	40.0	60.0	98.9	1.1	
Total %	0.1	49.6	0.2	0.3	49.3	0.6	

Start Time	App. Total	ACTON RD Westbound		App. Total	LAKELAND TRAIL Northbound		App. Total	ACTON RD Eastbound		Int. Total
		Left	Thru		Left	Right		Thru	Right	
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1										
Intersection	07:15 AM									
Volume	0	1	851	852	4	3	7	734	6	740
Percent		0.1	99.9		57.1	42.9		99.2	0.8	
07:30 Volume	0	0	248	248	3	1	4	193	2	195
Peak Factor										0.894
High Int.	6:45:00 AM	07:30 AM			07:30 AM			07:45 AM		
Volume	0	0	248	248	3	1	4	215	1	216
Peak Factor				0.859			0.438			0.856
Peak Hour From 07:00 AM to 08:45 AM - Peak 1 of 1										
By Approach	07:00 AM	07:15 AM			07:00 AM			07:15 AM		
Volume	0	1	851	852	6	2	8	734	6	740
Percent		0.1	99.9		75.0	25.0		99.2	0.8	
High Int.	-	07:30 AM			07:30 AM			07:45 AM		
Volume	-	0	248	248	3	1	4	215	1	216
Peak Factor	-			0.859			0.500			0.856

TRAFFIC DATA, LLC

1409 Turnham Lane
 Birmingham, AL 35216
 205-824-0125

File Name : birmingham14
 Site Code : 00000000
 Start Date : 04/06/2016
 Page No : 2

Start Time	App. Total	ACTON RD Westbound			LAKELAND TRAIL Northbound			ACTON RD Eastbound			Int. Total
		Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1											
Intersection	04:30 PM										
Volume	0	2	793	795	0	4	4	875	8	883	1682
Percent		0.3	99.7		0.0	100.0		99.1	0.9		
05:00 Volume	0	0	220	220	0	1	1	233	0	233	454
Peak Factor											0.926
High Int.		05:00 PM			04:30 PM			05:15 PM			
Volume	0	0	220	220	0	2	2	241	0	241	
Peak Factor				0.903			0.500			0.916	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1											
By Approach	04:00 PM	04:30 PM			04:00 PM			04:30 PM			
Volume	0	2	793	795	1	7	8	875	8	883	
Percent		0.3	99.7		12.5	87.5		99.1	0.9		
High Int.	-	05:00 PM			04:15 PM			05:15 PM			
Volume	-	0	220	220	1	3	4	241	0	241	
Peak Factor	-			0.903			0.500			0.916	

TRAFFIC DATA, LLC
1409 Turnham Lane, Birmingham, AL 35216
205-824-0125

Location: : ACTON RD north of INTERNATIONAL PARK DR
 City, State: : BIRMINGHAM, AL
 Speed Limit: : 35 mph

Date: 4/6/2016
 Wednesday

Begin	24 Hour Volume				Begin	24 Hour Volume			
	NB	SB	Combined	SB		NB	SB	Combined	SB
6:00 AM	24	36	60	498	6:00 PM	152	548	152	440
6:15 AM	40	57	97		6:15 PM	167		141	308
6:30 AM	65	81	146		6:30 PM	127		81	208
6:45 AM	88	107	195		6:45 PM	102		66	168
7:00 AM	104	121	225	1311	7:00 PM	71	324	66	227
7:15 AM	153	178	331		7:15 PM	69		55	124
7:30 AM	165	215	380		7:30 PM	89		57	146
7:45 AM	180	195	375		7:45 PM	95		49	144
8:00 AM	155	160	315	1096	8:00 PM	71	289	39	164
8:15 AM	109	148	257		8:15 PM	86		66	152
8:30 AM	150	118	268		8:30 PM	71		26	97
8:45 AM	141	115	256		8:45 PM	61		33	94
9:00 AM	77	138	215	731	9:00 PM	45	138	19	90
9:15 AM	77	90	167		9:15 PM	40		20	60
9:30 AM	84	94	178		9:30 PM	32		32	64
9:45 AM	76	95	171		9:45 PM	21		19	40
10:00 AM	63	85	148	648	10:00 PM	22	58	9	29
10:15 AM	66	89	155		10:15 PM	11		8	19
10:30 AM	90	76	166		10:30 PM	14		10	24
10:45 AM	68	111	179		10:45 PM	11		2	13
11:00 AM	82	89	171	805	11:00 PM	8	31	4	24
11:15 AM	116	91	207		11:15 PM	10		11	21
11:30 AM	106	115	221		11:30 PM	9		5	14
11:45 AM	108	98	206		11:45 PM	4		4	8
12:00 PM	91	114	205	876	12:00 AM	3	15	1	19
12:15 PM	109	109	218		12:15 AM	5		10	15
12:30 PM	106	105	211		12:30 AM	4		6	10
12:45 PM	114	128	242		12:45 AM	3		2	5
1:00 PM	99	104	203	747	1:00 AM	1	4	3	9
1:15 PM	85	86	171		1:15 AM	2		3	5
1:30 PM	79	106	185		1:30 AM	1		0	1
1:45 PM	102	86	188		1:45 AM	0		3	3
2:00 PM	96	119	215	822	2:00 AM	4	7	2	9
2:15 PM	106	87	193		2:15 AM	0		3	3
2:30 PM	111	102	213		2:30 AM	2		3	5
2:45 PM	126	75	201		2:45 AM	1		1	2
3:00 PM	137	88	225	1097	3:00 AM	2	4	0	4
3:15 PM	161	103	264		3:15 AM	1		1	2
3:30 PM	137	167	304		3:30 AM	1		1	2
3:45 PM	139	165	304		3:45 AM	0		2	2
4:00 PM	146	141	287	1276	4:00 AM	1	8	3	17
4:15 PM	161	154	315		4:15 AM	1		5	6
4:30 PM	151	181	332		4:30 AM	1		4	5
4:45 PM	198	144	342		4:45 AM	5		5	10
5:00 PM	169	137	306	1134	5:00 AM	9	58	10	19
5:15 PM	187	92	279		5:15 AM	17		9	26
5:30 PM	129	158	287		5:30 AM	11		20	31
5:45 PM	141	121	262		5:45 AM	21		24	45
24 Hour Volume	NB	SB	Combined	SB	Combined	NB	SB	Combined	SB
	6951 (51.0%)	6669 (49.0%)	13620						

12:00 AM - 12:00 PM

12:00 PM - 12:00 AM

Count 2483
 Peak Hour Volume 653
 Factor 0.91

NB 2483
 SB 2823
 Combined 5306

NB 4468
 SB 3846
 Combined 8314

46.8%
 53.2%
 7:15 AM
 7:15 AM
 748
 0.87

53.7%
 46.3%
 4:30 PM
 3:45 PM
 705
 0.89

4:15 PM
 1295
 641
 0.89

Location: ACTON RD north of INTERNATIONAL PARK DR
 City, State: BIRMINGHAM, AL
 Speed Limit: 35 mph

Date: 4/6/2016
 Wednesday

TRAFFIC DATA, LLC
 1409 Turnham Lane, Birmingham, AL 35216
 205-824-0125

24 Hour Speed
 Combined Channels

mph	Total	0 - < 15	15 - < 20	20 - < 25	25 - < 30	30 - < 35	35 - < 40	40 - < 45	45 - < 50	50 - < 55	55 - < 60	60 - < 65	65 - < 70	70 - < 200
6:00 AM	498	4	1	3	0	11	50	184	214	26	5	0	0	0
7:00 AM	1311	53	16	2	3	45	274	553	312	42	8	1	0	2
8:00 AM	1096	49	8	2	2	17	176	439	337	42	18	0	0	6
9:00 AM	731	12	3	1	2	13	103	308	246	26	13	2	0	2
10:00 AM	648	6	4	0	3	18	113	265	196	33	8	1	1	0
11:00 AM	805	12	3	5	1	19	143	353	237	23	8	1	0	0
12:00 PM	876	15	10	4	3	32	151	372	253	27	8	0	0	1
1:00 PM	747	17	1	4	6	54	161	264	209	19	10	0	0	2
2:00 PM	822	21	3	1	1	13	110	320	292	45	13	0	0	1
3:00 PM	1097	37	11	5	8	34	205	452	279	46	19	0	1	0
4:00 PM	1276	51	8	8	12	82	332	471	271	25	10	2	1	3
5:00 PM	1134	198	91	46	51	98	225	251	146	13	7	1	1	6
6:00 PM	988	22	12	3	17	69	243	389	208	16	4	1	1	3
7:00 PM	551	2	0	0	3	20	130	213	156	17	4	1	1	4
8:00 PM	453	3	4	7	18	73	132	148	46	8	6	5	0	3
9:00 PM	228	0	0	0	0	7	58	84	68	6	5	0	0	0
10:00 PM	87	0	0	0	1	7	23	18	27	7	4	0	0	0
11:00 PM	55	0	0	0	0	3	12	20	15	2	3	0	0	0
4/7/2016														
12:00 AM	34	0	0	0	0	2	10	11	8	2	1	0	0	0
1:00 AM	13	0	0	0	0	0	2	7	2	1	0	0	1	0
2:00 AM	16	0	0	0	1	4	2	3	5	0	1	0	0	0
3:00 AM	8	0	0	0	0	2	0	3	2	1	0	0	0	0
4:00 AM	25	0	0	0	2	0	5	5	6	6	1	0	0	0
5:00 AM	121	0	0	0	2	1	13	37	41	13	13	1	0	0
Total	13620	502	175	91	136	624	2673	5170	3576	446	169	18	7	33
%		3.7	1.3	0.7	1.0	4.6	19.6	38.0	26.3	3.3	1.2	0.1	0.1	0.2

Percentile Speeds (mph)
 10% 34.6
 15% 36.3
 50% 42.6
 85% 46.5
 90% 48.0

10 mph Pace Speed
 Number in Pace 9806 (72.0%)
 Average Minimum Maximum
 38.2 - 48.2
 5.0 mph
 40.9 mph
 99.3 mph

Speeds Exceeded
 25 mph 94.4%
 35 mph 88.8%
 45 mph 31.2%
 Count 12852 12092 4249

Location: :
 City, State: :
 Speed Limit: :

ACTON RD north of INTERNATIONAL PARK DR
 BIRMINGHAM, AL
 35 mph

Date: 4/6/2016
 Wednesday

TRAFFIC DATA, LLC
 1409 Turnham Lane, Birmingham, AL 35216
 205-824-0125

24 Hour Vehicle Classification
 Combined Channels

Time	Total	Bike	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi
6:00 AM	498	2	374	99	8	12	1	0	2	0	0	0	0	0
7:00 AM	1311	6	979	211	34	55	4	0	19	0	0	1	0	2
8:00 AM	1096	4	837	172	32	41	1	0	9	0	0	0	0	0
9:00 AM	731	2	541	149	10	24	1	0	4	0	0	0	0	0
10:00 AM	648	0	478	132	6	26	2	0	4	0	0	0	0	0
11:00 AM	805	6	620	143	9	19	2	1	7	0	0	0	0	0
12:00 PM	876	4	662	165	17	21	3	0	3	0	0	1	0	0
1:00 PM	747	3	603	103	15	17	2	0	2	2	0	0	0	0
2:00 PM	822	1	603	159	20	35	2	0	2	0	0	0	0	0
3:00 PM	1097	6	798	205	27	45	6	0	9	0	0	1	0	0
4:00 PM	1276	11	944	235	30	34	3	1	16	0	0	2	0	0
5:00 PM	1134	11	795	156	67	33	2	0	48	2	0	2	1	17
6:00 PM	988	6	761	165	18	25	2	0	10	0	0	1	0	0
7:00 PM	551	3	449	89	2	7	0	0	1	0	0	0	0	0
8:00 PM	453	0	341	77	7	27	0	0	0	1	0	0	0	0
9:00 PM	228	1	191	32	0	3	0	0	1	0	0	0	0	0
10:00 PM	87	0	73	14	0	0	0	0	0	0	0	0	0	0
11:00 PM	55	0	48	7	0	0	0	0	0	0	0	0	0	0
4/7/2016														
12:00 AM	34	0	28	6	0	0	0	0	0	0	0	0	0	0
1:00 AM	13	0	10	3	0	0	0	0	0	0	0	0	0	0
2:00 AM	16	0	12	4	0	0	0	0	0	0	0	0	0	0
3:00 AM	8	0	5	2	0	0	0	0	0	1	0	0	0	0
4:00 AM	25	0	18	7	0	0	0	0	0	0	0	0	0	0
5:00 AM	121	0	90	26	1	3	1	0	0	0	0	0	0	0
Total	13620	66	10260	2361	303	427	30	2	137	6	0	8	1	19
%		0.5	75.3	17.3	2.2	3.1	0.2	0.0	1.0	0.0	0.0	0.1	0.0	0.1

TRAFIC DATA, LLC
 1409 Turnham Lane, Birmingham, AL 35216
 205-824-0125

Location: : ACTON RD north of LAKELAND TRAIL
 City, State: : BIRMINGHAM, AL
 Speed Limit: : 35 mph

Date: 4/6/2016
 Wednesday

		24 Hour Volume									
Begin	NB	SB	Combined	Begin	NB	SB	Combined	Begin	NB	SB	Combined
6:00 AM	21	37	58	6:00 PM	156	553	163	448	319	1001	
6:15 AM	42	63	105	6:15 PM	164	136	300				
6:30 AM	54	81	135	6:30 PM	135	221	86	66	161		
6:45 AM	80	112	192	6:45 PM	98	310	63	221	133	531	
7:00 AM	101	122	223	7:00 PM	67	74	52	126	132		
7:15 AM	136	179	315	7:15 PM	79	50	50	140	125	449	
7:30 AM	133	188	321	7:30 PM	79	281	49	168	153		
7:45 AM	147	138	285	7:45 PM	90	281	63	79	79		
8:00 AM	109	152	261	8:00 PM	76	281	49	168	125	449	
8:15 AM	129	145	274	8:15 PM	90	281	63	79	153		
8:30 AM	129	123	252	8:30 PM	53	281	26	79	79		
8:45 AM	153	90	243	8:45 PM	62	143	30	93	92	236	
9:00 AM	79	125	204	9:00 PM	48	143	20	93	68		
9:15 AM	84	92	176	9:15 PM	38	143	28	66	66		
9:30 AM	92	93	185	9:30 PM	30	143	25	55	55		
9:45 AM	71	91	162	9:45 PM	27	58	20	47	47		
10:00 AM	67	82	149	10:00 PM	23	58	8	26	31	84	
10:15 AM	73	88	161	10:15 PM	9	31	7	16	16		
10:30 AM	85	81	166	10:30 PM	13	31	9	22	22		
10:45 AM	79	100	179	10:45 PM	13	31	2	15	15		
11:00 AM	82	80	162	11:00 PM	6	15	4	24	10	55	
11:15 AM	104	103	207	11:15 PM	11	15	11	22	22		
11:30 AM	108	110	218	11:30 PM	9	15	5	14	14		
11:45 AM	108	86	194	11:45 PM	5	15	4	9	9		
12:00 PM	91	116	207	12:00 AM	3	15	5	19	8	34	
12:15 PM	93	106	199	12:15 AM	5	15	7	12	12		
12:30 PM	107	105	212	12:30 AM	4	4	4	8	8		
12:45 PM	95	140	235	12:45 AM	3	4	3	6	6		
1:00 PM	111	106	217	1:00 AM	1	4	2	8	3	12	
1:15 PM	82	93	175	1:15 AM	2	4	3	5	5		
1:30 PM	80	118	198	1:30 AM	1	4	2	3	3		
1:45 PM	94	83	177	1:45 AM	0	4	1	1	1		
2:00 PM	91	113	204	2:00 AM	3	6	2	9	5	15	
2:15 PM	108	102	210	2:15 AM	0	6	4	4	4		
2:30 PM	109	96	205	2:30 AM	2	6	2	4	4		
2:45 PM	133	78	211	2:45 AM	1	4	1	2	2		
3:00 PM	135	92	227	3:00 AM	1	4	1	4	1	8	
3:15 PM	144	118	262	3:15 AM	2	4	0	3	3		
3:30 PM	111	170	281	3:30 AM	1	4	2	3	3		
3:45 PM	146	148	294	3:45 AM	0	4	1	1	1		
4:00 PM	147	151	298	4:00 AM	1	6	2	15	3	21	
4:15 PM	160	155	315	4:15 AM	1	6	4	5	5		
4:30 PM	157	160	317	4:30 AM	1	6	5	6	6		
4:45 PM	184	152	336	4:45 AM	3	6	4	7	7		
5:00 PM	194	179	373	5:00 AM	10	56	10	63	20	119	
5:15 PM	170	153	323	5:15 AM	15	56	11	26	26		
5:30 PM	173	126	299	5:30 AM	12	56	15	27	27		
5:45 PM	138	115	253	5:45 AM	19	56	27	46	46		
24 Hour Volume				Combined 13420							

Count NB 2357 SB 2679 Combined 5036
 Peak Hour Volume 525
 Factor 0.89

12:00 AM - 12:00 PM
 Count NB 2357 SB 2679 Combined 5036
 Peak Hour Volume 525
 Factor 0.89

12:00 PM - 12:00 AM
 Count NB 4429 SB 3955 Combined 8384
 Peak Hour Volume 721
 Factor 0.93

TRAFFIC DATA, LLC
 1409 Turnham Lane, Birmingham, AL 35216
 205-824-0125

Location: : ACTON RD north of LAKELAND TRAIL
 City, State: : BIRMINGHAM, AL
 Speed Limit: : 35 mph

Date: 4/6/2016
 Wednesday

24 Hour Speed
 Combined Channels

mph	Total	0 -	15 -	20 -	25 -	30 -	35 -	40 -	45 -	50 -	55 -	60 -	65 -	70 -	70 -
		< 15	< 20	< 25	< 30	< 35	< 40	< 45	< 50	< 55	< 60	< 65	< 70	< 200	
6:00 AM	490	7	1	8	49	226	167	30	1	0	0	0	0	0	1
7:00 AM	1144	131	34	41	245	463	208	18	1	1	0	0	0	1	1
8:00 AM	1030	68	29	28	189	488	201	20	4	0	0	0	0	1	2
9:00 AM	727	11	6	8	117	360	205	20	0	0	0	0	0	0	0
10:00 AM	655	1	5	8	110	339	166	19	5	0	1	0	0	0	1
11:00 AM	781	10	8	10	133	407	187	24	2	0	0	0	0	0	0
12:00 PM	853	23	4	15	161	431	196	20	0	1	0	0	0	0	2
1:00 PM	767	11	6	14	152	390	168	23	1	0	0	0	0	0	1
2:00 PM	830	8	6	13	123	473	188	18	1	0	0	0	0	0	0
3:00 PM	1064	43	16	36	225	535	186	16	3	0	0	0	0	0	2
4:00 PM	1266	54	12	42	297	641	195	16	0	3	0	0	1	0	0
5:00 PM	1248	91	44	62	308	570	157	11	1	0	0	0	2	0	2
6:00 PM	1001	18	6	38	314	506	106	8	0	0	0	0	1	0	2
7:00 PM	531	5	1	20	131	278	88	7	1	0	0	0	0	0	0
8:00 PM	449	2	2	50	200	161	32	1	0	0	0	0	0	0	0
9:00 PM	236	0	0	6	80	119	28	3	0	0	0	0	0	0	0
10:00 PM	84	0	0	3	17	45	17	2	0	0	0	0	0	0	0
11:00 PM	55	0	0	3	8	25	17	2	0	0	0	0	0	0	0
4/7/2016															
12:00 AM	34	0	0	2	4	17	9	2	0	0	0	0	0	0	0
1:00 AM	12	0	0	0	2	5	4	0	1	0	0	0	0	0	0
2:00 AM	15	0	0	0	4	7	3	1	0	0	0	0	0	0	0
3:00 AM	8	0	0	0	5	0	2	1	0	0	0	0	0	0	0
4:00 AM	21	0	0	0	2	9	9	1	0	0	0	0	0	0	0
5:00 AM	119	0	2	3	20	50	36	5	3	0	0	0	0	0	0
Total	13420	483	182	410	2896	6545	2575	268	24	5	8	7	3	14	0.1
%		3.6	1.4	3.1	21.6	48.8	19.2	2.0	0.2	0.0	0.1	0.1	0.0		

Percentile Speeds (mph)
 10% 26.1
 15% 27.6
 50% 32.4
 85% 36.3
 90% 37.2

10 mph Pace Speed Number in Pace
 27.6 - 37.6
 10727 (79.9%)
 Average Minimum Maximum
 31.4 mph 5.0 mph 87.6 mph

Speeds Exceeded
 25 mph 92.0%
 35 mph 21.6%
 45 mph 0.5%
 Count 12345 2904 61

Location: :
 City, State: :
 Speed Limit: :

ACTON RD north of LAKELAND TRAIL
 BIRMINGHAM, AL
 35 mph

Date: 4/6/2016
 Wednesday

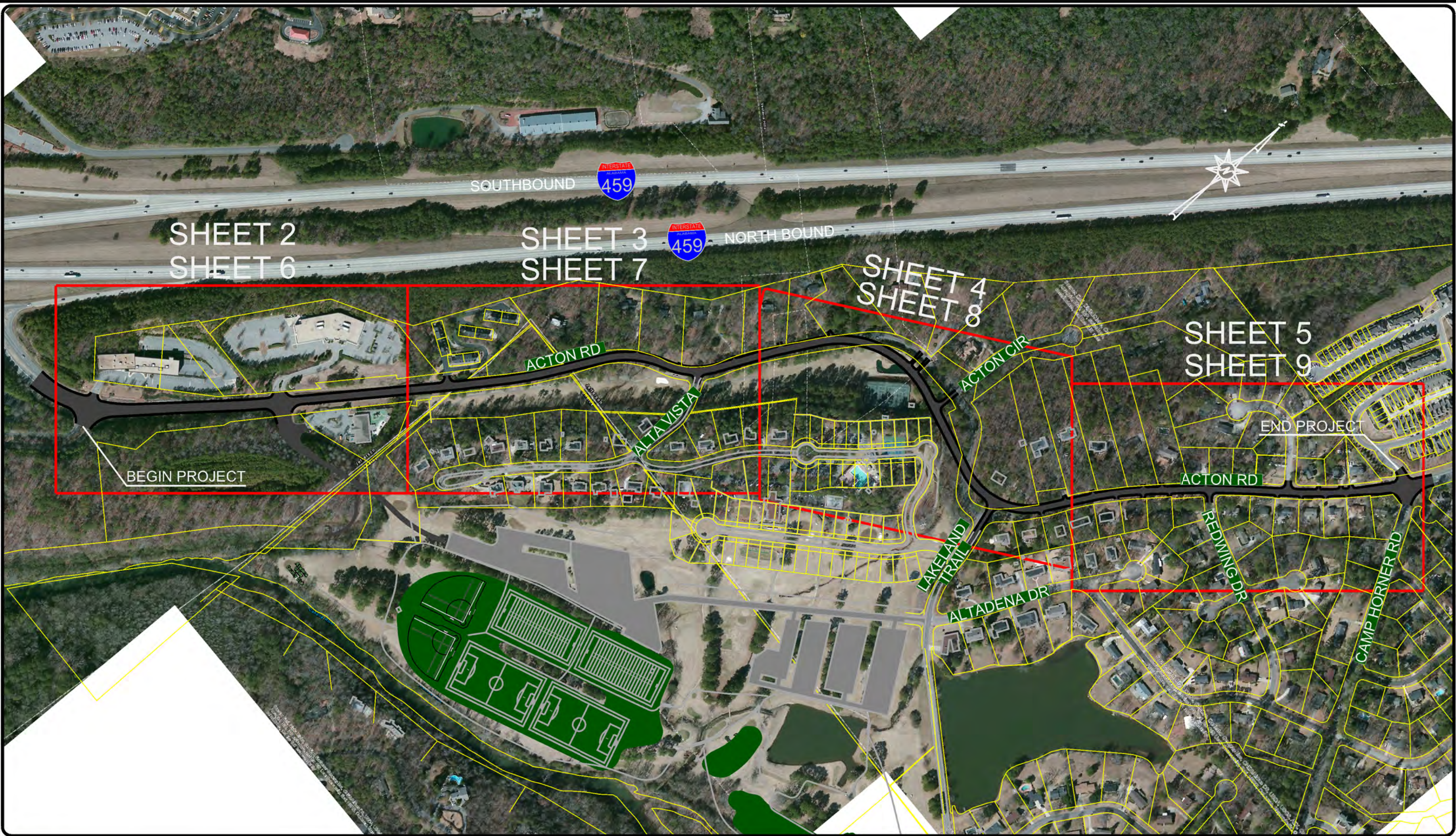
TRAFFIC DATA, LLC
 1409 Turnham Lane, Birmingham, AL 35216
 205-824-0125

24 Hour Vehicle Classification
 Combined Channels

Time	Total	Bike	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	
6:00 AM	490	0	369	94	9	12	2	0	3	1	0	0	0	0	
7:00 AM	1144	1	805	194	47	38	2	0	39	4	0	2	0	12	
8:00 AM	1030	3	753	162	39	39	2	0	25	1	0	2	0	4	
9:00 AM	727	3	533	153	9	21	2	0	6	0	0	0	0	0	
10:00 AM	655	1	478	141	4	26	2	0	3	0	0	0	0	0	
11:00 AM	781	4	584	153	14	21	1	0	3	1	0	0	0	0	
12:00 PM	853	1	640	168	17	19	2	0	5	0	1	0	0	0	
1:00 PM	767	3	609	117	9	19	1	0	7	2	0	0	0	0	
2:00 PM	830	3	598	176	11	35	1	0	5	1	0	0	0	0	
3:00 PM	1064	6	767	191	26	48	6	1	18	0	0	0	0	1	
4:00 PM	1266	8	941	224	24	29	1	0	33	4	0	0	0	2	
5:00 PM	1248	1	973	177	40	23	1	0	26	0	0	4	0	3	
6:00 PM	1001	2	785	174	12	17	2	0	7	0	0	2	0	0	
7:00 PM	531	0	437	84	2	6	0	0	2	0	0	0	0	0	
8:00 PM	449	0	364	77	0	7	0	0	0	1	0	0	0	0	
9:00 PM	236	0	204	28	0	3	0	0	1	0	0	0	0	0	
10:00 PM	84	0	71	13	0	0	0	0	0	0	0	0	0	0	
11:00 PM	55	0	49	6	0	0	0	0	0	0	0	0	0	0	
4/7/2016															
12:00 AM	34	0	29	5	0	0	0	0	0	0	0	0	0	0	
1:00 AM	12	0	10	2	0	0	0	0	0	0	0	0	0	0	
2:00 AM	15	0	11	4	0	0	0	0	0	0	0	0	0	0	
3:00 AM	8	0	5	2	0	0	0	0	0	1	0	0	0	0	
4:00 AM	21	0	16	5	0	0	0	0	0	0	0	0	0	0	
5:00 AM	119	0	90	27	0	1	1	0	0	0	0	0	0	0	
Total	13420	36	10121	2377	263	364	26	1	183	16	1	10	0	22	
%		0.3	75.4	17.7	2.0	2.7	0.2	0.0	1.4	0.1	0.0	0.1	0.0	0.2	

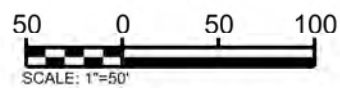
Appendix B Alternatives

1.) Realignment





MATCHLINE SEE SHEET 3



Note: This map is for presentation use only and not to be used for construction purposes.

- CURB & GUTTER
- SIDEWALK
- GRASS MEDIAN

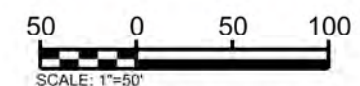
LEGEND

- CONCRETE ISLAND
- EX TRAFFIC SIGNAL
- PROPERTY LINE
- DEVELOPMENT BY OTHERS



MATCHLINE SEE SHEET 2

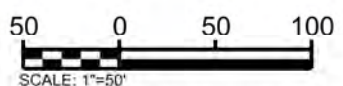
MATCHLINE SEE SHEET 4



Note: This map is for presentation use only and not to be used for construction purposes.

LEGEND					
	CURB & GUTTER		CONCRETE ISLAND		DEVELOPMENT BY OTHERS
	SIDEWALK		EX TRAFFIC SIGNAL		
	GRASS MEDIAN		PROPERTY LINE		

ACTON ROAD
ACCESS IMPROVEMENT STUDY
VESTAVIA HILLS, AL
MARCH 14, 2017



Note: This map is for presentation use only and not to be used for construction purposes.

- CURB & GUTTER
- SIDEWALK
- GRASS MEDIAN

LEGEND

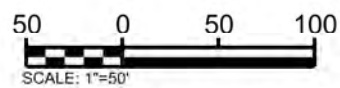
- CONCRETE ISLAND
- EX TRAFFIC SIGNAL
- PROPERTY LINE
- DEVELOPMENT BY OTHERS

**ACTON ROAD
ACCESS IMPROVEMENT STUDY
VESTAVIA HILLS, AL
MARCH 14, 2017**

MATCHLINE SEE SHEET 4



VOLKERT



Note: This map is for presentation use only and not to be used for construction purposes.

- CURB & GUTTER
- SIDEWALK
- GRASS MEDIAN

LEGEND

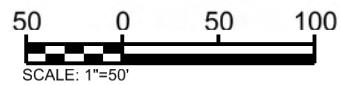
- CONCRETE ISLAND
- ● ● EX TRAFFIC SIGNAL
- PROPERTY LINE
- DEVELOPMENT BY OTHERS

ACTON ROAD
 ACCESS IMPROVEMENT STUDY
 VESTAVIA HILLS, AL
 MARCH 14, 2017



MATCHLINE SEE SHEET 7

VOLKERT



Note: This map is for presentation use only and not to be used for construction purposes.

LEGEND

- - - - - SANITARY SEWER
- - - - - WATER
- - - - - OVERHEAD ELECTRIC

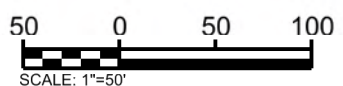
**ACTON ROAD
ACCESS IMPROVEMENT STUDY
VESTAVIA HILLS, AL
MARCH 14, 2017**

MATCHLINE SEE SHEET 6

MATCHLINE SEE SHEET 8



VOLKERT



Note: This map is for presentation use only and not to be used for construction purposes.

LEGEND

- - - - - SANITARY SEWER
- - - - - WATER
- - - - - OVERHEAD ELECTRIC

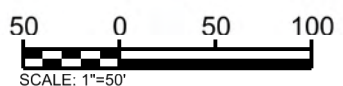
**ACTON ROAD
ACCESS IMPROVEMENT STUDY
VESTAVIA HILLS, AL
MARCH 14, 2017**



MATCHLINE SEE SHEET 7

MATCHLINE SEE SHEET 9

VOLKERT



Note: This map is for presentation use only and not to be used for construction purposes.

LEGEND

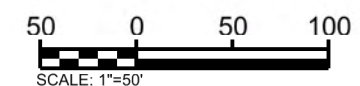
- - - - - SANITARY SEWER
- - - - - WATER
- - - - - OVERHEAD ELECTRIC

**ACTON ROAD
ACCESS IMPROVEMENT STUDY
VESTAVIA HILLS, AL
MARCH 14, 2017**

MATCHLINE SEE SHEET 8



VOLKERT



Note: This map is for presentation use only and not to be used for construction purposes.

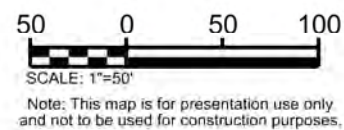
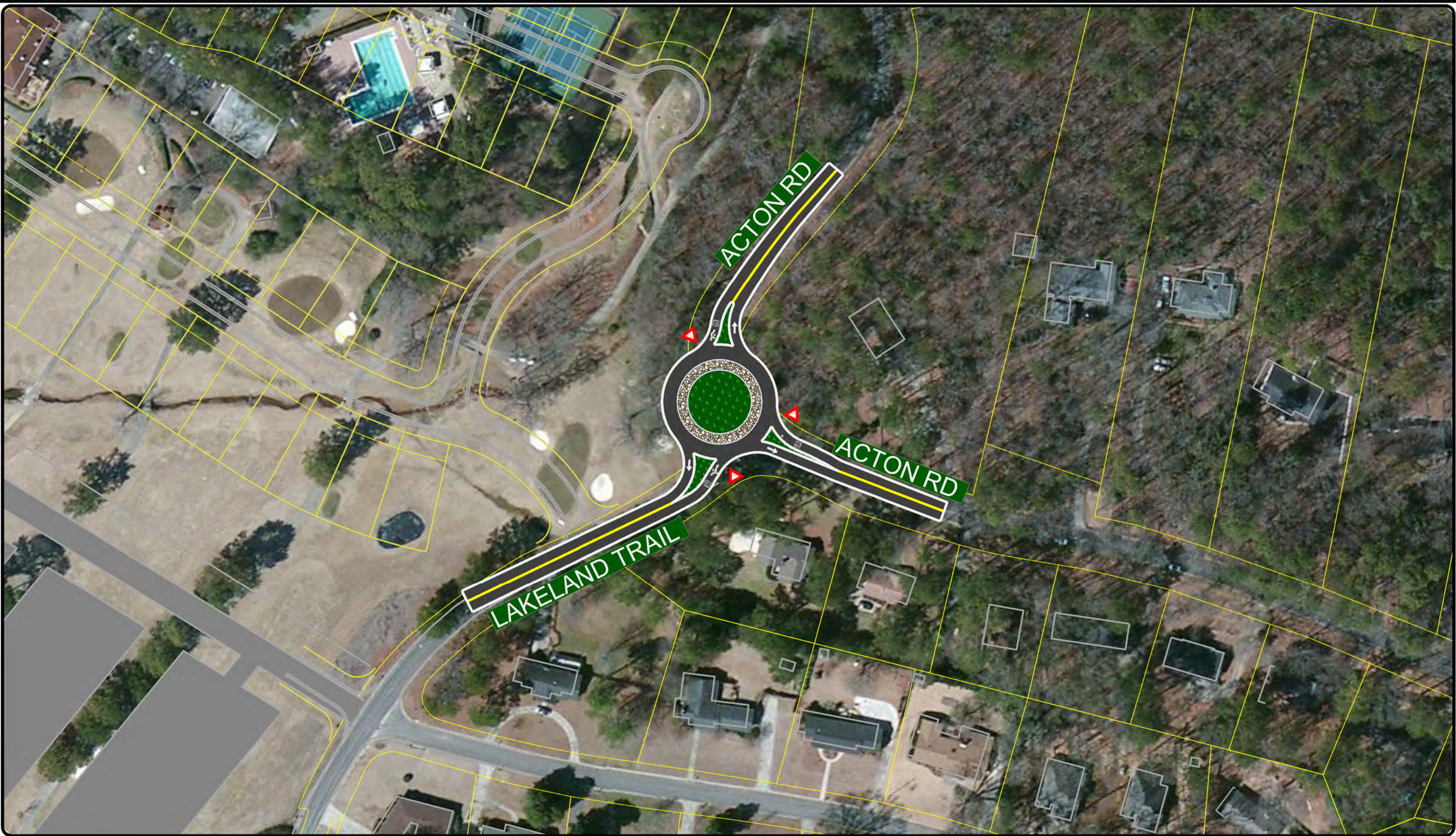
LEGEND

- - - - - SANITARY SEWER
- - - - - WATER
- - - - - OVERHEAD ELECTRIC

**ACTON ROAD
ACCESS IMPROVEMENT STUDY
VESTAVIA HILLS, AL
MARCH 14, 2017**

2.) Southern Expansion

3.) Roundabout



- CURB & GUTTER
- SIDEWALK
- GRASS MEDIAN

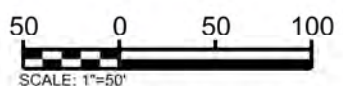
LEGEND

- CONCRETE ISLAND
- EX TRAFFIC SIGNAL
- PROPERTY LINE
- DEVELOPMENT BY OTHERS
- TRUCK APRON

4.) Camp Horner Intersection



Source: Esri, D
Aerogrid, IGN,
contributors, e



Note: This map is for presentation use only and not to be used for construction purposes.

- CURB & GUTTER
- SIDEWALK
- GRASS MEDIAN

LEGEND

- CONCRETE ISLAND
- EX TRAFFIC SIGNAL
- PROPERTY LINE
- DEVELOPMENT BY OTHERS
- RETAINING WALL

Appendix C
2016 Intersection Reports

1.) No Build

Intersection

Int Delay, s/veh 11

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	875	8	45	793	55	45
Future Vol, veh/h	875	8	45	793	55	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	951	9	49	862	60	49

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1915
Stage 1	-	-	955
Stage 2	-	-	960
Critical Hdwy	-	4.12	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.518
Pot Cap-1 Maneuver	-	717	74
Stage 1	-	-	374
Stage 2	-	-	372
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	717	64
Mov Cap-2 Maneuver	-	-	64
Stage 1	-	-	374
Stage 2	-	-	323

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	194.7
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	100	-	-	717	-
HCM Lane V/C Ratio	1.087	-	-	0.068	-
HCM Control Delay (s)	194.7	-	-	10.4	0
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	7	-	-	0.2	-

Intersection

Int Delay, s/veh 1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	734	6	5	851	20	25
Future Vol, veh/h	734	6	5	851	20	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	798	7	5	925	22	27

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	0	0	804	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	2.218	-
Pot Cap-1 Maneuver	-	-	820	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	820	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-






















Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	36.3
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	163	-	-	820	-
HCM Lane V/C Ratio	0.3	-	-	0.007	-
HCM Control Delay (s)	36.3	-	-	9.4	0
HCM Lane LOS	E	-	-	A	A
HCM 95th %tile Q(veh)	1.2	-	-	0	-

HCM 2010 Signalized Intersection Summary (AM Peak)

22: Acton Road & Camp Horner Road






















8/16/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	27	6	253	8	366	20	471	531	670	449	5
Future Volume (veh/h)	8	27	6	253	8	366	20	471	531	670	449	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	9	29	0	275	9	0	22	512	0	728	488	5
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	12	38	43	284	9	261	343	609	518	751	1320	14
Arrive On Green	0.03	0.03	0.00	0.16	0.16	0.00	0.33	0.33	0.00	0.36	0.72	0.72
Sat Flow, veh/h	436	1405	1583	1720	56	1583	900	1863	1583	1774	1841	19
Grp Volume(v), veh/h	38	0	0	284	0	0	22	512	0	728	0	493
Grp Sat Flow(s),veh/h/ln	1841	0	1583	1777	0	1583	900	1863	1583	1774	0	1859
Q Serve(g_s), s	3.0	0.0	0.0	23.6	0.0	0.0	2.5	37.9	0.0	50.2	0.0	15.2
Cycle Q Clear(g_c), s	3.0	0.0	0.0	23.6	0.0	0.0	2.5	37.9	0.0	50.2	0.0	15.2
Prop In Lane	0.24		1.00	0.97		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	50	0	43	293	0	261	343	609	518	751	0	1334
V/C Ratio(X)	0.77	0.00	0.00	0.97	0.00	0.00	0.06	0.84	0.00	0.97	0.00	0.37
Avail Cap(c_a), veh/h	68	0	59	293	0	261	343	609	518	787	0	1334
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	71.8	0.0	0.0	61.6	0.0	0.0	34.5	46.4	0.0	35.3	0.0	8.1
Incr Delay (d2), s/veh	28.7	0.0	0.0	43.9	0.0	0.0	0.4	13.2	0.0	24.4	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	0.0	15.2	0.0	0.0	0.7	21.7	0.0	34.2	0.0	8.0
LnGrp Delay(d),s/veh	100.5	0.0	0.0	105.5	0.0	0.0	34.8	59.5	0.0	59.7	0.0	8.9
LnGrp LOS	F			F			C	E		E		A
Approach Vol, veh/h		38			284			534			1221	
Approach Delay, s/veh		100.5			105.5			58.5			39.2	
Approach LOS		F			F			E			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	57.9	53.1		8.5		111.0		29.0				
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s	56.5	45.5		5.5		106.5		24.5				
Max Q Clear Time (g_c+l1), s	52.2	39.9		5.0		17.2		25.6				
Green Ext Time (p_c), s	1.2	3.0		0.0		8.7		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			54.3									
HCM 2010 LOS			D									

HCM 2010 Signalized Intersection Summary (PM Peak)

22: Acton Road & Camp Horner Road












8/15/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	40	25	425	10	700	8	375	320	300	340	10
Future Volume (veh/h)	15	40	25	425	10	700	8	375	320	300	340	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	16	43	0	462	11	0	9	408	0	326	370	11
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	21	57	68	511	12	466	418	646	549	473	950	28
Arrive On Green	0.04	0.04	0.00	0.29	0.29	0.00	0.35	0.35	0.00	0.14	0.53	0.53
Sat Flow, veh/h	498	1339	1583	1735	41	1583	998	1863	1583	1774	1800	54
Grp Volume(v), veh/h	59	0	0	473	0	0	9	408	0	326	0	381
Grp Sat Flow(s),veh/h/ln	1838	0	1583	1776	0	1583	998	1863	1583	1774	0	1853
Q Serve(g_s), s	3.2	0.0	0.0	25.7	0.0	0.0	0.6	18.4	0.0	11.2	0.0	12.3
Cycle Q Clear(g_c), s	3.2	0.0	0.0	25.7	0.0	0.0	0.6	18.4	0.0	11.2	0.0	12.3
Prop In Lane	0.27		1.00	0.98		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	79	0	68	523	0	466	418	646	549	473	0	979
V/C Ratio(X)	0.75	0.00	0.00	0.90	0.00	0.00	0.02	0.63	0.00	0.69	0.00	0.39
Avail Cap(c_a), veh/h	330	0	284	628	0	560	418	646	549	558	0	979
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	47.5	0.0	0.0	34.0	0.0	0.0	21.6	27.4	0.0	18.3	0.0	14.1
Incr Delay (d2), s/veh	13.1	0.0	0.0	14.8	0.0	0.0	0.1	4.7	0.0	2.9	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	0.0	14.8	0.0	0.0	0.2	10.2	0.0	5.8	0.0	6.6
LnGrp Delay(d),s/veh	60.6	0.0	0.0	48.8	0.0	0.0	21.7	32.1	0.0	21.2	0.0	15.2
LnGrp LOS	E			D			C	C		C		B
Approach Vol, veh/h		59			473			417			707	
Approach Delay, s/veh		60.6			48.8			31.9			18.0	
Approach LOS		E			D			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	18.2	39.3		8.8		57.5		34.1				
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s	18.5	30.0		18.0		53.0		35.5				
Max Q Clear Time (g_c+I1), s	13.2	20.4		5.2		14.3		27.7				
Green Ext Time (p_c), s	0.5	3.5		0.2		5.8		1.9				
Intersection Summary												
HCM 2010 Ctrl Delay			31.8									
HCM 2010 LOS			C									

2.) Build












HCM 2010 Signalized Intersection Summary (AM Peak)
 18: Lakeland Trail & Acton Road

8/16/2016

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	875	8	45	793	55	45		
Future Volume (veh/h)	875	8	45	793	55	45		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863		
Adj Flow Rate, veh/h	951	9	49	862	60	0		
Adj No. of Lanes	1	0	1	1	1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	1408	13	420	1423	149	133		
Arrive On Green	0.76	0.76	0.76	0.76	0.08	0.00		
Sat Flow, veh/h	1842	17	583	1863	1774	1583		
Grp Volume(v), veh/h	0	960	49	862	60	0		
Grp Sat Flow(s),veh/h/ln	0	1860	583	1863	1774	1583		
Q Serve(g_s), s	0.0	14.9	2.7	12.1	1.9	0.0		
Cycle Q Clear(g_c), s	0.0	14.9	17.6	12.1	1.9	0.0		
Prop In Lane		0.01	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	0	1421	420	1423	149	133		
V/C Ratio(X)	0.00	0.68	0.12	0.61	0.40	0.00		
Avail Cap(c_a), veh/h	0	2460	745	2464	374	334		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00		
Uniform Delay (d), s/veh	0.0	3.4	7.7	3.1	25.8	0.0		
Incr Delay (d2), s/veh	0.0	0.6	0.1	0.4	1.7	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	7.4	0.4	6.2	1.0	0.0		
LnGrp Delay(d),s/veh	0.0	4.0	7.8	3.5	27.5	0.0		
LnGrp LOS		A	A	A	C			
Approach Vol, veh/h	960			911	60			
Approach Delay, s/veh	4.0			3.7	27.5			
Approach LOS	A			A	C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4				8
Phs Duration (G+Y+Rc), s		9.5		49.8				49.8
Change Period (Y+Rc), s		4.5		4.5				4.5
Max Green Setting (Gmax), s		12.5		78.5				78.5
Max Q Clear Time (g_c+l1), s		3.9		16.9				19.6
Green Ext Time (p_c), s		0.1		26.2				25.7
Intersection Summary								
HCM 2010 Ctrl Delay			4.6					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary (PM Peak)
 18: Lakeland Trail & Acton Road






















8/16/2016

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	734	6	5	851	20	25		
Future Volume (veh/h)	734	6	5	851	20	25		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863		
Adj Flow Rate, veh/h	798	7	5	925	22	0		
Adj No. of Lanes	1	0	1	1	1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	1363	12	498	1377	165	148		
Arrive On Green	0.74	0.74	0.74	0.74	0.09	0.00		
Sat Flow, veh/h	1844	16	674	1863	1774	1583		
Grp Volume(v), veh/h	0	805	5	925	22	0		
Grp Sat Flow(s),veh/h/ln	0	1860	674	1863	1774	1583		
Q Serve(g_s), s	0.0	10.7	0.2	13.8	0.6	0.0		
Cycle Q Clear(g_c), s	0.0	10.7	10.9	13.8	0.6	0.0		
Prop In Lane		0.01	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	0	1374	498	1377	165	148		
V/C Ratio(X)	0.00	0.59	0.01	0.67	0.13	0.00		
Avail Cap(c_a), veh/h	0	3554	1288	3560	281	251		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00		
Uniform Delay (d), s/veh	0.0	3.2	5.7	3.6	22.3	0.0		
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.6	0.4	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	5.3	0.0	6.9	0.3	0.0		
LnGrp Delay(d),s/veh	0.0	3.6	5.7	4.2	22.7	0.0		
LnGrp LOS		A	A	A	C			
Approach Vol, veh/h	805			930	22			
Approach Delay, s/veh	3.6			4.2	22.7			
Approach LOS	A			A	C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4				8
Phs Duration (G+Y+Rc), s		9.5		44.1				44.1
Change Period (Y+Rc), s		4.5		4.5				4.5
Max Green Setting (Gmax), s		8.5		102.5				102.5
Max Q Clear Time (g_c+l1), s		2.6		12.7				15.8
Green Ext Time (p_c), s		0.0		23.9				23.8
Intersection Summary								
HCM 2010 Ctrl Delay			4.2					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary (AM Peak)

22: Acton Road & Camp Horner Road






















8/16/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	27	6	253	8	366	20	471	531	670	449	5
Future Volume (veh/h)	8	27	6	253	8	366	20	471	531	670	449	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	9	29	0	275	9	0	22	512	0	728	488	5
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	2	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	14	44	50	316	10	291	354	825	701	1110	1218	12
Arrive On Green	0.03	0.03	0.00	0.18	0.18	0.00	0.44	0.44	0.00	0.18	0.66	0.66
Sat Flow, veh/h	436	1405	1583	1720	56	1583	900	1863	1583	3442	1841	19
Grp Volume(v), veh/h	38	0	0	284	0	0	22	512	0	728	0	493
Grp Sat Flow(s),veh/h/ln	1841	0	1583	1777	0	1583	900	1863	1583	1721	0	1859
Q Serve(g_s), s	2.2	0.0	0.0	17.0	0.0	0.0	1.9	23.1	0.0	4.1	0.0	13.4
Cycle Q Clear(g_c), s	2.2	0.0	0.0	17.0	0.0	0.0	15.2	23.1	0.0	4.1	0.0	13.4
Prop In Lane	0.24		1.00	0.97		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	58	0	50	326	0	291	354	825	701	1110	0	1231
V/C Ratio(X)	0.66	0.00	0.00	0.87	0.00	0.00	0.06	0.62	0.00	0.66	0.00	0.40
Avail Cap(c_a), veh/h	92	0	79	462	0	412	354	825	701	1110	0	1231
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	52.5	0.0	0.0	43.4	0.0	0.0	25.9	23.5	0.0	31.4	0.0	8.5
Incr Delay (d2), s/veh	12.1	0.0	0.0	12.1	0.0	0.0	0.3	3.5	0.0	1.4	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	0.0	9.5	0.0	0.0	0.5	12.6	0.0	9.6	0.0	7.2
LnGrp Delay(d),s/veh	64.6	0.0	0.0	55.5	0.0	0.0	26.2	27.0	0.0	32.8	0.0	9.5
LnGrp LOS	E			E			C	C		C		A
Approach Vol, veh/h		38			284			534			1221	
Approach Delay, s/veh		64.6			55.5			26.9			23.4	
Approach LOS		E			E			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	24.0	53.0		7.9		77.0		24.6				
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s	19.5	48.5		5.5		72.5		28.5				
Max Q Clear Time (g_c+l1), s	6.1	25.1		4.2		15.4		19.0				
Green Ext Time (p_c), s	5.2	3.6		0.0		7.3		1.1				
Intersection Summary												
HCM 2010 Ctrl Delay			29.5									
HCM 2010 LOS			C									

HCM 2010 Signalized Intersection Summary (PM Peak)

22: Acton Road & Camp Horner Road

8/16/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	40	25	425	10	700	8	375	320	300	340	10
Future Volume (veh/h)	15	40	25	425	10	700	8	375	320	300	340	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	16	43	0	462	11	0	9	408	0	326	370	11
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	2	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	21	56	66	522	12	477	437	685	582	397	948	28
Arrive On Green	0.04	0.04	0.00	0.30	0.30	0.00	0.37	0.37	0.00	0.12	0.53	0.53
Sat Flow, veh/h	498	1339	1583	1735	41	1583	998	1863	1583	3442	1800	54
Grp Volume(v), veh/h	59	0	0	473	0	0	9	408	0	326	0	381
Grp Sat Flow(s),veh/h/ln	1838	0	1583	1776	0	1583	998	1863	1583	1721	0	1853
Q Serve(g_s), s	3.3	0.0	0.0	26.3	0.0	0.0	0.6	18.3	0.0	9.6	0.0	12.7
Cycle Q Clear(g_c), s	3.3	0.0	0.0	26.3	0.0	0.0	0.6	18.3	0.0	9.6	0.0	12.7
Prop In Lane	0.27		1.00	0.98		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	77	0	66	535	0	477	437	685	582	397	0	976
V/C Ratio(X)	0.77	0.00	0.00	0.88	0.00	0.00	0.02	0.60	0.00	0.82	0.00	0.39
Avail Cap(c_a), veh/h	115	0	99	781	0	696	437	685	582	486	0	976
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	49.1	0.0	0.0	34.5	0.0	0.0	20.9	26.5	0.0	44.7	0.0	14.6
Incr Delay (d2), s/veh	15.6	0.0	0.0	8.5	0.0	0.0	0.1	3.8	0.0	9.1	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.0	0.0	14.1	0.0	0.0	0.2	10.1	0.0	5.1	0.0	6.8
LnGrp Delay(d),s/veh	64.7	0.0	0.0	42.9	0.0	0.0	20.9	30.3	0.0	53.8	0.0	15.8
LnGrp LOS	E			D			C	C		D		B
Approach Vol, veh/h		59			473			417			707	
Approach Delay, s/veh		64.7			42.9			30.1			33.3	
Approach LOS		E			D			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	16.4	42.6		8.8		59.0		35.6				
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s	14.6	35.4		6.5		54.5		45.5				
Max Q Clear Time (g_c+I1), s	11.6	20.3		5.3		14.7		28.3				
Green Ext Time (p_c), s	0.4	4.5		0.0		5.8		2.9				
Intersection Summary												
HCM 2010 Ctrl Delay			36.4									
HCM 2010 LOS			D									

Appendix D
2036 Intersection Reports

1.) No Build

HCM 2010 TWSC (AM Peak)
 18: Lakeland Trail & Acton Road

8/15/2016

Intersection

Int Delay, s/veh 82.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	875	8	45	793	55	45
Future Vol, veh/h	875	8	45	793	55	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1236	11	64	1121	78	64

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1248
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	558
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	558
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	\$ 1491.3
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	37	-	-	558	-
HCM Lane V/C Ratio	3.819	-	-	0.114	-
HCM Control Delay (s)	\$ 1491.3	-	-	12.3	0
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	16.3	-	-	0.4	-

Notes

-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 3.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	734	6	5	851	20	25
Future Vol, veh/h	734	6	5	851	20	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1037	8	7	1203	28	35

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	0	0	1046	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	2.218	-
Pot Cap-1 Maneuver	-	-	665	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	665	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-






















Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	128.9
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	83	-	-	665	-
HCM Lane V/C Ratio	0.766	-	-	0.011	-
HCM Control Delay (s)	128.9	-	-	10.5	0
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	3.8	-	-	0	-

HCM 2010 Signalized Intersection Summary (AM Peak)

22: Acton Road & Camp Horner Road






















8/15/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	27	6	253	8	366	20	471	531	670	449	5
Future Volume (veh/h)	8	27	6	253	8	366	20	471	531	670	449	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	11	38	0	358	11	0	28	666	0	947	634	7
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	15	50	56	321	10	295	288	558	474	668	1250	14
Arrive On Green	0.04	0.04	0.00	0.19	0.19	0.00	0.30	0.30	0.00	0.35	0.68	0.68
Sat Flow, veh/h	414	1429	1583	1724	53	1583	785	1863	1583	1774	1839	20
Grp Volume(v), veh/h	49	0	0	369	0	0	28	666	0	947	0	641
Grp Sat Flow(s),veh/h/ln	1842	0	1583	1777	0	1583	785	1863	1583	1774	0	1859
Q Serve(g_s), s	3.6	0.0	0.0	25.5	0.0	0.0	3.5	41.0	0.0	47.5	0.0	23.1
Cycle Q Clear(g_c), s	3.6	0.0	0.0	25.5	0.0	0.0	3.5	41.0	0.0	47.5	0.0	23.1
Prop In Lane	0.22		1.00	0.97		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	65	0	56	331	0	295	288	558	474	668	0	1264
V/C Ratio(X)	0.75	0.00	0.00	1.11	0.00	0.00	0.10	1.19	0.00	1.42	0.00	0.51
Avail Cap(c_a), veh/h	242	0	208	331	0	295	288	558	474	668	0	1264
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	65.4	0.0	0.0	55.7	0.0	0.0	34.8	47.9	0.0	39.1	0.0	10.7
Incr Delay (d2), s/veh	16.0	0.0	0.0	84.0	0.0	0.0	0.7	103.7	0.0	196.3	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	0.0	0.0	20.1	0.0	0.0	0.8	37.0	0.0	61.5	0.0	12.3
LnGrp Delay(d),s/veh	81.4	0.0	0.0	139.7	0.0	0.0	35.5	151.6	0.0	235.4	0.0	12.2
LnGrp LOS	F			F			D	F		F		B
Approach Vol, veh/h		49			369			694			1588	
Approach Delay, s/veh		81.4			139.7			146.9			145.3	
Approach LOS		F			F			F			F	
Timer	1	2	3	4	5	6						

HCM 2010 Signalized Intersection Summary (PM Peak)

22: Acton Road & Camp Horner Road













8/15/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	40	25	425	10	700	8	375	320	300	340	10
Future Volume (veh/h)	15	40	25	425	10	700	8	375	320	300	340	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	21	57	0	601	14	0	11	530	0	424	480	14
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	28	76	89	570	13	520	316	517	439	370	883	26
Arrive On Green	0.06	0.06	0.00	0.33	0.33	0.00	0.28	0.28	0.00	0.17	0.49	0.49
Sat Flow, veh/h	495	1343	1583	1736	40	1583	899	1863	1583	1774	1801	53
Grp Volume(v), veh/h	78	0	0	615	0	0	11	530	0	424	0	494
Grp Sat Flow(s),veh/h/ln	1838	0	1583	1776	0	1583	899	1863	1583	1774	0	1853
Q Serve(g_s), s	4.5	0.0	0.0	35.5	0.0	0.0	1.0	30.0	0.0	18.5	0.0	20.0
Cycle Q Clear(g_c), s	4.5	0.0	0.0	35.5	0.0	0.0	1.0	30.0	0.0	18.5	0.0	20.0
Prop In Lane	0.27		1.00	0.98		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	103	0	89	583	0	520	316	517	439	370	0	909
V/C Ratio(X)	0.75	0.00	0.00	1.05	0.00	0.00	0.03	1.03	0.00	1.15	0.00	0.54
Avail Cap(c_a), veh/h	306	0	264	583	0	520	316	517	439	370	0	909
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	50.3	0.0	0.0	36.3	0.0	0.0	28.6	39.0	0.0	32.8	0.0	19.1
Incr Delay (d2), s/veh	10.5	0.0	0.0	52.4	0.0	0.0	0.2	46.1	0.0	92.4	0.0	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	0.0	0.0	25.8	0.0	0.0	0.3	22.0	0.0	20.5	0.0	10.7
LnGrp Delay(d),s/veh	60.8	0.0	0.0	88.7	0.0	0.0	28.8	85.2	0.0	125.2	0.0	21.5
LnGrp LOS	E			F			C	F		F		C
Approach Vol, veh/h		78			615			541			918	
Approach Delay, s/veh		60.8			88.7			84.0			69.4	
Approach LOS		E			F			F			E	
Timer	1	2	3	4	5	6	7	8				

2.) Build












HCM 2010 Signalized Intersection Summary (AM Peak)
 18: Lakeland Trail & Acton Road

8/16/2016

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	875	8	45	793	55	45		
Future Volume (veh/h)	875	8	45	793	55	45		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863		
Adj Flow Rate, veh/h	1236	11	64	1121	78	0		
Adj No. of Lanes	1	0	1	1	1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	1558	14	308	1574	114	101		
Arrive On Green	0.84	0.84	0.84	0.84	0.06	0.00		
Sat Flow, veh/h	1843	16	444	1863	1774	1583		
Grp Volume(v), veh/h	0	1247	64	1121	78	0		
Grp Sat Flow(s),veh/h/ln	0	1860	444	1863	1774	1583		
Q Serve(g_s), s	0.0	31.2	7.8	23.2	4.3	0.0		
Cycle Q Clear(g_c), s	0.0	31.2	39.1	23.2	4.3	0.0		
Prop In Lane		0.01	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	0	1572	308	1574	114	101		
V/C Ratio(X)	0.00	0.79	0.21	0.71	0.69	0.00		
Avail Cap(c_a), veh/h	0	1832	370	1835	251	224		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00		
Uniform Delay (d), s/veh	0.0	3.6	12.8	3.0	45.3	0.0		
Incr Delay (d2), s/veh	0.0	2.1	0.3	1.1	7.1	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	16.2	1.0	12.0	2.3	0.0		
LnGrp Delay(d),s/veh	0.0	5.8	13.1	4.1	52.5	0.0		
LnGrp LOS		A	B	A	D			
Approach Vol, veh/h	1247			1185	78			
Approach Delay, s/veh	5.8			4.6	52.5			
Approach LOS	A			A	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4				8
Phs Duration (G+Y+Rc), s		10.8		88.1				88.1
Change Period (Y+Rc), s		4.5		4.5				4.5
Max Green Setting (Gmax), s		14.0		97.5				97.5
Max Q Clear Time (g_c+l1), s		6.3		33.2				41.1
Green Ext Time (p_c), s		0.1		46.9				42.6
Intersection Summary								
HCM 2010 Ctrl Delay			6.6					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary (PM Peak)
 18: Lakeland Trail & Acton Road






















8/16/2016

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	734	6	5	851	20	25		
Future Volume (veh/h)	734	6	5	851	20	25		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1900	1863	1863	1863	1863		
Adj Flow Rate, veh/h	1037	8	7	1202	28	0		
Adj No. of Lanes	1	0	1	1	1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	1547	12	422	1561	103	92		
Arrive On Green	0.84	0.84	0.84	0.84	0.06	0.00		
Sat Flow, veh/h	1846	14	538	1863	1774	1583		
Grp Volume(v), veh/h	0	1045	7	1202	28	0		
Grp Sat Flow(s),veh/h/ln	0	1860	538	1863	1774	1583		
Q Serve(g_s), s	0.0	17.9	0.4	25.5	1.3	0.0		
Cycle Q Clear(g_c), s	0.0	17.9	18.4	25.5	1.3	0.0		
Prop In Lane		0.01	1.00		1.00	1.00		
Lane Grp Cap(c), veh/h	0	1559	422	1561	103	92		
V/C Ratio(X)	0.00	0.67	0.02	0.77	0.27	0.00		
Avail Cap(c_a), veh/h	0	2227	616	2230	154	137		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00		
Uniform Delay (d), s/veh	0.0	2.6	6.0	3.2	39.0	0.0		
Incr Delay (d2), s/veh	0.0	0.5	0.0	1.1	1.4	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.0	8.9	0.1	12.8	0.7	0.0		
LnGrp Delay(d),s/veh	0.0	3.1	6.0	4.3	40.4	0.0		
LnGrp LOS		A	A	A	D			
Approach Vol, veh/h	1045			1209	28			
Approach Delay, s/veh	3.1			4.3	40.4			
Approach LOS	A			A	D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4				8
Phs Duration (G+Y+Rc), s		9.5		76.9				76.9
Change Period (Y+Rc), s		4.5		4.5				4.5
Max Green Setting (Gmax), s		7.5		103.5				103.5
Max Q Clear Time (g_c+l1), s		3.3		19.9				27.5
Green Ext Time (p_c), s		0.0		47.3				45.0
Intersection Summary								
HCM 2010 Ctrl Delay			4.2					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary (AM Peak)

22: Acton Road & Camp Horner Road






















8/16/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	27	6	253	8	366	20	471	531	670	449	5
Future Volume (veh/h)	8	27	6	253	8	366	20	471	531	670	449	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	11	38	0	358	11	0	28	666	0	947	634	7
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	2	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	14	50	55	365	11	335	187	652	554	989	1177	13
Arrive On Green	0.03	0.03	0.00	0.21	0.21	0.00	0.35	0.35	0.00	0.25	0.64	0.64
Sat Flow, veh/h	414	1429	1583	1724	53	1583	785	1863	1583	3442	1839	20
Grp Volume(v), veh/h	49	0	0	369	0	0	28	666	0	947	0	641
Grp Sat Flow(s),veh/h/ln	1842	0	1583	1777	0	1583	785	1863	1583	1721	0	1859
Q Serve(g_s), s	3.1	0.0	0.0	24.5	0.0	0.0	3.7	41.5	0.0	27.9	0.0	22.5
Cycle Q Clear(g_c), s	3.1	0.0	0.0	24.5	0.0	0.0	26.2	41.5	0.0	27.9	0.0	22.5
Prop In Lane	0.22		1.00	0.97		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	64	0	55	376	0	335	187	652	554	989	0	1190
V/C Ratio(X)	0.77	0.00	0.00	0.98	0.00	0.00	0.15	1.02	0.00	0.96	0.00	0.54
Avail Cap(c_a), veh/h	85	0	73	376	0	335	187	652	554	989	0	1190
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	56.8	0.0	0.0	46.5	0.0	0.0	43.4	38.6	0.0	41.8	0.0	11.7
Incr Delay (d2), s/veh	24.9	0.0	0.0	41.3	0.0	0.0	1.7	40.9	0.0	19.1	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.0	0.0	16.3	0.0	0.0	0.9	28.6	0.0	17.9	0.0	12.0
LnGrp Delay(d),s/veh	81.7	0.0	0.0	87.9	0.0	0.0	45.0	79.5	0.0	61.0	0.0	13.5
LnGrp LOS	F			F			D	F		E		B
Approach Vol, veh/h		49			369			694			1588	
Approach Delay, s/veh		81.7			87.9			78.1			41.8	
Approach LOS		F			F			E			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	34.4	46.0		8.6		80.4		29.6				
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s	29.9	41.5		5.5		75.9		25.1				
Max Q Clear Time (g_c+I1), s	29.9	43.5		5.1		24.5		26.5				
Green Ext Time (p_c), s	0.0	0.0		0.0		11.2		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			58.1									
HCM 2010 LOS			E									

HCM 2010 Signalized Intersection Summary (PM Peak)

22: Acton Road & Camp Horner Road

8/16/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	40	25	425	10	700	8	375	320	300	340	10
Future Volume (veh/h)	15	40	25	425	10	700	8	375	320	300	340	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	21	57	0	601	14	0	11	530	0	424	480	14
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	2	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	21	57	68	652	15	595	314	579	492	451	859	25
Arrive On Green	0.04	0.04	0.00	0.38	0.38	0.00	0.31	0.31	0.00	0.13	0.48	0.48
Sat Flow, veh/h	495	1343	1583	1736	40	1583	899	1863	1583	3442	1801	53
Grp Volume(v), veh/h	78	0	0	615	0	0	11	530	0	424	0	494
Grp Sat Flow(s),veh/h/ln	1838	0	1583	1776	0	1583	899	1863	1583	1721	0	1853
Q Serve(g_s), s	5.5	0.0	0.0	42.6	0.0	0.0	1.1	35.3	0.0	15.7	0.0	24.5
Cycle Q Clear(g_c), s	5.5	0.0	0.0	42.6	0.0	0.0	4.2	35.3	0.0	15.7	0.0	24.5
Prop In Lane	0.27		1.00	0.98		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	78	0	68	667	0	595	314	579	492	451	0	884
V/C Ratio(X)	0.99	0.00	0.00	0.92	0.00	0.00	0.04	0.91	0.00	0.94	0.00	0.56
Avail Cap(c_a), veh/h	78	0	68	820	0	731	314	579	492	451	0	884
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	61.7	0.0	0.0	38.4	0.0	0.0	33.2	42.8	0.0	55.5	0.0	24.0
Incr Delay (d2), s/veh	99.8	0.0	0.0	13.9	0.0	0.0	0.2	21.4	0.0	27.8	0.0	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	0.0	23.4	0.0	0.0	0.3	21.6	0.0	9.2	0.0	13.1
LnGrp Delay(d),s/veh	161.5	0.0	0.0	52.3	0.0	0.0	33.4	64.2	0.0	83.3	0.0	26.6
LnGrp LOS	F			D			C	E		F		C
Approach Vol, veh/h		78			615			541			918	
Approach Delay, s/veh		161.5			52.3			63.5			52.8	
Approach LOS		F			D			E			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	21.4	44.6		10.0		66.0		52.9				
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s	16.9	40.1		5.5		61.5		59.5				
Max Q Clear Time (g_c+I1), s	17.7	37.3		7.5		26.5		44.6				
Green Ext Time (p_c), s	0.0	1.7		0.0		8.2		3.8				
Intersection Summary												
HCM 2010 Ctrl Delay			59.3									
HCM 2010 LOS			E									

Appendix E Cost Estimates

PRELIMINARY COST ESTIMATE

Acton Road - Alternative 1 (w/ path)

Resurfacing, Realignment, and Widening

By: RRV Date: 3/15/2017
Checked By:

SUMMARY OF COSTS

Linear Feet Costs

<u>Item</u>		<u>Cost</u>
Pavement	\$	678,525.00
Earthwork (Input EW cost if calculations are available)	\$	1,151,187.00
Roadway	\$	273,650.00
Subtotal Linear Foot Costs =		\$ 2,103,362.00

Culvert Pipes and Box Culverts	\$	54,950.00
Bridges	\$	-
Misc. Items	\$	80,000.00
Subtotal Other Costs =		\$ 134,950.00

Subtotal Costs = \$ 2,238,312.00

Mobilization (5%)	\$	111,915.60
Engineering Controls (0.5%)	\$	11,191.56
Erosion Control (2%)	\$	44,766.24
Traffic Control (1%)	\$	22,383.12
Utility Relocation Cost (Estimated based upon field review)		
Wetland Mitigation		
RR Cost		
Contingencies (10%)	\$	223,831.20

TOTAL ESTIMATED CONSTRUCTION COSTS = \$ 2,652,399.72

ROW Cost	Approx.	8.4	acres	\$	420,000.00
Survey/ROW Mapping				\$	55,435.15
Environmental Documentation				\$	55,435.15
Engineering				\$	129,171.87
Inspection				\$	184,341.78
Testing				\$	68,697.15
ROW Acquisition				\$	55,435.15

TOTAL ESTIMATED PROJECT COSTS = \$ 3,620,915.97

NOTES

1. This is a preliminary cost estimate based upon conceptual sketches. Detailed design of the roadway was not performed.

PRELIMINARY COST ESTIMATE

Acton Road - Alternative 1 (w/o path)

Resurfacing, Realignment, and Widening

By: RRV Date: 3/15/2017
Checked By:

SUMMARY OF COSTS

Linear Feet Costs

<u>Item</u>	<u>Cost</u>
Pavement	\$ 678,525.00
Earthwork (Input EW cost if calculations are available)	\$ 1,089,366.00
Roadway	\$ 180,650.00
Subtotal Linear Foot Costs =	\$ 1,948,541.00

Culvert Pipes and Box Culverts	\$ 54,950.00
Bridges	\$ -
Misc. Items	\$ 80,000.00
Subtotal Other Costs =	\$ 134,950.00

Subtotal Costs = \$ 2,083,491.00

Mobilization (5%)	\$ 104,174.55
Engineering Controls (0.5%)	\$ 10,417.46
Erosion Control (2%)	\$ 41,669.82
Traffic Control (1%)	\$ 20,834.91
Utility Relocation Cost (Estimated based upon field review)	
Wetland Mitigation	
RR Cost	
Contingencies (10%)	\$ 208,349.10

TOTAL ESTIMATED CONSTRUCTION COSTS = \$ 2,468,936.84

ROW Cost	Approx. 8.4 acres	\$ 420,000.00
Survey/ROW Mapping		\$ 51,600.78
Environmental Documentation		\$ 51,600.78
Engineering		\$ 120,237.22
Inspection		\$ 171,591.11
Testing		\$ 63,945.46
ROW Acquisition		\$ 51,600.78

TOTAL ESTIMATED PROJECT COSTS = \$ 3,399,512.97

NOTES

1. This is a preliminary cost estimate based upon conceptual sketches. Detailed design of the roadway was not performed.

PRELIMINARY COST ESTIMATE

**Acton Road
Roundabout and Approaches Only**

By: RRV Date: 8/12/2016
Checked By:

SUMMARY OF COSTS

Linear Feet Costs

<u>Item</u>		<u>Cost</u>
Pavement	\$	214,050.00
Earthwork (Input EW cost if calculations are available)	\$	138,896.00
Roadway	\$	5,928.00
Subtotal Linear Foot Costs =	\$	358,874.00
Culvert Pipes and Box Culverts	\$	-
Bridges	\$	-
Misc. Items	\$	120,000.00
Subtotal Other Costs =	\$	120,000.00
Subtotal Costs =	\$	478,874.00

Mobilization (5%)	\$	23,943.70
Engineering Controls (0.5%)	\$	2,394.37
Erosion Control (2%)	\$	9,577.48
Traffic Control (1%)	\$	4,788.74
Utility Relocation Cost (Estimated based upon field review)		
Wetland Mitigation		
Contingencies (10%)	\$	47,887.40
TOTAL ESTIMATED CONSTRUCTION COSTS =	\$	567,465.69

ROW Cost		
Survey/ROW Mapping	\$	13,789.42
Environmental Documentation	\$	13,789.42
Engineering	\$	32,118.56
Inspection	\$	45,907.97
Testing	\$	16,626.74
ROW Acquisition	\$	13,789.42
TOTAL ESTIMATED PROJECT COSTS =	\$	703,487.22

NOTES

1. This is a preliminary cost estimate based upon conceptual sketches. Detailed design of the roadway was not performed.

PRELIMINARY COST ESTIMATE

Camp Horner Intersection Improvements

Resurfacing, Realignment, and Widening

By: RRV Date: 3/15/2017
Checked By:

SUMMARY OF COSTS

Linear Feet Costs

<u>Item</u>		<u>Cost</u>
Pavement	\$	118,440.00
Earthwork (Input EW cost if calculations are available)	\$	24,698.20
Roadway	\$	34,383.00
Subtotal Linear Foot Costs =		\$ 177,521.20

Culvert Pipes and Box Culverts	\$	-
Bridges	\$	-
Misc. Items	\$	230,000.00
Subtotal Other Costs =		\$ 230,000.00

Subtotal Costs = \$ 407,521.20

Mobilization (5%)	\$	20,376.06
Engineering Controls (0.5%)	\$	2,037.61
Erosion Control (2%)	\$	8,150.42
Traffic Control (1%)	\$	4,075.21
Utility Relocation Cost (Estimated based upon field review)		
Wetland Mitigation		
RR Cost		
Contingencies (10%)	\$	40,752.12

TOTAL ESTIMATED CONSTRUCTION COSTS = \$ 482,912.62

ROW Cost	Approx.	0.5	acres	\$	25,000.00
Survey/ROW Mapping				\$	12,024.52
Environmental Documentation				\$	12,024.52
Engineering				\$	28,057.22
Inspection				\$	40,081.75
Testing				\$	14,439.09
ROW Acquisition				\$	12,024.52

TOTAL ESTIMATED PROJECT COSTS = \$ 626,564.24

NOTES

1. This is a preliminary cost estimate based upon conceptual sketches. Detailed design of the roadway was not performed.