

FINAL REPORT

Eagle Road and Zaldia Drive Intersection Control Evaluation



August 31, 2018

Eagle Road, Amity to Victory
Project No. 518040
GIS No. RD207-33



Prepared for:
Ada County Highway District



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Contents

Chapter 1	Introduction.....	1
1.1	Project Context.....	1
Chapter 2	Performance Measures	3
2.1	Analysis Years	3
2.2	Vehicle Delay	3
2.3	v/c Ratio	4
2.4	Queue Length.....	5
2.5	Life-cycle Cost	6
2.6	Summary	7
Appendix		A



Chapter 1 Introduction

The Ada County Highway District (ACHD) is currently designing a project to widen Eagle Road in Meridian to five lanes from the Amity Road intersection north one mile to the Victory Road intersection. Right-of-way acquisition for the Eagle Road, Amity to Victory, project is scheduled for year 2020, with construction currently programmed for year 2021.

Zaldia Drive intersects Eagle Road approximately one-third mile north of Amity Road. The intersection currently operates with two-way stop control on Zaldia Drive. The project design team is considering other control types for the intersection, including traffic signals and a roundabout. ACHD retained Six Mile Engineering to conduct this evaluation to quantify performance measures of the intersection options. In coordination with ACHD staff, the performance measures identified for this evaluation are:

- Vehicle delay
- v/c ratio
- Queue length
- Life-cycle cost

Intersection Control Types Evaluated	
Stop Sign (two-way stop for Zaldia Drive)	 two-way
Traffic Signal	
Roundabout	

1.1 Project Context

Zaldia Drive is functionally classified as a collector and connects local residential streets on the east and west sides of Eagle Road. On the east side of Eagle Road, Zaldia Drive is planned to extend to Howry Lane, a north-south collector that intersects Amity Road, and Bott Lane, an east-west collector that intersects Cloverdale Road.

Eagle Road is functionally classified as a minor arterial within the project limits and is currently a two-lane road with intermittent sections of detached sidewalk without curb and gutter. North of Victory Road, Eagle Road is a five-lane roadway with curb, gutter and sidewalk, and south of Amity Road, it is currently a two-lane roadway without curb and gutter. ACHD's master street map identifies Eagle Road as a future five-lane roadway from Lake Hazel Road, which is one mile south of Amity Road, north approximately 3.5 miles to the I-84 interchange.

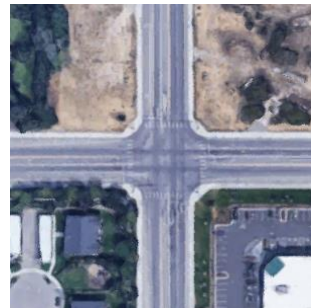
Land use adjacent to the project improvements is predominantly low-density and medium-density residential, with the exception of two locations. A small mixed-use community development with

a Rite-Aid is located on the southeast corner of the Victory Road intersection. A large undeveloped parcel located in the northwest corner of the Amity Road intersection, zoned for mixed-use community, has been approved for an Albertsons and pad sites. An elementary school and a YMCA with a small park have recently been constructed south of Amity Road approximately one-quarter mile east of Eagle Road. The area north of Amity Road served by the future Zaldia Drive and Howry Lane extension is planned for medium-density housing and a middle school.

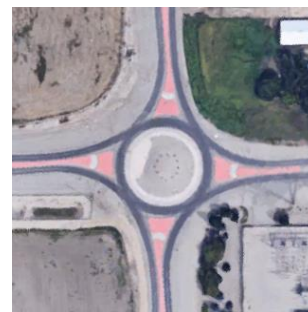
The Eagle Road and Victory Road intersection is currently controlled with a traffic signal and no changes are planned with the project other than minor traffic signal modifications.

The Eagle Road and Amity Road intersection is controlled with a single-lane roundabout that is planned to be widened to a dual-lane roundabout by the developer of the proposed Albertsons commercial site. It is anticipated that construction of the roundabout widening will be concurrent with construction of ACHD's project to widen Eagle Road.

A multi-use pathway currently runs along the Ten Mile Feeder Canal, which is oriented east-west and crosses Eagle Road approximately midway between Amity and Victory Roads. The project plans to construct a pedestrian hybrid beacon with a two-stage crossing of Eagle Road for the multi-use pathway. No other traffic control improvements are included with the project other than changing the two-way stop control at the Zaldia Drive intersection.



Existing Eagle Road and
Victory Road intersection



Existing Eagle Road and
Amity Road intersection

Chapter 2 Performance Measures

The intersection control options at the Eagle Road and Zaldia Drive intersection were evaluated with four performance measures:

- Vehicle delay
- v/c ratios
- Queue lengths
- Life-cycle cost

2.1 Analysis Years

Performance measures for the current two-way stop control at the intersection were calculated with traffic counts from March 2018 to quantify the existing conditions. Performance measures were calculated for each of the three control options for year 2021, the programmed construction year, and year 2041, the design year to estimate future traffic operations.

The year 2021 and year 2041 traffic volumes used for analysis were estimated from annual growth rates calculated from the 2023 and 2040 traffic forecasts from the COMPASS adopted models for peak hour traffic. Demographics in the year 2018, 2025 and 2040 models were reviewed to verify that the approved developments in the intersection area are included in the models. The intersection turning movement volumes were developed from the peak hour approach volumes using the iterative Furness Method (based on *NCHRP Report 765 – Analytical Travel Forecasting Approaches for Project-Level Planning and Design*) with the existing traffic counts used as the initial turning movement percentages. Intersection turning movement volumes are provided in the Appendix.

2.2 Vehicle Delay

Vehicle delay for the intersection was calculated for the two-way stop and traffic signal control options using *Synchro*, which follows the *Highway Capacity Manual 6th Edition* methodology. *SIDRA* methodology was used to calculate roundabout delay, utilizing parameter values from the Washington Department of Transportation's *SIDRA Policy Settings*. The analysis results are summarized below.

Vehicle Delay (average per vehicle in seconds)							
		<u>2018</u>		<u>2021</u>		<u>2041</u>	
		AM	PM	AM	PM	AM	PM
 two-way	Intersection	-	-	-	-	-	-
	Northbound Traffic	0	1	0	1	0	1
	Southbound Traffic	0	0	0	0	1	0
	Eastbound Traffic	30	23	141	202	>300	>300
	Westbound Traffic	16	16	14	21	53	>300
	Intersection			20	12	22	19
	Northbound Traffic			11	7	19	9
	Southbound Traffic	-	-	7	8	10	17
	Eastbound Traffic			89	61	69	70
	Westbound Traffic			93	70	85	80
	Intersection			8	7	8	7
	Northbound Traffic			6	6	6	7
	Southbound Traffic	-	-	7	7	8	7
	Eastbound Traffic			13	13	13	18
	Westbound Traffic			9	9	12	10

The roundabout at the Amity Road intersection is located approximately one-third mile south of the Zaldia Drive intersection. Because of the proximity, the intersection control at the Zaldia Drive intersection will likely affect traffic operations at the Amity Road roundabout. Vehicles arriving at the Amity Road intersection randomly from a nearby roundabout, for example, would have less impact on the roundabout's operations because the random vehicle arrival provides larger and more consistent gaps to allow vehicles from the other approaches to enter the roundabout. In contrast, vehicles arriving from a nearby traffic signal would arrive in groups or platoons that would reduce gaps while the platoon vehicles travel through the roundabout. Quantifying the traffic impact of vehicle arrival types is best accomplished with a microsimulation model, which is beyond the scope of this evaluation. Qualitatively, the roundabout and two-way stop control options (because the platoon from the signalized Victory Road intersection would be dispersed) would have less impact on the Amity Road roundabout's operations.

2.3 v/c Ratio

The v/c ratio performance measures the demand volume of a vehicle movement relative to the capacity. When the v/c ratio reaches 1.0, the vehicle movement is at its capacity. The following table lists the maximum v/c ratio of a vehicle movement per approach. Typically, the maximum v/c ratio occurs for turning movements.

v/c ratio (maximum volume/capacity per approach)		<u>2018</u>		<u>2021</u>		<u>2041</u>	
		AM	PM	AM	PM	AM	PM
 two-way	Northbound Traffic	0.01	0.03	0.02	0.05	0.03	0.19
	Southbound Traffic	0.01	0.02	0.02	0.02	0.07	0.06
	Eastbound Traffic	0.5	0.3	1.10	1.23	>2	>2
	Westbound Traffic	0.1	0.1	0.06	0.14	0.40	>2
	Northbound Traffic			0.44	0.23	0.72	0.31
	Southbound Traffic	-	-	0.18	0.45	0.24	0.84
	Eastbound Traffic			0.81	0.50	0.72	0.54
	Westbound Traffic			0.67	0.45	0.71	0.65
	Northbound Traffic			0.44	0.23	0.68	0.30
	Southbound Traffic	-	-	0.18	0.46	0.22	0.81
	Eastbound Traffic			0.23	0.19	0.21	0.36
	Westbound Traffic			0.05	0.04	0.13	0.09

2.4 Queue Length

The queue length performance measure is the 95th percentile queue length, which is the maximum back of queue with 95th percentile traffic volumes. The queue lengths tabulated below are the maximum queue lengths per approach measured in vehicles.

Queue length (maximum 95 th percentile queue per lane in vehicles per approach)		<u>2018</u>		<u>2021</u>		<u>2041</u>	
		AM	PM	AM	PM	AM	PM
 two-way	Northbound Traffic	0	1	1	1	1	1
	Southbound Traffic	0	1	1	1	1	1
	Eastbound Traffic	3	2	10	8	20	14
	Westbound Traffic	1	2	1	1	2	6
	Northbound Traffic			13	5	29	8
	Southbound Traffic	-	-	5	10	7	32
	Eastbound Traffic			15	6	13	7
	Westbound Traffic			3	2	5	4
	Northbound Traffic			4	2	7	2
	Southbound Traffic	-	-	1	4	2	13
	Eastbound Traffic			1	1	1	2
	Westbound Traffic			1	1	1	1

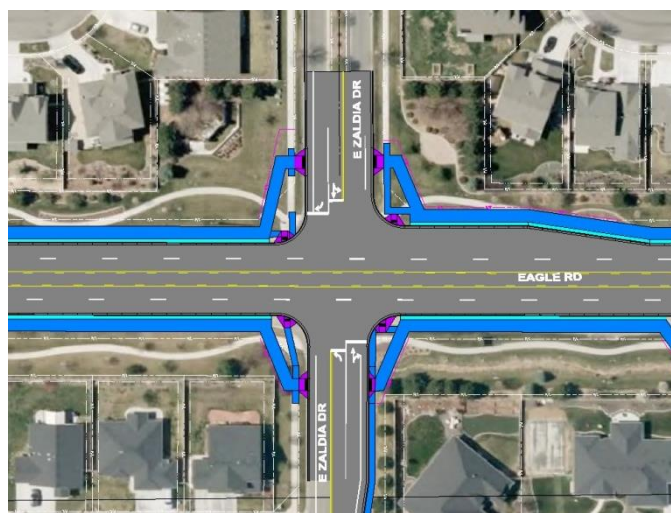
2.5 Life-cycle Cost

Life-cycle costs for the three intersection control options were estimated using the Florida Department of Transportation's (FDOT's) *Intersection Control Evaluation (ICE) Tool*, which is based on *NCHRP Project 3-110 Estimating the Life-Cycle Cost of Intersection Designs*. A summary of the *ICE Tool* output is included in the Appendix. The life-cycle cost categories are listed below and simplified descriptions of the calculations for each category follow:

- Capital costs
- Operations and maintenance costs
- Vehicle delay costs
- Safety (expected future crash costs)

Capital costs include the planning-level estimates for intersection design, construction and right-of-way. The planning level estimates for design and construction of the three control options are based on constructing approximately 550 feet of Eagle Road and 400 feet of Zaldia Drive centered on the intersection. The figure to the top right shows the proposed lane configuration of the two-way stop and traffic signal options, which is the basis of their construction cost estimates. The figure to the bottom right is the basis of the roundabout construction cost estimate. It is a planning-level roundabout that is based on the roundabout at the intersection of Whitewater Parkway and Stewart Avenue in Boise and has the same 154' inscribed circle diameter. The design and construction costs are summarized below. Right-of-way costs were not estimated.

- Two-way stop: \$660,000
- Traffic signal: \$940,000
- Roundabout: \$1,400,000



Proposed lane configuration for the two-way stop and traffic signal control options (from ACHD)



Proposed lane configuration for the roundabout control option

Annual operations and maintenance costs were estimated for each alternative. For the two-way stop option, operations and maintenance costs were estimated to include intersection safety lighting. For the traffic signal option, operations and maintenance costs include signal re-timing, equipment replacement and power. For the roundabout, operations and maintenance costs include equipment replacement for the lighting and power and limited landscape maintenance.

The cost of vehicle delay was calculated for passenger cars and freight. Hourly vehicle delay costs were based on ITD's *Road User Costs*. The most current costs are for 2016, which are \$19.91 per hour for passenger cars and \$48.36 for freight. Freight counts were unavailable so a 2 percent freight value was assumed for the evaluation. The FDOT life-cycle delay methodology uses the weekday AM and PM peak hour delays for 2021 and 2041 to project the delay for all hours, days, weeks and months of the year over the project design life. The cumulative vehicle hours of delay over the project design life is multiplied by the road user delay cost to estimate the delay costs.

The safety cost is the cost of the predicted number of crashes to occur over the project design life. Crash costs were based on ITD's *2016 Idaho Traffic Crashes* report. An averaged cost for fatality and injury crashes was calculated as \$294,465 per crash. Property damage only crash costs are \$3,243. FDOT life-cycle safety methodology uses the safety performance functions (SPFs) and the predictive method from the *Highway Safety Manual* to predict crashes over a life-cycle for the purposes of comparing different intersection control alternatives. The predicted crashes over the project design life are multiplied by the crash costs to estimate the safety costs.

A discount rate of 4 percent was applied to all annual costs – operations and maintenance, vehicle delay, and safety – to bring the costs to a net present value. The Appendix contains three ICE Tool output sheets that compare each control option to the other two options by selecting a base control option. For ease of comparison, the life-cycle costs for the three control options at the Eagle Road and Zaldia Drive intersection are summarized in the table to the right.

Life-Cycle Cost (20-year life)	
 two-way	\$35,600,000
	\$24,800,000
	\$19,600,000

2.6 Summary

The roundabout measured by four performance measures analyzed for this intersection control evaluation exceeded the performance of the two-way stop and traffic signal control options.

Appendix

HCM 6th TWSC
1: Eagle Road & Zaldia Drive

Existing AM

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	↔
Traffic Vol, veh/h	107	0	6	1	0	19	4	734	2	8	280	25
Future Vol, veh/h	107	0	6	1	0	19	4	734	2	8	280	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	100
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	120	0	7	1	0	21	4	825	2	9	315	28

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1178	1168	315	1185	1195	826	343	0	0	827	0	0
Stage 1	333	333	-	834	834	-	-	-	-	-	-	-
Stage 2	845	835	-	351	361	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	168	193	725	166	186	372	1216	-	-	804	-	-
Stage 1	681	644	-	362	383	-	-	-	-	-	-	-
Stage 2	357	383	-	666	626	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	157	190	725	163	183	372	1216	-	-	804	-	-
Mov Cap-2 Maneuver	260	292	-	277	292	-	-	-	-	-	-	-
Stage 1	679	637	-	361	382	-	-	-	-	-	-	-
Stage 2	335	382	-	652	619	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	29.8		15.5		0		0.2	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1216	-	-	269	366	804	-
HCM Lane V/C Ratio	0.004	-	-	0.472	0.061	0.011	-
HCM Control Delay (s)	8	-	-	29.8	15.5	9.5	-
HCM Lane LOS	A	-	-	D	C	A	-
HCM 95th %tile Q(veh)	0	-	-	2.4	0.2	0	-

HCM 6th TWSC
1: Eagle Road & Zaldia Drive

Existing PM

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	↔
Traffic Vol, veh/h	47	1	15	9	0	18	19	342	6	17	650	127
Future Vol, veh/h	47	1	15	9	0	18	19	342	6	17	650	127
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	100
Veh in Median Storage, #	-	1	-	-	1	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	25	63	56	25	75	79	88	75	61	92	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	64	4	24	16	0	24	24	389	8	28	707	148

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1216	1208	707	1292	1352	393	855	0	0	397	0	0
Stage 1	763	763	-	441	441	-	-	-	-	-	-	-
Stage 2	453	445	-	851	911	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	158	183	435	140	150	656	785	-	-	1162	-	-
Stage 1	397	413	-	595	577	-	-	-	-	-	-	-
Stage 2	586	575	-	355	353	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	146	173	435	126	142	656	785	-	-	1162	-	-
Mov Cap-2 Maneuver	266	286	-	230	244	-	-	-	-	-	-	-
Stage 1	385	403	-	577	559	-	-	-	-	-	-	-
Stage 2	547	557	-	324	345	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	22.5		15.7		0.6		0.3	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	785	-	-	297	376	1162	-
HCM Lane V/C Ratio	0.031	-	-	0.31	0.107	0.024	-
HCM Control Delay (s)	9.7	-	-	22.5	15.7	8.2	-
HCM Lane LOS	A	-	-	C	C	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.3	0.4	0.1	-

HCM 6th TWSC
1: Eagle Road & Zaldia Drive

2021 AM

Intersection												
Int Delay, s/veh	16.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	176	0	15	1	0	27	16	995	4	13	384	71
Future Vol, veh/h	176	0	15	1	0	27	16	995	4	13	384	71
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	191	0	16	1	0	29	17	1082	4	14	417	77
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	1020	1565	209	1355	1640	543	494	0	0	1086	0	0
Stage 1	445	445	-	1118	1118	-	-	-	-	-	-	-
Stage 2	575	1120	-	237	522	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 191	110	797	108	99	484	1066	-	-	638	-	-
Stage 1	562	573	-	221	281	-	-	-	-	-	-	-
Stage 2	470	280	-	745	529	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 174	106	797	103	95	484	1066	-	-	638	-	-
Mov Cap-2 Maneuver	~ 174	106	-	103	95	-	-	-	-	-	-	-
Stage 1	553	560	-	217	277	-	-	-	-	-	-	-
Stage 2	434	276	-	714	517	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	140.5		13.9			0.1			0.3			
HCM LOS	F		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1066	-	-	174	797	103	484	638	-	-		
HCM Lane V/C Ratio	0.016	-	-	1.099	0.02	0.011	0.061	0.022	-	-		
HCM Control Delay (s)	8.4	-	-	151.7	9.6	40.3	12.9	10.8	-	-		
HCM Lane LOS	A	-	-	F	A	E	B	B	-	-		
HCM 95th %tile Q(veh)	0.1	-	-	9.6	0.1	0	0.2	0.1	-	-		
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon				

HCM 6th Signalized Intersection Summary

1: Eagle Road & Zaldia Drive

2021 AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	176	0	15	1	0	27	16	995	4	13	384	71
Future Volume (veh/h)	176	0	15	1	0	27	16	995	4	13	384	71
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
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	191	0	16	1	0	29	17	1082	4	14	417	77
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	235	0	47	231	0	43	672	2432	9	367	2373	1058
Arrive On Green	0.11	0.00	0.03	0.11	0.00	0.03	0.02	0.71	0.71	0.01	0.70	0.70
Sat Flow, veh/h	1688	0	1502	1688	0	1502	1688	3440	13	1688	3367	1502
Grp Volume(v), veh/h	191	0	16	1	0	29	17	529	557	14	417	77
Grp Sat Flow(s),veh/h/ln	1688	0	1502	1688	0	1502	1688	1683	1770	1688	1683	1502
Q Serve(g_s), s	18.0	0.0	1.7	0.0	0.0	3.1	0.5	21.5	21.5	0.4	6.7	1.0
Cycle Q Clear(g_c), s	18.0	0.0	1.7	0.0	0.0	3.1	0.5	21.5	21.5	0.4	6.7	1.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	235	0	47	231	0	43	672	1190	1251	367	2373	1058
V/C Ratio(X)	0.81	0.00	0.34	0.00	0.00	0.67	0.03	0.44	0.44	0.04	0.18	0.07
Avail Cap(c_a), veh/h	235	0	282	231	0	263	802	1190	1251	500	2373	1058
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	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	71.0	0.0	75.9	63.4	0.0	77.0	6.4	10.0	10.0	7.8	8.0	1.1
Incr Delay (d2), s/veh	19.2	0.0	4.2	0.0	0.0	16.7	0.0	1.2	1.1	0.0	0.2	0.1
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(95%),veh/ln	14.1	0.0	1.3	0.1	0.0	2.5	0.3	12.5	13.0	0.2	4.4	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	90.2	0.0	80.1	63.4	0.0	93.7	6.4	11.2	11.2	7.8	8.1	1.3
LnGrp LOS	F	A	F	E	A	F	A	B	B	A	A	A
Approach Vol, veh/h	207			30			1103			508		
Approach Delay, s/veh	89.4			92.6			11.1			7.1		
Approach LOS	F			F			B			A		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	23.0	9.6	8.7	118.8	22.6	10.0	8.3	119.1				
Change Period (Y+Rc), s	5.0	5.0	6.0	6.0	5.0	5.0	6.0	6.0				
Max Green Setting (Gmax), s	18.0	28.0	15.0	77.0	16.0	30.0	15.0	77.0				
Max Q Clear Time (g_c+I1), s	20.0	5.1	2.5	8.7	2.0	3.7	2.4	23.5				
Green Ext Time (p_c), s	0.0	0.2	0.0	7.3	0.0	0.1	0.0	22.1				
Intersection Summary												
HCM 6th Ctrl Delay	20.1											
HCM 6th LOS	C											

MOVEMENT SUMMARY

 Site: 1 [Eagle-Zaldia - 2021 AM - SIDRA]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Eagle Rd											
3	L2	17	2.0	0.444	13.1	LOS B	3.1	78.5	0.50	0.58	41.6
8	T1	1082	2.0	0.444	7.0	LOS A	3.2	80.3	0.49	0.57	43.8
18	R2	4	2.0	0.444	6.7	LOS A	3.2	80.3	0.49	0.56	40.7
Approach		1103	2.0	0.444	7.1	LOS A	3.2	80.3	0.49	0.57	43.8
East: Zaldia Dr											
1	L2	1	2.0	0.053	15.1	LOS B	0.2	5.0	0.62	0.80	41.6
6	T1	1	2.0	0.053	9.2	LOS A	0.2	5.0	0.62	0.80	41.1
16	R2	29	2.0	0.053	8.8	LOS A	0.2	5.0	0.62	0.80	42.3
Approach		32	2.0	0.053	9.0	LOS A	0.2	5.0	0.62	0.80	42.3
North: Eagle Rd											
7	L2	14	2.0	0.175	11.8	LOS B	1.0	25.1	0.11	0.47	44.4
4	T1	417	2.0	0.175	5.9	LOS A	1.0	25.3	0.11	0.47	45.0
14	R2	77	2.0	0.175	5.6	LOS A	1.0	25.3	0.11	0.47	43.6
Approach		509	2.0	0.175	6.0	LOS A	1.0	25.3	0.11	0.47	44.8
West: Zaldia Dr											
5	L2	191	2.0	0.226	13.3	LOS B	0.8	20.1	0.41	0.77	41.1
2	T1	1	2.0	0.226	7.3	LOS A	0.8	20.1	0.41	0.77	38.6
12	R2	16	2.0	0.226	6.9	LOS A	0.8	20.1	0.41	0.77	38.4
Approach		209	2.0	0.226	12.8	LOS B	0.8	20.1	0.41	0.77	40.9
All Vehicles		1852	2.0	0.444	7.5	LOS A	3.2	80.3	0.38	0.57	43.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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HCM 6th TWSC
1: Eagle Road & Zaldia Drive

2021 PM

Intersection												
Int Delay, s/veh	13.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	88	2	30	11	0	21	25	530	7	19	1025	167
Future Vol, veh/h	88	2	30	11	0	21	25	530	7	19	1025	167
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	96	2	33	12	0	23	27	576	8	21	1114	182

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1498	1794	557	1234	1972	292	1296	0	0	584	0	0
Stage 1	1156	1156	-	634	634	-	-	-	-	-	-	-
Stage 2	342	638	-	600	1338	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 85	80	474	133	62	704	531	-	-	987	-	-
Stage 1	209	269	-	434	471	-	-	-	-	-	-	-
Stage 2	646	469	-	455	220	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 78	74	474	115	58	704	531	-	-	987	-	-
Mov Cap-2 Maneuver	~ 78	74	-	115	58	-	-	-	-	-	-	-
Stage 1	198	263	-	412	447	-	-	-	-	-	-	-
Stage 2	593	445	-	411	215	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	202.1		20.5		0.5		0.1	
HCM LOS	F		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	531	-	-	78	354	115	704	987	-	-
HCM Lane V/C Ratio	0.051	-	-	1.226	0.098	0.104	0.032	0.021	-	-
HCM Control Delay (s)	12.1	-	-	269.6	16.3	39.9	10.3	8.7	-	-
HCM Lane LOS	B	-	-	F	C	E	B	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	7.2	0.3	0.3	0.1	0.1	-	-

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

HCM 6th Signalized Intersection Summary

1: Eagle Road & Zaldia Drive

2021 PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	2	30	11	0	21	25	530	7	19	1025	167
Future Volume (veh/h)	88	2	30	11	0	21	25	530	7	19	1025	167
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
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821	1821
Adj Flow Rate, veh/h	96	2	33	12	0	23	27	576	8	21	1114	182
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	191	8	126	120	0	51	342	2529	35	642	2494	1112
Arrive On Green	0.07	0.09	0.09	0.01	0.00	0.03	0.02	0.72	0.72	0.02	0.72	0.72
Sat Flow, veh/h	1734	89	1468	1734	0	1543	1734	3494	49	1734	3460	1543
Grp Volume(v), veh/h	96	0	35	12	0	23	27	285	299	21	1114	182
Grp Sat Flow(s),veh/h/ln	1734	0	1557	1734	0	1543	1734	1730	1812	1734	1730	1543
Q Serve(g_s), s	7.3	0.0	2.9	0.9	0.0	2.0	0.6	7.6	7.6	0.4	18.6	5.2
Cycle Q Clear(g_c), s	7.3	0.0	2.9	0.9	0.0	2.0	0.6	7.6	7.6	0.4	18.6	5.2
Prop In Lane	1.00		0.94	1.00		1.00	1.00		0.03	1.00		1.00
Lane Grp Cap(c), veh/h	191	0	133	120	0	51	342	1252	1312	642	2494	1112
V/C Ratio(X)	0.50	0.00	0.26	0.10	0.00	0.45	0.08	0.23	0.23	0.03	0.45	0.16
Avail Cap(c_a), veh/h	276	0	311	295	0	309	487	1252	1312	794	2494	1112
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	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	58.3	0.0	59.9	64.1	0.0	66.4	6.0	6.4	6.4	5.0	8.1	6.2
Incr Delay (d2), s/veh	2.0	0.0	1.0	0.4	0.0	6.0	0.1	0.4	0.4	0.0	0.6	0.3
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(95%),veh/ln	5.9	0.0	2.2	0.8	0.0	1.6	0.3	4.4	4.6	0.2	9.8	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.4	0.0	60.9	64.4	0.0	72.3	6.1	6.8	6.8	5.0	8.6	6.5
LnGrp LOS	E	A	E	E	A	E	A	A	A	A	A	A
Approach Vol, veh/h	131			35			611			1317		
Approach Delay, s/veh	60.5			69.6			6.8			8.3		
Approach LOS	E			E			A			A		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.2	9.7	9.3	106.9	6.9	17.0	8.8	107.4				
Change Period (Y+Rc), s	5.0	5.0	6.0	6.0	5.0	5.0	6.0	6.0				
Max Green Setting (Gmax), s	16.0	28.0	15.0	59.0	16.0	28.0	15.0	59.0				
Max Q Clear Time (g_c+I1), s	9.3	4.0	2.6	20.6	2.9	4.9	2.4	9.6				
Green Ext Time (p_c), s	0.1	0.2	0.0	18.7	0.0	0.2	0.0	7.5				
Intersection Summary												
HCM 6th Ctrl Delay	12.1											
HCM 6th LOS	B											

MOVEMENT SUMMARY

 Site: 1 [Eagle-Zaldia - 2021 PM - SIDRA]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Eagle Rd											
3	L2	27	2.0	0.230	12.3	LOS B	1.3	34.1	0.32	0.51	42.3
8	T1	576	2.0	0.230	6.3	LOS A	1.4	34.7	0.31	0.50	44.4
18	R2	8	2.0	0.230	6.0	LOS A	1.4	34.7	0.31	0.48	41.4
Approach		611	2.0	0.230	6.6	LOS A	1.4	34.7	0.31	0.50	44.3
East: Zaldia Dr											
1	L2	12	2.0	0.044	13.6	LOS B	0.1	3.6	0.46	0.71	41.3
6	T1	1	2.0	0.044	7.7	LOS A	0.1	3.6	0.46	0.71	40.8
16	R2	23	2.0	0.044	7.3	LOS A	0.1	3.6	0.46	0.71	42.1
Approach		36	2.0	0.044	9.4	LOS A	0.1	3.6	0.46	0.71	41.8
North: Eagle Rd											
7	L2	21	2.0	0.460	12.0	LOS B	3.4	86.3	0.22	0.46	44.1
4	T1	1114	2.0	0.460	6.1	LOS A	3.4	86.4	0.22	0.46	44.7
14	R2	182	2.0	0.460	5.8	LOS A	3.4	86.4	0.21	0.47	43.2
Approach		1316	2.0	0.460	6.1	LOS A	3.4	86.4	0.21	0.46	44.5
West: Zaldia Dr											
5	L2	96	2.0	0.189	15.1	LOS B	0.7	17.2	0.58	0.87	40.9
2	T1	2	2.0	0.189	9.1	LOS A	0.7	17.2	0.58	0.87	38.3
12	R2	33	2.0	0.189	8.7	LOS A	0.7	17.2	0.58	0.87	38.2
Approach		130	2.0	0.189	13.4	LOS B	0.7	17.2	0.58	0.87	40.2
All Vehicles		2093	2.0	0.460	6.8	LOS A	3.4	86.4	0.27	0.50	44.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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HCM 6th TWSC
1: Eagle Road & Zaldia Drive

2041 AM

Intersection												
Int Delay, s/veh	84.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	170	0	19	8	0	49	26	1648	15	23	534	70
Future Vol, veh/h	170	0	19	8	0	49	26	1648	15	23	534	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	185	0	21	9	0	53	28	1791	16	25	580	76

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1582	2493	290	2195	2561	904	656	0	0	1807	0	0
Stage 1	630	630	-	1855	1855	-	-	-	-	-	-	-
Stage 2	952	1863	-	340	706	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 73	29	707	25	26	280	927	-	-	337	-	-
Stage 1	436	473	-	76	122	-	-	-	-	-	-	-
Stage 2	279	121	-	648	437	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 54	26	707	22	23	280	927	-	-	337	-	-
Mov Cap-2 Maneuver	~ 54	26	-	22	23	-	-	-	-	-	-	-
Stage 1	423	438	-	74	118	-	-	-	-	-	-	-
Stage 2	219	117	-	582	405	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	1124.2		53.2		0.1		0.6	
HCM LOS	F		F					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	927	-	-	54	707	22	280	337	-	-
HCM Lane V/C Ratio	0.03	-	-	3.422	0.029	0.395	0.19	0.074	-	-
HCM Control Delay (s)	9	-	-	\$ 1248.7	10.2	250.8	20.9	16.5	-	-
HCM Lane LOS	A	-	-	F	B	F	C	C	-	-
HCM 95th %tile Q(veh)	0.1	-	-	19.8	0.1	1.2	0.7	0.2	-	-

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

HCM 6th Signalized Intersection Summary

1: Eagle Road & Zaldia Drive

2041 AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	0	19	8	0	49	26	1648	15	23	534	70
Future Volume (veh/h)	170	0	19	8	0	49	26	1648	15	23	534	70
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
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	185	0	21	9	0	53	28	1791	16	25	580	76
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	259	0	231	129	0	75	568	2473	22	180	2431	1084
Arrive On Green	0.11	0.00	0.15	0.01	0.00	0.05	0.02	0.69	0.69	0.02	0.68	0.68
Sat Flow, veh/h	1781	0	1585	1781	0	1585	1781	3609	32	1781	3554	1585
Grp Volume(v), veh/h	185	0	21	9	0	53	28	881	926	25	580	76
Grp Sat Flow(s),veh/h/ln	1781	0	1585	1781	0	1585	1781	1777	1865	1781	1777	1585
Q Serve(g_s), s	15.4	0.0	1.8	0.8	0.0	5.3	0.8	49.5	49.7	0.7	9.9	2.5
Cycle Q Clear(g_c), s	15.4	0.0	1.8	0.8	0.0	5.3	0.8	49.5	49.7	0.7	9.9	2.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	259	0	231	129	0	75	568	1218	1278	180	2431	1084
V/C Ratio(X)	0.72	0.00	0.09	0.07	0.00	0.71	0.05	0.72	0.72	0.14	0.24	0.07
Avail Cap(c_a), veh/h	265	0	297	289	0	277	696	1218	1278	309	2431	1084
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	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.9	0.0	59.1	71.4	0.0	75.1	7.3	15.7	15.7	15.5	9.5	8.4
Incr Delay (d2), s/veh	8.7	0.0	0.2	0.2	0.0	11.6	0.0	3.8	3.6	0.3	0.2	0.1
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(95%),veh/ln	12.2	0.0	1.4	0.7	0.0	4.4	0.5	27.2	28.4	0.6	7.0	1.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.5	0.0	59.3	71.6	0.0	86.7	7.4	19.5	19.4	15.9	9.8	8.5
LnGrp LOS	E	A	E	E	A	F	A	B	B	B	A	A
Approach Vol, veh/h	206			62			1835			681		
Approach Delay, s/veh	69.4			84.5			19.2			9.9		
Approach LOS	E			F			B			A		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	22.5	12.6	9.6	115.4	6.6	28.4	9.4	115.6				
Change Period (Y+Rc), s	5.0	5.0	6.0	6.0	5.0	5.0	6.0	6.0				
Max Green Setting (Gmax), s	18.0	28.0	15.0	77.0	16.0	30.0	15.0	77.0				
Max Q Clear Time (g_c+I1), s	17.4	7.3	2.8	11.9	2.8	3.8	2.7	51.7				
Green Ext Time (p_c), s	0.0	0.5	0.0	11.0	0.0	0.1	0.0	22.8				
Intersection Summary												
HCM 6th Ctrl Delay	22.1											
HCM 6th LOS	C											

MOVEMENT SUMMARY

 Site: 1 [Eagle-Zaldia - 2041 AM - SIDRA]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Eagle Rd											
3	L2	28	2.0	0.681	13.8	LOS B	6.8	172.9	0.67	0.64	40.9
8	T1	1791	2.0	0.681	7.5	LOS A	6.8	172.9	0.65	0.61	43.3
18	R2	16	2.0	0.681	7.0	LOS A	6.7	170.7	0.63	0.59	40.1
Approach		1836	2.0	0.681	7.6	LOS A	6.8	172.9	0.65	0.61	43.2
East: Zaldia Dr											
1	L2	9	2.0	0.134	17.0	LOS B	0.6	15.4	0.78	0.91	40.0
6	T1	1	2.0	0.134	11.1	LOS B	0.6	15.4	0.78	0.91	39.3
16	R2	53	2.0	0.134	10.7	LOS B	0.6	15.4	0.78	0.91	40.9
Approach		63	2.0	0.134	11.5	LOS B	0.6	15.4	0.78	0.91	40.8
North: Eagle Rd											
7	L2	25	2.0	0.222	11.9	LOS B	1.3	33.9	0.17	0.47	44.1
4	T1	580	2.0	0.222	5.9	LOS A	1.4	34.6	0.17	0.47	44.8
14	R2	76	2.0	0.222	5.7	LOS A	1.4	34.6	0.16	0.46	43.4
Approach		682	2.0	0.222	6.1	LOS A	1.4	34.6	0.17	0.47	44.6
West: Zaldia Dr											
5	L2	185	2.0	0.211	13.4	LOS B	0.7	18.8	0.45	0.79	41.0
2	T1	1	2.0	0.211	7.4	LOS A	0.7	18.8	0.45	0.79	38.6
12	R2	21	2.0	0.211	7.0	LOS A	0.7	18.8	0.45	0.79	38.4
Approach		207	2.0	0.211	12.7	LOS B	0.7	18.8	0.45	0.79	40.8
All Vehicles		2787	2.0	0.681	7.7	LOS A	6.8	172.9	0.52	0.60	43.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: X:\projects\201801\Traffic\SIDRA\Eagle-Zaldia Roundabout.sip7

HCM 6th TWSC
1: Eagle Road & Zaldia Drive

2041 PM

Intersection												
Int Delay, s/veh	192.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	87	2	49	32	0	39	34	730	18	42	2017	178
Future Vol, veh/h	87	2	49	32	0	39	34	730	18	42	2017	178
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	95	2	53	35	0	42	37	793	20	46	2192	193
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	2755	3171	1096	2066	3354	407	2385	0	0	813	0	0
Stage 1	2284	2284	-	877	877	-	-	-	-	-	-	-
Stage 2	471	887	-	1189	2477	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 9	10	208	~ 31	8	593	199	-	-	810	-	-
Stage 1	~ 40	74	-	310	364	-	-	-	-	-	-	-
Stage 2	542	360	-	199	58	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 7	8	208	~ 15	6	593	199	-	-	810	-	-
Mov Cap-2 Maneuver	~ 7	8	-	~ 15	6	-	-	-	-	-	-	-
Stage 1	~ 33	70	-	252	296	-	-	-	-	-	-	-
Stage 2	410	293	-	135	55	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, \$	4224.1		512.7			1.2			0.2			
HCM LOS	F		F									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	199	-	-	7	105	15	593	810	-	-		
HCM Lane V/C Ratio	0.186	-	-	13.509	0.528	2.319	0.071	0.056	-	-		
HCM Control Delay (s)	27.2	-	-	\$ 6657.8	72.5	\$ 1123.5	11.5	9.7	-	-		
HCM Lane LOS	D	-	-	F	F	F	B	A	-	-		
HCM 95th %tile Q(veh)	0.7	-	-	13.6	2.4	5.1	0.2	0.2	-	-		
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon				

HCM 6th Signalized Intersection Summary

1: Eagle Road & Zaldia Drive

2041 PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	2	49	32	0	39	34	730	18	42	2017	178
Future Volume (veh/h)	87	2	49	32	0	39	34	730	18	42	2017	178
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
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	95	2	53	35	0	42	37	793	20	46	2192	193
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	176	5	120	144	0	65	135	2594	65	533	2610	1164
Arrive On Green	0.06	0.08	0.08	0.02	0.00	0.04	0.03	0.73	0.73	0.03	0.73	0.73
Sat Flow, veh/h	1781	58	1536	1781	0	1585	1781	3542	89	1781	3554	1585
Grp Volume(v), veh/h	95	0	55	35	0	42	37	398	415	46	2192	193
Grp Sat Flow(s),veh/h/ln	1781	0	1594	1781	0	1585	1781	1777	1854	1781	1777	1585
Q Serve(g_s), s	8.0	0.0	5.3	3.0	0.0	4.2	0.8	12.3	12.4	1.0	68.4	5.9
Cycle Q Clear(g_c), s	8.0	0.0	5.3	3.0	0.0	4.2	0.8	12.3	12.4	1.0	68.4	5.9
Prop In Lane	1.00		0.96	1.00		1.00	1.00		0.05	1.00		1.00
Lane Grp Cap(c), veh/h	176	0	124	144	0	65	135	1301	1358	533	2610	1164
V/C Ratio(X)	0.54	0.00	0.44	0.24	0.00	0.65	0.27	0.31	0.31	0.09	0.84	0.17
Avail Cap(c_a), veh/h	243	0	279	278	0	277	257	1301	1358	652	2610	1164
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	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	66.3	0.0	70.4	71.3	0.0	75.6	24.2	7.4	7.4	5.3	14.7	6.4
Incr Delay (d2), s/veh	2.6	0.0	2.5	0.9	0.0	10.5	1.1	0.6	0.6	0.1	3.5	0.3
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(95%),veh/ln	6.8	0.0	4.0	2.6	0.0	3.4	1.4	7.7	7.9	0.6	31.5	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.8	0.0	72.9	72.1	0.0	86.2	25.2	8.0	8.0	5.3	18.2	6.7
LnGrp LOS	E	A	E	E	A	F	C	A	A	A	B	A
Approach Vol, veh/h	150			77			850			2431		
Approach Delay, s/veh	70.3			79.8			8.7			17.0		
Approach LOS	E			E			A			B		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.9	11.5	10.0	123.5	9.0	17.5	10.4	123.2				
Change Period (Y+Rc), s	5.0	5.0	6.0	6.0	5.0	5.0	6.0	6.0				
Max Green Setting (Gmax), s	16.0	28.0	15.0	79.0	16.0	28.0	15.0	79.0				
Max Q Clear Time (g_c+I1), s	10.0	6.2	2.8	70.4	5.0	7.3	3.0	14.4				
Green Ext Time (p_c), s	0.1	0.4	0.0	8.4	0.0	0.4	0.1	12.1				
Intersection Summary												
HCM 6th Ctrl Delay	18.7											
HCM 6th LOS	B											

MOVEMENT SUMMARY

 Site: 1 [Eagle-Zaldia - 2041 PM - SIDRA]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Eagle Rd											
3	L2	37	2.0	0.302	12.4	LOS B	1.9	49.5	0.38	0.53	42.0
8	T1	793	2.0	0.302	6.4	LOS A	2.0	51.2	0.37	0.51	44.3
18	R2	20	2.0	0.302	6.1	LOS A	2.0	51.2	0.36	0.50	41.2
Approach		850	2.0	0.302	6.7	LOS A	2.0	51.2	0.37	0.51	44.1
East: Zaldia Dr											
1	L2	35	2.0	0.092	13.8	LOS B	0.3	8.2	0.52	0.78	40.8
6	T1	1	2.0	0.092	7.8	LOS A	0.3	8.2	0.52	0.78	40.2
16	R2	42	2.0	0.092	7.4	LOS A	0.3	8.2	0.52	0.78	41.6
Approach		78	2.0	0.092	10.2	LOS B	0.3	8.2	0.52	0.78	41.2
North: Eagle Rd											
7	L2	46	2.0	0.809	12.8	LOS B	12.3	313.1	0.60	0.49	42.6
4	T1	2192	2.0	0.809	6.8	LOS A	12.9	327.2	0.56	0.48	43.4
14	R2	193	2.0	0.809	6.4	LOS A	12.9	327.2	0.53	0.47	42.0
Approach		2432	2.0	0.809	6.9	LOS A	12.9	327.2	0.56	0.48	43.3
West: Zaldia Dr											
5	L2	95	2.0	0.363	20.7	LOS C	1.9	47.9	0.86	0.98	38.4
2	T1	2	2.0	0.363	14.7	LOS B	1.9	47.9	0.86	0.98	35.4
12	R2	53	2.0	0.363	14.3	LOS B	1.9	47.9	0.86	0.98	35.5
Approach		150	2.0	0.363	18.3	LOS B	1.9	47.9	0.86	0.98	37.4
All Vehicles		3510	2.0	0.809	7.4	LOS A	12.9	327.2	0.53	0.52	43.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Organisation: SIX MILE ENGINEERING PA | Processed: Tuesday, August 21, 2018 10:26:58 AM

Project: X:\projects\201801\Traffic\SIDRA\Eagle-Zaldia Roundabout.sip7

Agency:	Ada County Highway District
Project Name:	Eagle Road, Amity to Victory
Project Reference:	518040
Intersection:	Eagle Road and Zaldia Drive
City:	Meridian
State:	Idaho
Performing Department or Organization:	Six Mile Engineering
Date:	08/24/18
Analyst:	LGK
Analysis Type	At-Grade Intersection

Analysis Summary

Cost Categories	Net Present Value of Costs		
	Two-Way Stop Control	Traffic Signal	Roundabout
Planning, Construction & Right of Way Costs	\$ 660,000	\$ 940,000	\$ 1,400,000
Post-Opening Costs	\$ 3,648	\$ 90,358	\$ 29,181
Auto Passenger Delay	\$ 27,741,994	\$ 16,011,658	\$ 13,540,966
Truck Delay	\$ 1,375,171	\$ 793,698	\$ 671,226
Safety	\$ 5,793,552	\$ 6,991,009	\$ 3,955,086
Total cost	\$35,574,365	\$24,826,723	\$19,596,458

Select Base Case for Benefit-Cost Comparison: (Choose from list)	Two-Way Stop Control		
Benefit Categories	Net Present Value of Benefits Relative to Base Case		
	Two-Way Stop Control	Traffic Signal	Roundabout
Auto Passenger Delay		\$ 11,730,336	\$ 14,201,029
Truck Delay		\$ 581,473	\$ 703,945
Safety		\$ (1,197,457)	\$ 1,838,466
Net Present Value of Benefits		\$ 11,114,352	\$ 16,743,440
Net Present Value of Costs		\$ 366,710	\$ 765,533
Net Present Value of Improvement		\$ 10,747,642	\$ 15,977,907
Benefit-Cost (B/C) Ratio		30.31	21.87
Delay B/C		33.57	19.47
Safety B/C		Control Strategy not preferred. Benefits are less than base case and cost is greater than base case.	2.40

Agency:	Ada County Highway District
Project Name:	Eagle Road, Amity to Victory
Project Reference:	518040
Intersection:	Eagle Road and Zaldia Drive
City:	Meridian
State:	Idaho
Performing Department or Organization:	Six Mile Engineering
Date:	08/24/18
Analyst:	LGK
Analysis Type	At-Grade Intersection

Analysis Summary

Cost Categories	Net Present Value of Costs		
	Two-Way Stop Control	Traffic Signal	Roundabout
Planning, Construction & Right of Way Costs	\$ 660,000	\$ 940,000	\$ 1,400,000
Post-Opening Costs	\$ 3,648	\$ 90,358	\$ 29,181
Auto Passenger Delay	\$ 27,741,994	\$ 16,011,658	\$ 13,540,966
Truck Delay	\$ 1,375,171	\$ 793,698	\$ 671,226
Safety	\$ 5,793,552	\$ 6,991,009	\$ 3,955,086
Total cost	\$35,574,365	\$24,826,723	\$19,596,458

Select Base Case for Benefit-Cost Comparison: (Choose from list)	Traffic Signal		
Benefit Categories	Net Present Value of Benefits Relative to Base Case		
	Two-Way Stop Control	Traffic Signal	Roundabout
Auto Passenger Delay	\$ (11,730,336)		\$ 2,470,692
Truck Delay	\$ (581,473)		\$ 122,472
Safety	\$ 1,197,457		\$ 3,035,923
Net Present Value of Benefits	\$ (11,114,352)		\$ 5,629,088
Net Present Value of Costs	\$ (366,710)		\$ 398,823
Net Present Value of Improvement	\$ (10,747,642)		\$ 5,230,265
Benefit-Cost (B/C) Ratio	Benefits are less than base case and cost is less than base case.		14.11
Delay B/C	Benefits are less than base case and cost is less than base case.		6.50
Safety B/C	Control strategy preferred. Benefits are greater than base case and cost is less than base case.		7.61

Agency:	Ada County Highway District
Project Name:	Eagle Road, Amity to Victory
Project Reference:	518040
Intersection:	Eagle Road and Zaldia Drive
City:	Meridian
State:	Idaho
Performing Department or Organization:	Six Mile Engineering
Date:	08/22/18
Analyst:	LGK
Analysis Type	At-Grade Intersection

Analysis Summary

Cost Categories	Net Present Value of Costs		
	Two-Way Stop Control	Traffic Signal	Roundabout
Planning, Construction & Right of Way Costs	\$ 660,000	\$ 940,000	\$ 1,400,000
Post-Opening Costs	\$ 3,648	\$ 90,358	\$ 29,181
Auto Passenger Delay	\$ 27,741,994	\$ 16,011,658	\$ 13,540,966
Truck Delay	\$ 1,375,171	\$ 793,698	\$ 671,226
Safety	\$ 5,793,552	\$ 6,991,009	\$ 3,955,086
Total cost	\$35,574,365	\$24,826,723	\$19,596,458

Select Base Case for Benefit-Cost Comparison: (Choose from list)	Roundabout		
Benefit Categories	Net Present Value of Benefits Relative to Base Case		
	Two-Way Stop Control	Traffic Signal	Roundabout
Auto Passenger Delay	\$ (14,201,029)	\$ (2,470,692)	
Truck Delay	\$ (703,945)	\$ (122,472)	
Safety	\$ (1,838,466)	\$ (3,035,923)	
Net Present Value of Benefits	\$ (16,743,440)	\$ (5,629,088)	
Net Present Value of Costs	\$ (765,533)	\$ (398,823)	
Net Present Value of Improvement	\$ (15,977,907)	\$ (5,230,265)	
Benefit-Cost (B/C) Ratio	Benefits are less than base case and cost is less than base case.	Benefits are less than base case and cost is less than base case.	
Delay B/C	Benefits are less than base case and cost is less than base case.	Benefits are less than base case and cost is less than base case.	
Safety B/C	Benefits are less than base case and cost is less than base case.	Benefits are less than base case and cost is less than base case.	