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Traffic Operational Analysis

Intersection Geometry Modifications

Traffic Operations Study for ITS

City of Marco Island, Collier County, Florida
7/21/2023

Prepared for:

City of Marco Island
50 Bald Eagle Drive
Marco Island, FL 34145
Phone: 239-389-3992

Prepared by:

Trebilcock Consulting Solutions, PA
2800 Davis Boulevard, Suite 200
Naples, FL 34104
Phone: 239-566-9551
Email: ntrebilcock@trebilcock.biz

Statement of Certification

I certify that this Traffic Operational Analysis has been prepared by me or under my immediate supervision and that I have experience and training in the field of Traffic and Transportation Engineering.

Norman J. Trebilcock, AICP, PTOE, PE
FL Registration No. 47116
Trebilcock Consulting Solutions, PA
2800 Davis Boulevard, Suite 200
Naples, FL 34104
Company Cert. of Auth. No. 27796

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Description

A comprehensive traffic signal retiming project was performed in the City of Marco Island during the peak season traffic conditions. The overall purpose of the retiming/coordination project was to optimize the mainline progression while minimizing the side street delay at the signalized intersections as much as practical.

The purpose of this report is to evaluate traffic operations and provide geometry modification recommendations for the following signalized intersections:

- N. Collier Boulevard at N. Barfield Drive
- N. Collier Boulevard at E. Elkcam Circle
- N. Collier Boulevard at W. Elkcam Circle
- Bald Eagle Drive at Elkcam Circle

The location of the analyzed intersections is presented in **Appendix A**.

As illustrated in the Traffic Operations Study/Retiming – Peak Season 2023 (Timing Plans, Coordination and Time of Day Settings) prepared by Florida Transportation Engineering, Inc. (FTE), new signal timing plans were developed for the analyzed intersections using Synchro software to determine the optimal phasing, cycle length and split times for the subject corridor.

The analyzed intersections located on N. Collier Boulevard are anticipated to operate as part of a single coordinated system from N. Barfield Drive to San Marco Road. The signal located at the Bald Eagle Drive and Elkcam Circle intersection is proposed to function under free operations.

Traffic analyses are conducted for the subject intersections based on the weekday AM and PM peak hour, peak season traffic conditions.

Existing Intersection Lane Configuration

Existing intersection lane configurations are depicted in this report based on field observations.

N. Collier Boulevard at N. Barfield Drive:

- N. Collier Boulevard – Westbound (WB): one left-turn lane; two through lanes; one right-turn lane
- N. Collier Boulevard – Eastbound (EB): one left-turn lane; two through lanes; one right-turn lane
- N. Barfield Drive – Northbound (NB): one shared through/left-turn lane; one right-turn lane
- N. Barfield Drive – Southbound (SB): one shared through/left-turn lane; one right-turn lane

N. Collier Boulevard at E. Elkcam Circle:

- N. Collier Boulevard – WB: one left-turn lane; one through lane; one shared through/right-turn lane
- N. Collier Boulevard – EB: one left-turn lane; one through lane; one shared through/right-turn lane
- E. Elkcam Circle – NB: one left-turn lane; one shared through/right-turn lane
- E. Elkcam Circle – SB: one left-turn lane; one shared through/right-turn lane

N. Collier Boulevard at W. Elkcarn Circle:

- N. Collier Boulevard – WB: one left-turn lane; one through lane; one shared through/right-turn lane
- N. Collier Boulevard – EB: one left-turn lane; one through lane; one shared through/right-turn lane
- W. Elkcarn Circle – NB: one left-turn lane; one shared through/right-turn lane
- W. Elkcarn Circle – SB: one left-turn lane; one through lane; one right-turn lane

Bald Eagle Drive at Elkcarn Circle:

- Bald Eagle Drive – NB: one left-turn lane; one through lane; one right-turn lane
- Bald Eagle Drive – SB: one left-turn lane; one through lane; one right-turn lane
- Elkcarn Circle – WB: one shared through/left-turn lane; one right-turn lane
- Elkcarn Circle – EB: one shared through/left-turn lane; one right-turn lane

Intersection Traffic Data and New Signal Timing Plans

The Traffic Operations Study/Retiming – Peak Season 2023 prepared by FTE provides the projected traffic volumes and the new signal timing plans developed for the analyzed intersections.

The proposed Synchro Timing Plans for the AM and PM peak hour peak season traffic conditions for the analyzed intersections are depicted in **Appendix B: Synchro – Proposed Intersection Timing Plans**.

Intersection Improvements – General Considerations

The purpose of this report is to propose geometric improvements to address a specific transportation deficiency or to improve a specific movement performance.

Intersection Committed Improvements

Roadway improvements that are currently under construction or are scheduled to be constructed as part of the approved City of Marco Capital Construction Projects are considered committed improvements.

Based on our review of the City of Marco Public Works website (City Current Projects), no intersection improvements were identified for the analyzed locations.

Improvements to Address Transportation Deficiencies or to Improve Movement Performance

Per Florida Statute, the term transportation deficiency means a facility or facilities on which the adopted level-of-service (LOS) standard is exceeded by the existing, committed, and vested trips, plus additional projected background trips from any source other than the development project under review, and trips that are forecast by established traffic standards, including traffic modeling.

The goal of the traffic signal retiming report was to optimize the mainline progression along the Collier Boulevard corridor while minimizing the side street delay at the subject intersections. As illustrated in the traffic signal retiming report, delay and LOS were reported for the intersections as Measures of Effectiveness (MOEs) and are used in this evaluation.

Based on our evaluation of the proposed Synchro Intersection Timing Plans (reference **Appendix B**) for the analyzed intersections along N. Collier Boulevard, there are specific side street movements that are projected to operate at LOS F during the AM and PM peak hour, peak season traffic conditions.

In addition, the traffic signal retiming report provides a queueing analysis at the following locations: N. Collier Boulevard at N. Barfield Drive, and Bald Eagle Drive at Elkcam Circle. Based on the results of the 95th percentile queue analysis for the AM and PM peak hours, the traffic signal retiming report concluded that the following movement's queues are beyond the available storage:

N. Collier Boulevard at N. Barfield Drive:

- Eastbound right-turn lane (PM peak hour)
- Westbound left-turn lane (PM peak hour)
- Westbound right-turn lane (AM peak hour)
- Northbound right-turn lane (PM peak hour)
- Observations did not indicate capacity issues for the eastbound or westbound right-turn lanes as vehicles could not access either right-turn lane due to adjacent through vehicle queuing

Bald Eagle Drive at Elkcam Circle:

- The storage capacity of the existing turn lanes exceed the current vehicular demand (AM and PM peak hours)

The improvements needed to restore subject intersection movements to a minimum acceptable LOS include the addition of geometric improvements such as turn or through lanes.

The improvements proposed in this report are intended to address the minimum LOS requirement for a specific deficiency and are not intended to optimize the overall intersection performance.

The traffic signal retiming project concluded there are no LOS deficiencies projected for the traffic movements at the Bald Eagle Drive and Elkcam Circle intersection. In order to accommodate occasional traffic intensive events and to promote safe operations, this analysis recommends specific geometric improvements.

Intersection Analyses – Geometry Modifications

Intersection Improvements

The following roadway improvements are recommended in this report:

N. Collier Boulevard at N. Barfield Drive:

- N. Barfield Drive – NB: convert one shared through/left-turn lane to through lane and add one left-turn lane
- N. Barfield Drive – SB: convert one shared through/left-turn lane to through lane and add one left-turn lane

N. Collier Boulevard at E. Elkcam Circle:

- E. Elkcam Circle – NB: convert one shared through/right-turn lane to through lane and add one right-turn lane
- E. Elkcam Circle – SB: convert one shared through/right-turn lane to through lane and add one right-turn lane

N. Collier Boulevard at W. Elkcam Circle:

- W. Elkcam Circle – NB: convert one shared through/right-turn lane to through lane and add one right-turn lane

Bald Eagle Drive at Elkcam Circle:

- Elkcam Circle – WB: provide one left-turn lane; one through lane; one right-turn lane
- Elkcam Circle – EB: provide one left-turn lane; one through lane; one right-turn lane

Capacity Analysis

An assessment of the Level of Service (LOS) and volume to capacity (V/C) ratio analysis of the subject intersections are conducted using the most recent version of Synchro software (Version 11).

Synchro computes the signalized intersection, unsignalized intersection, and arterial LOS according to the Highway Capacity Manual (HCM). For signalized intersections, Synchro provides the user with two additional intersection LOS methods: Synchro's Percentile Delay Method and the Intersection Capacity Utilization (ICU) Method. The Percentile Delay Method uses the same numerical delay thresholds as the HCM. In most situations, the delays calculated by the Synchro Percentile and HCM methodologies are similar and will be within a few seconds of each other.

One of the key differences between the two methods (Synchro vs HCM) is the Right-Turn-On-Red (RTOR) operation. In the HCM methods, the RTOR is a volume input by the user and is used as a volume reduction (not a capacity increase). As illustrated in the HCM 6, Volume 4, Chapter 31, page 31-121, the treatment of RTOR operation in the motorized vehicle methodology is simplistic. In addition, HCM 6th Edition states that it may be preferable to use an alternative tool to evaluate RTOR operation.

Based on these considerations, all signalized intersections are evaluated in this report based on the Synchro Percentile Method.

LOS Criteria

LOS is defined in terms of the average vehicle delay. For the purposes of this report, an adequate LOS for each movement is considered when the LOS E is not exceeded.

Signalized intersection LOS

Signalized intersection LOS is defined in terms of the average total vehicle delay of all movements through an intersection.

Volume to Capacity Ratio

The volume to capacity ratio (V/C), also referred to as degree of saturation, represents the sufficiency of an intersection to accommodate the vehicular demand. A V/C ratio less than 0.85 generally indicates that

adequate capacity is available and vehicles are not expected to experience significant queues and delays. As the V/C ratio approaches 1.0, traffic flow may become unstable, and delay and queuing conditions may occur. Once the demand exceeds the capacity (a V/C ratio greater than 1.0), traffic flow is unstable and excessive delay and queuing is expected. Under these conditions vehicles may require more than one signal cycle to pass through the intersection (known as cycle failure). For design purposes, a V/C ratio between 0.85 and 0.95 is generally utilized for the peak hour of the horizon year.

As such, each intersection movement is analyzed to ensure that the threshold value of V/C failure (1.0) is not reached.

It is noted that the westbound through volumes were inflated to reflect a potential traffic demand at two locations along N. Collier Boulevard:

- At N. Barfield Drive – WB through volume – from 1,208 vehicles to 2,000 vehicles (AM peak hour)
- At E. Elkcam Drive – WB through volume – from 805 vehicles to 1,600 vehicles (AM peak hour)

Due to these volumes adjustments, a V/C ratio greater than 1 is projected for the westbound through movement at these locations. It is noted that an adequate LOS is projected for the westbound through movement at these intersections.

Signal Timings

The proposed Synchro Timing Plans for the AM and PM peak hour, peak season traffic conditions for the analyzed intersections (**Appendix B**) are utilized for the purposes of this report.

The intersection analyses illustrate minor signal phasing and timing adjustments aimed at eliminating or reducing operational deficiencies and to accommodate the recommended improvements.

Synchro Analyses Results

The proposed intersection improvements would not impact the overall traffic flow patterns within the study area. Therefore, the projected AM and PM peak hour turning movement volume forecasts for the traffic signal retiming project are also evaluated for the improved geometry conditions at the subject intersections.

The results of the Synchro intersection analyses for AM and PM peak hour conditions are provided in **Appendix C: Intersection Analyses – Synchro Reports**.

Based upon the results of the capacity analyses performed, the subject intersections are shown to operate at acceptable LOS D or better for the AM and PM peak hour, peak season traffic conditions.

Intersection Improvements – Recommendations

Intersection improvements needed to address transportation deficiencies are recommended based on the Synchro analyses results illustrated in **Appendix C**.

In order to allow for increased mainline progression, the improvements proposed in this report are intended to address the minimum LOS requirement for a specific side street deficiency and are not intended to optimize the overall intersection performance.

Consistent with the guidelines presented in the FDOT (Florida Department of Transportation) Design Manual (FDM), Section 232.2, a double left-turn lane is considered for all analyzed signalized intersections, where left turn volumes exceed 300 vph. This report concludes that single left-turn lanes are adequate to accommodate projected vehicular demand for all analyzed intersections.

The turn lane size recommendations provided in this report are based on the 95th percentile queue length for the AM and PM peak hours, as provided by the Synchro intersection analysis. The 95th percentile of queue length is the length of queue that is not projected to be exceeded in 95% of all signal cycles.

Consistent with FDM Section 232.2, the queue length per vehicle is 25 feet. The projected Synchro 95th percentile queue lengths are rounded to the nearest 25 foot interval.

Turn lane size recommendations illustrated in this report include a 50 foot taper (single turn lane).

N. Collier Boulevard at N. Barfield Drive

This intersection is projected to perform with a maximum V/C ratio of 1.05 for the Westbound through movements (AM peak hour).

Recommended improvements

- Add one southbound left-turn lane with a length of 225 feet.
- Add one northbound left-turn lane with a length of 200 feet.
- Extend the westbound left-turn lane for a total of 325 feet.
- Signal modifications to allow protected/permissive phasing for the southbound and northbound left-turn movements.

It is noted that the available storage is adequate for the eastbound left-turn movements. There is an existing full median opening located at approximately 300 feet west of the N. Collier Boulevard and N. Barfield Drive intersection. In order to provide additional stacking to accommodate unforeseen congested traffic conditions and enhance safety performance, the eastbound left-turn lane may be extended for a total length of 250 feet provided the full median opening is closed.

N. Collier Boulevard at E. Elkcam Circle

This intersection is projected to perform with a maximum V/C ratio of 1.07 for the Westbound through movements (AM peak hour).

Recommended improvements

- Add one southbound right-turn lane with a length of 150 feet.
- Add one northbound right-turn lane with a length of 150 feet.
- Signal modifications to allow protected/permissive phasing for the southbound and northbound left-turn movements.

It is noted that the available storage is adequate for the westbound left-turn movements. The existing taper length is approximately 100 feet. It is recommended that the taper length be reduced to 50 feet to allow for additional queueing.

N. Collier Boulevard at W. Elkcam Circle

Recommended improvements

- Signal modifications to allow protected/permissive phasing for the southbound and northbound left-turn movements.

A northbound right-turn lane with a total length of 150 feet may be provided in order to improve intersection operations under occasional heavy traffic conditions.

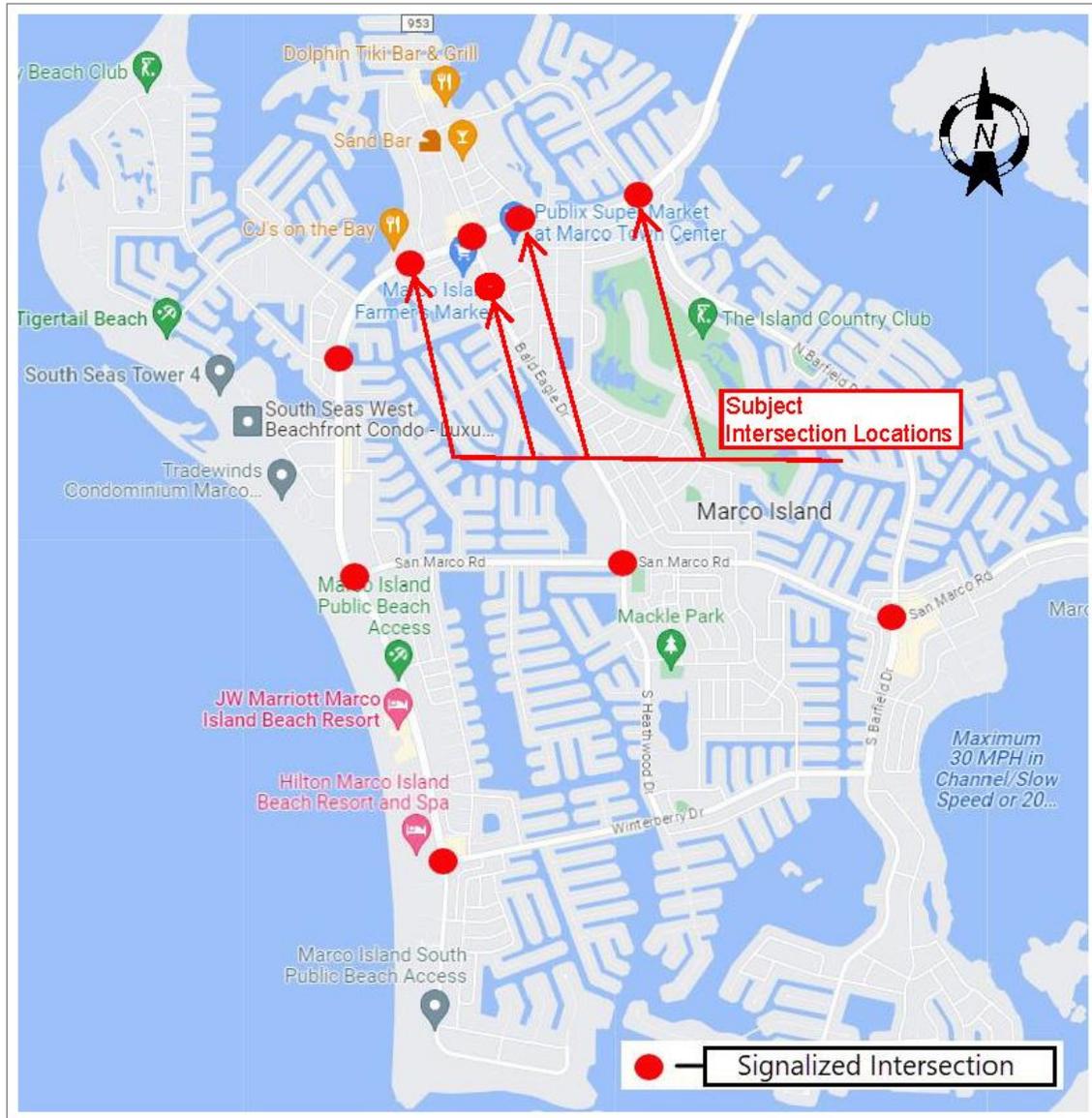
Bald Eagle Drive at Elkcam Circle

The storage capacity of the existing turn lanes exceed the current vehicular demand in both the AM and PM peak hour traffic periods.

In order to improve traffic operations the following improvements are recommended:

- Add one eastbound left-turn lane with a length of 175 feet.
- Convert one westbound shared through/left-turn lane to left-turn lane and restripe to provide a total length of 225 feet (to include a 50 foot taper)
- Convert one westbound right-turn lane to one through lane
- Add one westbound right-turn lane with a length of 150 feet.
- Signal modifications to allow protected/permissive phasing for the westbound and eastbound left-turn movements.

Appendix A:
Intersection Location Map



Appendix B:

Synchro – Proposed Intersection Timing Plans

Pattern 1 - AM Peak

1: Barfield Dr & Collier Blvd

01/13/2023

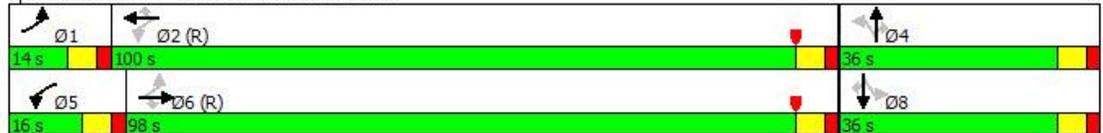


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (vph)	13	622	54	25	120	143	58	53	232	63	43	21
Future Volume (vph)	13	622	54	25	120	143	58	53	232	63	43	21
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4				
Permitted Phases	6		6	2		2	4		4	6		6
Detector Phase	1	6	6	5	2	2	4	4	4	6	6	6
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	16.0	26.0	26.0	16.0	25.0	25.0	33.0	33.0	33.0	33.0	33.0	33.0
Total Split (s)	14.0	98.0	98.0	16.0	100.0	100.0	36.0	36.0	36.0	36.0	36.0	36.0
Total Split (%)	9.3%	65.3%	65.3%	10.7%	66.7%	66.7%	24.0%	24.0%	24.0%	24.0%	24.0%	24.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	110.4	106.5	106.5	110.5	106.5	106.5		24.0	24.0		24.0	24.0
Actuated g/C Ratio	0.74	0.71	0.71	0.74	0.71	0.71		0.16	0.16		0.16	0.16
w/c Ratio	0.10	0.28	0.05	0.05	0.57	0.16		0.87	0.58		0.86	0.12
Control Delay	9.5	14.9	8.2	5.8	13.5	2.9		99.9	10.7		103.1	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	9.5	14.9	8.2	5.8	13.5	2.9		99.9	10.7		103.1	3.2
LOS	A	B	A	A	B	A		F	B		F	A
Approach Delay		14.2			12.2			43.0			82.1	
Approach LOS		B			B			D			F	

Intersection Summary

Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 134 (89%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum w/c Ratio: 0.87
 Intersection Signal Delay: 21.3
 Intersection LOS: C
 Intersection Capacity Utilization 58.6%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 1: Barfield Dr & Collier Blvd



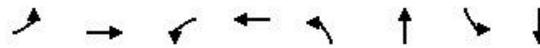
Baseline

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Pattern 1 - AM Peak

2: E. Elkcam Cir & Collier Blvd

01/18/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↖	↕	↖	↕	↖	↕	↖	↕
Traffic Volume (vph)	74	395	172	805	54	117	59	72
Future Volume (vph)	74	395	172	805	54	117	59	72
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	5	2	1	6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	5	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	5.0	15.0	5.0	15.0	5.0	5.0	5.0	5.0
Minimum Split (s)	16.0	27.0	16.0	29.0	16.0	16.0	16.0	16.0
Total Split (s)	18.0	77.0	24.0	83.0	49.0	49.0	49.0	49.0
Total Split (%)	12.0%	51.3%	16.0%	55.3%	32.7%	32.7%	32.7%	32.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?								
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effect Green (s)	100.6	92.6	106.1	95.3	28.6	28.6	28.6	28.6
Actuated g/C Ratio	0.67	0.62	0.71	0.64	0.19	0.19	0.19	0.19
w/c Ratio	0.28	0.23	0.29	0.51	0.37	0.83	0.93	0.45
Control Delay	6.7	4.5	6.0	8.9	56.5	69.9	138.6	47.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.7	4.5	6.0	8.9	56.5	69.9	138.6	47.7
LOS	A	A	A	A	E	E	F	D
Approach Delay		4.9		8.4		67.3		77.1
Approach LOS		A		A		E		E

Intersection Summary

Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 7 (5%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum w/c Ratio: 0.93
 Intersection Signal Delay: 23.0
 Intersection LOS: C
 Intersection Capacity Utilization 67.8%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 2: E. Elkcam Cir & Collier Blvd



Baseline

Synchro 9 Report
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Pattern 1 - AM Peak

4: W. Elkcam Cir & Collier Blvd

01/18/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↖	↕	↖	↕	↖	↕	↖	↕	↖
Traffic Volume (vph)	25	607	52	799	86	9	10	8	15
Future Volume (vph)	25	607	52	799	86	9	10	8	15
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA	Perm
Protected Phases	5	2	1	6		8		4	
Permitted Phases	2		6		8		4		4
Detector Phase	5	2	1	6	8	8	4	4	4
Switch Phase									
Minimum Initial (s)	5.0	15.0	5.0	15.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	16.0	32.0	16.0	47.0	16.0	16.0	34.0	34.0	34.0
Total Split (s)	22.0	85.0	23.0	86.0	42.0	42.0	42.0	42.0	42.0
Total Split (%)	14.7%	56.7%	15.3%	57.3%	28.0%	28.0%	28.0%	28.0%	28.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag					
Lead-Lag Optimize?									
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None
Act Effect Green (s)	115.1	110.0	116.2	110.5	17.6	17.6	17.6	17.6	17.6
Actuated g/C Ratio	0.77	0.73	0.77	0.74	0.12	0.12	0.12	0.12	0.12
w/c Ratio	0.08	0.35	0.14	0.37	0.70	0.29	0.09	0.06	0.12
Control Delay	3.7	6.5	1.6	1.8	84.3	20.9	57.4	56.1	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.7	6.5	1.6	1.8	84.3	20.9	57.4	56.1	1.0
LOS	A	A	A	A	F	C	E	E	A
Approach Delay		6.4		1.8		60.3		28.4	
Approach LOS		A		A		E		C	

Intersection Summary

Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 92 (61%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum w/c Ratio: 0.70
 Intersection Signal Delay: 9.5
 Intersection LOS: A
 Intersection Capacity Utilization 53.8%
 ICU Level of Service A
 Analysis Period (min) 15

Splits and Phases: 4: W. Elkcam Cir & Collier Blvd



Baseline

Synchro 9 Report
Page 4

Pattern 1 - AM Peak

10: Bald Eagle Dr & Elkcam Cir

01/18/2023

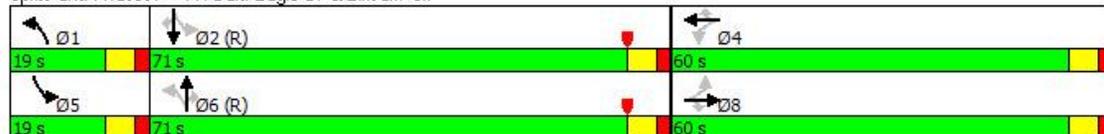


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↗	↖	↗	↖	↗
Traffic Volume (vph)	12	61	90	159	46	85	99	297	186	90	259	34
Future Volume (vph)	12	61	90	159	46	85	99	297	186	90	259	34
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		§			4		1	6		5	2	
Permitted Phases	§		§	4		4	6		6	2		2
Detector Phase	§	§	§	4	4	4	1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	15.0	15.0	5.0	15.0	15.0
Minimum Split (s)	39.0	39.0	39.0	39.0	39.0	39.0	16.0	36.0	36.0	16.0	34.0	34.0
Total Split (s)	60.0	60.0	60.0	60.0	60.0	60.0	19.0	71.0	71.0	19.0	71.0	71.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	12.7%	47.3%	47.3%	12.7%	47.3%	47.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min						
Act Effct Green (s)		38.3	38.3		38.3	38.3	93.8	84.6	84.6	93.6	84.4	84.4
Actuated g/C Ratio		0.26	0.26		0.26	0.26	0.63	0.56	0.56	0.62	0.56	0.56
w/c Ratio		0.23	0.24		0.80	0.22	0.18	0.37	0.23	0.19	0.30	0.07
Control Delay		43.2	7.0		69.3	8.7	11.4	21.3	3.1	17.5	27.2	9.1
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		43.2	7.0		69.3	8.7	11.4	21.3	3.1	17.5	27.2	9.1
LOS		D	A		E	A	B	C	A	B	C	A
Approach Delay		23.2			52.4			14.0			22.8	
Approach LOS		C			D			B			C	

Intersection Summary

Cycle Length: 150	
Actuated Cycle Length: 150	
Offset: 96 (64%), Referenced to phase 2:SBTL and 6:NBTL, Start of Yellow	
Natural Cycle: 95	
Control Type: Actuated-Coordinated	
Maximum w/c Ratio: 0.80	
Intersection Signal Delay: 25.4	Intersection LOS: C
Intersection Capacity Utilization 53.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 10: Bald Eagle Dr & Elkcam Cir



Baseline

Synchro 9 Report
Page 10

Pattern 3 - PM Peak

1: Barfield Dr & Collier Blvd

01/18/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↖	↖	↗	↖		↖	↖		↖	↖
Traffic Volume (vph)	15	1409	69	218	1053	100	76	51	376	125	46	27
Future Volume (vph)	15	1409	69	218	1053	100	76	51	376	125	46	27
Turn Type	pm-rt	NA	Perm	pm-rt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	16.0	26.0	26.0	16.0	25.0	25.0	33.0	33.0	33.0	33.0	33.0	33.0
Total Split (s)	16.0	73.0	73.0	27.0	84.0	84.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	11.4%	52.1%	52.1%	19.3%	60.0%	60.0%	28.6%	28.6%	28.6%	28.6%	28.6%	28.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	78.5	72.5	72.5	97.3	89.9	89.9		30.7	30.7		30.7	30.7
Actuated g/C Ratio	0.56	0.52	0.52	0.70	0.64	0.64		0.22	0.22		0.22	0.22
w/c Ratio	0.06	0.86	0.10	0.89	0.51	0.11		0.81	0.90		0.93	0.09
Control Delay	7.1	31.9	2.3	72.3	15.8	3.5		81.3	49.1		94.6	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	7.1	31.9	2.3	72.3	15.8	3.5		81.3	49.1		94.6	0.4
LOS	A	C	A	E	B	A		F	D		F	A
Approach Delay		30.1			24.1			57.6			80.6	
Approach LOS		C			C			E			F	

Intersection Summary

Cycle Length: 140	
Actuated Cycle Length: 140	
Offset: 86 (61%), Referenced to phase 2:WBTL and 6:EBTL, Start of Yellow	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum w/c Ratio: 0.93	
Intersection Signal Delay: 35.1	Intersection LOS: D
Intersection Capacity Utilization 86.6%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: Barfield Dr & Collier Blvd



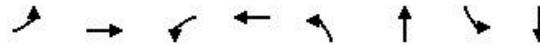
Baseline

Synchro 9 Report
Page 1

Pattern 3 - PM Peak

2: E. Elkcam Cir & Collier Blvd

01/18/2023



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↕	↗	↖	↘	↕	↘	↖	↘
Traffic Volume (vph)	77	957	180	779	61	107	120	102
Future Volume (vph)	77	957	180	779	61	107	120	102
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	5	2	1	6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	5	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	5.0	15.0	5.0	15.0	5.0	5.0	5.0	5.0
Minimum Split (s)	16.0	27.0	16.0	29.0	38.0	38.0	38.0	38.0
Total Split (s)	16.0	63.0	25.0	72.0	52.0	52.0	52.0	52.0
Total Split (%)	11.4%	45.0%	17.9%	51.4%	37.1%	37.1%	37.1%	37.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?								
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effect Green (s)	79.9	71.7	90.2	77.3	36.5	36.5	36.5	36.5
Actuated g/C Ratio	0.57	0.51	0.64	0.55	0.26	0.26	0.26	0.26
w/c Ratio	0.29	0.60	0.62	0.52	0.33	0.77	1.25	0.45
Control Delay	5.7	9.4	13.0	19.7	43.0	47.1	212.6	39.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.7	9.4	13.0	19.7	43.0	47.1	212.6	39.1
LOS	A	A	B	B	D	D	F	D
Approach Delay		9.1		18.5		46.4		106.5
Approach LOS		A		B		D		F

Intersection Summary

Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 5 (4%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
 Natural Cycle: 85
 Control Type: Actuated-Coordinated
 Maximum w/c Ratio: 1.25
 Intersection Signal Delay: 29.0
 Intersection LOS: C
 Intersection Capacity Utilization 83.2%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 2: E. Elkcam Cir & Collier Blvd



Baseline

Synchro 9 Report
Page 2

Pattern 3 - PM Peak

10: Bald Eagle Dr & Elkcam Cir

01/18/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↗	↗	↖	↗	↗
Traffic Volume (vph)	33	30	48	20	39	99	46	361	219	118	356	15
Future Volume (vph)	33	30	48	20	39	99	46	361	219	118	356	15
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Protected Phases		§			4		1	6		5	2	
Permitted Phases	§		§	4		4	6		6	2		2
Detector Phase	§	§	§	4	4	4	1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	15.0	15.0	5.0	15.0	15.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	36.0	36.0	16.0	34.0	34.0
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	16.0	67.0	67.0	23.0	74.0	74.0
Total Split (%)	35.7%	35.7%	35.7%	35.7%	35.7%	35.7%	11.4%	47.9%	47.9%	16.4%	52.9%	52.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min						
Act Effct Green (s)		38.0	38.0		38.0	38.0	81.4	73.9	73.9	87.5	78.8	78.8
Actuated g/C Ratio		0.27	0.27		0.27	0.27	0.58	0.53	0.53	0.62	0.56	0.56
w/c Ratio		0.32	0.13		0.81	0.23	0.11	0.40	0.26	0.25	0.38	0.03
Control Delay		41.8	0.7		64.3	6.7	12.1	23.6	3.5	17.5	27.1	0.7
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		41.8	0.7		64.3	6.7	12.1	23.6	3.5	17.5	27.1	0.7
LOS		D	A		E	A	B	C	A	B	C	A
Approach Delay		24.1			47.5			15.7			23.5	
Approach LOS		C			D			B			C	

Intersection Summary

Cycle Length: 140	
Actuated Cycle Length: 140	
Offset: 94 (67%), Referenced to phase 2:SBTL and 6:NBT, Start of Yellow	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum w/c Ratio: 0.81	
Intersection Signal Delay: 26.0	Intersection LOS: C
Intersection Capacity Utilization 60.8%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 10: Bald Eagle Dr & Elkcam Cir



Baseline

Synchro 9 Report
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Appendix C:
Intersection Analyses – Synchro Reports

N. Collier Boulevard and N. Barfield Drive

Lanes, Volumes, Timings

1: Barfield Dr & Collier Blvd

07/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗	↘	↘	↗	↘	↘	↗	↘	↘	↗	↘
Traffic Volume (vph)	13	622	54	255	2000	143	58	53	232	63	43	21
Future Volume (vph)	13	622	54	255	2000	143	58	53	232	63	43	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		190	160		200	150		190	150		195
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	55			45			50			50		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ft			0.850			0.850			0.850			0.850
Ft Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1413	3094	1411	1477	3036	1333	1562	1613	1358	1533	1569	1371
Ft Permitted	0.043			0.332			0.585			0.709		
Satd. Flow (perm)	64	3094	1411	516	3036	1333	962	1613	1358	1144	1569	1371
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			153			109			276			153
Link Speed (mph)		35			35			28			28	
Link Distance (ft)		2301			1259			1099			1222	
Travel Time (s)		44.8			24.5			26.8			29.8	
Peak Hour Factor	0.55	0.90	0.87	0.93	0.88	0.81	0.69	0.73	0.84	0.83	0.73	0.58
Heavy Vehicles (%)	15%	5%	3%	10%	7%	9%	4%	6%	7%	6%	9%	6%
Adj. Flow (vph)	24	691	62	274	2273	177	84	73	276	76	59	36
Shared Lane Traffic (%)												
Lane Group Flow (vph)	24	691	62	274	2273	177	84	73	276	76	59	36
Turn Type	pm+pt	NA	Perm									
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	16.0	26.0	26.0	16.0	25.0	25.0	11.0	33.0	33.0	11.0	33.0	33.0
Total Split (s)	16.0	76.0	76.0	30.0	90.0	90.0	11.0	33.0	33.0	11.0	33.0	33.0
Total Split (%)	10.7%	50.7%	50.7%	20.0%	60.0%	60.0%	7.3%	22.0%	22.0%	7.3%	22.0%	22.0%
Maximum Green (s)	10.0	70.0	70.0	24.0	84.0	84.0	5.0	27.0	27.0	5.0	27.0	27.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag									
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)		15.0	15.0		14.0	14.0		22.0	22.0		22.0	22.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	100.3	94.1	94.1	114.2	106.6	106.6	19.0	12.8	12.8	16.4	12.7	12.7
Actuated g/C Ratio	0.67	0.63	0.63	0.76	0.71	0.71	0.13	0.09	0.09	0.11	0.08	0.08
w/c Ratio	0.24	0.36	0.07	0.57	1.05	0.18	0.55	0.53	0.75	0.55	0.45	0.14
Control Delay	20.8	24.8	2.1	10.7	58.0	4.3	71.4	78.2	19.8	72.5	74.2	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Pattern 1 - AM Peak Hour Proposed Intersection Improvements

Synchro 11 Report
Page 1

Lanes, Volumes, Timings
1: Barfield Dr & Collier Blvd

07/11/2023

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	20.8	24.8	2.1	10.7	58.0	4.3	71.4	78.2	19.8	72.5	74.2	1.1
LOS	C	C	A	B	E	A	E	E	B	E	E	A
Approach Delay		22.9			49.8			39.6			58.0	
Approach LOS		C			D			D			E	
Queue Length 50th (ft)	10	212	3	68	~1315	21	75	70	0	67	56	0
Queue Length 95th (ft)	16	335	m13	127	#1488	47	91	95	63	103	80	0
Internal Link Dist (ft)		2221			1179			1019			1142	
Turn Bay Length (ft)	165		190	160		200	150		190	150		195
Base Capacity (vph)	134	1940	941	546	2157	978	152	290	470	138	282	372
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.36	0.07	0.50	1.05	0.18	0.55	0.25	0.59	0.55	0.21	0.10

Intersection Summary

Area Type: CBD
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.05
 Intersection Signal Delay: 44.0 Intersection LOS: D
 Intersection Capacity Utilization 91.1% ICU Level of Service F
 Analysis Period (min) 15
 - Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Barfield Dr & Collier Blvd



Lanes, Volumes, Timings

1: Barfield Dr & Collier Blvd

07/16/2023

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	1409	69	218	1053	100	76	51	376	125	46	27
Future Volume (vph)	15	1409	69	218	1053	100	76	51	376	125	46	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		190	160		200	150		190	150		195
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	55			45			50			50		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit			0.850			0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1624	3094	1384	1547	3185	1439	1593	1676	1346	1562	1710	1371
Fit Permitted	0.237			0.049			0.712			0.683		
Satd. Flow (perm)	405	3094	1384	80	3185	1439	1194	1676	1346	1123	1710	1371
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			153			109			397			153
Link Speed (mph)		35			35			28			28	
Link Distance (ft)		2301			1259			1099			1222	
Travel Time (s)		44.8			24.5			26.8			29.8	
Peak Hour Factor	0.81	0.92	0.79	0.87	0.90	0.84	0.79	0.82	0.85	0.81	0.67	0.70
Heavy Vehicles (%)	0%	5%	5%	5%	2%	1%	2%	2%	8%	4%	0%	6%
Adj. Flow (vph)	19	1532	87	251	1170	119	96	62	442	154	69	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	19	1532	87	251	1170	119	96	62	442	154	69	39
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	16.0	26.0	26.0	16.0	25.0	25.0	11.0	33.0	33.0	11.0	33.0	33.0
Total Split (s)	16.0	64.0	64.0	48.0	96.0	96.0	24.0	18.0	18.0	20.0	14.0	14.0
Total Split (%)	10.7%	42.7%	42.7%	32.0%	64.0%	64.0%	16.0%	12.0%	12.0%	13.3%	9.3%	9.3%
Maximum Green (s)	10.0	58.0	58.0	42.0	90.0	90.0	18.0	12.0	12.0	14.0	8.0	8.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)		15.0	15.0		14.0	14.0		22.0	22.0		22.0	22.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	82.3	76.3	76.3	106.3	98.9	98.9	25.1	12.1	12.1	26.3	12.7	12.7
Actuated g/C Ratio	0.55	0.51	0.51	0.71	0.66	0.66	0.17	0.08	0.08	0.18	0.08	0.08
w/c Ratio	0.07	0.97	0.11	0.86	0.56	0.12	0.41	0.46	0.93	0.65	0.48	0.15
Control Delay	10.3	53.3	0.3	70.6	15.8	2.6	55.5	77.5	37.5	66.3	77.3	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Pattern 3 - PM Peak Hour Proposed Intersection Improvements

Synchro 11 Report

Page 1

Lanes, Volumes, Timings
1: Barfield Dr & Collier Blvd

07/16/2023

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	10.3	53.3	0.3	70.6	15.8	2.6	55.5	77.5	37.5	66.3	77.3	1.3
LOS	B	D	A	E	B	A	E	E	D	E	E	A
Approach Delay		50.0			23.7			44.5			59.5	
Approach LOS		D			C			D			E	
Queue Length 50th (ft)	5	754	0	195	337	4	80	59	43	133	65	0
Queue Length 95th (ft)	12	#1051	0	269	407	24	117	101	#194	#185	91	0
Internal Link Dist (ft)		2221			1179			1019			1142	
Turn Bay Length (ft)	165		190	160		200	150		190	150		195
Base Capacity (vph)	314	1573	779	467	2099	985	287	135	473	240	144	255
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.97	0.11	0.54	0.56	0.12	0.33	0.46	0.93	0.64	0.48	0.15

Intersection Summary

Area Type: CBD
 Cycle Length: 150
 Actuated Cycle Length: 150
 Offset: 0 (0%), Referenced to phase 2:WBT L and 6:EBTL, Start of Yellow
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.97
 Intersection Signal Delay: 39.8
 Intersection LOS: D
 Intersection Capacity Utilization 91.8%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Barfield Dr & Collier Blvd



N. Collier Boulevard and E. Elkcarn Circle

Lanes, Volumes, Timings

2: E. Elkcarn Cir & Collier Blvd

07/16/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖	↖	↖	↖	↖
Traffic Volume (vph)	74	395	20	172	1600	117	54	117	119	59	72	41
Future Volume (vph)	74	395	20	172	1600	117	54	117	119	59	72	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	150		0	150		100	145		100
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	50			100			40			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fit		0.991			0.989				0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1593	3043	0	1547	2979	0	1593	1710	1346	1577	1676	1425
Fit Permitted	0.044			0.460			0.500			0.636		
Satd. Flow (perm)	74	3043	0	749	2979	0	838	1710	1346	1066	1676	1425
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			10				139			153
Link Speed (mph)		35			35				28			28
Link Distance (ft)		1050			2301			1156			1147	
Travel Time (s)		20.5			44.8			28.1			27.9	
Peak Hour Factor	0.76	0.89	0.71	0.92	0.87	0.83	0.77	0.81	0.82	0.79	0.79	0.62
Heavy Vehicles (%)	2%	6%	3%	5%	8%	6%	2%	0%	8%	3%	2%	2%
Adj. Flow (vph)	97	444	28	187	1839	141	70	144	145	75	91	66
Shared Lane Traffic (%)												
Lane Group Flow (vph)	97	472	0	187	1980	0	70	144	145	75	91	66
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	16.0	27.0		16.0	29.0		11.0	16.0	16.0	11.0	16.0	16.0
Total Split (s)	16.0	97.0		16.0	97.0		26.0	26.0	26.0	11.0	11.0	11.0
Total Split (%)	10.7%	64.7%		10.7%	64.7%		17.3%	17.3%	17.3%	7.3%	7.3%	7.3%
Maximum Green (s)	10.0	91.0		10.0	91.0		20.0	20.0	20.0	5.0	5.0	5.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None
Walk Time (s)		7.0			5.0			6.0	6.0		6.0	6.0
Flash Dont Walk (s)		14.0			18.0			26.0	26.0		26.0	26.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	101.2	92.3		102.6	93.0		28.8	19.1	19.1	19.7	15.7	15.7
Actuated g/C Ratio	0.67	0.62		0.68	0.62		0.19	0.13	0.13	0.13	0.10	0.10
v/c Ratio	0.69	0.25		0.33	1.07		0.32	0.66	0.50	0.48	0.52	0.23
Control Delay	72.2	3.9		10.4	57.9		54.1	77.5	16.2	66.5	75.9	1.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0

Pattern 1 - AM Peak Hour Proposed Intersection Improvements

Synchro 11 Report

Page 1

Lanes, Volumes, Timings

2: E. Elkcam Cir & Collier Blvd

07/16/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	72.2	3.9		10.4	57.9		54.1	77.5	16.2	65.5	75.9	1.9
LOS	E	A		B	E		D	E	B	E	E	A
Approach Delay		15.6			53.8			48.2			51.5	
Approach LOS		B			D			D			D	
Queue Length 50th (ft)	69	35		81	~1136		57	136	5	62	87	0
Queue Length 95th (ft)	92	50		m87	m#1033		88	190	53	97	#161	0
Internal Link Dist (ft)		970			2221			1076			1067	
Turn Bay Length (ft)	200			150			150		100	145		100
Base Capacity (vph)	152	1875		567	1850		268	228	299	155	174	285
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.25		0.33	1.07		0.26	0.63	0.48	0.48	0.52	0.23

Intersection Summary

Area Type:	CBD
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	0 (0%), Referenced to phase 2:EB TL and 6:WBTL, Start of Yellow
Natural Cycle:	140
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	1.07
Intersection Signal Delay:	46.5
Intersection LOS:	D
Intersection Capacity Utilization:	83.1%
ICU Level of Service:	E
Analysis Period (min):	15
-	Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: E. Elkcam Cir & Collier Blvd



Lanes, Volumes, Timings

2: E. Elkcam Cir & Collier Blvd

07/16/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	967	34	180	779	79	61	107	219	120	102	67
Future Volume (vph)	77	967	34	180	779	79	61	107	219	120	102	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	150		0	150		100	145		100
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	50			100			40			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fit		0.993			0.985				0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1608	3107	0	1577	3134	0	1593	1676	1384	1608	1693	1439
Fit Permitted	0.228			0.159			0.675			0.447		
Satd. Flow (perm)	386	3107	0	264	3134	0	1132	1676	1384	757	1693	1439
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			13				255			164
Link Speed (mph)		35			35			28				28
Link Distance (ft)		1050			2301			1156				1147
Travel Time (s)		20.5			44.8			28.1				27.9
Peak Hour Factor	0.82	0.95	0.73	0.86	0.87	0.78	0.79	0.89	0.86	0.87	0.80	0.75
Heavy Vehicles (%)	1%	4%	0%	3%	2%	3%	2%	2%	5%	1%	1%	1%
Adj. Flow (vph)	94	1007	47	209	895	101	77	120	255	138	128	89
Shared Lane Traffic (%)												
Lane Group Flow (vph)	94	1054	0	209	996	0	77	120	255	138	128	89
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8		8	4		4
Detector Phase	5	2		1	6		3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	16.0	27.0		16.0	29.0		11.0	38.0	38.0	11.0	38.0	38.0
Total Split (s)	16.0	68.0		27.0	79.0		30.0	15.0	15.0	30.0	15.0	15.0
Total Split (%)	11.4%	48.6%		19.3%	56.4%		21.4%	10.7%	10.7%	21.4%	10.7%	10.7%
Maximum Green (s)	10.0	62.0		21.0	73.0		24.0	9.0	9.0	24.0	9.0	9.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max		None	None	None	None	None	None
Walk Time (s)		7.0			5.0			6.0	6.0		6.0	6.0
Flash Dont Walk (s)		14.0			18.0			26.0	26.0		26.0	26.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
Act Effct Green (s)	78.1	69.6		88.7	75.6		27.4	16.8	16.8	36.5	21.3	21.3
Actuated g/C Ratio	0.56	0.50		0.63	0.54		0.20	0.12	0.12	0.26	0.15	0.15
w/c Ratio	0.33	0.68		0.69	0.59		0.30	0.60	0.66	0.48	0.50	0.25
Control Delay	8.2	13.5		24.8	23.5		42.5	72.0	15.4	46.4	62.4	1.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0

Pattern 3 - PM Peak Hour Proposed Intersection Improvements

Synchro 11 Report

Page 1

Lanes, Volumes, Timings

2: E. Elkcam Cir & Collier Blvd

07/16/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	8.2	13.5		24.8	23.5		42.5	72.0	15.4	46.4	62.4	1.7
LOS	A	B		C	C		D	E	B	D	E	A
Approach Delay		13.0			23.7			35.1			41.0	
Approach LOS		B			C			D			D	
Queue Length 50th (ft)	9	117		75	313		53	104	0	100	107	0
Queue Length 95th (ft)	36	241		120	370		85	#220	74	155	160	0
Internal Link Dist (ft)		970			2221			1076			1067	
Turn Bay Length (ft)	200			150			150		100	145		100
Base Capacity (vph)	306	1547		366	1697		381	200	389	351	258	358
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.68		0.57	0.59		0.20	0.60	0.66	0.39	0.50	0.25

Intersection Summary

Area Type: CBD
 Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 0 (0%), Referenced to phase 2:EB TL and 6:WBTL, Start of Yellow
 Natural Cycle: 105
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.69
 Intersection Signal Delay: 23.4 Intersection LOS: C
 Intersection Capacity Utilization 70.7% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 2: E. Elkcam Cir & Collier Blvd



N. Collier Boulevard and W. Elkcam Circle

Lanes, Volumes, Timings

4: W. Elkcam Cir & Collier Blvd

07/20/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↖↗		↖	↖		↖	↖	↖
Traffic Volume (vph)	25	607	119	52	799	34	86	9	44	10	8	15
Future Volume (vph)	25	607	119	52	799	34	86	9	44	10	8	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		0	100		0	150		0	60		60
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	60			40			50			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fit		0.970			0.992			0.877				0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1624	3127	0	1577	3129	0	1624	1488	0	1624	1710	1454
Fit Permitted	0.264			0.278			0.428			0.711		
Satd. Flow (perm)	451	3127	0	462	3129	0	732	1488	0	1216	1710	1454
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29			5			58				109
Link Speed (mph)		25			25							28
Link Distance (ft)		2455			1304			1243				1110
Travel Time (s)		67.0			35.6			30.3				27.0
Peak Hour Factor	0.66	0.86	0.67	0.78	0.90	0.70	0.74	0.71	0.76	0.66	0.63	0.52
Heavy Vehicles (%)	0%	1%	0%	3%	3%	3%	0%	0%	1%	0%	0%	0%
Adj. Flow (vph)	38	706	178	67	888	49	116	13	58	15	13	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	884	0	67	937	0	116	71	0	15	13	29
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Detector Phase	5	2		1	6		3	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	16.0	32.0		16.0	47.0		11.0	16.0		11.0	34.0	34.0
Total Split (s)	18.0	80.0		18.0	80.0		32.0	20.0		32.0	20.0	20.0
Total Split (%)	12.0%	53.3%		12.0%	53.3%		21.3%	13.3%		21.3%	13.3%	13.3%
Maximum Green (s)	12.0	74.0		12.0	74.0		26.0	14.0		26.0	14.0	14.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	None
Walk Time (s)		7.0			9.0					7.0	7.0	
Flash Dont Walk (s)		19.0			32.0					21.0	21.0	
Pedestrian Calls (#/hr)		0			0						0	0
Act Effct Green (s)	107.0	101.6		108.5	102.3		25.5	19.9		12.3	6.7	6.7
Actuated g/C Ratio	0.71	0.68		0.72	0.68		0.17	0.13		0.08	0.04	0.04
v/c Ratio	0.10	0.42		0.17	0.44		0.54	0.29		0.13	0.17	0.17
Control Delay	4.2	11.0		13.5	29.3		63.1	21.5		50.7	73.4	2.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0

Pattern 1 - AM Peak Hour Proposed Intersection Improvements

Synchro 11 Report

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Lanes, Volumes, Timings

4: W. Elkcam Cir & Collier Blvd

07/20/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	4.2	11.0		13.5	29.3		63.1	21.5		50.7	73.4	2.2
LOS	A	B		B	C		E	C		D	E	A
Approach Delay		10.7			28.3			47.3			31.2	
Approach LOS		B			C			D			C	
Queue Length 50th (ft)	8	287		34	407		101	11		12	13	0
Queue Length 95th (ft)	9	337		m42	m396		125	36		23	25	0
Internal Link Dist (ft)		2375			1224			1163			1030	
Turn Bay Length (ft)	185			100			150			60		60
Base Capacity (vph)	428	2126		434	2135		296	256		305	159	234
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.09	0.42		0.15	0.44		0.39	0.28		0.05	0.08	0.12

Intersection Summary

Area Type:	CBD
Cycle Length:	150
Actuated Cycle Length:	150
Offset:	0 (0%), Referenced to phase 2:EB TL and 6:WBTL, Start of Yellow
Natural Cycle:	110
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.54
Intersection Signal Delay:	22.5
Intersection LOS:	C
Intersection Capacity Utilization:	56.9%
ICU Level of Service:	B
Analysis Period (min):	15
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 4: W. Elkcam Cir & Collier Blvd



Lanes, Volumes, Timings

4: W. Elkcam Cir & Collier Blvd

07/20/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	1160	45	96	923	50	118	12	45	36	8	26
Future Volume (vph)	50	1160	45	96	923	50	118	12	45	36	8	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		0	100		0	150		0	60		60
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	60			40			50			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fit		0.993			0.989			0.895				0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1624	3196	0	1624	3181	0	1624	1520	0	1593	1710	1454
Fit Permitted	0.223			0.139			0.354			0.755		
Satd. Flow (perm)	381	3196	0	238	3181	0	605	1520	0	1266	1710	1454
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			9			54				117
Link Speed (mph)		25			25			28				28
Link Distance (ft)		2455			1304			1243			1110	
Travel Time (s)		67.0			35.6			30.3			27.0	
Peak Hour Factor	0.82	0.93	0.79	0.81	0.93	0.66	0.83	0.53	0.84	0.85	0.55	0.56
Heavy Vehicles (%)	0%	1%	0%	0%	1%	1%	0%	0%	1%	2%	0%	0%
Adj. Flow (vph)	61	1247	57	119	992	76	142	23	54	42	15	46
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	1304	0	119	1068	0	142	77	0	42	15	46
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		4
Detector Phase	5	2		1	6		3	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	16.0	32.0		16.0	47.0		11.0	16.0		11.0	34.0	34.0
Total Split (s)	16.0	82.0		19.0	85.0		27.0	16.0		23.0	12.0	12.0
Total Split (%)	11.4%	58.6%		13.6%	60.7%		19.3%	11.4%		16.4%	8.6%	8.6%
Maximum Green (s)	10.0	76.0		13.0	79.0		21.0	10.0		17.0	6.0	6.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max		None	None		None	None	None
Walk Time (s)		7.0			9.0						7.0	7.0
Flash Dont Walk (s)		19.0			32.0						21.0	21.0
Pedestrian Calls (#/hr)		0			0						0	0
Act Effct Green (s)	94.2	87.1		98.8	91.1		26.1	13.9		13.7	6.3	6.3
Actuated g/C Ratio	0.67	0.62		0.71	0.65		0.19	0.10		0.10	0.04	0.04
w/c Ratio	0.19	0.66		0.47	0.51		0.62	0.39		0.29	0.19	0.26
Control Delay	4.3	11.8		18.2	31.6		61.1	27.9		50.1	70.2	3.5
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0

Pattern 3 - PM Peak Hour Proposed Intersection Improvements

Synchro 11 Report
Page 1

Lanes, Volumes, Timings

4: W. Elkcam Cir & Collier Blvd

07/20/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	4.3	11.8		18.2	31.6		61.1	27.9		50.1	70.2	3.5
LOS	A	B		B	C		E	C		D	E	A
Approach Delay		11.4			30.3			49.5			32.2	
Approach LOS		B			C			D			C	
Queue Length 50th (ft)	7	134		69	484		114	19		32	13	0
Queue Length 95th (ft)	m15	622		m94	m595		160	22		61	24	0
Internal Link Dist (ft)		2375			1224			1163			1030	
Turn Bay Length (ft)	185			100			150			60		60
Base Capacity (vph)	352	1989		301	2074		274	199		240	78	178
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.17	0.66		0.40	0.51		0.52	0.39		0.17	0.19	0.26

Intersection Summary

Area Type:	CBD
Cycle Length:	140
Actuated Cycle Length:	140
Offset:	0 (0%), Referenced to phase 2:EB TL and 6:WBTL, Start of Yellow
Natural Cycle:	110
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.66
Intersection Signal Delay:	22.9
Intersection LOS:	C
Intersection Capacity Utilization:	72.1%
ICU Level of Service:	C
Analysis Period (min):	15
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 4: W. Elkcam Cir & Collier Blvd



Bald Eagle Drive and Elkcarn Circle

Lanes, Volumes, Timings

10: Bald Eagle Dr & Elkcarn Cir

07/17/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (vph)	12	61	90	159	46	85	99	297	186	90	259	34
Future Volume (vph)	12	61	90	159	46	85	99	297	186	90	259	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		130	175		100	275		275	285		0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	50			50			50			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit			0.850			0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1624	1693	1398	1562	1598	1411	1593	1660	1384	1608	1613	1232
Fit Permitted	0.715			0.509			0.440			0.390		
Satd. Flow (perm)	1223	1693	1398	837	1598	1411	738	1660	1384	660	1613	1232
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			136			136			227			136
Link Speed (mph)		28			28			35			35	
Link Distance (ft)		929			785			1442			901	
Travel Time (s)		22.6			19.1			28.1			17.6	
Peak Hour Factor	0.59	0.80	0.76	0.80	0.72	0.83	0.85	0.78	0.82	0.80	0.85	0.66
Heavy Vehicles (%)	0%	1%	4%	4%	7%	3%	2%	3%	5%	1%	6%	18%
Adj. Flow (vph)	20	76	118	199	64	102	116	381	227	113	305	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	76	118	199	64	102	116	381	227	113	305	52
Turn Type	pm+pt	NA	Perm									
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		2
Detector Phase	3	8	8	7	4	4	1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	15.0	15.0	5.0	15.0	15.0
Minimum Split (s)	11.0	39.0	39.0	11.0	39.0	39.0	16.0	36.0	36.0	16.0	34.0	34.0
Total Split (s)	11.0	39.0	39.0	16.0	44.0	44.0	16.0	49.0	49.0	16.0	49.0	49.0
Total Split (%)	9.2%	32.5%	32.5%	13.3%	36.7%	36.7%	13.3%	40.8%	40.8%	13.3%	40.8%	40.8%
Maximum Green (s)	5.0	33.0	33.0	10.0	38.0	38.0	10.0	43.0	43.0	10.0	43.0	43.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag									
Lead-Lag Optimize?	Yes											
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Recall Mode	None	Min	Min	None	Min	Min						
Walk Time (s)		12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		18.0	18.0		16.0	16.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	16.4	11.3	11.3	27.3	23.9	23.9	37.3	30.5	30.5	36.4	27.6	27.6
Actuated g/C Ratio	0.20	0.14	0.14	0.33	0.29	0.29	0.45	0.37	0.37	0.44	0.34	0.34
v/c Ratio	0.07	0.33	0.38	0.54	0.14	0.20	0.27	0.62	0.35	0.29	0.56	0.10
Control Delay	23.4	39.2	9.0	29.9	29.0	3.8	12.2	27.6	4.3	12.3	26.5	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Pattern 1 - AM Peak Hour Proposed Intersection Improvements

Synchro 11 Report

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Lanes, Volumes, Timings

10: Bald Eagle Dr & Elkcam Cir

07/17/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	23.4	39.2	9.0	29.9	29.0	3.8	12.2	27.6	4.3	12.3	26.5	0.4
LOS	C	D	A	C	C	A	B	C	A	B	C	A
Approach Delay		21.1			22.5			17.8			20.2	
Approach LOS		C			C			B			C	
Queue Length 50th (ft)	7	36	0	78	23	0	29	167	0	28	125	0
Queue Length 95th (ft)	17	78	20	144	57	16	56	226	32	51	200	0
Internal Link Dist (ft)		849			705			1362			821	
Turn Bay Length (ft)	125		130	175		100	275		275	285		
Base Capacity (vph)	269	697	655	368	757	740	449	891	848	422	865	724
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.11	0.18	0.54	0.08	0.14	0.26	0.43	0.27	0.27	0.35	0.07

Intersection Summary

Area Type:	CBD
Cycle Length:	120
Actuated Cycle Length:	82.2
Natural Cycle:	105
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.62
Intersection Signal Delay:	19.8
Intersection LOS:	B
Intersection Capacity Utilization:	54.4%
ICU Level of Service:	A
Analysis Period (min):	15

Splits and Phases: 10: Bald Eagle Dr & Elkcam Cir



Lanes, Volumes, Timings

10: Bald Eagle Dr & Elkcam Cir

07/17/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (vph)	33	30	48	208	39	99	46	361	219	118	356	15
Future Volume (vph)	33	30	48	208	39	99	46	361	219	118	356	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		130	175		100	275		275	285		0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	50			50			45			50		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit			0.850			0.850			0.850			0.850
Fit Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1577	1598	1411	1593	1660	1454	1562	1660	1371	1624	1660	1411
Fit Permitted	0.723			0.421			0.407			0.360		
Satd. Flow (perm)	1200	1598	1411	706	1660	1454	669	1660	1371	616	1660	1411
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			136			136			235			136
Link Speed (mph)		28			28			35			35	
Link Distance (ft)		929			785			1442			901	
Travel Time (s)		22.6			19.1			28.1			17.6	
Peak Hour Factor	0.66	0.82	0.73	0.88	0.75	0.83	0.73	0.93	0.93	0.82	0.90	0.63
Heavy Vehicles (%)	3%	7%	3%	2%	3%	0%	4%	3%	6%	0%	3%	3%
Adj. Flow (vph)	50	37	66	236	52	119	63	388	235	144	396	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	50	37	66	236	52	119	63	388	235	144	396	24
Turn Type	pm+pt	NA	Perm									
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		2
Detector Phase	3	8	8	7	4	4	1	6	6	5	2	2
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	15.0	15.0	5.0	15.0	15.0
Minimum Split (s)	11.0	16.0	16.0	11.0	16.0	16.0	11.0	36.0	36.0	11.0	34.0	34.0
Total Split (s)	23.0	16.0	16.0	23.0	16.0	16.0	11.0	70.0	70.0	11.0	70.0	70.0
Total Split (%)	19.2%	13.3%	13.3%	19.2%	13.3%	13.3%	9.2%	58.3%	58.3%	9.2%	58.3%	58.3%
Maximum Green (s)	17.0	10.0	10.0	17.0	10.0	10.0	5.0	64.0	64.0	5.0	64.0	64.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag									
Lead-Lag Optimize?	Yes											
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
Recall Mode	None	Min	Min	None	Min	Min						
Walk Time (s)		12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		18.0	18.0		16.0	16.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	14.3	9.3	9.3	26.3	18.8	18.8	32.5	27.2	27.2	34.5	30.8	30.8
Actuated g/C Ratio	0.18	0.12	0.12	0.34	0.24	0.24	0.42	0.35	0.35	0.44	0.40	0.40
w/c Ratio	0.20	0.19	0.23	0.58	0.13	0.26	0.19	0.67	0.37	0.42	0.60	0.04
Control Delay	22.2	39.5	1.9	27.2	29.9	6.6	13.2	28.7	4.5	17.4	26.2	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Pattern 3 - PM Peak Hour Proposed Intersection Improvements

Synchro 11 Report

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Lanes, Volumes, Timings

10: Bald Eagle Dr & Elkcam Cir

07/17/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay	22.2	39.5	1.9	27.2	29.9	6.6	13.2	28.7	4.5	17.4	26.2	0.1
LOS	C	D	A	C	C	A	B	C	A	B	C	A
Approach Delay		17.6			21.5			19.0			22.9	
Approach LOS		B			C			B			C	
Queue Length 50th (ft)	16	18	0	86	22	0	17	170	0	41	175	0
Queue Length 95th (ft)	34	47	0	175	50	29	30	268	44	68	275	0
Internal Link Dist (ft)		849			705			1362			821	
Turn Bay Length (ft)	125		130	175		100	275		275	285		
Base Capacity (vph)	471	217	309	465	402	455	340	1335	1148	341	1335	1161
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.17	0.21	0.51	0.13	0.26	0.19	0.29	0.20	0.42	0.30	0.02

Intersection Summary

Area Type:	CBD
Cycle Length:	120
Actuated Cycle Length:	77.9
Natural Cycle:	75
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.67
Intersection Signal Delay:	20.6
Intersection LOS:	C
Intersection Capacity Utilization:	62.8%
ICU Level of Service:	B
Analysis Period (min):	15

Splits and Phases: 10: Bald Eagle Dr & Elkcam Cir

